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This document has been distributed for information and comment to:

Title	Name	Date sent	Comments received
HRA – Portsmouth Harbour SPA – Oyster Dredging (v1.2)	Natural England	03/02/2016	23/03//2016
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Southern Inshore Fisheries and Conservation Authority (IFCA)

Fisheries in EMS Habitats Regulations Assessment for amber and green risk categories

European Marine Site: Portsmouth Harbour SPA (UK9011051)

Feature(s): Nationally and **i**nternationally important populations of regularly occurring migratory species (Dark-bellied brent goose; Red-breasted merganser; Black-tailed godwit; Dunlin)

Generic Feature(s): Estuarine birds

Site Specific Sub-feature(s)/Supporting Habitat(s): Intertidal mudflats and sandflats

Generic Sub-feature(s)/Supporting Habitat(s): Intertidal mud and sand

Gear type(s) Assessed: Oyster dredging

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1. Introduction

1.1 Need for an HRA assessment

Southern IFCA has duties under Regulation 9(3) of the Conservation of Habitats and Species Regulations 2010 as a competent authority, with functions relevant to marine conservation to exercise those functions so as to secure compliance with the Habitats Directive. Article 6.2 of the Habitats Directive requires appropriate steps to be taken to avoid, in Natura 2000 sites, the deterioration of natural habitats and habitats of species as well as significant disturbance of the species for which the area has been classified.

Management of European Marine Sites is the responsibility of all competent authorities which have powers or functions which have, or could have, an impact on the marine area within or adjacent to a European Marine Site (EMS). Under section 36 of the Species and Habitats Regulations (2010):

"The relevant authorities, or any of them, may establish for a European marine site a management scheme under which their functions (including any power to make byelaws) are to be exercised so as to secure in relation to that site compliance with the requirements of the Habitats Directive."

Within the Solent EMS such a management scheme has been developed in the form of the SEMS management scheme which was established in 2004. This resulted in the establishment of a framework for the effective management of the Solent EMS so that the conservation objectives are met. The key principles of the management scheme are included in Annex 2.

In the SEMs Management Group 2015 Monitoring Report, fishing activities have been flagged to be a high risk or (Tier 1) activity. High risk activities are considered as potentially representing a high risk and/or not having sufficient "systems in place to ensure they are managed in line with the Habitats Regulations" and, therefore, requiring further management consideration. During the 2015 consultation a request was made to reduce the risk of fishing activity from high to medium risk. The response from the group was that in order to do this a clear audit and evidence trail would be required to reduce the risk. This assessment, in line with Article 6.2 of the Habitats Directives, will form part of that audit trail, as will other assessments regarding the fishing activities within the Solent EMS. It is considered that some level of management will be required for high risk activities within the EMS.

This audit trail will be achieved through Southern IFCA's responsibilities under the revised approach to the management of commercial fisheries in European Marine sites announced by the Department for Environment, Food and Rural Affairs (DEFRA).

The objective of this revised approach is to ensure that all existing and potential commercial fishing activities in European Marine Sites are managed in accordance with Article 6 of the Habitats Directive. Articles 4.1 and 4.2 of the Birds Directive also require that the Member States ensure the species mentioned in Annex I and regularly occurring migratory bird species are subject to special conservation measures concerning their habitat in order to ensure survival and reproduction in their area of distribution. This affords Special Protection Areas (SPAs) a similar protection regime to that of Special Areas of Conservation (SACs).

This approach is being implemented using an evidence-based, risk-prioritised, and phased approach. Risk prioritisation is informed by using a matrix of the generic sensitivities of the sub-features of the EMS to a suite of fishing activities as a decision making tool. These sub-feature-

activity combinations have been categorised according to specific definitions, as red[1], amber[2], green[3] or blue[4].

Activity/feature interactions identified within the matrix as red risk have the highest priority for implementation of management measures by the end of 2013 in order to avoid the deterioration of Annex I features in line with obligations under Article 6(2) of the Habitats Directive.

Activity/feature interactions identified within the matrix as amber risk require a site-level assessment to determine whether management of an activity is required to conserve site features. Activity/feature interactions identified within the matrix as green also require a site level assessment if there are "in-combination effects" with other plans or projects.

Site level assessments are being carried out in a manner that is consistent with the provisions of Article 6(3) of the Habitats Directive, but are required to meet the 6(2) responsibilities of Southern IFCA as a competent authority. The aim of the assessment will be to consider if the activity could significantly disturb the species or deteriorate natural habitats or the habitats of the protected species and from this, a judgement can be made as to whether or not the conservation measures in place are appropriate to maintain and restore the habitats and species for which the site has been designated to a favourable conservation status (Article 6(2)). If measures are required, the revised approach requires these to be implemented by 2016.

The purpose of this site specific assessment document is to assess whether or not in the view of Southern IFCA the fishing activity 'Oyster Dredging' has a likely significant effect on the Nationally and internationally important populations for regularly occurring migratory species and supporting habitats of the Portsmouth Harbour SPA, and as part of this assessment to test whether the proposed management measures will be sufficient to ensure that the Southern IFCA meets its responsibilities as a Competent Authority and ensure that the conservation objectives will be met in relation to Oyster Dredging over the features/supporting habitats of the Portsmouth Harbour SPA.

1.2 Documents reviewed to inform this assessment

- SEMs Annual Monitoring Report 2015
- SEMs Delivery Plan 2014
- Natural England's risk assessment Matrix of fishing activities and European habitat features and protected species[5]
- Reference list[6] (Annex 1)

[1] Where it is clear that the conservation objectives for a feature (or sub-feature) will not be achieved because of its sensitivity to a type of fishing, - irrespective of feature condition, level of pressure, or background environmental conditions in all EMSs where that feature occurs – suitable management measures will be identified and introduced as a priority to protect those features from that fishing activity or activities.
[2] Where there is doubt as to whether the conservation objectives for a feature (or sub-feature) will be achieved because of its sensitivity to a type of fishing, in all EMSs where that feature occurs, the effect of that activity or activities on such features will need to be assessed in detail at a site specific level. Appropriate management action should then be taken based on that assessment.
[3] Where it is clear that the achievement of conservation objectives for a feature is highly unlikely to be affected by a type of fishing activity or activities, in all EMSs where that feature occurs, further action is not likely to be required, unless there is the potential for in combination effects.
[4] For gear types where there can be no feasible interaction between the gear types and habitat features, a fourth categorisation of blue is used, and no management action should be necessary.
[5] See Fisheries in EMS matrix:
http://www.marinemanagement.org.uk/protecting/conservation/documents/ems_fisheries/populated_matrix3.xls

- Natural England's Regulation 33 advice[7]/Natural England's interim conservative advice
- Site map(s) – supporting habitats location and extent (Annex 3)
- Fishing activity data (map(s), etc) (Annex 4)
- Fisheries Impact Evidence Database (FIED)
- Natural England's scoping advice on the potential impacts of oyster dredging within the Solent (Annex 5)

2. Information about the EMS

- Portsmouth Harbour SPA (UK9011051)

2.1 Overview and qualifying features

- **Nationally and internationally important populations of the regularly occurring migratory species** (A046a Branta bernicla bernicla; Dark-bellied brent goose (Non-breeding); A069 Mergus serrator; Red-breasted merganser (Non-breeding); A149 Calidris alpina alpina; Dunlin (Non-breeding); A156 Limosa limosa islandica; Black-tailed godwit (Non-breeding))
    - Saltmarsh
    - Intertidal mudflats and sandflats
    - Shallow coastal waters

Please refer to Annex 3 for a map of supporting habitats.

Portsmouth Harbour is located on the central south coast of England. It is a large industrialised estuary and includes one of the four largest expanses of mud-flats and tidal creeks on the south coast of Britain. The mud-flats support large beds of Narrow-leaved Eelgrass Zostera angustifolia and Dwarf Eelgrass Z. noltii, extensive green algae beds, mainly Enteromorpha species, and Sea Lettuce Ulva lactuca. Portsmouth Harbour has only a narrow connection to the sea via the Solent, and receives comparatively little fresh water, thus giving it an unusual hydrology. The site supports important numbers of wintering Dark-bellied Brent Goose Branta b. bernicla, which feed also in surrounding agricultural areas away from the SPA.[8]

2.2 Conservation Objectives

The conservation objective for the Portsmouth Harbour SPA features:

- Nationally and internationally important populations of the regularly occurring migratory species

are to "ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site**."**

[6] Reference list will include literature cited in the assessment (peer, grey and site specific evidence e.g. research, data on natural disturbance/energy levels etc)
[7] Solent EMS Regulation 33 Conservation Advice: http://publications.naturalengland.org.uk/publication/3194402
[8] Information taken from: http://jncc.defra.gov.uk/default.aspx?page=2036

The high level conservation objectives for the Portsmouth Harbour SPA are available online at: http://publications.naturalengland.org.uk/publication/4857883850178560

3. Interest feature(s) of the EMS categorised as 'Red' risk and overview of management measure(s) (if applicable)

- Subtidal eelgrass *Zostera marina* beds

A red risk interaction between bottom towed gears and eelgrass/seagrass beds was identified and subsequently addressed through the creation of the 'Bottom Towed Fishing Gear' byelaw[9] and 'Prohibition of Gathering (Sea Fisheries Resources) in Seagrass Beds' byelaw[10]. The 'Bottom Towed Fishing Gear' prohibits the use any bottom towed fishing gear within sensitive areas (characterised by reef features or eelgrass/seagrass beds) in European Marine Sites throughout the district. The byelaw also states that if transiting through a prohibited area carrying bottom towed fishing gear, all parts of the gear are inboard and above the sea. Within the Solent EMS, which includes north of the Isle of Wight, all eastern harbours and Southampton Water, there are 20 prohibited areas. The 'Prohibition of Gathering (Sea Fisheries Resources) in Seagrass Beds' byelaw prevents digging, fishing for or taking any sea fisheries resource in or from prohibited areas containing eelgrass/seagrass beds in European Marine Sites throughout the district. Exceptions to the prohibition include if a net, rod and line or hook and line are used, in addition to the use of a vessel as long as the vessel's hull is not in contact with the seabed. It is also prohibited to carry a rake, spade, fork or any similar tool within specified areas. Within the Solent EMS, which includes north of the Isle of Wight, all eastern harbours and Southampton Water, there are 25 prohibited areas.

4. Information about the fishing activities within the site

4.1 Activities under Consideration/Summary of Fishery

The native oyster (*Ostrea edulis*) has been historically fished in the Solent since the 18th century. Oyster dredging is an established fishing activity in the Solent and the modern fishery developed during the 1960s. From 1972 till 2006 was Europe's largest self-sustaining flat oyster fishery, peaking between 1970 and 1980. From 2007, the population and fishery have been declining. The reason for the decline remains unknown but is likely to be caused by a combination of factors.

The target species of the fishery is the Native oyster (*Ostrea edulis*) although catches may include the non-native Pacific oyster (*Crassostrea gigas*).

Up until 2010, the fishery was managed by the Solent Oyster Fishery Order 1980, a regulating order which limited the vessels entering the vessel and operated a closed season (1st March – 31st October). In 2010, it was decided the regulating order would not be renewed due to the ongoing decline of the fishery and the area is now a public fishery. Management of the fishery after 2010 is summarised in Table 1. This includes closure of the wider Solent from 2013/14 season onwards which was achieved using the 'Temporary Closure of Shellfish Beds' byelaw.

[9] Bottom Towed Fishing Gear Byelaw: https://secure.toolkitfiles.co.uk/clients/25364/sitedata/files/PDFbyelaw_bottomtowedfishi.pdf
[10] Prohibition of Gathering (Sea Fisheries Resources) in Seagrass Beds Byelaw: https://secure.toolkitfiles.co.uk/clients/25364/sitedata/files/PDFbyelaw_prohibitionofgat.pdf

Table 1. Management of the Solent oyster fishery after the Solent Fishery Order 1980 expired in 2010 in response to continued declines in the population.

Season	Management
2010/11	Regulating order expired and fishery became public fishery. Closed season still operated from 1st March till 31st October.
2011/12	Closed season 1st March till 31st October.
2012/13	Closed season 1st March till 31st October.
2013/14	Public fishery was closed in the wider Solent (including Southampton Water) and a shorter season of four weeks from 31st October. Eastern harbours, Langstone and Portsmouth remained open for the shorter season.
2014/15	Public fishery was closed in the wider Solent (including Southampton Water) and a shorter season of two weeks from 31st October. Eastern harbours, Langstone and Portsmouth remained open for the shorter season.
2015/16	Public fishery was closed in the wider Solent (including Southampton Water) and a shorter season of two weeks from 31st October. Eastern harbours, Langstone and Portsmouth remained open for the shorter season.
2016/17	Public fishery will be shut in the wider Solent (including Southampton Water). Eastern harbours, Langstone and Portsmouth, will default to the 'Oyster Close Season' byelaw (i.e. open for four months between November and February).

4.2 Technical Gear Specifications

A type of mechanical dredge, known as a ladder dredge is used to fish for oysters in the Portsmouth Harbour SPA. A ladder dredge consists of a metal frame with parallel bars at the base of the dredge mouth which form a 'ladder', a set of skis at both ends of the dredge base and a posterior mesh chain-link bag used to collect oysters (Figure 1). The skis allow the dredge to sit on the seabed whilst being towed. Unwanted debris passes and sediment pass through the mesh chain-link bag. A diving plate is fitted to the top of the dredge and helps to stabilise the dredge during deployment. The ladder, which reduces penetration into the sediment when compared with toothed dredges such those used for clam dredging in the Solent, can be up to 8.5 cm long, with parallel bars spaced approximately 4.5 cm apart. As stipulated by the 'Oyster Dredges' byelaw (see section 6.4), the width of a dredge cannot exceed 1.5 m in width.

Figure 1. Ladder style oyster dredge similar to those used within the Solent oyster fishery. One or two dredges are deployed side by side, depending on the size of the boat, from the stern. The dredge is typically deployed using a mechanized winch to lower the gear to the sea bed and lift it back onto the vessel. The dredge is attached to the vessel using a metal wire and is towed along the seabed in straight lines in the direction of the boat. Once back on deck, the dredge is emptied onto sorting table where the catch is sorted and sized.

4.3 Location, Effort and Scale of Fishing Activities

Oyster dredging takes place in distinct, small spatial areas, where shellfish beds exist. Fishing effort is typically focused upon subtidal habitats. Historical oyster beds within the wider Solent, which have been closed since the 2013/2014 season, are illustrated in Figure 2. Oyster dredging within the eastern harbours is concentrated subtidally within the channels.

Sightings data from the 2014/15 and 2015/16 season, illustrated in Annex 4, show oyster dredging occurred throughout Portsmouth Harbour, with the vast majority of sightings taking place within the channels. A number of sightings are concentrated in the upper reaches on both the eastern and western channels. In the north eastern quarter of the harbour, a number of sightings show that oyster dredging also takes place on the fringes of the intertidal, with a limited number of sightings occurring on the intertidal in an area known as Tipner Lake.

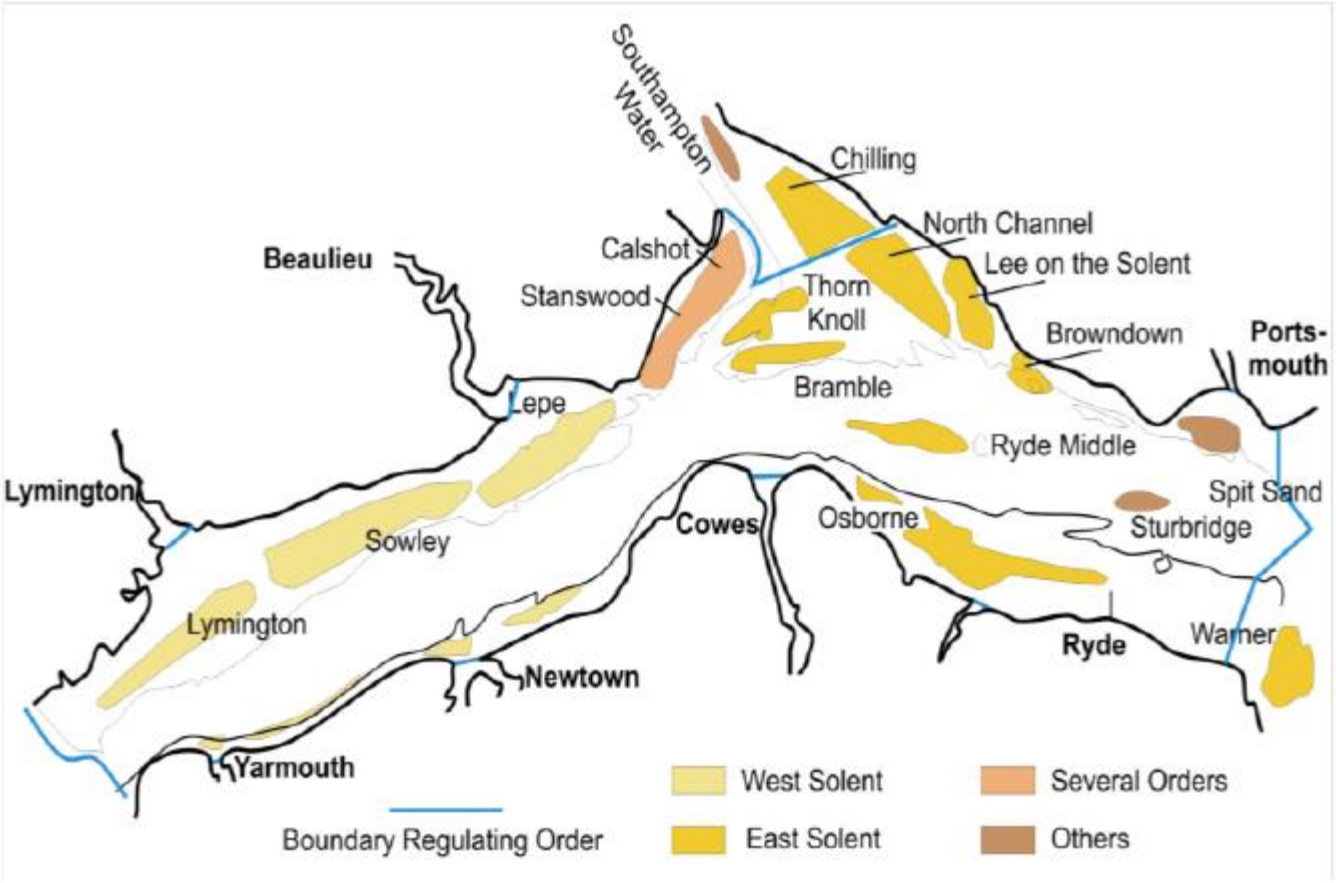

Figure 2. Historical Native oyster (*Ostrea edulis*) grounds in the wider Solent. Source: Palmer & Firmin, 2011.

The numbers of vessels participating within the fishery has largely declined over the last ten years or more. In 2002/03, the fishery supported 77 licenses and in 2009/10 the number of licenses had declined to 22 (Figure 3). The Solent regulating order expired in 2009/10, removing the need for individual oyster license. In recent years (2013/14 & 2014/15 seasons), the number of vessels participating in the fishery has ranged from between 12 to 15 in Chichester, 3 in Langstone and 3 in Portsmouth Harbour. In 2014/15 season, high levels of catches were sustained in Portsmouth Harbour for approximately three days. After this initial period, 2 boats continued to fish for the remaining duration of the two week season. Fishing effort in Langstone Harbour remained light as a result of shellfish classification closures by the Food Standards Agency which closed off larger areas of the harbour to fishing. In Chichester Harbour, the fishery was closed by Sussex IFCA after 3 days. In 2015/16 season, there were relatively low catches from Portsmouth Harbour, with approximately 5 to 10 vessels fishing on the first day with some finishing early, 3 to 4 vessels on the second day and 1 vessel continuing to fish for the first week. The start of the oyster season in Chichester Harbour commenced a day after that of Portsmouth Harbour. A number of vessels moved from Portsmouth Harbour to Chichester Harbour, where catches were sustained for approximately 8 days. In Langstone Harbour, shellfish classification closures limited fishing activity to one vessel, which obtained the correct paperwork and fished for two days.

The number of vessels sighted by Southern IFCA in the 2014/15 season is summarised in Table 2. The number of vessels sighted totalled 14, with 8 being sighted twice or more during the two week season.

Table 2. Oyster dredging vessel sightings in the eastern harbours in the Solent (predominantly Portsmouth Harbour) in the 2014/15 oyster season, from data collected during sea and land patrols.

Year	Month	No. of fishing vessels sighted	No. of fishing vessels sighted twice or more	No. of fishing vessels sighted 5 times or more	No. of fishing vessels sighted 10 times or more
2014	November	14	8	1	0

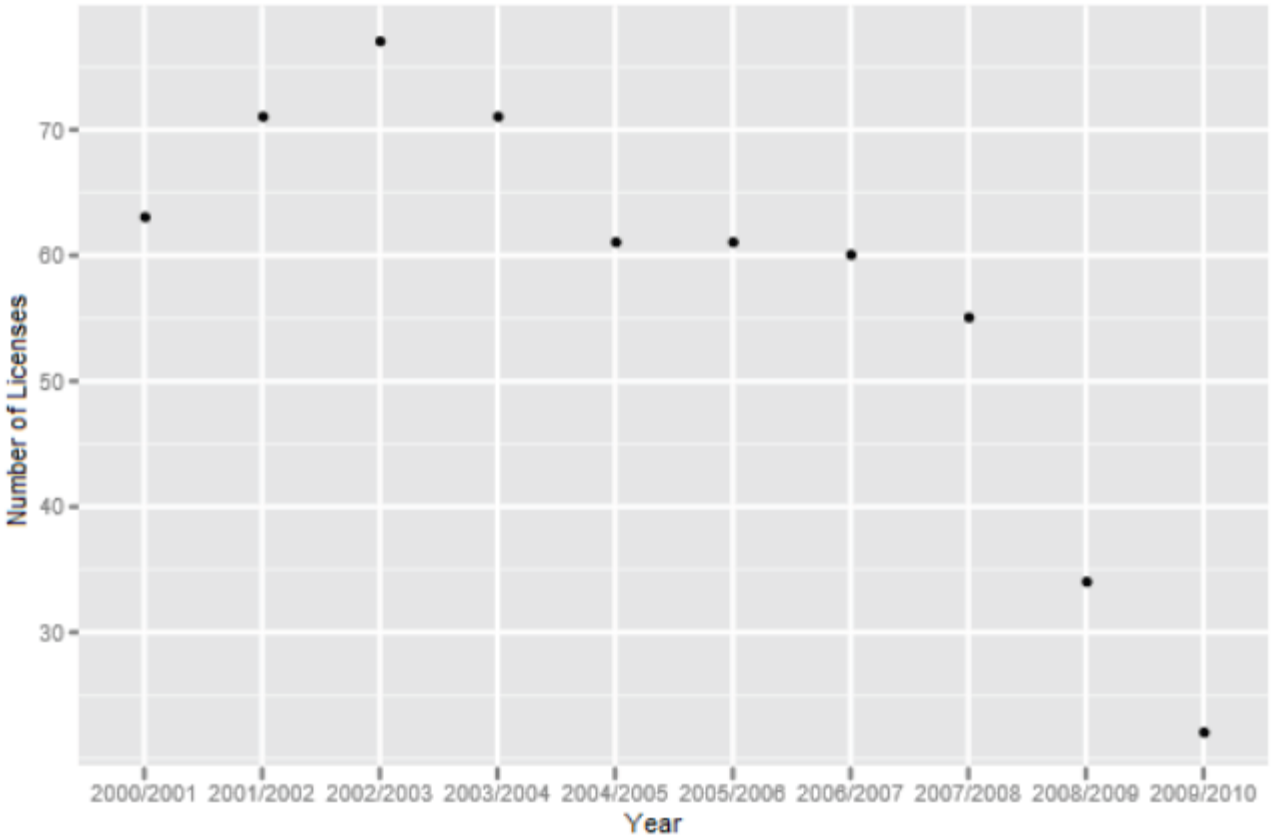

Figure 3. The number of licenses taken out for the Solent oyster fishery between 2000 and 2010 from the Southern Sea Fisheries Committee (SSFC). Source: Kamphausen, 2012.

the decline observed since 2007 onwards, with a large drop of 60% in the landings of oysters observed between 2007 and 2008 (Figure 4). Since then, landings have continued to decline year on year, except for a slight increase in 2011, with landings of only 12.4 tonnes in 2014. It is important to note that typically the oyster season (1st November until the last day in February) spans over two years, so landings from seasons prior to 2013/14 cannot be directly compared. Despite this, yearly landings still clearly demonstrate the steep decline in native oyster population. The landings data show the greatest quantities of oysters between 2005 and 2014 were landed into Portsmouth, followed by much smaller quantities landed into the Isle of Wight and then Southampton (Table 3). Please note that landings data should be viewed with caution, although reflective of the overall trends of the fishery. Exact figures are not always accurate; however this data represents the best available information to date.

Table 3. Landings (in tonnes) of the native oyster (*Ostrea edulis*) into ports located within the Solent European Marine Site (EMS). Data was provided by the Marine Management Organisation (MMO).

	Landings (Tonnes)									
Port of Landing	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Cowes		2.0	11.1	1.0	1.0	0.8				
Emsworth		5.7	18.5	3.1		1.6	3.2	0.3	1.7	1.1

Hamble	46.8	12.5	4.0	3.5	1.7		0.2			
Isle of Wight	64.0	60.0	56.3	7.8	1.1		3.9			
Lymington and Keyhaven	2.1	39.8	27.9	8.0	5.4	12.3	1.0	1.1	3.5	
Portsmouth	496.8	405.0	423.9	210.5	127.2	83.9	100.8	71.9	26.2	11.3
Southampton	47.5	49.6	27.0	5.3	5.0	3.3	1.5	4.3	4.2	
Total	**657.2**	**574.6**	**568.7**	**239.3**	**141.4**	**102.0**	**110.5**	**77.5**	**35.6**	**12.4**

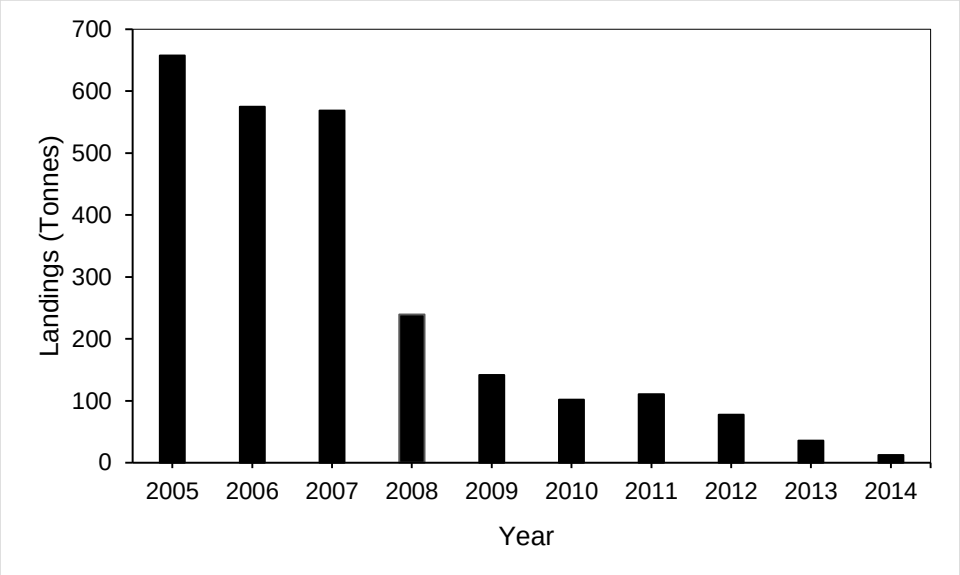

Figure 4. Total landings (in tonnes) of the Native oyster (*Ostrea edulis*) into ports located within the Solent European Marine Site (EMS). Data was provided by the Marine Management Organisation (MMO).

5. Test of Likely Significant Effect (TLSE)

The Habitats Regulations Assessment (HRA) is a step-wise process and is first subject to a coarse test of whether a plan or project will cause a likely significant effect on an EMS[11]. Each feature/supporting habitat was subject to a TLSE, the results of which are summarised in table 4 and 5.

5.1 Table 4: Summary of LSE Assessment(s) – Estuarine birds

1. Is the activity/activities directly connected with or necessary to the management of the site for nature conservation?	**No**

[11] Managing Natura 2000 sites: http://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm

<table>
<tr><td>2. What potential pressures, exerted by the gear type(s), are likely to affect the feature(s)/supporting habitat(s)?</td><td colspan="2">Regulation 35 Advice (Draft)/SPA Toolkit:
1. Above water noise/Underwater noise changes/Displacement
2. Changes in suspended solids (water clarity)/Increased turbidity
3. Collision above/below water with static or moving objects
4. Hydrocarbon and PAH contamination
5. Introduction of light
6. Introduction of microbial pathogens
7. Introduction of other substances
8. Introduction or spread of non-indigenous species
9. Synthetic compound contamination
10. Transition elements and organo-metal
11. Visual disturbance/Displacement
12. SPA Toolkit: Competition for prey
13. SPA Toolkit: Changes in food availability</td></tr>
<tr><td rowspan="3">3. Is the feature(s)/supporting habitat(s) likely to be exposed to the pressure(s) identified?</td><td>Pressure</td><td>Screening - Justification</td></tr>
<tr><td>1.</td><td>IN – Vessels can operate close inshore, although effort is focused subtidally, and noise disturbance can result from the presence/movement of fishing vessels and operation of fishing gear. The magnitude of disturbance and displacement is influenced by the intensity of fishing (no. of vessels, frequency and duration) and the activities relative proximity to sensitive bird species (wildfowl & waders). Further investigation is therefore necessary into the scale activity and location of sensitive bird species.</td></tr>
<tr><td>11.</td><td>IN – Vessels can operate close inshore, although effort is focused subtidally, and visual disturbance is possible from the presence/movement of fishing vessels and operation of fishing gear. The magnitude of disturbance and displacement is influenced by the intensity of fishing (no. of vessels, frequency and duration) and the activities relative proximity to sensitive bird species (wildfowl & waders). Further investigation is therefore necessary into the scale activity and location of sensitive bird species.</td></tr>
</table>

	13.	IN – Oyster dredging can have an indirect impact on bird species by affecting the availability of prey through community structure changes as a result of physical disturbance, removal/mortality of non-target organisms, smothering of prey species and physical damage to supporting habitats. Further assessment of oyster dredging impacts on non-target species is needed, with consideration given to the sensitivity of different prey types and the key prey groups of different bird features. It is also important to note that oyster dredging is focused upon sub-tidal habitats so any disturbance to benthic organisms/potential prey species is likely to occur subtidally.
4. What key attributes of the site are likely to be affected by the identified pressure(s)?	Regulation 35 Advice (Draft)/Scoping Advice: - Supporting habitat: minimising disturbance caused by human activity - Supporting habitat: food availability within supporting habitat - Supporting habitat: extent and distribution of supporting non-breeding habitat - Supporting habitat: landform	
5. Potential scale of pressures and mechanisms of effect/impact (if known)	Refer to full LSE	
6. Is the potential scale or magnitude of any effect likely to be significant?	**Alone** Yes	**OR In-combination**[12] N/A
6. Have NE been consulted on this LSE test? If yes, what was NE's advice?	Please refer to letters from Natural England dated 23/03/2016 & 29/04/16.	

5.2 Table 5: Summary of LSE Assessment(s) – Intertidal mud and sand; Intertidal mixed sediments

1. Is the activity/activities directly connected with or necessary to the management of the site for nature conservation?	**No**

[12] If conclusion of LSE alone an in-combination assessment is not required.

2. What potential pressures, exerted by the gear type(s), are likely to affect the feature(s)/supporting habitat(s)?	Regulation 35 Advice (Draft): 1. Abrasion/disturbance of the substrate on the surface of the seabed/ Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion 2. Introduction of other substances 3. Introduction or spread of non-indigenous species 4. Physical change (to another seabed type) 5. Siltation rate changes (high), including smothering	
3. Is the feature(s)/supporting habitat(s) likely to be exposed to the pressure(s) identified?	Pressure	Screening - Justification
	1.	IN – Oyster dredging is known to cause abrasion and subsurface disturbance to the seabed. Supporting habitats including intertidal mudflats and sandflats all considered vulnerable to physical damage by abrasion. The exposure to activities and one-off developments that may cause abrasion is higher for intertidal mudflats, sandflats and mixed sediment communities. Repeated or permanent damage can adversely affect the ability of the habitats to recover and may ultimately lead to loss. Further assessment on the local of vessel sightings, supporting habitats and species distribution is necessary to confirm this.
4. What key attributes of the site are likely to be affected by the identified pressure(s)?	Regulation 35 Advice (Draft)/Scoping Advice: - Supporting habitat: landform	
5. Potential scale of pressures and mechanisms of effect/impact (if known)	Refer to full LSE.	
6. Is the potential scale or magnitude of any effect likely to be significant?	**Alone** Yes	**OR In-combination**[13] N/A
6. Have NE been consulted on this LSE test? If yes, what was NE's advice?	Please refer to letters from Natural England dated 23/03/2016 & 29/04/16.	

[13] If conclusion of LSE alone an in-combination assessment is not required.

6. Appropriate Assessment

6.1 Co-location of Fishing Activity and Site Features/Supporting habitats(s)

Key areas favoured by designated bird species in the Portsmouth Harbour SPA are summarised in table 6.

Table 6. Key areas for designated bird species in the Portsmouth Harbour SPA. Source: Portsmouth Harbour Draft Regulation 35 Advice.

Common Name	Latin Name	Favoured Area(s)
Dunlin	*Calidris alpina*	**At high tide**, dunlin roost on pontoons near Wicor Shore, on saltmarsh at RNAD Gosport, Bedenham or on an island adjacent to Priddy's Hard. Dunlin also fly over to Langstone Harbour to roost at high tide (Potts, 2014). **At low tide**, dunlin feed in high densities in the north western corner of the harbour around Cams Bay and Wicor Lake. High densities also feed at Foulton Lake and along the western side of the harbour (Austin et al., 2014). See also low tide WeBS data distribution maps presented in Annex 7 and 8.
Dark-bellied brent goose	*Branta bernicla bernicla*	**At low tide**, high densities of brent geese often feed at Paulsgrove Lake and Portchester in the north and also at Foulton Lake in the west of the harbour (Austin et al., 2014). Pewit Island is an important high tide feeding site for dark-bellied brent geese within the SPA (King, 2010). In the Solent, dark-bellied brent geese show diverse feeding habits and will also feed at high tide in areas outside the SPA. These areas include farmland with cereals and pasture along with amenity grasslands and coastal grazing marsh (King, 2010). Important **high tide** feeding sites are RNAD Gosport in Bedenham, Cams Hall, Portchester, Priddy's Hard, Tipner Ranges, St George's playing field and Port Solent on Horsea Island (King, 2010; Potts, 2014). See also low tide WeBS data distribution maps presented in Annex 7 and 8.
Black-tailed godwit	*Tadorna tadorna*	**At high tide**, black-tailed godwits roost on upper saltmarsh areas in Portsmouth Harbour and on coastal grazing marsh outside the SPA boundary. Important roost sites are located at RNAD Gosport in Bedenham, Pewit Island and at Farlington Marshes in Langstone Harbour. In wet weather, black-tailed godwits also move between Portsmouth Harbour and Titchfield Haven in the Meon Valley (Potts, 2014).

		At low tide, high densities of black-tailed godwit feed on the mudflats in the north western section of Portsmouth Harbour at Cams Bay and Wicor Lake (Austin et al., 2014). See also low tide WeBS data distribution maps presented in Annex 7 and 8.
Red-breasted merganser	*Mergus serrator*	No information available.

In general, areas of particular importance are located in RNAD Gosport in Bedenham, Pewit Island, Cams Bay, Wicor Lake, Priddy's Hard and Forton Lake. Bird roosting sites from the Solent Waders and Brent Goose Strategy are presented in Annex 9 and data provided in the Solent Overwintering Birds Workshop is presented in Annex 10.

A map of oyster dredge sightings from the 2014/15 and 2015/16 seasons and supporting habitats can be found in Annex 6. This map reveals where fishing activity occurs in relation to the designated supporting habitats of the site. In Portsmouth Harbour, oyster dredging is shown to occur within the main channels, with a number of sightings on the fringes of intertidal mud and very limited number of sightings occurring on the intertidal mud. As oyster dredging is concentrated subtidally, it is unlikely that the activity will have any effect (through disturbance or changes to prey availability) on feeding sites that are utilised by a number of designated bird species at low tide. Using knowledge presented in table 6 and low tide WeBS data distribution maps (presented in Annex 7 and 8), oyster dredging in areas where sightings which occur on the fringes of the intertidal mud may affect Dunlin and dark-bellied Brent geese including an area west of Whale Island, Wicor, Tipner and Frater Lake, as well as black-tailed godwits including areas in the vicinity of Frater Lake and Wicor. It is important to note that low tide WeBS data, illustrated in Annex 7 and 8, will be indicative of when birds are feeding at low tide and during low tide oyster dredging will be restricted to the channels, so it is likely that oyster dredging will have very little direct impact on the disturbance of designated bird species feeding on the intertidal sediments. Oyster dredging may affect other designated bird species, such as the red-breasted merganser, which is a diving duck that feeds on small fish.

Please note that the low tide count WeBS data distribution map displayed in Annex 8 represent counts made in 2008/09. This map represents dot density and not the location of individual counts. It is important to note that the low tide count WeBS data collection is undertaken in the Solent during the winter period on neap tides, two hours either side of low water. This means a number of areas will be missed as they will be covered by water and is particularly true in Portsmouth Harbour. On a spring tide a larger area of the intertidal is exposed and this can lead to a greater number of birds. The maps can therefore only provide a snap shot in time.

6.2 Potential Impacts on Birds and Supporting Habitats

The potential impacts of shellfish dredging on Portsmouth Harbour SPA designated bird species, identified by Natural England (2014), include direct impacts through disturbance and displacement caused by human activity and competition for prey and indirect impacts through changes in prey availability. Wheeler *et al*. (2014) identified a knowledge gap on the effects of shellfish dredging due to a lack of research.

The scale of impact caused by shellfish dredging depends on a number of factors which include the scale and intensity of harvest, the size of targeted shellfish, species taken, season, weather, availability of alternative foraging sites, competition and extent of alternate food resources (Stillman *et al*., 2001; Goss-Custard *et al*., 2004; Verhulst *et al*., 2004; West *et al*., 2005).

6.2.1 Changes in prey availability

Prey availability can be modified directly through the targeted removal of shellfish species that also form a prey item of designated bird species and indirectly through physical disturbance or damage to supporting habitats which can result in changes to community structure, the removal and mortality of non-target organisms through interaction with fishing gear and smothering of prey species through increased sedimentation (Natural England, 2014).

Direct competition

Commercial shellfisheries can provide a potential source of conflict by competing with the same food resources as certain bird species (Schmechel, 2001; Atkinson *et al*., 2003). The removal of food resources by shellfishing therefore has the potential to have detrimental effects on the amount of food available per bird and subsequently increases the chance of a threshold being reached where mortality from starvation begins to increase (West *et al*., 2005; Navedo *et al*., 2008). The removal of shellfish from productive beds, along with associated disturbance, can drive birds from preferred feeding grounds to areas of poorer quality. This can lead to an increase in bird densities and a subsequent intensification of interference and exploitation competition for food which can reduce intake rate and probability of starvation, particularly in winter (Goss-Custard & Verboven, 1993; Clark, 1993; Goss-Custard *et al*., 1996). It is important to understand to what degree bird species are able to switch to other food resources, if their target species (that may also be the target species of the fishery) is reduced (Schmechel, 2001). It was reported by Zwarts *et al*. (1996a) that along the north west European coast there are limited possibilities of alternative prey items for certain bird species, especially in winter due to changes in availability (Schmechel, 2001). Using individual behaviour-based models it has been shown that shellfish stocks should not fall below 2.5 to 8 times the biomass that shorebird populations require to survive (Stillman *et al*. 2003; Goss-Custard *et al*. 2004; Stillman *et al*. 2010).

A link has been shown between the state of shellfish stocks and oystercatcher survival in the Wash (Schmechel, 2001). The Wash, constitutes an important estuary for supporting large numbers of wintering waterfowl (310 000), including internationally important numbers of knot and oystercatcher (Schmechel, 2001; Atkinson *et al*., 2003). The area also supports one of the three major cockle fisheries in Britain (Atkinson *et al*., 2003). The majority of cockle harvesting involves the use of continuous delivery hydraulic suction dredges (Bannister, 1998; 1999). Between 1990 and 1999, stocks of cockles and mussels collapsed following a period of poor recruitment and high levels of fishing effort in the 1980s (Bannister, 1998; 1999). During this period, oystercatcher populations fell from 110,000 to 40,000 (Atkinson *et al*., 2000). Population modelling has confirmed that declines in the availability of these prey items were associated with changes in oystercatcher survival between 1970 and 1998, which included three periods of mass mortality (Atkinson *et al*., 2003). Oystercatchers are particularly sensitive to low cockle stocks in

years where stocks of mussels are also low and in the Wash, it is thought that mussels act as a buffer during periods when cockle numbers are low (Atkinson *et al*., 2003; Velhurst *et al*., 2004). In the Wash, oystercatcher mortality occurred during winters when stocks of both species were low (Atkinson *et al*., 2003).

Atkinson *et al*. (2010) investigated overall changes in the waterbird assemblage in the Wash between 1980-1982 and 2002-2003. During this study period, the waterbird assemblage underwent a gradual change from one being dominated by species with a high proportion of bivalves or 'other' prey i.e. crustaceans and fish in their diet to those with a higher proportion of worms (Atkinson *et al*., 2010). Three winters in this period were characterised by elevated levels of oystercatcher mortality, 5 to 13 times greater than normal winter levels (Atkinson *et al*., 2010). The great declines were observed in oystercatcher, knot and shelduck (Atkinson *et al*., 2010). Bar-tailed godwit and grey plover showed large increases over the study period. As expected, these changes were found to be significantly related to mussel and cockle stock levels and nutrient levels to a lesser extent (Atkinson *et al*., 2010). Six out of 11 bird species investigated, showed significantly lower rates of annual change in the 10 years before and after the crash of mussel stocks (which occurred during 1992) (Atkinson *et al*., 2010).

There have also been changes in the bird populations in other areas were cockle fisheries are known exist. Like the Wash, the Burrey Inlet cockle fishery saw a decrease in the number of oystercatchers feeding in the inlet for a number of years, in response to removal of less than 25% of available cockle stocks (Norris *et al*., 1998). Oystercatcher numbers remained stable or slightly increased from 1970 to 1986, before declining through to 1993 and then recovering slightly (Schmechel, 2001). In the Thames, there has been a consistent increase in the number of birds from 5000 in the 1970s to 16000 in 1997/98, despite a simultaneous increase in cockle dredging (Schmechel, 2001).

Stillman *et al*. (2001) used a behaviour-based model to investigate the effects of present-day management regimes of the Exe estuary mussel fishery and Burry Inlet cockle fishery on the survival and numbers of overwintering oystercatchers. Results of the study concluded that at present intensities (2 fishing units in the Exe estuary and 50 fishing units in Burry Inlet) in both fisheries does not cause oystercatcher mortality to be higher than it would be in absence of the activity (Stillman *et al*., 2001). Theoretical changes in management, such as fishing effort, a reduction in the minimum size of target species and increase in the daily catch quota were shown to have an impact on oystercatcher mortality and population size (Stillman *et al*., 2001). Different fishing methods were investigated as part of the study. The model predicted the use of dredges on either estuary increased the time birds would spent feeding and the use of supplementary feeding areas (Stillman *et al*., 2001). As would be expected, the removal rates of mussels and cockles using mussel dredges and suction dredges were much greater that hand-raking or hand-picking (Stillman *et al*., 2001). Sixty suction dredges could kill all the Burry Inlet oystercatchers (Stillman *et al*., 2001). Hand-raking for mussels however was found to reduce the area of beds, permanently increase interference and disturb birds, temporarily increasing interference, whilst dredging for mussels only decreased bed area (Stillman *et al*., 2001). The varying impacts of different fishing methods reflect differences in the way they deplete shellfish stocks (Stillman *et al*., 2001).

Size of prey species

The exact role of the fishery and its effect on bird population, as a result of direct competition, will largely depend on the different size fractions of the stock that may be exploited by fishers and birds (Schmechel, 2001). Whilst there may be an overlap in the size of cockles taken by both fishers and birds, most bird predation is of a smaller size class than fishers take (Norris *et al*., 1998). If sizes overlap there can be a genuine conflict of interest between the birds and the fishery, therefore larger minimum sizes are therefore more favourable to birds (Lambeck *et al*., 1996). Oystercatchers have shown a preference for older cockles, 20 to 40 mm, and will not take cockles less than 10 mm when these larger size classes are available (Hulscher, 1982; Zwarts *et al*., 1996a). On the other hand, oystercatchers do not necessarily chose the largest cockles as they are difficult to handle, with studies reporting that larger cockles were refused more often than small ones (Zwarts *et al*. 1996a). Oystercatchers are known to refuse small prey due to low profitability and the size of cockles left after fishing may therefore have an impact on feeding rate of the oystercatcher (Zwarts *et al*. 1996b; Wheeler *et al*., 2014).

Indirect effects

Fishing activity can have indirect impact upon birds by affecting the availability of prey through pathways that do not include targeted removal (Natural England, 2014). In general, bottom towed fishing gear has been shown to reduce biomass, production and species richness and diversity of benthic communities where fishing activities take place (Veale *et al*., 2000; Hiddink *et al*., 2003). Alterations in the size structure of populations and community are also known to occur (Roberts *et al*., 2010). When dredges are towed along the seafloor, surface dwelling organisms can be removed; crushed, buried or exposed and sessile organisms will be removed from the substrate surface (Mercaldo-Allen & Goldberg, 2011). Direct burial or smothering of infaunal and epifaunal organisms is possible due to enhanced sedimentation rates (Mercaldo-Allen & Goldberg, 2011). In a meta-analysis of 39 studies investigating the effects of bottom towed gear, there was an overall reduction of 46% in the abundance of individuals within disturbed (fished) plots (Collie *et al*., 2000). In studies investigating the effect of intertidal dredging, it was common to observe 100% removal of biogenic fauna (Collie *et al*., 2000). This was observed in an experimental study conducted in Langstone Harbour, where the fauna were seen to either be completed removed or considerably reduced by the dredging activity using a modified oyster dredge (EMU, 1992). In the same study, species richness was also found to decrease with a mean number of 6.5 species in the control site compared with 4.4 in the dredge site (EMU, 1992). The magnitude of the response of fauna to bottom towed fishing gear varied with gear type, habitat (including sediment type) and among taxa (Collie *et al*., 2000).

In a study by Ferns *et al*. (2000), bird feed activity increased shortly after the mechanical harvesting of cockles using a tractor, particularly in areas of muddy sand rather than in areas of clean sand. Gulls and waders took advantage of the invertebrates made available by harvesting. For example, 80 dunlins and seven curlews were observed feeding on harvested areas 6 days after harvesting. Following this increase, the level of bird activity declined in areas of muddy sand when compared with control areas and become particularly apparent 21 and 45 days after harvest (Figure 4). Levels of bird activity remained significantly lower in curlews and gulls for more than 80 days after harvesting and in oystercatchers for more than 50 days. Any initial net benefit of harvesting was matched by decreased feeding opportunities in the winter. Harvesting large areas however would not result in a neutral effects, firstly as the bird population would not be large enough to fully exploit the enhanced feeding opportunities and secondly the subsequent reduction in feeding opportunities would extend over a longer period of time (Ferns *et al*., 2000). Other effects would include the migration of birds into unharvested areas which would then lead to increased bird densities in these areas (Sutherland & Goss-Custard 1991; Goss-Custard 1993).

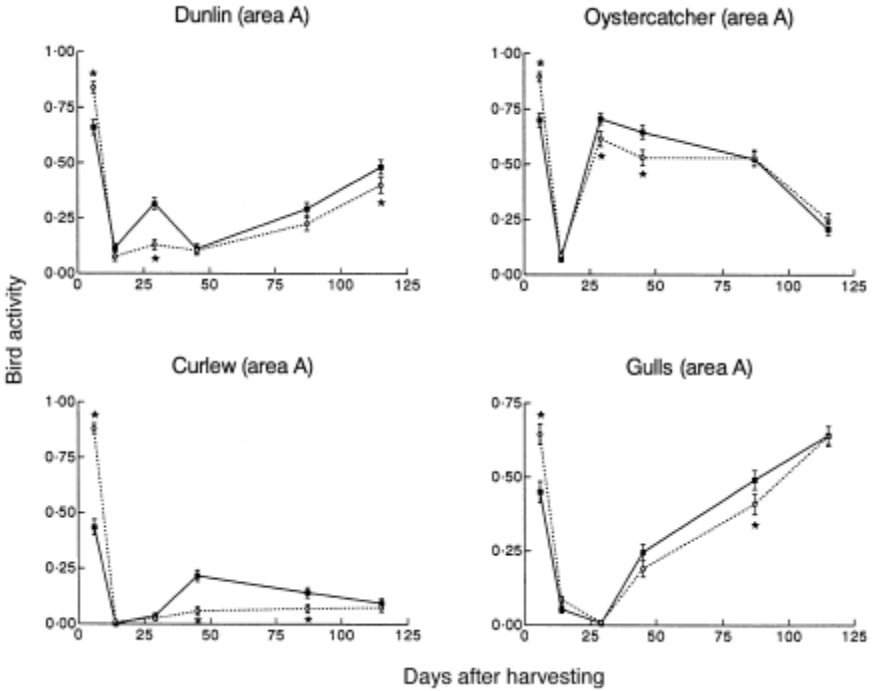

Figure 4. Mean proportion (±SD) of samples in control (black squares) and harvested (white circles) sectors containing footprints of different bird species. Significant differences between sectors are indicated by an asterisk and estimated by bootstrapping. Source: Ferns *et al*., 2000

In areas that are intensively fished (more than three times per year), the faunal community is likely to be maintained in a permanently altered state and inhabited by fauna adapted to frequent physical disturbance (Collie *et al*., 2000). There is likely to be a shift from communities

dominated by relatively high biomass species towards the dominance of high abundances of small-sized organisms (Collie *et al*., 2000). Kaiser *et al*., 2000 reported that regular fishing activity, in the vicinity of the Isle of Man, excluded large-bodied individuals and the resulting benthic community was dominated by smaller bodied organisms more adapted to physical disturbance (Johnson, 2002). Whilst dredging causes direct mortality to small and large infaunal and epifaunal organisms, many small benthic organisms such as crustaceans, polychaetes and molluscs, have short generation times and high fecundities, both of which enhance their capacity for rapid recolonization (Coen, 1995). These shifts in the faunal communities can be reflected in the associated waterbird assemblage (Atkinson *et al*., 2010). In the Wash, a lack of recruitment and heavy fishing pressure led to low stock levels of cockles and mussels (Bannister, 1998; 1999). During this period of stock collapse, the waterbird assemblage underwent a shift from one dominated by species with a high proportion of bivalves and 'other' prey such as crustaceans and fish in their diet, to those with a higher proportion of worms, with the oystercatcher, knot and shelduck showing the highest levels of decline (Atkinson *et al*., 2010). Under intense dredging pressure, research suggests that benthic invertebrates such as worms, which are characterised by rapid growth and short generation times, should predominate over species such as bivalves with slower growth and longer generation times (Atkinson *et al*., 2010).

The relative impact of shellfish dredging on benthic organisms, which form potential prey items, is species-specific and largely related to their biological characteristics and physical habitat (Mercaldo-Allen & Goldberg, 2011). The vulnerability of an organism is ultimately related to whether or not it is infaunal or epifaunal, modile or sessile and soft-bodied or hard-shelled (Mercaldo-Allen & Goldberg, 2011). Epifauna, organisms inhabiting the seabed surface, are subject to crushing or at risk of being buried, in addition to effects of smothering, whilst infauna, organisms living within sediment, may be excavated and exposed (Mercaldo-Allen & Goldberg, 2011). A number of studies have found soft-bodied, deposit feeding crustaceans, polychaetes and ophiuroids to be most affected by dredging activities (Constantino *et al*., 2009). This is supported by a meta-analysis conducted by Collie *et al*. (2000) who predicted a reduction of 93% for anthozoa, malacostraca, ophiuroidea and polychaete after chronic exposure to dredging. Furthermore, a study looking at the effects of mechanical cockle harvesting in intertidal plots of muddy sand and clean sand, found that annelids declined by 74% in intertidal muddy sand and 32% in clean sand and molluscs declined by 55%in intertidal muddy sand and 45% in clean sand (Ferns *et al*., 2000). Similar results were reported by EMU (1992), who found a distinct reduction in polychaetes, but less distinct difference in bivalves, after dredging had taken place and between dredged and control samples. This corresponds with analysis completed by Collie *et al*. (2000) who reported that bivalves appeared to less sensitive to fishing disturbance than anthozoa, malacostraca, ophiuroidea, holothuroidea, maxillopoda, polychaeta, gastropoda and echinoidea,

An ongoing study conducted by Leo Clarke at the University of Bournemouth investigated the impacts of clam dredging in Poole Harbour using a BACI (Before-After-Control-Impact) methodology. Core samples were taken from separate areas representing different levels of dredging intensity: an area that has historically been intensively dredged and remains open for a seven month season ('chronic' fishing site); an area that has historically been closed to dredging but will be opened for a five month season ('acute' fishing site); and an area that remains permanently closed to dredging (control site). Interim results indicate a significant effect of site (regardless of time) and of time (regardless of site). Organic content and the volume of fine sediments were found to be highest in the control site and lowest in the chronic fishing site during the study period. Additionally, both organic content and fine sediment volume were observed to decrease in all sites during the study. However, the

interaction term between time and site, which would indicate an overall impact of dredging activity in terms of relative change, appears non-significant. While incomplete at the time of writing, the analysis of biological assemblage data indicates that a significant shift in community structure occurred within the acute fishing site during the study period. This shift is characterised by an increase in the abundance of polychaete worm species, but does not constitute a change to the overall biotope composition observed during the study.

A number of studies have highlighted species that are particularly vulnerable to dredging as well as those which appear to be more tolerant. For example, the polychaete *Lanice conchilega* are highly incapable of movement in response to disturbance and therefore take a significant period of time to recolonise disturbed habitats (Goss-Custard, 1977). Deep burrowing molluscs, such as *Macoma balthica*, also have limited capability to escape. Following suction dredging for the common cockle on intertidal sand, the abundance of *Macoma* declined for 8 years from 1989 to 1996 (Piersma *et al*., 2001). Ferns *et al*. (2000) reported reductions of 30% in the abundance of *Lanica conchilega* in intertidal muddy sand after mechanical cockle harvesting (using a tractor) took place, although abundances of *Macoma balthica* increased. The same study also revealed large reductions of 83% and 52% in the abundance of the polychaete *Pygospio elegans* and *Nephtys hombergii*, respectively (Ferns *et al*., 2000). The former species remained significantly depleted in the area of muddy sand for more than 100 days after harvesting and the latter for more than 50 days (Ferns *et al*., 2000). Other polychaete species also thought to be particularly affected are *Arenicola*, *Scoloplos*, *Heteromastus* and *Glycera* (Collie *et al*., 2000).

The time scale of recovery for benthic communities and potential prey species largely depends on sediment type, associated fauna and the rate of natural disturbance (Roberts *et al*., 2010). In locations where natural disturbance levels are high, the associated fauna are characterised by species adapted to withstand and recover from disturbance (Collie *et al*., 2000; Roberts *et al*., 2010). More stable habitats, which are often distinguished by high diversity and epifauna, are likely to take a greater time to recover (Roberts *et al*., 2010). The recovery for gravel habitats has been predicted to be in the order of ten years (Collie *et al*., 2005). This was reported by recovery rates observed during a 10 year monitoring program of a gravel habitat located close to the Isle of Man following closure of the area to scallop dredging (Bradshaw *et al*., 2000). Similar recovery periods were estimated for muddy sands, which Kaiser *et al*. (2006) estimated to take years after finding the sediment type was particularly vulnerable to impacts of fishing activities. The recovery periods for sandy habitats is estimated to take days to months (Kaiser *et al*., 2006). In the meta-analysis conducted by Kaiser *et al*. (2006), a significant linear regression with time for the response of annelids to the impacts of intertidal dredging in sand and muddy sand habitats was reported. Annelids were predicted to have recovered after 98 days post fishing in sand habitats and 1210 days in muddy sand habitats (Kaiser *et al*., 2006). Authors stated recovery for the latter however should be treated with caution (Kaiser *et al*., 2006).

Population recovery rates are known to be species specific (Roberts *et al*., 2010). Long-lived bivalves will undoubtedly take longer to recovery from disturbance than other species (Roberts *et al*., 2010). Megafaunal species such as molluscs and shrimp over 10 mm in size, especially sessile species, are more vulnerable to impacts of fishing gear than macrofaunal species as a result of their slower growth and therefore are likely to have long recovery periods (Roberts *et al*., 2010). Short-lived and small benthic organisms on the other hand have rapid generation times, high fecundities and therefore excellent recolonization capacities (Coen, 1995). For example, slow-growing large biomass biota such as

sponges and soft corals are estimated to take up to 8 years, whilst biota with short life-spans such as polychaetes are estimated to take less than a year (Kaiser *et al*., 2006).

Studies on recovery rate

There are a limited number of studies which examine the recovery rate from biological and physical disturbance caused by shellfish dredging. Five studies were found on the impacts of shellfish harvesting on intertidal habitats, four of which are based in the UK (details are provided in Annex 13). The recovery rates reported range from no effect (thus no recovery is required) up to 12 months, with intermediate recovery rates reported at 56 days and 7 months (Kaiser et al., 1996; Hall & Harding, 1997). Spencer et al. (1998) reported a recovery rate of up to 12 months, although inferred it was not possible to be certain recovery had not occurred before this as not all treatment replicates were taken 4 and 8 months after sampling. The authors compared their findings with similar studies and speculated the greater length of recovery in comparison was related to the protected nature of the site (Spencer et al. 1998). This study highlights the importance of exposure in determining recovery rates of different habitats and also how recovery rates are site-specific.

Ferns *et al*. (2000) examined the recovery rates of individual species and found the rate of recovery varied between sediment types (muddy sand versus clean sand). Recovery rates reported for relevant species (i.e. those likely to form prey species) are presented in Annex 12.

Species-specific diets

While shorebirds will typically eat a range of different prey species such as molluscs and annelids, the type of preferred prey species will vary between bird species (Natural England, 2014). It is important to knowledge these variations in prey preference as the impacts of dredging on bird species are likely to be reflective vary depending on the vulnerability of prey species to impacts of dredging. The plasticity of a bird's diet will also vary depending on the species and it is important to consider alternate prey species as bird will not be restricted to one source of food. Table 7 provides details of prey items taken by designated bird species within the Portsmouth Harbour SPA. For example, oystercatchers will prey upon small cockles, Baltic tellins, soft-shell clams, lug-worms and ragworms (Wheeler *et al*., 2014). Some prey items may be of low value to the birds and not a major component of their diet (Zwarts *et al*. 1996ab; Atkinson *et al*. 2003 in Wheeler *et al*., 2015). Alternative prey sources may also be less available as organisms may bury deeper into the sediment and thus require the birds to expend a greater amount of energy (Zwarts *et al*. 1996ab). Birds may directly compete with the fishery if both target the same species. The key bird species at risk from changes in prey availability are non-breeding overwintering species as food requirements are considerably greater during winter due to thermoregulatory needs and metabolic costs (Wheeler *et al*., 2014).

Table 7. Typical prey items known to be taken by designated bird species in the Portsmouth Harbour SPA. Information on general prey preference was obtained from the SPA Tool Kit. Specific information on prey species was taken from the Solent EMS Regulation 33 Advice and from Portsmouth Harbour SPA Draft Regulation 35 Advice.

Common Name	Latin Name	General Prey Preference	Prey Species
Dunlin	*Calidris alpina*	Molluscs, insects, worms	*Macoma, Hydrobia* spp., *Nereis, Crangon, Carcinus*
Dark-bellied brent goose	*Branta bernicla bernicla*	Plants/grasses/seeds	*Zostera* spp., *Enteromorpha, Ulva lactuca*
Black-tailed godwit	*Limosa limosa*	Insects, worms, plants/grasses/seeds	*Hediste diversicolor, Cerastoderma edule, Macoma baltica, Cardium, Neresis*
Red-breasted merganser	*Mergus serrator*	Fish	Gobies, flatfish, herring fry (<11cm), shrimp, sticklebacks, *Nereis* spp.

6.2.2 Disturbance and displacement

Generic impacts

Human disturbance to shorebirds can be defined as 'any situation in which human activities cause bird to behave differently from the behaviour it would exhibit without presence of that activity' (Wheeler *et al*., 2014). The response of birds to disturbance is influenced by a number of factors, including distance from the disturbance source, scale of disturbance and time of year (Stillman *et al*., 2009). Disturbance from many small-scale sources is thought to be more detrimental than fewer, large-scale sources (West *et al*., 2002).

Disturbance can result in displacement when birds are unable to use an area due to the magnitude of the disturbance present (Natural England, 2014). Under certain circumstances the impacts of disturbance may be equivalent to habitat loss, although such effects are reversible (Madsen, 1995; Hill *et al*., 1997; Stillman *et al*., 2007; Natural England *et al*., 2012). The effects of habitat loss through disturbance can include a reduction in the survival of displaced individuals and effects on the population size (Goss-Custard *et al*., 1995; Burton *et al*., 2006). Sites with high levels of human activity are often characterised by lower densities of birds when compared with sites that have low levels (Burger, 1981; Klein *et al*., 1995). The movement of birds to alternate feeding areas as a result of disturbance, which may be less suitable, can lead to increased shorebird density and thus interspecific competition; with alternate sites becoming depleted in food resources if used for prolonged periods of time (Goss-Custard, 2006; Wheeler *et al*., 2014). Disturbance can affect wintering bird populations in a number of ways including reduced intake a result of enhanced vigilance (Riddington 1996; Goss-Custard *et al*. 2006; Klaassen *et al*. 2006) and physiological impacts such as stress (Thiel *et al*., 2011). Such impacts can affect the fitness of individuals and have knock-on effects at a population scale (Natural England, 2011). Furthermore, disturbance can cause birds to take flight which increase energy demands and reduce food intake with potential consequences for survival and reproduction.

Birds can modify their behaviour in order to compensate for disturbance (Stillman *et al*., 2009). Some bird species may become habituated to particular disturbance events or types of disturbance (Walker *et al*., 2006, Nisbet, 2000, Baudains & Lloyd, 2007; Blumstein *et al*., 2003) and can do so over short periods of time (Rees *et al*., 2005; Stillman *et al*., 2009). The frequency of the disturbance will help to determine the extent to which birds can become habituated and thus the distance at which they response (Stillman *et al*., 2009). The behavioural response of a bird to disturbance is also dependent on the time of year (Stillman *et al*., 2009). Towards the end of winter, when migratory birds need to increase feeding rates to provide energy for migration, behavioural response to disturbance is less (Stillman *et al*., 2009). Birds will approach a disturbance source more closely and return more quickly after a disturbance has taken place (Stillman *et al*., 2009).

In the context of shellfish harvesting from a vessel, limited has taken place to investigate its potential effects on bird populations through disturbance. It is thought that shellfish dredging has very little direct impact on disturbance of waders since it occurs at high tide (Sewell *et al*., 2007). Sewell *et al*. (2007, p. 51) stated that 'We know of no evidence that dredging will have a direct impact in terms of disturbance on seabirds since most dredging occurs subtidally or at high-tide'. Wheeler *et al*. (2014) however stated, like other forms of disturbance, it could cause

relocation and increased energy expenditure of birds.

Examples of disturbance impacts

In the mid-1980s, localised and sustained disturbance from bait diggers at Lindisfarne National Nature Reserve were considered responsible for significant declines in the numbers of Wigeon, Bar-tailed Godwit and Redshank at the site (Townshend & O'Connor, 1993).

In 1996/97, Gill *et al*. (2001) investigated the effect of human-induced disturbance on black-tailed godwits across 20 sites on the east coast of England. The study revealed no significant relationship between numbers of godwits and human activity at a range of spatial scales (Gill *et al*., 2001). There was also no effect of the presence of marinas or footpaths on the number of godwits supported on the adjacent mudflats (Gill *et al*., 2001).

Using a behaviour-based model, Durell *et al*. (2005) explored the effect if an extension to the port at Le Havre and proposed mitigation measures on the mortality and body condition of three overwintering bird species; curlew, dunlin and oystercatcher. Body condition was expressed as the percentage of birds failing to achieve at least 75% of their target weight for the time of year. Disturbance to feeding birds, day and night, had a significant effect on the mortality and body condition of all three species. The same was found for roosting birds. Roost disturbance was simulated by increased energy costs due to extra flying time of 10 minutes or more each day. Disturbance limited to the daytime only removed the effect of disturbance in curlew and oyster catcher, and although reduced the disturbance effect it still had a significant effect on the body condition and mortality of feeding dunlin. The introduction of a buffer zone, which would prevent disturbance within 150 m of the seawall, reduced the effects of disturbance on mortality and body condition to pre-disturbance levels.

Studies in the Solent which have focused on disturbance to birds, have reported disturbance levels of 30% during the winter of 1993/94 using disturbance events observed during low tide counts. Sources of disturbance from human activity on the shore included dog walkers, walkers, bait diggers and kite flyers (Thompson, 1994). A more recent study conducted from December 2009 to February 2010, which formed phase II of the Solent Disturbance & Mitigation Project, found for water-based recreational activities that 25% of observations resulted in disturbance and on the intertidal 41% of observation result in disturbance (Liley *et al*., 2010). Surfing, rowing and horse riding were activities found to most likely result in disturbance to birds. Over half of incidences where major flight was observed involved activities on the intertidal, with dog walking accounting for 47% of major flight events (Liley *et al*., 2010). The most responsive bird species to different activities were oyster catcher and wigeon (Liley *et al*., 2010). These two species had the highest proportion of observations involving a disturbance response. Primary data collected by Liley *et al*. (2010) was used to predict if disturbance could reduce the survival of birds using computer models (Stillman *et al*., 2012). Dunlin, ringed plover, oystercatcher and curlew were predicted to be the species most vulnerable to disturbance due to a combination of disturbance distances (see species-specific response), night-time feeding efficiency and vulnerability to food competition at high competitor densities (Stillman *et al*., 2012). Redshank, grey plover and black-tailed godwit typically had the shortest disturbance distances and were able to feed relatively effectively at night, meaning that these species were less affected by visitors (Stillman *et al*., 2012). Disturbance was predicted to result in increases in the

level of time spent feeding intertidally by dunlin, ringed plover, redshank and grey plover, with no effect on black-trailed godwit and reductions in oystercatcher and curlew (Stillman *et al*., 2012). This was related to the ability of modelled birds to feed in terrestrial habitats, as those unable to do so spent longer feeding in intertidal habitats (Stillman *et al*., 2012).

Species-specific response

Responsiveness to disturbance is thought to be a species-specific trait (Yasué, 2005). Gathe and Hüppop (2004) developed a wind farm sensitivity index (WSI) for seabirds. The index was based on nine factors, derived from specie' attributes, and include; flight manoeuvrability, flight altitude, percentage of time flying, nocturnal flight activity, sensitivity towards disturbance by ship and helicopter traffic, flexibility in habitat use, biogeographical population size, adult survival rate and European threat and conservation status (Gathe & Hüppop, 2004). Each factor was scored on a 5-point scale from 1 (low vulnerability of seabirds) to 5 (high vulnerability of seabirds). The WSI was used by King *et al*. (2009) to develop sensitivity scores for species likely to be susceptible to cumulative impacts of offshore wind farms development. Table 8 provides available sensitivity scores of species within Portsmouth Harbour SPA, with details of scores given for the species vulnerability to disturbance by ship and helicopter traffic.

Table 8. Sensitivity scores for designated bird species in the Portsmouth Harbour SPA to offshore wind farm developments. Higher scores are indicative of a greater sensitivity. Information on species vulnerability to disturbance by ship or helicopter traffic is also provided. Scores were taken from King et al. 2009 who calculated scores using methods by Garthe & Huppop (2004).

Species	Total sensitivity score	Disturbance by ship and helicopter traffic (1 – very flexible in habitat use, 5 – reliant on specific habitat characteristics)
Dark-bellied Brent Goose	21.7	2
Black-tailed godwit	9.9	1
Red-breasted Merganser	21.0	3
Dunlin	3.3	1

There is great variation in the escape flight distances between species (Kirby *et al*., 2000) and the distance at which birds fly away from a disturbance can be viewed as a specie-specific trait (Blumstein *et al*., 2003). Response distances can depend on a number of different factors, including the time of year, tide, frequency, regularity and severity of disturbance, flock size and age of bird (WWT Consulting, 2012). Body mass has also been shown to be positively related to response distance (Liley *et al*., 2010). Table 9 and 10 provides details of response distances of species within Portsmouth Harbour SPA, with Table 9 providing details of response distances in relation to different types of activities.

Table 9. Distances from disturbance stimuli (in metres) at which study waterbird species took flight. Taken from Kirby et al., 2004 in WWT Consulting 2012.

	Study						
	Tydeman 1978	Cooke 1980	Tensen and van Zoest	Watmough 1983a,b	Smit and Visser 1993	Smit and Visser 1993	Smit and Visser 1993
Activity	Boats	Researcher	People	Researcher	People	Kayaks	Surfers
Distance measure	Min	Mean	Mean	Mean	Mean	Mean	Mean
Brent goose					105		
Dunlin		30			71/163		

Table 10. Comparison, by species, of distances (in metres) at which no response or disturbance events (i.e. alert, short walk/swim, short flight or major flight) occurred to recreational activities in the Solent. Significance column indicates results from Mann-Whitney statistical tests. Source: Lilley et al., 2010.

Species	**No response**		**Disturbance occurred**		**Significance**
	Median	Range	Median	Range	
Brent goose	97	17-215	51.5	5-178	P<0.01
Dunlin	115	29-200	75	25-300	P<0.01

In a study by Liley *et al*. (2010), which formed phase II of the Solent Disturbance & Mitigation Project, there was no clear set-back distance that would result in no response. There were instances where no response occurred within a few metres and there were instances were major flight occurred when birds when over 200 m from the disturbance source (Liley *et al*., 2010). Having said this, the proportion of events resulting in the displacement of birds declined beyond 100 m (Liley *et al*., 2010).

Mitigation

The effects of disturbance on the quality of an area for birds are reversible (Natural England *et al*., 2012). Studies have shown that bird numbers increase when either the source of disturbance is removed or mitigated (Natural England *et al*., 2012). Modelling of wintering oystercatchers on the Exe estuary revealed that preventing disturbance during late winter, when feeding conditions are harder and a migratory bird's energetic demands are higher, has been shown to largely eliminate any predicted population consequences (West *et al*., 2002). Following this modelling, it was recommended that to eliminate predicted population consequences of disturbances, competent authorities responsible for management should prevent disturbance to birds during late winter (West *et al*., 2002).

Establishing flight-initiation distances may be considered a starting point for competent authorities responsible for management in order to minimise adverse effects of disturbance (Wheeler *et al*., 2014). The establishment of such buffer areas are dependent on a number of factors including population densities, food availability, time of year and behaviour of individuals (Wheeler *et al*., 2014). As aforementioned, a buffer zone of 150 m from the seawall was found to reduce the effects of disturbance from an extension to the port at Le Havre on the mortality and body condition to pre-disturbance levels for three bird species (dunlin, curlew and oystercatcher) (Durell *et al*. 2005). Investigation into disturbance caused by recreational activities in the Solent however suggested that there was no clear set-back distance, for all species on all sites due to the large variability observed in response distances, which would result in no disturbance (Liley *et al*., 2010). The largely variability in flight-initiation distances suggests that competent authorities should be conservative when developing buffer zones, although previously published flight-initiation distances for a given species may be used as a guideline for setting buffer zones (Blumstein *et al*., 2003).

Whilst many authors may try and define a distance beyond which disturbance is assumed to have no effect, which is then used in turn to determine set-back distances, it may be inappropriate to set such distances (Stillman *et al*., 2009). The reason for this is because of the variation between species (Blumstein *et al*., 2005), as well as variation between individuals of the same species (Beale & Monaghan, 2004). This is further compounded by particular circumstances such as habitat, flock size, cold weather, variations in food availability, all of which will influence a birds' ability to response to disturbance and hence the scale of the impact (Rees *et al*., 2005; Stillman *et al*., 2001). In addition, there is no guarantee that the behavioural response i.e. response distance, will be related to population consequence (Gill *et al*., 1996; 2001b).

6.3 Site-Specific Seasonality Table

Table 11 below indicates (highlighted in grey) when significant numbers of each mobile designated feature are most likely to be present at the site during a typical calendar year. Periods highlighted in grey are likely to require consideration of mitigation to minimise impacts to qualifying bird features during these principal periods of site usage by those features. The months which are not highlighted in grey do not necessarily indicate when features are absent, rather that features may be present in less significant numbers than in typical years.

Table 11. Presence by month of mobile designated features at the Portsmouth Harbour SPA. Grey indicates periods of presence in significant numbers whereas blank (white) indicates either periods of absence or of presence but only in numbers of less significance.

Common Name	Latin Name	Designated Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Reference
Black-tailed godwit	*Limosa limosa*	Nonbreeding; Wintering													Wernham et al., 2002
Dark-bellied	*Branta bernicla*	Nonbreeding; Wintering													Cramp & Simmons,

brent goose	*bernicla*														1977
Dunlin	*Calidris alpha*	Nonbreeding; Wintering													Wernham et al., 2002; Cramp & Simmons, 1983
Red-breasted merganser	*Mergus serrator*	Nonbreeding; Wintering													Cramp & Simmons, 1977

6.4 Site Condition

6.4.1 Condition Assessments

Natural England provides information on the condition of designated sites and describes the status of interest features. This is derived from the application of 'Common Standards Monitoring Guidance' which is applied to a subset of 'attributes' of site features as set out in the sites' Regulation 33/35 Conservation Advice document. Feature condition influences the Conservation Objectives in that it is used to determine whether a 'maintain' or 'recover' objective is needed to achieve the target level for each attribute. Natural England's current process for conducting condition assessments for marine features was developed due to requirements to report on condition of Annex 1 features at the national level in 2012/13 under Article 17 of the Habitats Directive. Since then, the methods have been reviewed and Natural England are actively working to revise this process further so that it better fulfils obligations to inform management actions within MPAs and allows them to report on condition. In light of this revision to the assessment methods, the condition assessments for the features of European Marine Sites have not been made available in the timeframe required under the revised approach.

An indication of the condition of site interest features can be inferred, if available, from assessments of SSSIs[14] that underpin the SPA. There are a number of SSSIs which exist within the area covered by Portsmouth Harbour SPA and these, along with relevant feature condition assessments are summarised in Table 12. Note that only SSSI sites where oyster dredging is known to occur have been chosen.

[14] SSSI Condition assessments: http://designatedsites.naturalengland.org.uk/.

Table 12. Condition assessments of SSSI units within the Portsmouth Harbour SPA.

SSSI Site Name	Habitat	Unit Name	Condition	Condition Threat Risk	Comments
Portsmouth Harbour	Littoral Sediment	Frater	Favourable[15]	Medium	This unit has been assessed as favourable for its intertidal mudflats, saltmarsh and over-wintering bird features, which represents an improvement in condition since the last assessment of 'unfavourable recovering' in November 2010. This unit comprises Littoral mud with saltmarsh on the high shore. Characteristic infaunal species of the mudflats include Hydrobia Ulvae, Tubificoides benedii, Tubificiodes pseudogaster, Streblospio, Nematodes, Corophium sp. and Arenicola marina. A thin layer of Entermorpha and Ulva covers the intertidal. In the most recent assessment (Marcg 2014), the cover of Ulva and Enteromorpha was below the 75% cover threshold for adverse effects on the sediment and infauna. This area has low levels of recreational disturbance impacts due to lack of public access. The site has seen increases in populations of dunlin, dark-bellied brent goose and black-tailed godwit, although slight declines in the numbers of grey plover since 1992/93.
Portsmouth Harbour	Littoral Sediment	Port Solent to Horsea	Unfavourable - recovering[16]	Medium	This unit compromises littoral mud and polychaete/oligochaete dominated upper estuarine mud shores, with littoral coarse sediment on the upper shore and around Horsea Island. Characteristic infaunal species of the mudflats include

[15] Favourable definition - The designated feature(s) within a unit are being adequately conserved and the results from monitoring demonstrate that the feature(s) in the unit are meeting all the mandatory site specific monitoring targets set out in the FCT. The FCT sets the minimum standard for favourable condition for the designated features and there may be scope for the further (voluntary) enhancement of the features / unit. A unit can only be considered favourable when all the component designated features are favourable.

[16] Unfavourable recovering definition - Units/features are not yet fully conserved but all the necessary management mechanisms are in place. At least one of the designated feature(s) mandatory attributes are not meeting their targets (as set out in the site specific FCT). Provided that the recovery work is sustained, the unit/feature will reach favourable condition in time.

					Hydrobia ulvae, Tharyx sp., Tubificoides benedii, Aphelochaeta marioni, Nematodes, Cerastoderma edule and Carcinus maenas. Opportunistic green macroalgae cover was below adverse cover threshold levels. There are potentially high levels of contamination from the historic landfill at Paulsgrove. Anthropogenic impacts in this section of the harbour include litter and discarded man-made items. This area has low levels of recreational disturbance impacts due to lack of public access. The site has seen increases in populations of dunlin, dark-bellied brent goose and black-tailed godwit, although slight declines in the numbers of grey plover since 1992/93. These bird interest features have been assessed as being in favourable condition.
Portsmouth Harbour	Littoral Sediment	Whale Island	Unfavourable - recovering	Medium	This intertidal area comprises Littoral mud (A2.3), including Polychaete/oligochaetes-dominated upper estuarine mud shores (A2.32), and gravel (pebble) and shingle shores (A2.11). Characteristic infaunal species of the mudflats include Tubificoides benedii, Aphelochata marioni, Chaetozone gibber, Tharyx killariensis, Hydrobia ulvae, Pagarus bernhardus, Crepidula fornicata, Cerastoderma edule, and Littorina littorea. Levels of Enteromorpha and Ulva macroalgae which are present across most of the intertidal were below adverse cover threshold levels. Other anthropogenic impacts in this section of the harbour include litter and discarded man-made items such as tyres and metal work.

					There is no public access along the foreshore in this unit so recreational disturbance impacts are lower than in other parts of the harbour. The site has seen increases in populations of dunlin, dark-bellied brent goose and black-tailed godwit, although slight declines in the numbers of grey plover since 1992/93. These bird interest features have been assessed as being in favourable condition.
Portsmouth Harbour	Littoral Sediment	Portchester	Unfavourable - recovering	Medium	This intertidal area comprises Littoral mud (A2.3), with polychaete / oligochaete dominated upper estuarine mud shores (A2.32) and Tubificiodes benedii and other oligochaetes in littoral mud (A2.323), and gravel (pebble) and shingle shores (A2.11) on the upper shore in front of the sea walls. Characteristic infaunal species of the mudflats include Tubificoides benedii, Tharyx killariensis, Hydrobia ulvae, Nematodes, Littorina littorea, Arenicola and Nephtys spp. The intertidal mudflats in this unit had less than 25% cover of opportunistic macroalgae (Enteromorpha and Ulva) and no anoxic layer was present. Much of this unit has potentially high levels of historic contamination due to previous and further investigation is required to determine the potential impact of this. There is a public footpath along the whole frontage of this unit. Disturbance to feeding and roosting birds is being addressed through the Solent Disturbance and Mitigation Project. The site has seen increases in populations of dunlin, dark-bellied brent goose and black-tailed godwit, although slight declines in the numbers of grey plover since 1992/93. These bird interest features have been assessed as being in favourable condition.

Portsmouth Harbour	Littoral Sediment	Bombketch Lake	Unfavourable - recovering	Medium	This intertidal area comprises Littoral mud (A2.3), including the biotopes Polychaete/bivalve dominated mid estuarine mud shores (A2.31), Polychaete/oligochaetes-dominated upper estuarine mud shores (A2.32) and Tubificoides benedii and other oligochaetes in littoral mud (A2.323). Characteristic infaunal species of the mudflats include Tubificoides benedii, Tubificoides galiciensis, Melinna palmate, Nematodes, Streblospio sp., Scrobicularia plana, Arenicola marina and Hydrobia ulvae. Levels of Enteromorpha and Ulva macroalgae which are present across most of the intertidal were below adverse cover threshold levels. Saltmarsh across the whole harbour is declining in extent due to coastal squeeze resulting from the presence of hard sea defences. The site has seen increases in populations of dunlin, dark-bellied brent goose and black-tailed godwit, although slight declines in the numbers of grey plover since 1992/93. These bird interest features have been assessed as being in favourable condition.

Overall, the SSSI condition assessments appear to suggest that littoral sediments within selected SSSI sites are favourable or unfavourable, but recovering. When examining reasons for this, it appears from the condition assessment comment that the reasons for this are largely explained by a combination of different factors including contamination, coastal squeeze, litter and disturbance. This would suggest that whilst the condition of many of the sites is unfavourable, the reasons for this are unrelated to fishing activities.

6.4.2 Population Trends

Population trend data, where available, can be used to identify site-specific pressures. Information on population trends comes from Wetland Bird Survey (WeBS) Alerts and JNCC's Seabird Monitoring Programme (SMP) population data. WeBS Alert data is only available for one of the four regularly occurring migratory species (Dark-bellied brent goose) and provides information on population sizes, from which trends in numbers and distribution can be detected. The most recent WeBS report is based upon Alerts status as of 2009/10 and identifies no site-specific decline in populations of dark-bellied brent geese in Portsmouth Harbour. Unfortunately the other three species are not assessed due to a lack of data.

It is important to note that the data used to inform WeBS Alerts was collected in 2009/10 and therefore this data may not have captured the effects of fishing activities that have since commenced or increased since publication. The effects of fishing activities may not necessarily be captured in the next WeBS Alerts report (due in 2015) due to the time lag between cause and effect. With respect to oyster dredging, the level of fishing effort has been seen to decrease and therefore any effects of fishing activity is likely to be highly reduced when compared to 2009/10.

6.5 Existing Management Measures (Southern IFCA)

- **Bottom Towed Fishing Gear** byelaw – prohibits bottom towed fishing gear over sensitive seagrass features within the Chichester and Langstone Harbour SPA closing most of the site to these activities.
- **Vessels Used in Fishing** byelaw – prohibits commercial fishing vessels over 12 metres from the Southern IFCA district. The reduction in vessel size also restricts the type of gear that can be used, with vessels often using lighter towed gear and restricted to carry less static gear.
- **The Solent European Marine Site (Prohibition of Method of Dredging) Order 2004** prohibits any fishing boat from deploying or carrying a dredge (unless inboard, secured and stowed) in any part of the Solent European Marine Site. Within the order 'dredge' refers to any form of shellfish dredge used in conjunction with any means of injecting water into the dredge or into the vicinity of the dredge. The order was created to prevent pump scooping as a means of taking shellfish.
- **Bass Nursery Areas** – fishing for bass or fishing for any fish using sand-eels as bait by any fishing boat within designated areas is prohibited between 30 April and 1 November. Designated areas include Southampton Water (Cadland foreshore to the Warsash foreshore, but excluding those waters above the Redbridge Causeway on the River Test) and Langstone Harbour (Gunnery Range Light at Eastney Point to Langstone Fairway Buoy, then to the foreshore east of Gunner Point) and all year round in a 556 m radius around the Fawley Power Station outfall.
- **Fixed Engines** byelaw states that the placing and use of fixed engines, other than Fyke Nets, for the taking of seafish is prohibited during the period from 1 April to 30 September in any year in all parts of the Rivers Test and Itchen upstream of the line due East and West from the Southern end of the Port of Southampton Dockhead.
- **Prohibition of Gathering (Sea Fisheries Resources) in Seagrass Beds** byelaw. This prohibits any person from digging for, fishing for or taking any sea fisheries resource in or from the prohibited areas and does not apply to fishing/taking fisheries resources by means of net, rod and line and hook and line. It also does not apply to fishing for/taking sea fisheries resources using a vessel, provided that no part of the vessels hull in contact with the seabed. No person shall carry a rake, spade, fork or any similar tool in prohibited areas
- **Fishing for Oysters, Mussels and Clam** byelaw states that when fishing for these species only the following methods are used; a) hand picking and b) dredging using a dredge with a rigid framed south so designed to take shellfish only when towed along the sea bed.
- **Oysters, Clams, Mussels – Prohibition on Night Fishing** byelaw – No person shall dredge or fish or take any before 8.00 am or after 4.00 pm, although this byelaw does not apply to the taking of clams and mussels during any close season for oysters.

- **Oyster Dredge** byelaw – in dredging or fishing for oysters is any fishery no dredge shall be used which has a front edge or blade exceeding 1.5 metres in length and if two or more dredges are in dredging or fishing for oysters used at the same time or in from the same boat or vessel the total length of the front edges or blades of such dredges when added together shall not exceed 3.0 metres.
- **Oysters** byelaw – no person shall remove from a public or regulated fishery any oyster (other than Portuguese or Pacific oysters) which will pass through a circular ring of 70 mm in internal diameter.
- **Regulation of the Use of Stake or Stop Nets in Langstone Harbour** – north of a line across the harbour entrance (Gunnar point to Eastney Lake Pumping Outfall Light), no person shall place or maintain or partly across a channel or creek at any place which becomes dry at low water, any stake, stop or dosh net during the period between the commencement of the last hour before the tide leaves that place and the expiration of the first hour after the tide has begun to reflow.
- **Oyster Close Season** prohibits any person from dredging or fishing for in or taking any fishery oysters during the period from the 1st day of March to the 31st of October in any year, although this byelaw does not apply to the taking of clams and mussels during any close season for oysters. This byelaw does also not apply to the dredging or fishing or taking of clams in Southampton Water North of the line joining the Northern ends of the Hamble and Fawley Oil Terminal Jetties.
- **Temporary Closure of Shellfish Beds** byelaw allows the authority to temporarily close any bed or part of a bed of shellfish where it is the opinion of the Committee that it is severely depleted and as such required temporary closure in order to ensure recovery, or any bed or part of bed containing mainly immature or undersized shellfish which is in the interest of protection and development of the fishery, or any bed of transplanted shellfish that ought to not be fished until it becomes established. In the context of this byelaw, 'shellfish' refers to mussels, oysters and clams. This byelaw has been used to restrict the Solent oyster fishery since the 2013/14 season (see table 1 for details).
- The **Scallop Fishing (England) Order 2012** states that no more than 8 dredges per side to be towed at any one time and provides details for dredge configuration (i.e. the frame cannot exceed 85 cm in width). The **Scallop Fishing** Southern Sea Fisheries District Committee legacy byelaw states the maximum number of dredges which can be towed at any time is twelve, provides details of dredge configuration and that no person shall fish for or take any scallop from any fishery on any day before 0700 and after 1900 local time
- The **Cockles** Byelaw states that no person shall fish for or take from a fishery any cockle between 1st day of February and 30th of April and when the cockle bed is covered by water only a dredge less than 460 mm in width can be used. In addition, no person shall remove a cockle that is able to pass through a gauge with a square opening measuring 23.8 mm along each side.
- **American Hard Shelled Clams – Minimum Size** byelaw – no person shall remove from a fishery any clams of the species Mercenaria mercenaria which measures less than 63 mm across the longest part of the shell.
- European minimum size, listed under Council Regulation (EEC) 850/98, Statutory Instruments specify the minimum size for Manila clams (*Ruditapes philippinarum*) is 3.5 cm and for Grooved Carpet Shell clams (*Ruditapes decussatus*) is 4.0 cm.

6.6 Existing Management Measures (Sussex IFCA)

Chichester harbour spans the districts of the Southern and Sussex IFCAs. It has been agreed the oyster fishery within Chichester Harbour will however being managed by Sussex IFCA through a section 167 agreement.

- **Dredging for, fishing for and taking of oysters & clams and removal of cultch** byelaw – no person shall dredge for, for fish or take oysters from any public fishery on any day between the 1st of May and the 31st day of October both days inclusive or during the period commencing half an hour after sunset on any day and a half an hour before sunrise on the following day. No person shall remove any oyster (other than a Portuguese Oyster) which can be passed through a circular ring having an internal diameter of 70 mm.
- Sussex IFCA has recently introduced an **Oyster Permit** byelaw[17]. The Oyster Permit byelaw establishes a permit based system for the commercial exploitation of native oyster stocks by dredging. The permit has a number of conditions which restrictions on gear and dredge configuration and these include an overall width dimension not exceeding 1.2 metres and if two or more dredges are used the total overall width dimension shall not exceed 2.4 metres, no teeth attached to the dredge along all or any part of the lower dredge mouth frame, any parallel bars forming a 'ladder' at the bottom of the dredge mouth must have a minimum gap of 60 mm between the bars, no diving blade is fitted to the dredge, the dredges are clearly marked with the fishing vessels registration or the permit number and the maximum weight of the dredge shall not exceed 50 kg. Other permit conditions include catch restrictions, spatial restrictions and temporal restrictions. Catch restrictions include the prohibition of removing any undersized oyster which are any oyster (except for Portuguese and Pacific Oysters) whose maximum dimension will pass through a circular ring of 70 mm in internal diameter. Time restrictions include a diurnal closure, with fishing only allowed to occur from Monday to Friday, 08:00 until 2:00 pm and a seasonal closure from 1st day of March to the 31st day of October. Spatial restrictions include permitted areas within Chichester Harbour, these include an zone (Fishbourne and Bosham Channels) which are prohibited to dredging, and two zones (Emsworth Channel and Thorney Channel) which are open to fishing, however access to these zones during the season are staggered. During the 2015/16 channel, Emsworth Channel was the first to open and was closed when the harvest control threshold was reached, this triggered the opening of the Thorney Channel which was closed then when the harvest control threshold was reached. The harvest control threshold is based on a minimum catch per unit effort.

6.7 Classification of Shellfish

EC Regulations 853/2004 and 854/2004 set out criteria relating to the commercial production and sale of live bivalve molluscs (clams, cockles, oysters, mussels etc.) from classified production areas. These regulations form part of UK law and are implemented by means of the Food Safety and Hygiene (England) Regulations 2013. CEFAS coordinate the classification of shellfish beds on behalf of the FSA. Local Authorities are responsible for implementing sampling plans and are empowered to enforce the regulations.

[17] Oyster dredge permit byelaw for Chichester Harbour (Sussex IFCA): http://sussex-ifca.gov.uk/repository/Sussex%20IFCA%20Oyster%20Permit%20Byelaw%20-%20FINAL%20Signed.pdf

Shellfish production areas are classified according to the extent to which shellfish sampled from the area are contaminated with potentially harmful bacteria. The classification of a production area determines the treatment required before the molluscs may be marketed and the classes are as follows:
A class - bivalve molluscs can be harvested for direct human consumption.
B class - bivalve molluscs can be marketed for human consumption after purification in an approved plant or after relaying in an approved class A relaying area or after being subjected to an EC approved heat treatment process.
C class - bivalve molluscs can be marketed for human consumption only after relaying for at least two months in an approved relaying area followed, where necessary, by treatment in a purification centre, or after an EC approved heat treatment process.
Prohibited areas - molluscs must not be subject to production or be collected.

Currently within the Solent EMS there are a number of areas where the native oyster is classified for harvesting. Within these areas there are a number where harvesting of shellfish has been prohibited due to the high E. Coli levels. The sampling regime for shellfish classification is dependent on the Local Enforcement Authority. In Southampton Water sampling takes place on a regular basis, although large proportions are prohibited to shellfish harvesting. In Portsmouth and Langstone Harbours, due to the restrictive length of the season, since 2014 oysters have been temporarily declassified out of season and sampling reduced to quarterly, until two months prior to the season when regular samples are taken (see Annex 11 for the most recent classification status). During the 2015/16 season, Portsmouth Harbour was classified as a class B.

6.8 Table 13: Summary of Impacts

The potential pressures, associated impacts, level of exposure and mitigation measures are summarised in table 13. Only relevant attributes identified through the TLSE process have been considered here.

Feature	Supporting habitat(s)	Attribute	Target	Potential Pressure(s) and Associated Impacts	Nature and Likelihood of Impacts	Mitigation measures[18]
Nationally and internationally important regularly occurring	Intertidal mudflats and sandflats	Food availability (Reg 33); Supporting habitat: food availability	Presence and abundance of suitable prey species should not deviate	Selective extraction of species and competition for prey were identified as potential pressures through direct impacts of oyster dredging. Changes in prey availability was identified as a potential	The 2013/14 season was reduced to four weeks in Portsmouth Harbour. The following two seasons were reduced to two weeks. Approximately three vessels fished within Portsmouth Harbour in the 2013/14 and 2014/15 seasons. In the 2015/16 season,	Vessels Used in Fishing byelaw prohibits commercial fishing vessels over 12 metres from the Southern IFCA district. The reduction in vessel size also restricts the type of gear that can be used, with vessels often using

[18] Detail how this reduces/removes the potential pressure/impact(s) on the feature e.g. spatial/temporal/effort restrictions that would be introduced.

migratory species		within supporting habitat (Draft Reg 35)	significantly from an established baseline, subject to natural change (Reg 33); Maintain overall prey availability at preferred prey sizes (Black-tailed godwit & Dunlin – Draft Reg 35); Maintain Zostera at least at Good Ecological Potential and restore macroalgae to at least Good Ecological Potential/Maintain a high cover/abundance of preferred food plants (Dark-bellied Brent goose – Draft Reg 35)	pressure through indirect impacts of oyster dredging. The selective extraction of species and competition for prey were screened out at TLSE level as oysters do not represent the prey species of designated bird species. The indirect change in prey availability is caused through physical disturbance or damage to supporting habitats which can result in changes to community structure, the removal and mortality of non-target organisms through interaction with fishing gear and smothering of prey species through increased sedimentation. Bottom towed gear has been shown to reduce biomass, production and species richness and diversity (Veale *et al*., 2000; Hiddink *et al*., 2003). In a meta-analysis of 39 studies, those investigating the effect of intertidal dredging commonly reported 100% removal of biogenic fauna and were reported to have the most severe initial impact (Collie *et al*., 2000). Intertidal dredging may refer to other types of dredge including suction dredging. The relative impact of shellfish	approximately 6 to 7 vessels began to fish on the first day, however this reduced to approximately 3 to 4 on the second day and only one vessel continued to fish for the first week of the season. The 2016/17 season will default back to the 4 month open season as dictated by the Oyster Close Season byelaw. Feature data provided by Natural England, combined with sightings data, reveals that oyster dredging occurs infrequently over the fringes of the intertidal. Areas where this is shown to take place and potentially overlap with foraging areas of designated bird species (Black-tailed godwits, Dunlin, Dark-bellied Brent goose) include west of Whale Island, Wicor, Tipner, Frater Lake and Wicor. The spatial overlap of affected areas is likely to be very limited and therefore the exposure of benthic communities to adverse impacts will be minimal. The infrequent nature of the activity within the intertidal, combined with a close season period of 8 months (2016/17 season) is considered to be sufficient to allow for the recovery of any adverse effects on prey species. An indication of recovery of key prey species is given in Annex 12, however limited information is available on this.	lighter towed gear. The Solent European Marine Site (Prohibition of Method of Dredging) Order 2004 prevents pump scooping as a means of taking shellfish. Fishing for Oysters, Mussels and Clam byelaw regulates methods can be used to fish for these species. These are a) hand picking and b) dredging using a dredge with a rigid framed south so designed to take shellfish only when towed along the sea bed. Temporary Closure of Shellfish Beds byelaw allows the authority to temporarily close any bed or part of a bed of shellfish where it is the opinion of the Committee that it is severely depleted and as such required temporary closure in order to ensure recovery, or any bed or part of bed containing mainly immature or undersized shellfish which is in the interest of protection and development of the fishery, or any bed of transplanted shellfish that ought to not be fished until it becomes established. For the last three seasons (2013/14, 2014/15 and 2015/16) this byelaw has been used to close the oyster fishery in Southampton Water and the wider Solent, as well as shortening the open season in the eastern harbours. For the 2016/17 season, Southampton Water and

				dredging on benthic organisms, which form potential prey items, is species-specific and largely related to their biological characteristics and physical habitat (Mercaldo-Allen & Goldberg, 2011). Population recovery rates are species specific (Roberts *et al*., 2010).). Long-lived bivalves will undoubtedly take longer to recovery from disturbance than other species such as short-lived and small benthic organisms on the other hand have rapid generation times, high fecundities and therefore excellent recolonization capacities (Coen, 1995; Roberts *et al*., 2010).		the wider Solent will remain closed and the eastern harbours will open as per the Oyster Close Season byelaw. The Oyster Close Season byelaw prohibits any person from dredging or fishing for in or taking any fishery oysters during the period from the 1st day of March to the 31st of October in any year. Oyster dredge byelaw prohibits the use of any dredge which exceeds 1.5 m in length when using a single dredge or totalling 3.0 m in length when using two dredges at the same time. Oysters, Clams, Mussels – Prohibition on Night Fishing byelaw prohibits any person from dredging or fishing or taking any oysters before 8.00 am or after 4.00 pm during the open season. The Prohibition of Gathering (Sea Fisheries Resources) in Seagrass Beds byelaw prohibits any person from digging for, fishing for or taking any sea fisheries resource in or from the prohibited areas. No person shall carry a rake, spade, fork or any similar tool in prohibited areas. The Bottom Towed Fishing Gear byelaw prohibits bottom towed fishing gear over sensitive features including reef features and seagrass within the Solent and Portsmouth Harbour SPA,

						closing most of the site to these activities. Southern IFCA is currently amending this byelaw to introduce additional network of permanent bottom towed fishing gear closure areas. The network is designed to protect good examples of low-energy SAC habitats, maintaining the integrity of the site, whilst also offering long-term stability to guard against the effects of fishing effort displacement which may result from other additional measures also being introduced. These additional measures include spatial and temporal restrictions on shellfish dredging within the site, via a network of dredge fishing management areas and daily closures from 17:00 to 07:00 (further details in Annex 18). Within each dredge fishing management area, shellfish dredging will be prohibited for 35 weeks of the year during the spring, summer and autumn months in order to enable the recovery of infaunal communities and to maintain the structure of intertidal and subtidal habitats, as well as supporting breeding shellfish populations.
Dark-bellied brent goose	All	Disturbance (Reg 33); Supporting habitat: disturbance caused by human activity	No significant reduction in numbers or displacement of wintering birds from an established	Disturbance and displacement through visual presence and noise were identified as potential pressures of oyster dredging. Disturbance can result in displacement when birds are	The 2013/14 season was reduced to four weeks in Portsmouth Harbour. The following two seasons were reduced to two weeks. Approximately three vessels fished within Portsmouth Harbour in the 2013/14 and 2014/15 seasons. In the 2015/16 season, approximately 6 to 7 vessels began to	Vessels Used in Fishing byelaw prohibits commercial fishing vessels over 12 metres from the Southern IFCA district. The reduction in vessel size also restricts the type of gear that can be used, with vessels often using lighter towed gear.

		(Draft Reg 35)	baseline, subject to natural change (Reg 33); The frequency, duration and/or intensity of disturbance affecting foraging and/or roosting birds should not reach levels that substantially affect the feature	unable to use an area due to the magnitude of the disturbance. The effects of disturbance can include a reduction in the survival of displaced individuals and effects on the population size. The movement of birds to less suitable feeding areas can lead to increased densities and interspecific competition. Disturbance can cause birds to take flight which increase energy demands and reduce food intake with potential consequences for survival and reproduction. The significance of disturbance is likely to depend on the availability of alternative undisturbed areas for birds and the frequency, seasonality and intensity at which shellfish dredging takes place. Responsiveness to disturbance is largely thought to be a species-specific trait.	fish on the first day, however this reduced to approximately 3 to 4 on the second day and only one vessel continued to fish for the first week of the season. The 2016/17 season will default back to the 4 month open season as dictated by the Oyster Close Season byelaw. Dark-bellied brent geese are known to feed on intertidal mudflats and sandflats and in on mixed sediment shores during low tide. It is however thought that oyster dredging has very little direct impact on disturbance of waders since the activity occurs subtidally and when it does occur on the fringes of the intertidal zone (which is infrequently) it does so at high tide and feeding takes place at low tide, thus eliminating the possibly of any adverse significant effect. Dark-bellied brent geese occur from October to March. The wind-farm sensitivity index indicates the Dark-bellied brent goose has moderate sensitivity to wind farm developments. The escape flight distance exhibited by the species ranges. The median distance at which a response occurred was reported at 51.5 metres in the Solent. Portsmouth Harbour is an area subject to high levels of vessel traffic and some bird species can become habituated to particular disturbance events or types of disturbance. In the	The Solent European Marine Site (Prohibition of Method of Dredging) Order 2004 prevents pump scooping as a means of taking shellfish. Fishing for Oysters, Mussels and Clam byelaw regulates methods can be used to fish for these species. These are a) hand picking and b) dredging using a dredge with a rigid framed south so designed to take shellfish only when towed along the sea bed. Temporary Closure of Shellfish Beds byelaw allows the authority to temporarily close any bed or part of a bed of shellfish where it is the opinion of the Committee that it is severely depleted and as such required temporary closure in order to ensure recovery, or any bed or part of bed containing mainly immature or undersized shellfish which is in the interest of protection and development of the fishery, or any bed of transplanted shellfish that ought to not be fished until it becomes established. For the last three seasons (2013/14, 2014/15 and 2015/16) this byelaw has been used to close the oyster fishery in Southampton Water and the wider Solent, as well as shortening the open season in the eastern harbours. For the 2016/17 season, Southampton Water and the wider Solent will remain

					context of the high vessel levels that occur within Portsmouth Harbour, it is therefore highly unlikely that oyster dredging will lead to a significant adverse effect on the feature. In addition, Portsmouth Harbour is subject to recent maintenance dredging that is likely to lead to greater disturbance than that caused by shellfish dredging.	closed and the eastern harbours will open as per the Oyster Close Season byelaw. The Oyster Close Season byelaw prohibits any person from dredging or fishing for in or taking any fishery oysters during the period from the 1st day of March to the 31st of October in any year. Oyster dredge byelaw prohibits the use of any dredge which exceeds 1.5 m in length when using a single dredge or totalling 3.0 m in length when using two dredges at the same time. Oysters, Clams, Mussels – Prohibition on Night Fishing byelaw prohibits any person from dredging or fishing or taking any oysters before 8.00 am or after 4.00 pm during the open season. The Prohibition of Gathering (Sea Fisheries Resources) in Seagrass Beds byelaw prohibits any person from digging for, fishing for or taking any sea fisheries resource in or from the prohibited areas. No person shall carry a rake, spade, fork or any similar tool in prohibited areas. The Bottom Towed Fishing Gear byelaw prohibits bottom towed fishing gear over sensitive features including reef features and seagrass within the Solent and Portsmouth Harbour SPA, closing most of the site to these

						activities. Southern IFCA is currently amending this byelaw to introduce additional network of permanent bottom towed fishing gear closure areas. The network is designed to protect good examples of low-energy SAC habitats, maintaining the integrity of the site, whilst also offering long-term stability to guard against the effects of fishing effort displacement which may result from other additional measures also being introduced. These additional measures include spatial and temporal restrictions on shellfish dredging within the site, via a network of dredge fishing management areas and daily closures from 17:00 to 07:00 (further details in Annex 18). Within each dredge fishing management area, shellfish dredging will be prohibited for 35 weeks of the year during the spring, summer and autumn months in order to enable the recovery of infaunal communities and to maintain the structure of intertidal and subtidal habitats, as well as supporting breeding shellfish populations.
Red-breasted merganser	All	Disturbance (Reg 33); Supporting habitat: disturbance caused by human activity (Draft Reg	No significant reduction in numbers or displacement of wintering birds from an established baseline,	Disturbance and displacement through visual presence and noise were identified as potential pressures of oyster dredging. Disturbance can result in displacement when birds are unable to use an area due to	The 2013/14 season was reduced to four weeks in Portsmouth Harbour. The following two seasons were reduced to two weeks. Approximately three vessels fished within Portsmouth Harbour in the 2013/14 and 2014/15 seasons. In the 2015/16 season, approximately 6 to 7 vessels began to fish on the first day, however this	Vessels Used in Fishing byelaw prohibits commercial fishing vessels over 12 metres from the Southern IFCA district. The reduction in vessel size also restricts the type of gear that can be used, with vessels often using lighter towed gear.

		35)	subject to natural change (Reg 33); The frequency, duration and/or intensity of disturbance affecting foraging and/or roosting birds should not reach levels that substantially affect the feature	the magnitude of the disturbance. The effects of disturbance can include a reduction in the survival of displaced individuals and effects on the population size. The movement of birds to less suitable feeding areas can lead to increased densities and interspecific competition. Disturbance can cause birds to take flight which increase energy demands and reduce food intake with potential consequences for survival and reproduction. The significance of disturbance is likely to depend on the availability of alternative undisturbed areas for birds and the frequency, seasonality and intensity at which shellfish dredging takes place. Responsiveness to disturbance is largely thought to be a species-specific trait.	reduced to approximately 3 to 4 on the second day and only one vessel continued to fish for the first week of the season. The 2016/17 season will default back to the 4 month open season as dictated by the Oyster Close Season byelaw. Red-breasted mergansers are a type of diving duck known to feed on small fish. Oyster dredging therefore may cause disturbance to the species when feeding. Unfortunately there is a lack of information of where the species is known to feed to determine if this overlaps with areas of oyster dredging. The level of fishing activity is however low and concentrated within a short period (maximum of 14 days). This is likely to largely reduce the likelihood of disturbance from oyster dredging. Red-breasted mergansers occur in significant numbers from November to April. The wind-farm sensitivity index indicates the Red-breasted merganser has moderate sensitivity to wind farm developments. Portsmouth Harbour is an area subject to high levels of vessel traffic and some bird species can become habituated to particular disturbance events or types of disturbance. In the context of the high vessel levels that occur within Portsmouth Harbour, it is therefore unlikely that oyster dredging will lead to a significant adverse effect	The Solent European Marine Site (Prohibition of Method of Dredging) Order 2004 prevents pump scooping as a means of taking shellfish. Fishing for Oysters, Mussels and Clam byelaw regulates methods can be used to fish for these species. These are a) hand picking and b) dredging using a dredge with a rigid framed south so designed to take shellfish only when towed along the sea bed. Temporary Closure of Shellfish Beds byelaw allows the authority to temporarily close any bed or part of a bed of shellfish where it is the opinion of the Committee that it is severely depleted and as such required temporary closure in order to ensure recovery, or any bed or part of bed containing mainly immature or undersized shellfish which is in the interest of protection and development of the fishery, or any bed of transplanted shellfish that ought to not be fished until it becomes established. For the last three seasons (2013/14, 2014/15 and 2015/16) this byelaw has been used to close the oyster fishery in Southampton Water and the wider Solent, as well as shortening the open season in the eastern harbours. For the 2016/17 season, Southampton Water and the wider Solent will remain closed and the eastern harbours

					on the feature. In addition, Portsmouth Harbour is subject to recent maintenance dredging that is likely to lead to greater disturbance than that caused by shellfish dredging.	will open as per the Oyster Close Season byelaw. The Oyster Close Season byelaw prohibits any person from dredging or fishing for in or taking any fishery oysters during the period from the 1st day of March to the 31st of October in any year. Oyster dredge byelaw prohibits the use of any dredge which exceeds 1.5 m in length when using a single dredge or totalling 3.0 m in length when using two dredges at the same time. Oysters, Clams, Mussels – Prohibition on Night Fishing byelaw prohibits any person from dredging or fishing or taking any oysters before 8.00 am or after 4.00 pm during the open season. The Prohibition of Gathering (Sea Fisheries Resources) in Seagrass Beds byelaw prohibits any person from digging for, fishing for or taking any sea fisheries resource in or from the prohibited areas. No person shall carry a rake, spade, fork or any similar tool in prohibited areas. The Bottom Towed Fishing Gear byelaw prohibits bottom towed fishing gear over sensitive features including reef features and seagrass within the Solent and Portsmouth Harbour SPA, closing most of the site to these activities. Southern IFCA is

						currently amending this byelaw to introduce additional network of permanent bottom towed fishing gear closure areas. The network is designed to protect good examples of low-energy SAC habitats, maintaining the integrity of the site, whilst also offering long-term stability to guard against the effects of fishing effort displacement which may result from other additional measures also being introduced. These additional measures include spatial and temporal restrictions on shellfish dredging within the site, via a network of dredge fishing management areas and daily closures from 17:00 to 07:00 (further details in Annex 18). Within each dredge fishing management area, shellfish dredging will be prohibited for 35 weeks of the year during the spring, summer and autumn months in order to enable the recovery of infaunal communities and to maintain the structure of intertidal and subtidal habitats, as well as supporting breeding shellfish populations.
Black-tailed godwit	All	Disturbance (Reg 33); Supporting habitat: disturbance caused by human activity (Draft Reg 35)	No significant reduction in numbers or displacement of wintering birds from an established baseline, subject to	Disturbance and displacement through visual presence and noise were identified as potential pressures of oyster dredging. Disturbance can result in displacement when birds are unable to use an area due to the magnitude of the	The 2013/14 season was reduced to four weeks in Portsmouth Harbour. The following two seasons were reduced to two weeks. Approximately three vessels fished within Portsmouth Harbour in the 2013/14 and 2014/15 seasons. In the 2015/16 season, approximately 6 to 7 vessels began to fish on the first day, however this reduced to approximately 3 to 4 on the	Vessels Used in Fishing byelaw prohibits commercial fishing vessels over 12 metres from the Southern IFCA district. The reduction in vessel size also restricts the type of gear that can be used, with vessels often using lighter towed gear. The Solent European Marine Site

			natural change (Reg 33); The frequency, duration and/or intensity of disturbance affecting foraging and/or roosting birds should not reach levels that substantially affect the feature	disturbance. The effects of disturbance can include a reduction in the survival of displaced individuals and effects on the population size. The movement of birds to less suitable feeding areas can lead to increased densities and interspecific competition. Disturbance can cause birds to take flight which increase energy demands and reduce food intake with potential consequences for survival and reproduction. The significance of disturbance is likely to depend on the availability of alternative undisturbed areas for birds and the frequency, seasonality and intensity at which shellfish dredging takes place. Responsiveness to disturbance is largely thought to be a species-specific trait.	second day and only one vessel continued to fish for the first week of the season. The 2016/17 season will default back to the 4 month open season as dictated by the Oyster Close Season byelaw. Black-tailed godwits are known to feed at low tide. These areas may have limited overlap with areas where oyster dredging takes place when it occurs on the fringes of the intertidal. It is however thought that oyster dredging has very little direct impact on disturbance of waders since the activity occurs subtidally and when it does occur on the fringes of the intertidal zone (which is infrequently) it does so at high tide and feeding takes place at low tide, thus eliminating the possibly of any adverse significant effect. Black-tailed godwits are present in significant numbers from July to April. The wind-farm sensitivity index indicates the Black-tailed godwit has low sensitivity to wind farm developments. Furthermore, Gill *et al*. (2001) reported no significant relationship between numbers of black-tailed godwits and human activity at a range of spatial scales (Gill *et al*., 2001). There was also no effect of the presence of marinas or footpaths on the number of godwits supported on the adjacent mudflats (Gill *et al*., 2001). Another study looking at the disturbance of bird species in the	(Prohibition of Method of Dredging) Order 2004 prevents pump scooping as a means of taking shellfish. Fishing for Oysters, Mussels and Clam byelaw regulates methods can be used to fish for these species. These are a) hand picking and b) dredging using a dredge with a rigid framed south so designed to take shellfish only when towed along the sea bed. Temporary Closure of Shellfish Beds byelaw allows the authority to temporarily close any bed or part of a bed of shellfish where it is the opinion of the Committee that it is severely depleted and as such required temporary closure in order to ensure recovery, or any bed or part of bed containing mainly immature or undersized shellfish which is in the interest of protection and development of the fishery, or any bed of transplanted shellfish that ought to not be fished until it becomes established. For the last three seasons (2013/14, 2014/15 and 2015/16) this byelaw has been used to close the oyster fishery in Southampton Water and the wider Solent, as well as shortening the open season in the eastern harbours. For the 2016/17 season, Southampton Water and the wider Solent will remain closed and the eastern harbours will open as per the Oyster Close

					Solent reported low vulnerability to disturbance as a result of short disturbance distances and ability to feed effectively at night, when disturbance levels are much lower (Stillman *et al*., 2012). Portsmouth Harbour is an area subject to high levels of vessel traffic and some bird species can become habituated to particular disturbance events or types of disturbance. In the context of the high vessel levels that occur within Portsmouth Harbour, it is therefore highly unlikely that oyster dredging will lead to a significant adverse effect on the feature. In addition, Portsmouth Harbour is subject to recent maintenance dredging that is likely to lead to greater disturbance than that caused by shellfish dredging.	Season byelaw. The Oyster Close Season byelaw prohibits any person from dredging or fishing for in or taking any fishery oysters during the period from the 1st day of March to the 31st of October in any year. Oyster dredge byelaw prohibits the use of any dredge which exceeds 1.5 m in length when using a single dredge or totalling 3.0 m in length when using two dredges at the same time. Oysters, Clams, Mussels – Prohibition on Night Fishing byelaw prohibits any person from dredging or fishing or taking any oysters before 8.00 am or after 4.00 pm during the open season. The Prohibition of Gathering (Sea Fisheries Resources) in Seagrass Beds byelaw prohibits any person from digging for, fishing for or taking any sea fisheries resource in or from the prohibited areas. No person shall carry a rake, spade, fork or any similar tool in prohibited areas. The Bottom Towed Fishing Gear byelaw prohibits bottom towed fishing gear over sensitive features including reef features and seagrass within the Solent and Portsmouth Harbour SPA, closing most of the site to these activities. Southern IFCA is currently amending this byelaw to

						introduce additional network of permanent bottom towed fishing gear closure areas. The network is designed to protect good examples of low-energy SAC habitats, maintaining the integrity of the site, whilst also offering long-term stability to guard against the effects of fishing effort displacement which may result from other additional measures also being introduced. These additional measures include spatial and temporal restrictions on shellfish dredging within the site, via a network of dredge fishing management areas and daily closures from 17:00 to 07:00 (further details in Annex 18). Within each dredge fishing management area, shellfish dredging will be prohibited for 35 weeks of the year during the spring, summer and autumn months in order to enable the recovery of infaunal communities and to maintain the structure of intertidal and subtidal habitats, as well as supporting breeding shellfish populations.

Dunlin	All	Disturbance (Reg 33); Supporting habitat: disturbance caused by human activity (Draft Reg 35)	No significant reduction in numbers or displacement of wintering birds from an established baseline, subject to natural change (Reg 33); The frequency, duration and/or intensity of disturbance affecting foraging and/or roosting birds should not reach levels that substantially affect the feature	Disturbance and displacement through visual presence and noise were identified as potential pressures of oyster dredging. Disturbance can result in displacement when birds are unable to use an area due to the magnitude of the disturbance. The effects of disturbance can include a reduction in the survival of displaced individuals and effects on the population size. The movement of birds to less suitable feeding areas can lead to increased densities and interspecific competition. Disturbance can cause birds to take flight which increase energy demands and reduce food intake with potential consequences for survival and reproduction. The significance of disturbance is likely to depend on the availability of alternative undisturbed areas for birds and the frequency, seasonality and intensity at which shellfish dredging takes place. Responsiveness to disturbance is largely thought to be a species-specific trait.	The 2013/14 season was reduced to four weeks in Portsmouth Harbour. The following two seasons were reduced to two weeks. Approximately three vessels fished within Portsmouth Harbour in the 2013/14 and 2014/15 seasons. In the 2015/16 season, approximately 6 to 7 vessels began to fish on the first day, however this reduced to approximately 3 to 4 on the second day and only one vessel continued to fish for the first week of the season. The 2016/17 season will default back to the 4 month open season as dictated by the Oyster Close Season byelaw. Dunlin are known to feed at low tide. These areas may have limited overlap with areas where oyster dredging takes place when it occurs on the fringes of the intertidal. It is however thought that oyster dredging has very little direct impact on disturbance of waders since the activity occurs subtidally and when it does occur on the fringes of the intertidal zone (which is infrequently) it does so at high tide and feeding takes place at low tide, thus eliminating the possibly of any adverse significant effect. Dunlin are present in significant numbers from November to March. The wind-farm sensitivity index indicates the Dunlin have a very has low sensitivity to wind farm developments. The escape flight	Vessels Used in Fishing byelaw prohibits commercial fishing vessels over 12 metres from the Southern IFCA district. The reduction in vessel size also restricts the type of gear that can be used, with vessels often using lighter towed gear. The Solent European Marine Site (Prohibition of Method of Dredging) Order 2004 prevents pump scooping as a means of taking shellfish. Fishing for Oysters, Mussels and Clam byelaw regulates methods can be used to fish for these species. These are a) hand picking and b) dredging using a dredge with a rigid framed south so designed to take shellfish only when towed along the sea bed. Temporary Closure of Shellfish Beds byelaw allows the authority to temporarily close any bed or part of a bed of shellfish where it is the opinion of the Committee that it is severely depleted and as such required temporary closure in order to ensure recovery, or any bed or part of bed containing mainly immature or undersized shellfish which is in the interest of protection and development of the fishery, or any bed of transplanted shellfish that ought to not be fished until it becomes established. For the last three

					distance exhibited by the species ranges, in one study the distance from the disturbance stimuli was 30 m when stimuli was a researcher, to 71 to 163 m when people caused the disturbance. The median distance at which a response occurred was reported at 75 metres in the Solent. Studies in the Solent revealed that Dunlin were predicted to be one of the most vulnerable species to disturbance and disturbance was predicted to increase time spent feeding intertidally (Stillman *et al*., 2012). It is worth noting however that the study looked at disturbance in response to land-based and water-based recreational activities, with half of all incidences where major flight was observed involving activities on the intertidal. Portsmouth Harbour is an area subject to high levels of vessel traffic and some bird species can become habituated to particular disturbance events or types of disturbance. In the context of the high vessel levels that occur within Portsmouth Harbour, it is therefore highly unlikely that oyster dredging will lead to a significant adverse effect on the feature. In addition, Portsmouth Harbour is subject to recent maintenance dredging that is likely to lead to greater disturbance than that caused by shellfish dredging.	seasons (2013/14, 2014/15 and 2015/16) this byelaw has been used to close the oyster fishery in Southampton Water and the wider Solent, as well as shortening the open season in the eastern harbours. For the 2016/17 season, Southampton Water and the wider Solent will remain closed and the eastern harbours will open as per the Oyster Close Season byelaw. The Oyster Close Season byelaw prohibits any person from dredging or fishing for in or taking any fishery oysters during the period from the 1st day of March to the 31st of October in any year. Oyster dredge byelaw prohibits the use of any dredge which exceeds 1.5 m in length when using a single dredge or totalling 3.0 m in length when using two dredges at the same time. Oysters, Clams, Mussels – Prohibition on Night Fishing byelaw prohibits any person from dredging or fishing or taking any oysters before 8.00 am or after 4.00 pm during the open season. The Prohibition of Gathering (Sea Fisheries Resources) in Seagrass Beds byelaw prohibits any person from digging for, fishing for or taking any sea fisheries resource in or from the prohibited areas. No person shall carry a rake, spade, fork or any similar tool in

						prohibited areas. The Bottom Towed Fishing Gear byelaw prohibits bottom towed fishing gear over sensitive features including reef features and seagrass within the Solent and Portsmouth Harbour SPA, closing most of the site to these activities. Southern IFCA is currently amending this byelaw to introduce additional spatial and temporal restrictions on clam dredging within the site, via a network of dredge fishing management areas (detailed in Annex 18). Within each dredge fishing management area, clam dredging will be prohibited for 42 weeks of the year during the spring, summer and autumn months in order to enable the recovery of infaunal communities and to maintain the structure of intertidal and subtidal habitats, as well as supporting breeding shellfish populations.

7. Conclusion[19]

Oyster dredging was identified as having the potential to disturb regularly occurring migratory birds and waterfowl species and lead to changes in prey availability. Disturbance can occur visually or through noise. Changes in prey availability relate to the indirect effects of oyster dredging which include interactions with fishing gear through crushing, burial or exposure and smothering of prey species through enhanced sedimentation. It is therefore recognised that this activity has the potential to lead an adverse effect on a number of attributes including:

- Disturbance
- Food availability

Using Southern IFCA sightings data and feature mapping data (provided by Natural England), it is clear that the majority of oyster dredging takes place on subtidal mixed sediments which exist within the subtidal harbour channels and the activity has limited interaction with intertidal sediments used by migratory birds for feeding.

Having reviewed a wide range of evidence, including scientific literature, sightings data and feature mapping, it has been indicated that oyster dredging is unlikely to have a significant adverse effect on the regularly occurring migratory bird species and waterfowl assemblage and their supporting habitats, particularly in the present state of the fishery. The decline of the Solent oyster fishery since 2007 has led to a much reduced fishery, with Southampton Water and the wider Solent closed since 2013. There should be a negligible impact on intertidal sediments, with respect to food availability, as the activity occurs subtidally and infrequently fringes on the intertidal zone. This means that feeding sites utilised by a number of designated bird species at low tide are likely to remain unaffected. In the event of the activity occurring on the fringes of the intertidal, the infrequent nature of the activity within this area, combined with a closed season (of eight months as dictated by Oyster Close Season byelaw and new Solent Dredge Fishing byelaw) is likely to be sufficient to allow for the recovery of any adverse impacts on prey species.

In addition to changes in food availability, disturbance to feeding birds was also considered. The sensitivity of individual designated bird species was assessed and it was concluded that oyster dredging was unlikely to lead to the disturbance of these species for a number of reasons; birds which feed on the intertidal do so at low tide and oyster dredging is undertaken at high tide, thus effectively eliminating the possibility of disturbance during feeding periods at low tide. Furthermore, bird species within Portsmouth Harbour are subject to high levels of vessel traffic and so are likely to be habituated to such types of disturbance. The period during such disturbance events could occur is also largely reduced and the level of activity is low.

Based on the subtidal nature of the activity, lack of possibility for disturbance and 8 month close season (in the absence of restrictions applied through the Temporary Closure of Shellfish Beds byelaw), it is deemed that at its current level oyster dredging is unlikely to have an adverse effect on designated migratory bird species and waterfowl assemblage and their supporting habitats and will not hinder the site from achieving its conservation objectives. This conclusion has been reached regardless of any restrictions applied through the Temporary Closure of Shellfish Beds byelaw, but with regard to the introduction of bottom towed fishing gear management measures (which is applicable to oyster dredging) (see Annex 18). It is Southern IFCA's duty as the competent and relevant authority to manage damaging activities that may affect site integrity and lead to deterioration of the site.

[19] If conclusion of adverse effect alone an in-combination assessment is not required.

In order to ensure that the management of oyster dredging remains consistent with the conservation objectives of the site, Southern IFCA aim to implement a monitoring programme, in partnership with Natural England, to assess the impacts of fishing activity upon designated sub-features (details provided in Annex 18). In addition to this, Southern IFCA will continue to monitor fishing effort through sightings data and information from IFCOs. In the short term a change in the status of the fishery is unforeseen, however it is recognised that the status of a fishery may change. Efforts are currently being made to restore the Solent oyster population through the relaying of broodstock in higher density areas. On this basis, the management of oyster dredging will be reviewed as appropriate should new evidence on activity levels and/or gear-habitat interaction become available.

8. In-combination assessment

No adverse effect on bird features and their supporting habitats of the Portsmouth Harbour SPA was concluded for the effect of oyster dredging alone within the SPA. Oyster dredging occurs in the Portsmouth Harbour SPA alongside other fishing activities and commercial plans and projects and therefore requires an in-combination assessment.

Commercial plans and projects that occur within or may affect the Portsmouth Harbour SPA are considered in section 8.1. The impacts of these plans or projects require a Habitats Regulations Assessment in their own right, accounting for any in-combination effects, alongside existing fisheries activities.

There is the potential for oyster dredging to have a likely significant effect when considered in-combination with other fishing activities (i.e. clam dredging) that occur within the site. These are outlined in section 8.2. Any fishing activities that were screened out as part of the revised approach assessment process will not be considered (see Portsmouth Harbour SPA screening summary for details of these activities). In the Portsmouth Harbour SPA, commercially licensed fishing vessels are known to utilise a number of different gear types and can be engaged in multiple fishing activities and this, whilst dividing effort between gear types, may lead to cumulative impacts different to those of a single fishing activity.

8.1 Other plans and project

Project details	Status	Potential for in-combination effect
Tipner Housing redevelopment	Consented but not constructed yet	Relevant impact pathways identified for this project including bird disturbance (construction and operation). The site is adjacent to the Portsmouth Harbour SPA. Low level construction vibration is anticipated from piling activities. A startle reaction from piling works could temporarily disrupt feeding and /or roosting birds and closer to construction works birds may be temporarily displaced to other areas. Survey work established important roosting areas for some bird species along the frontage and that important numbers of several SPA species forage within the wider area of Tipner Lake. Measures have been incorporated into the project to minimise disturbance to these areas to reduce impacts to the point where

		they are unlikely to be significant. Construction operations will be rotated around the site to prevent continuous disruption in one location. Piling operations on and around the waterfront will not take place during the sensitive overwintering period. The derelict jelly will be removed and replaced with a high tide roost in the form of a floating pontoon 50m from the shore, prior to autumn when birds return to the harbour. There will be no access to the foreshore at any point along the development frontage to reduce disturbance further and the coastal walkway will be partially screened from the intertidal. New residents will receive packs containing information on important areas and the necessity to act responsibly when undertaking recreational activities. Interpretation boards will also be used as an educational tool. In addition, activities currently taking place in the harbour, as well as the presence of the M275 which runs next to the site, means noise from construction activity is likely to be indistinguishable from background noise. Based on the mitigation measures that will be undertaken, there will be no likely significant effects on ecology. At a tLSE level for oyster dredging, visual disturbance and noise disturbance were screened in. On further investigation (contained within this HRA), both impact pathways have been screened out. The reason for this is largely down to the limited potential for direct impact since the activity predominantly subtidal at high tide and feeding/foraging takes place at low tide, thus largely eliminating the possibility of disturbance. In further support of this, Portsmouth Harbour is subject to high levels of vessel traffic and it is likely that some bird species become habituated to these types of disturbance. Based on the mitigation measures that will be undertaken as part of the project and the lack of potential for bird disturbance from oyster dredging, it is anticipated that there will be no in-combination effects.
Queen Elizabeth aircraft carrier capital dredge	Consented and underway	Relevant impact pathways identified in relation to the project include increase in suspended sediment concentrations, increase in sedimentation rates, bird disturbance (operation and construction) and loss of intertidal. Increase in suspended sediment concentrations/ sedimentation rates - the capital dredging operation in Portsmouth Harbour and approach channel will result in resuspension of sediment into the water

		column and potentially result in smothering of sensitive habitats. A likely significant effect on Portsmouth Harbour SPA for internationally important populations of regularly occurring migratory species was concluded with respect to increased suspended sedimentation, associated siltation and localised smothering from the approach channel dredge. These impacts could affect intertidal invertebrates and epifloral communities. Modelling of deposition rates within Portsmouth Harbour, around Hamilton Bank and the outer approaches, confirmed deposition of fine sediment is expected to occur within and outside of the dredging area with a maximum accretion of less than 5 mm. In the north and north west of Foundation Lake Approach and turning circle, accretion rates are predicted in the range of 10 to 30 mm. Intertidal infaunal communities within the harbour are characteristic of muddy sediments which suggests increases in fine subtidal sediments is unlikely to have a negative impact these communities. Very little sediment would be expected to be deposited over intertidal areas as a result of dredging activity. Localised adverse impacts could occur with respect to *Zostera* spp. if beds are located directly adjacent to the dredge footprint. Mapping however shows that locations of *Zostera* recorded in 2012 do not overlap with areas of increased suspended sediment. A more detailed appropriate assessment concluded that suspended sediment and sedimentation rates would not result in an adverse effect on the interest features of the site. Bird disturbance – noise disturbance to SPA bird species could occur during the installation of navigation aids and middle slip jetty refurbishment and a likely significant effect was concluded for both project elements. Installation of navigation aids could lead to disturbance and displacement over an area of approximately 250 metres from the construction site. Bird surveys however have revealed at locations in close proximity to the construction works, that utilisation of mudflats by birds relatively low when compared with other areas in the harbour and bird density is also low. The bird surveys have also shown that birds appear to be habituated to the noise and disturbance associated with regular harbour activities. The duration of the works is also short. Mitigation measures, where possible, include avoiding construction in the upper harbour during the overwintering period (January and February) and the use of shrouds to reduce noise. Piling works associated with the Middle Slip Jetty refurbishment

		has the potential for disturbance. Nearest areas of mudflat are 400 to 600m away. At such distances noise levels are less than 70 dB LAeq, which is significantly below the 85 dB threshold where flight and temporary displacement has been observed. The distance from intertidal areas mean it is unlikely to give rise to disturbance and any changes would be expected to be short-lived. A more detailed appropriate assessment concluded that noise disturbance arising from different project elements would not result in an adverse effect on the interest features of the site. Loss of intertidal – the approach channel dredge is expected to lead to an average increase of 2 to 4 mm in water levels at low water within the harbour. This permanent rise in water level translates to a loss of approximately 1 hectare of low intertidal mudflat distributed throughout the harbour, representing a loss of 0.12% of intertidal resources. This corresponds to a reduction in mudflat exposure around low water for approximately three hours per month (0.001 percent of mudflat hectare exposure per month). Increases of 2 to 4 mm are not sufficient to prevent Brent Geese from feeding within these areas. Zostera and Enteromorpha would still be present in the affected area and so still available to Brent Geese. The increase in water level is expected to have a negligible impact on the species with respect to foraging. A reduction in foraging duration (1 ha of intertidal mud for 10 minutes at low water on a neap tidal cycle) is also not expected to have a significant impact on Brent Geese. There is also a potential loss of intertidal mudflat due to the installation of navigation aids. Two sets of transit lights may be installed within the inner harbour, either immediately adjacent to or over intertidal mudflat, with the preferred option to locate them subtidally. If located intertidally however there would be loss of mudflat habitat of between 110 to 216 square metres (0.0026% of the intertidal resource). A more detailed appropriate assessment concluded that loss of intertidal, arising from different project elements, would not result in an adverse effect on the interest features of the site. At a tLSE level for oyster dredging, visual disturbance and noise disturbance were screened in. On further investigation (contained within this HRA), both impact pathways have been screened out. The reason for this is largely down to the limited potential for direct impact since the activity predominantly subtidal at high tide and feeding/foraging takes place

		at low tide, thus largely eliminating the possibility of disturbance. In further support of this, Portsmouth Harbour is subject to high levels of vessel traffic and it is likely that some bird species become habituated to these types of disturbance. Changes in suspended solids (water clarity/ increased turbidity) and siltation rate changes (high), including smothering were screened out on the basis that increases in the turbidity are only temporary and unlikely to cause significant impact on feeding success and smothering effects are unlikely to have a physical impact on the supporting habitats as the activity is concentrated subtidally. Impacts surrounding the project come from several different project elements and each have been considered to not have an adverse effect on the interest feature of the site. Due to the lack of overlapping impact pathways (loss of intertidal, increase in suspended sediment concentrations and increase in sedimentation rate) between the activity and project and the relatively localised and short duration (during the construction period) of impacts caused by the project (noise disturbance) it is unlikely that in-combination effects will be significant.
Portchester to Emsworth Coastal Defence Strategy	In planning	Relevant impact pathways identified in relation to the project include the loss of intertidal habitat and bird disturbance (construction). Loss of intertidal - The Portsea Island Coastal Strategy Study [PICSS] was approved in 2011 and covers the whole of Portsea Island. The strategy confirms the North Solent Shoreline Management Plan [SMP] policy (2010) for Portsea Island of 'Hold the Line' and splits Portsea Island into 7 discrete flood cells. Under the North Portsea Island scheme, covering 8.4 km of coastline from Tipner through to Milton, works have been identified including raising of seawalls and improving seawalls structural integrity. These proposed works are planned over the first ten years and these follow a phased approach, including Phase 1, Ports Creek Railways Bridge to Kendall's Wharf Northern Boundary, and Phase 2, Milton Common and Great Salterns Quay. Coastal squeeze loss of 11.69 ha of intertidal will be caused by sea level rise and the delivery of the delivery of the strategic policy option of 'Hold the Line'. An appropriate assessment concluded that because of the calculated coastal squeeze losses, that implementation of the strategy would have an adverse effect on designated sites. The AA however also concluded there is justification for these adverse

		effects as there is no alterative policy and there is an over-riding public need to protect life and property and so an Imperative Reasons of Overriding Public Interest statement was made. Environmental compensation will be achieved through the Regional Habitat Creation Programme which promotes the realignment of defences elsewhere in the Solent to create new intertidal habitats. This was signed off by Defra in April 2011. The phases that are currently underway or in planning have a small working footprint during their construction which is strictly controlled by a Construction and Environment Management Plan. Direct disturbance to the sediment is minimal and in discrete locations at any one time. For phase 1 there was an access footprint of 15m and in phase 2 a maximum access footprint of 10 m along the Milton Common Frontage and 20 m around Great Salterns Quay. No LSE is expected as any disturbance to discrete working areas is minimal, temporary and must follow good working practices as outlined in the Construction and Environment Management Plan. This is expected to lead to no longer term impacts in these areas which are considered less sensitive bird feeding areas as areas are highly disturbed and so is not well utilised by birds. In addition, works are undertaken outside of bird sensitive periods and so the impact of the works on food availability is further reduced. Phase 2 works will lead to the gain of 2,460m^2 mudflat habitat within Langstone Harbour from the removal of Great Salterns Quay. Bird disturbance – construction works, particularly to seawalls, are expected to generate some level of noise and visual disturbance. The sensitivity of the Phase 1 area is considered to be of low sensitivity due to existing activities which occur in and around the Harbour. Works will run outside of the most sensitive overwintering period. The installation of noise absorbing screens will also be adopted if levels reach 69 dB or higher at the location of overwintering birds (Phase 1). The use hand operation machinery has also been used to reduce noise levels. The working footprint of the intertidal area will be strictly controlled, keeping direct disturbance to sediments to a minimum and in one discrete location at any one time (phased approach). This means that disturbance will be both localised and temporary and there will be vast ‘free from disturbance’ areas available at any one time. Access will remain similar to existing access and therefore no additional

		disturbance is expected above existing levels, with some areas (in Phase 2 works) seeing large reductions in access. No LSE is expected on interest features present. At a tLSE level for oyster dredging, visual disturbance and noise disturbance were screened in. On further investigation (contained within this HRA), both impact pathways have been screened out. The reason for this is largely down to the limited potential for direct impact since the activity predominantly subtidal at high tide and feeding/foraging takes place at low tide, thus largely eliminating the possibility of disturbance. In further support of this, Portsmouth Harbour is subject to high levels of vessel traffic and it is likely that some bird species become habituated to these types of disturbance. The combined impacts of phased small scale coastal defence works and oyster dredging will not lead to in-combination effects, with respect to noise and visual disturbance, as there is no temporal overlap with respect to the activity (November) and construction works (April to October). Any disturbance caused by the works is concentrated during the least sensitive periods and are temporary, localised and small in scale. The general loss of intertidal from the overall strategy has been signed off by Defra under an Imperative Reasons of Overriding Public Interest statement.

8.2 Other fishing activities

Fishing activity	Potential for in-combination effect
Clam dredging	Common impact pathways identified at a tLSE level and these include, physical damage – abrasion, disturbance (noise and visual) and changes in food availability. Noise and visual disturbance were both screened out at an appropriate assessment level as they occur at high tide or in subtidal areas. Birds feed at low tide and subtidal sediment communities do not form supporting habitats for the SPA. It is unlikely the two activities will lead to significant in-combination effects with respect to disturbance (noise and visual). Clam dredging is often focused in areas on softer sediment in distinct, small spatial areas where shellfish beds exist. These largely include the north western quarter of Portsmouth Harbour (east of Tipner) and Fareham Creek. These sites occur intertidally (fished at high tide) and subtidally, with vessels often operating in very shallow waters. Sightings data, indicative of recent fishing effort, is presented in Annex 16 and illustrates areas where the two activities could potentially overlap in the subtidal channels in the north east of Portsmouth Harbour where the main channel splits. Historic sightings data are presented in Annex 17 and this shows a clear overlap in of the two

	activities in the same locality, in addition to a small number of overlapping sightings in the western subtidal channel which extends towards and up into Fareham Creek. Based on the nature of both gear types, which are forms of shellfish dredges known to penetrate into the seabed, and the known impact pathways of both activities, oyster dredging and clam dredging have the potential to cause in-combination effects. The areas of concern are those where the activities are known to overlap which is mainly in subtidal areas or on the fringes of the intertidal. The upper reaches of the intertidal are much less at risk of in-combination effects due to the lack of oyster dredging taking place over these features. These in-combination effects, which include physical damage through abrasion (and penetration) and potentially siltation, can only take place when both activities are allowed i.e. within the oyster season. It is also worth noting that differences in the design of both dredges. The design of the oyster dredge, is likely to cause less damage than those used for clam dredging which can have teeth of up to 14 cm. The ladder on an oyster dredge can be up to 8.5 cm long. An oyster dredge is designed to be towed on top of the seabed, thus limiting penetration into the sediment, the clam dredge is designed to penetrate into the sediment. This is linked to the ecology of the target species. Southern IFCA's Habitat Regulation Assessment for clam dredging in the Portsmouth Harbour SPA concluded that this activity alone will not have an adverse effect upon the integrity of the site due to the introduction of management measures for shellfish dredging and bottom towed fishing gear. These measures include spatial and temporal restrictions on shellfish dredging within the site, via a network of dredge fishing management areas and permanent gear closure areas. It is therefore concluded that oyster dredging will not lead to any significant in-combination effects with clam dredging due to these and the timing/location of the two activities.
Demersal netting	No impact pathways were identified at a tLSE level for demersal netting. The activity is low impact and unlikely to lead to any in-combination effects. In addition, static gear types such as netting and mobile gear types such as oyster dredging are not compatible and often occur in different areas, thus largely eliminating any spatial overlap between the two activities.
Demersal longlining	No impact pathways were identified at a tLSE level for demersal longlining. The activity is low impact and unlikely to lead to any in-combination effects. In addition, static gear types such as longlining and mobile gear types such as oyster dredging are not compatible and often occur in different areas, thus largely eliminating any spatial overlap between the two activities.
Handlines & Jigging/Trolling	No impact pathways were identified at a tLSE level for handlines and jigging/trolling. The activity is very low impact and unlikely to lead to any in-combination effects.

9. Summary of consultation with Natural England

Consultation	Date submitted	Response from NE	Date received
First draft – excluding management measures	03/02/2016	Recommended amendments	23/03/2016

(v1.2)			
Revised draft in response to NE recommendations (v1.4)	21/04/2016	Accepted amendments	29/04/2016
Revised final draft in relation to 2016/17 oyster management (v1.7)	05/10/2016	Accepted changes	21/10/2016

10. Integrity test

Based on the subtidal nature of oyster dredging, lack of potential for disturbance and 8 month close season (in the absence of restrictions applied through the Temporary Closure of Shellfish Beds byelaw), it is deemed that oyster dredging alone will not have an adverse effect on designated migratory bird species and waterfowl assemblage and their supporting habitats and will not hinder the site from achieving its conservation objectives. The in-combination assessment concluded the potential for adverse effect between clam dredging and oyster dredging in areas of spatial overlap due to similar impact pathways. However the proposed bottom towed fishing gear management measures, which will apply to both activities, address any risks posed to site integrity through in-combination effects, regardless of restrictions imposed on the oyster fishery through the 'Temporary Closure of Shellfish Beds' byelaw and therefore also addresses any risk to the achievement of the sites conservation objectives should the oyster fishery develop.

A change in the current status of the clam and oyster fishery, upon which the Habitats Regulation Assessment is based, is unforeseen, however it is recognised that future changes may occur. For example, efforts are currently being made to restore the Solent oyster population. Southern IFCA will continue to monitor fishing activity within the Portsmouth Harbour SPA, in addition to collating data on the potential impacts of shellfish dredging upon site features/sub-features. New evidence on activity levels, and impacts (such as that collected through monitoring), will be periodically reviewed to ensure management of the fishery continues to be compatible with the conservation objectives of the site. In the event new evidence has the potential to hinder the sites conservation objectives, such as an increase in fishing activity, a Habitat Regulations Assessment will be undertaken.

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Annex 2: The Key Principles of the SEMS Management Scheme (http://www.solentems.org.uk/sems/management_scheme/)

Principle 1 - Favourable Condition

The SEMS has qualified for designation against the background of current use and there is a working assumption that the features for which the site is designated are in favourable condition from the time of designation. The Management Scheme and the monitoring to be carried out by 2006 will test this assumption.

Principle 2 - Sustainable Development

The aim of the Management Scheme is not to exclude human activities from SEMS, but rather to ensure that they are undertaken in ways which do not threaten the nature conservation interest, and wherever possible, in ways that support it. The Management Scheme should ensure a balance of social, economic and environmental objectives when considering the management of activities within the Solent.

Principle 3 - Regulatory Use of Bye-laws

New bye-laws may be used as a regulatory mechanism for the SEMS. These should only be introduced into the Management Scheme when all other options have been considered and it is the only effective solution.

Principle 4 - Links to Existing Management and Other Plans/Initiative

Where appropriate the SEMS Management Scheme will directly utilise management actions from other existing management plans. The actions identified in the Management Scheme will therefore serve to inform and support existing management effects rather than duplicate them. The management measures identified in other plans will remain the mechanism through which these are to be implemented.

Principle 5 - Onus of Proof

The wording for principle 5 is based on the following three-stage process:

- Stage 1 - Evidence must be established that a site feature is in deterioration. This evidence must be scientific, credible and unambiguous but it need not originate from English Nature itself. It is acknowledged that other Relevant Authorities will be undertaking monitoring regimes and if their programmes flag up something of interest, it would be expected that they would present it to English Nature for further comment and verification.
- Stage 2 - English Nature, as the Government's body with responsibility for nature conservation, must believe that a site feature is in deterioration. If the evidence to support this view has come from their own monitoring - or if it has come from an external, authoritative source - EN should act as a conduit to demonstrate this fact to the Relevant Authority with responsibility for the management of the activity suspected of having detrimental effect.
- Stage 3 - English Nature and the Relevant Authority (ies) involved should work together to establish any cause and effect relationship. From this, changes to management actions may be made.

Consideration of this process had led to the following definition of onus of proof: If through their own site condition monitoring programme or that of another Relevant Authority, English Nature can demonstrate that they have reasonable evidence to indicate that a deterioration in the condition of a SEMS feature or

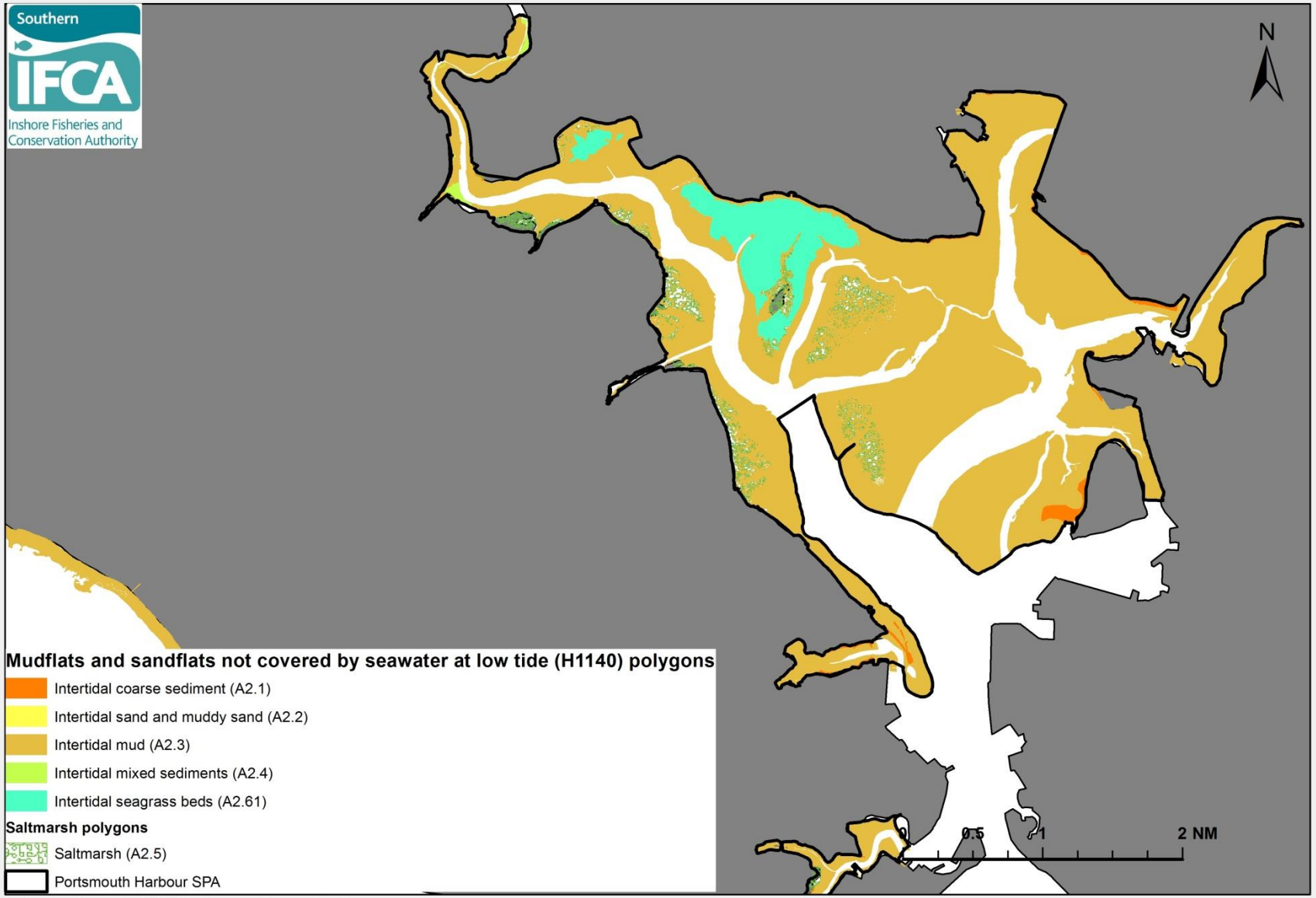
species exists, then English Nature and the Relevant Authorities concerned will work together to identify any cause and effect relationship.

Principle 6 - Management Actions

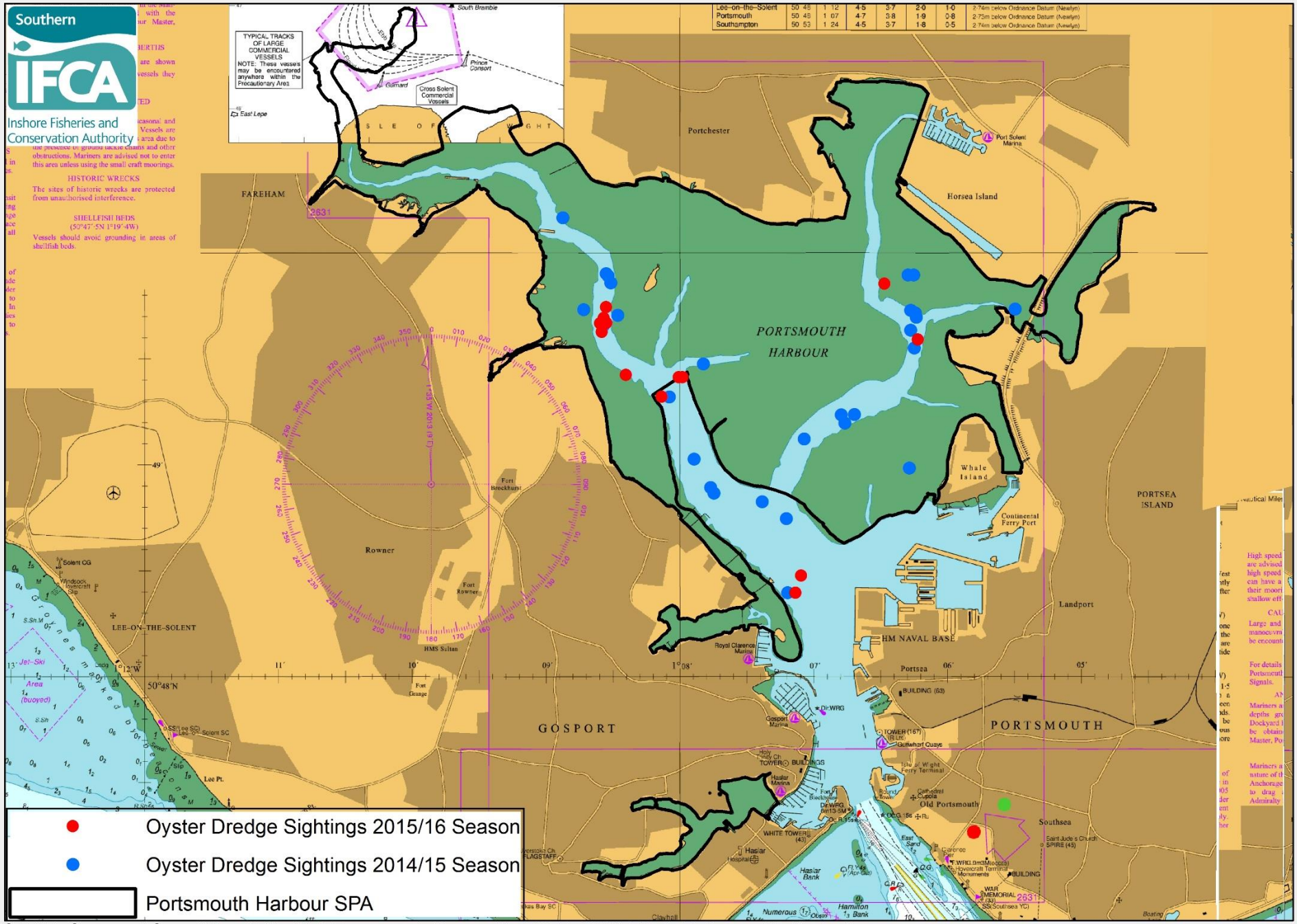
Where reasonable evidence is found to clearly demonstrate the cause and effect relationship the Relevant Authorities involved will instigate changes to the management of the activity, which will be within a RAs statutory obligations and will provide a solution that is in accordance with the Regulations and be fair, balanced, proportionate and appropriate to the site and the activity. Where the cause and effect relationship is uncertain but deterioration in the condition is still significant the Relevant Authorities should consider any potential changes in management practices in light of the precautionary principle* and the cost effectiveness of proposed measures in preventing damage. However, the precautionary principle should not be used to prevent existing management actions continuing where there is no evidence of real risk of deterioration or significant disturbance to site features.

All forms of environmental risk should be tested against the precautionary principle which means that where there are real risks to the site, lack of full scientific certainty should not be used as a reason for postponing measures that are likely to be cost effective in preventing such damage. It does not however imply that the suggested cause of such damage must be eradicated unless proved to be harmless and it cannot be used as a licence to invent hypothetical consequences. Moreover, it is important, when considering whether information available is sufficient, to take account of the associated balance of likely costs, including environmental costs, and benefits." (DETR & the Welsh Office, 1998).

Annex 3: Supporting Habitat(s) Site Feature Map for Portsmouth Harbour SPA



Annex 4: Fishing Activity Map(s) using Oyster Dredging Sightings Data from 2014/15 and 2015/16 Oyster Seasons in Portsmouth Harbour SPA



Annex 5: Natural England's Scoping Advice

Date: 19 December 2014
Our ref: 139600

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BY EMAIL ONLY

Dear Rob

Natural England's advice on the potential impacts of oyster dredging within the Solent

The following constitutes Natural England's formal advice regarding the potential impacts of dredging for oysters on the nature conservation features of the following designated sites:

- Solent Maritime Special Area of Conservation (SAC)
- Solent and Southampton Water Special Protection Area (SPA)
- Solent and Southampton Water Wetland of International Importance under the Ramsar Convention (Ramsar site)

Oyster dredging is an established fishing activity in the Solent; the modern fishery developed during the 1960s and was exploited by over 400 vessels during its peak in the late 1970s. The principal species targeted is the Native oyster (*Ostrea edulis*), but catches may include the non-native Pacific oyster (*Crassostrea gigas*). Oyster dredging effort within the Solent is focused upon sub-tidal habitats, with potential impacts on the designated sites listed above. These sites are afforded protection under the Habitats and Species Regulations 2010 (as amended), and underpinned by Sites of Special Scientific Interest (SSSI) which are afforded protection under the Wildlife and Countryside Act (1981) (as amended under the Countryside and Rights of Way Act 2000). The Solent oyster fishery is subject to Southern Inshore Fisheries and Conservation Authority (SIFCA) byelaws that stipulate a close season (01 March – 31 October); the type of dredge that may be used; the hours during which vessels may fish; the spatial extent of the fishery (to avoid damage to seagrass beds); and a minimum landing size for Native oysters. The ongoing decline in oyster landings over the last twenty years led to the termination in 2010 of the Solent Oyster Fishery Order, which was implemented in 1980 to manage the fishery. In further response to the continued decline in landings, Southern IFCA applied their Temporary Closure of Shellfish Beds Byelaw for the 2013/14 season: to close the wider Solent fishery and reduce the season within fished harbours to four weeks. A decision was recently taken by the Southern IFCA Committee to apply this byelaw again for the 2014/15 season: closing the wider Solent fishery and further reducing the season within harbours to two weeks. Oyster dredging also

takes place in Portsmouth Harbour SPA and Chichester and Langstone SPA, and Natural England will provide advice with respect to these designated sites in due course.

1. Legal Requirements

Natural England and the Southern IFCA have duties under Regulation 9(3) of the Conservation of the Habitats & Species Regulations 2010 as competent authorities with functions relevant to marine conservation to exercise those functions so as to secure compliance with the Habitats Directive. Article 6.2 of the Habitats Directive requires appropriate steps to be taken to avoid, in Natura 2000 sites, the deterioration of natural habitats and habitats of species as well as significant disturbance of the species for which the area has been classified. SIFCA also need to ensure that the measures proposed are compatible with the conservation and enhancement of the special interest of relevant SSSIs in line with their status as a Section 28G authority under the Wildlife and Countryside Act 1981 (as amended).

This advice is to inform the scope of an assessment required by SIFCA through Defra's revised approach to the management of commercial fisheries within European Marine Sites, to avoid damage or deterioration to the conservation features of the Solent Maritime SAC and Solent and Southampton Water SPA and Ramsar site.

2. Protected Sites

2.1 Solent Maritime SAC

2.1.1 Site overview

The Solent Maritime SAC is located in one of only a few major sheltered channels in Europe, lying between a substantial island (the Isle of Wight) and the mainland. The Solent and its inlets are unique in Britain and Europe for their complex tidal regime, with long periods of tidal stand at high and low tide, and for the complexity and particularly dynamic nature of the marine and estuarine habitats present within the area. There is a wide variety of marine sediment habitats influenced by a range of salinities, wave shelter and intensity of tidal streams, resulting in a uniquely complex site. Sediment habitats within the estuaries include extensive areas of estuarine flats, with intertidal areas often supporting eelgrass *Zostera sp.* and green algae, saltmarshes and natural shoreline transitions, such as drift line vegetation.

2.1.2 Features/sub-features at risk of impact

Natural England has reviewed the SAC features/sub-features at risk of impact from oyster dredging and agrees with the prioritisation exercise conducted by SIFCA. In addition to these 'at risk' features, we recommend that SIFCA also consider the risk of impact of oyster dredging upon intertidal SAC features. While the focus of oyster dredging effort occurs within sub-tidal habitats, the potential remains for dredging to also take place within the intertidal zone. To this end, Natural England has identified the features and sub-features which are at risk of impact from oyster dredging, and should therefore be included in an assessment of this activity within the Solent Maritime SAC (Table 1). As you are aware, Natural England is in the process of revising the Regulation 35 Conservation Advice document for the Solent Maritime SAC which is scheduled for draft publication in Spring 2015. We have sought to prioritise the drafting of Regulation 35 documents of relevance to

this scoping advice, and have used the revised feature and sub-feature descriptions for the Solent Maritime SAC within this advice letter.

Table 1: Summary of Solent Maritime SAC features/sub-features at risk of impact from oyster dredging

Feature	Sub-feature
Sandbanks which are slightly covered by seawater all the time	Subtidal coarse sediment
	Subtidal sand
	Subtidal seagrass beds
Estuaries	Subtidal coarse sediment
	Subtidal sand
	Subtidal seagrass beds
	Intertidal coarse sediment
	Intertidal mixed sediments
	Intertidal mud
	Intertidal sand and muddy sand
	Intertidal seagrass beds
Mudflats and sand flats not covered by seawater at low tide	Intertidal coarse sediment
	Intertidal mixed sediments
	Intertidal mud
	Intertidal sand and muddy sand
	Intertidal seagrass beds

Data on the presence and extent of these features/sub-features has been provided to SIFCA through Natural England's ongoing Evidence Mapping Project. We recommend that SIFCA utilise this GIS data as best available evidence on presence and extent, and where possible, seek to incorporate this data with evidence of oyster dredging activity to identify and assess impacts. While the sub-features in table 1 have been identified as at risk of impact from oyster dredging, it may be possible that clams do not occur within all of these habitats in the Solent Maritime SAC.

The conservation objectives of these features/sub-features together with their specific attributes and targets are outlined below in section 2.1.3

2.1.3 Conservation Objectives

The European Site Conservation Objectives for the Solent Maritime SAC[1] are as follows:

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats;
- The structure and function of the habitats of qualifying species;

[1] Source: http://publications.naturalengland.org.uk/publication/5762436174970880

- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
- The populations of qualifying species; and
- The distribution of qualifying species within the site.

The above objectives should be considered in conjunction with accompanying Supplementary Advice Tables (SATs) which are scheduled for draft publication within the Regulation 35 Conservation Advice document in Spring 2015. As the Regulation 35 attribute and target descriptions were not finalised at the time of writing, we have used the existing Regulation 33 descriptions within this letter. Please note that the wording of these attributes and targets may therefore be subject to revision, however, it is not envisaged that the general principles upon which they are based will change substantively. Natural England will provide SIFCA with a copy of the SATs for the Solent Maritime SAC once finalised.

2.1.4 Condition Assessment

Natural England provides information on the condition of designated sites and describes the status of interest features. This is derived from the application of 'Common Standards Monitoring Guidance' which is applied to a subset of 'attributes' of site features as set out in the sites' Regulation 33/35 Conservation Advice document. Feature condition influences the Conservation Objectives in that it is used to determine whether a 'maintain' or 'recover' objective is needed to achieve the target level for each attribute.

Natural England's current process for conducting condition assessments for marine features was developed due to requirements to report on condition of Annex 1 features at the national level in 2012/13 under Article 17 of the Habitats Directive. Since then, the methods have been reviewed and we are actively working now to revise this process further so that it better fulfils obligations to inform management actions within MPAs and allows us to report on condition. In light of this revision to the assessment methods, Natural England will not be publishing condition information until this process is complete. We therefore advise that IFCAs assess the potential impact of amber-green or new fishing activities on a site, using a broad range of available information in addition to the Conservation Objectives. This information should include (but not be limited to) the following:

- Feature sensitivity information or advice on operations (to be drafted Spring 2015);
- The Natural England SPA toolkit and Fisheries Impacts Evidence Database;
- Activity information including distribution, type and intensity;
- Existing management practices and measures;
- Risk information including potential impact pathways between activities and features.

Additionally, an indication of condition for site interest features may, in some instances, be obtained from assessments of the SSSIs that underpin the SAC, which are available online at: http://designatedsites.naturalengland.org.uk/. Natural England is happy to liaise further with SIFCA in interpreting and utilising this data.

Natural England also recommends that SIFCA consider other threats to the condition of the site as highlighted in the Solent European Marine Sites (SEMS) Delivery Plan (http://www.solentems.org.uk/publications/) when assessing the impact of oyster dredging upon Solent Maritime SAC qualifying features.

2.2 Solent and Southampton Water SPA and Ramsar site

2.2.1 Site overview

The Solent and Southampton Water Special Protection Area (SPA) and Ramsar site extends from Hurst Spit to Hill Head along the south coast of Hampshire, and from Yarmouth to Whitecliff Bay along the north coast of the Isle of Wight. The site comprises a series of estuaries and harbours with extensive mudflats and saltmarshes together with adjacent coastal habitats including saline lagoons, shingle beaches, reedbeds, damp woodland and grazing marsh. The mudflats support beds of *Enteromorpha sp.* and *Zostera sp.* and have a rich invertebrate fauna that forms the food resource for estuarine birds. In summer, the site is of importance for breeding seabirds, including Mediterranean gulls and four species of terns. In winter, the site supports a large and diverse assemblage of waterbirds, including geese, ducks and waders.

2.2.2 Features and supporting habitats at risk of impact

Natural England has identified the following features and supporting habitats of the Solent and Southampton Water SPA and Ramsar site that are at risk of potential impact from oyster dredging. These impacts include disturbance and displacement, competition for prey, changes in food availability and physical damage or loss of non-breeding habitat.

- Internationally important populations of regularly occurring Annex 1 species (breeding):
  - Mediterranean gull
  - Sandwich tern
  - Common tern
  - Little tern
  - Roseate tern

- Internationally important populations of regularly occurring migratory species (non-breeding):
  - Dark-bellied brent goose
  - Teal
  - Ringed plover
  - Black-tailed godwit

- Internationally important assemblage of waterfowl:
  - Wintering waterfowl assemblage

The supporting habitats at risk of impact from oyster dredging are principally those that occur within the intertidal zone and are utilised by regularly occurring migratory species and the wintering waterfowl assemblage, namely:

- Intertidal coarse sediment
- Intertidal mixed sediments
- Intertidal mud
- Intertidal sand and muddy sand
- Intertidal seagrass beds

While the use of towed fishing gear has the potential to impact upon saltmarsh and *Spartina* swards in certain locations, informal discussions with SIFCA indicate that oyster dredging is unlikely to have a significant effect upon these features in the Solent due to the proximity at which vessels may feasibly operate. However, Natural England recommends that SIFCA seek to confirm this using vessel sightings and habitat mapping data, and also consider the likelihood of this current situation changing in the future (e.g. through the realistic evolution of the fishery).

2.2.3 Conservation Objectives

The European Site Conservation Objectives for the Solent and Southampton Water SPA and Ramsar site[2] are as follows:

> With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change;
>
> Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;
> - The extent and distribution of the habitats of the qualifying features;
> - The structure and function of the habitats of the qualifying features;
> - The supporting processes on which the habitats of the qualifying features rely;
> - The population of each of the qualifying features;
> - The distribution of the qualifying features within the site.

As with the Solent Maritime SAC, the above objectives should be considered in conjunction with accompanying Supplementary Advice Tables (SATs) which will be published within the Regulation 35 Conservation Advice document. While this document is not scheduled for publication until Spring 2016 we have included the draft SPA attributes and targets in section 3.2. Please note that the wording of these attributes and targets may be subject to further revision, however, the general principles upon which they are based are unlikely to vary substantively. Natural England will provide SIFCA with a copy of the SATs for the Solent and Southampton Water SPA and Ramsar site once finalised.

2.2.4 Condition Assessment

While a formal condition assessment of the Solent and Southampton Water SPA and Ramsar site is not currently available, an indication of condition for bird species and their supporting habitats may be obtained from a number of sources – which are detailed below.

The British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) aims to identify population sizes, determine trends in numbers and distribution, and identify important sites for non-breeding waterbirds in the UK. Data can be used to highlight SPA bird features where population numbers have exhibited trends that are inconsistent with regional and/or national population trends, and thereby may be subject to site-specific pressures. Species that have undergone major changes in numbers are triggered by the issuing of a WeBS Alert, which can be viewed online at: http://blx1.bto.org/webs-reporting/.

The most recent WeBS report, based upon Alerts status as of 2009/10, does not trigger alerts for three of the four internationally important populations of regularly occurring

[2] Source: http://publications.naturalengland.org.uk/publication/5762436174970880

migratory species within the SPA site: Dark-bellied brent goose; Teal and Black-tailed godwit. While numbers of Ringed plover within the site have been stable in the short-term (5 years), their previous decline has triggered an alert for the long-term (25 years) reporting period. The WeBS report notes that this trend appears to be tracking that of wider regional and British trends, which suggests that the declining numbers underpinning these Alerts result from broad-scale population trends. Furthermore, the report states that the increasing proportion of regional numbers supported by the Solent and Southampton Water SPA suggests that environmental conditions remain relatively favourable and also indicates that this site is becoming increasingly important on a regional scale for this species. It should be noted, however, that this data may not have captured the effects of fishing activities that have commenced or increased in intensity during the ensuing period. Similarly, these effects may not necessarily be captured in the next WeBS Alerts report (due in 2015) due to the time lag between cause and effect. Natural England recommends that these observations are given due consideration when assessing the impact of oyster dredging upon SPA/Ramsar qualifying features.

Information on breeding seabird species is available through JNCC's Seabird Monitoring Programme (SMP), which collates sample data on breeding numbers and breeding success of seabirds in Britain and Ireland. The most recent population trends are presented in the Seabird Population Trends and Causes of Change: 1986-2012 report, which can be viewed online at: http://jncc.defra.gov.uk/page-3201. Alternatively, this data has been analysed by ABPmer on behalf of Natural England and provided to IFCAs within Natural England's SPA Toolkit. Unfortunately, data is not currently available for the qualifying bird species of the Solent and Southampton Water SPA (i.e. Mediterranean gull, Sandwich tern, Common tern, Little tern and Roseate tern) due to insufficient records. Natural England therefore recommends that SIFCA utilise data collated through alternative sources, including site leads and nature reserve wardens where applicable. Natural England is currently collating this data for tern species which we will make available to Southern IFCA early next year.

In addition to the qualifying bird species and assemblage it is necessary to consider the status of supporting habitats when assessing condition of the SPA and Ramsar site. As noted in section 2.2.2, Natural England has identified habitats within the intertidal zone to be at risk of impact from oyster dredging. An indication of condition for these supporting habitats may be obtained from assessments of the SSSIs that underpin the SPA/Ramsar site, which are available online at: http://designatedsites.naturalengland.org.uk/. Natural England is happy to liaise further with SIFCA in interpreting and utilising this data.

As with the Solent Maritime SAC, SIFCA should also consider other threats to the condition of the site as highlighted in the SEMS Delivery Plan (http://www.solentems.org.uk/publications/) when assessing the impact of oyster dredging upon SPA/Ramsar qualifying features.

3. Potential impacts on attribute targets that could prevent the achievement of conservation objectives

Having identified the SAC and SPA features, sub-features and supporting habitats at risk of impact from oyster dredging in sections 2.1.2 and 2.2.2 respectively, the following section outlines the relevant site attributes, targets and impact pathways that should be considered by SIFCA when assessing this activity. As previously noted, Natural England is currently revising the Conservation Advice documents for these sites so the wording of these attributes and targets may be subject to change.

Consistent with Natural England's corresponding advice on the potential impacts of clam dredging within the Solent (ref. 132777), the magnitude of oyster dredging impacts on benthic habitats will be determined by a combination of factors which include the location, scale and intensity of harvesting activities, together with local environment conditions such as sediment characteristics, water depth, wave exposure, strength of tidal currents, the presence of algae and seagrass, and sub-tidal/intertidal location (Kaiser et al. 2001; Wheeler et al. 2014). Similarly, the magnitude of impacts upon bird populations will be determined by environmental conditions such as the type and size of target and non-target prey species, climate/weather, alternate foraging sites, competition from other species and the relevant extent of alternate food supplies. Natural England recommends that these attributes are given full consideration when assessing the significance of potential impacts upon the SAC and SPA/Ramsar site. In the first instance, we recommend that SIFCA collate spatial/temporal effort data on oyster dredging within the designated sites and analyse this with respect to the location of sensitive features. Natural England is in the process of providing SIFCA with GIS feature mapping for the Solent Maritime SAC which collates confidence assessed datasets and represents our best available evidence base. In addition to SAC features, this feature mapping data will include the presence and extent of Solent and Southampton Water SPA supporting habitats where available.

For data pertaining to the distribution of SPA bird features, Natural England recommends that SIFCA utilise BTO WeBS Core Counts data on numbers and trends, together with that collected through the WeBS Low Tide Count (LTC) scheme. The LTC scheme collects data on feeding waterbirds within major UK estuaries, although sites are counted approximately every six years rather than annually. The estuaries within the Solent and Southampton Water SPA for which LTC data is available include Southampton Water (2000/2001), Beaulieu (2010/11), North-west Solent (2010/11) and Newtown Harbour (2008/9). Data can be viewed online at: http://blx1.bto.org/webs-reporting/?tab=lowtide or downloaded in GIS format through Natural England's SPA Toolkit. As with WeBS Alerts, we would advise caution when using this data for assessments of fishing activity.

Additional data on bird roosting sites is provided in the Solent Waders and Brent Goose Strategy (King, 2010), the outputs of which are available online at: http://www.solentforum.org/forum/sub_groups/Natural_Environment_Group/Waders%20and%20Brent%20Goose%20Strategy/.

3.1 Solent Maritime SAC

3.1.1 Feature: Estuaries; Sandbanks which are slightly covered by seawater all the time; Mudflats and sandflats not covered by seawater at low tide;

1. Relevant attribute (Reg.33):
Topography

Target:
Shore profile should not deviate significantly from an established baseline, subject to natural change.

Potential impacts:
Shellfish dredging can have a direct impact upon mudflats, sandflats and sandbanks by physically altering their topography. Typical effects include the creation of depressions and trenches, and the smoothing of ripples or creation of ridges within sand environments (Wheeler et al. 2014). Changes to topography from dredging have been linked to a decline in oyster populations through habitat loss and increased siltation (Rothschild et al., 1994).

Topography reflects the energy conditions and stability of soft sediment habitats, which in turn influences the distribution of benthic communities. For this reason, Natural England recommends that potential impacts upon the topography of mudflats, sandflats and sandbanks are also assessed with respect to sediment character and the range and distribution of characteristic biotopes.

2. Relevant attribute (Reg.33):
Sediment Character

Target:
i) Particle Size Analysis (PSA): Average PSA parameters should not deviate significantly from the baseline, subject to natural change.

ii) Sediment penetrability: Average measure should not deviate significantly from an established baseline, subject to natural change.

Potential impacts:
Oyster dredging has the potential to alter the sediment character of benthic habitats with resultant impacts upon community structure. Disruption caused by dredging can alter the physical structure of soft sediments, resulting in a loss of stability and vertical stratification (Tarnowski, 2006). The effects of towed-gear fishing within stable, low-energy estuarine environments can be particularly significant, with negative impacts upon sediment complexity and species diversity (Greathead et al., 2007; Hinz et al., 2009). While oyster beds are found within relatively turbid estuarine environments, an increase in suspended sediment may have longer-term impacts upon oyster populations by inhibiting recruitment, especially if this increase coincides with peak settlement periods (Jackson & Wilding, 2009). Additionally, the disruption of sediments can release anoxic materials and contaminants which have a potentially detrimental effect upon re-colonisation and recruitment of target and non-target species (Piersma et al., 2001).

3.1.2 Sub-features: Subtidal coarse sediment; Subtidal sand; Subtidal seagrass beds; Intertidal coarse sediment; Intertidal mixed sediments; Intertidal mud; Intertidal sand and muddy sand; Intertidal seagrass beds

1. Relevant attribute (Reg.33):
Range and distribution of characteristic biotopes

Target:
Range and distribution should not deviate significantly from an established baseline, subject to natural change.

Potential impacts:
Oyster dredging has a number of potential impacts upon the range and distribution of characteristic biotopes. In addition to indirect effects of altering topography and sediment character, dredging results in the direct removal/mortality of benthic and epifaunal organisms – including both target and non-target species. Research suggests that impacts will be influenced by the type of organisms affected and the substrate over which dredging takes place. For example, Ferns et al. (2000) found that the decline of annelids, molluscs and crustaceans from dredging was greater in intertidal muddy sand habitats compared with intertidal sand. Population densities also took longer to recover within intertidal muddy sand, which the authors attributed to the release of anoxic chemicals.

2. Relevant attribute (Reg.33):
Extent of *Zostera* beds

Target:
No decrease in extent from an established baseline subject to natural change.

Potential impacts:
Oyster dredging can impact upon seagrass beds through two principal pathways: the direct removal/damage of shoots and rhizomes; and the indirect effect of sediment plumes smothering seagrass and reducing light absorption. As shellfish dredging within the vicinity of seagrass beds is prohibited by SIFCA's Bottom Towed Fishing Gear Byelaw, this activity is not considered to represent a significant risk to this sub-feature of the SAC. However, given that the potential currently exists for oyster dredging activity to interact with this sub-feature, Natural England recommends its inclusion in the assessment process – together with consideration of byelaw compliance.

3.2 Solent and Southampton Water SPA and Ramsar site

Natural England has reviewed the potential impacts of oyster dredging within the Solent and Southampton Water SPA and Ramsar site and identified the following impact pathways through which this activity may affect designated features and supporting habitats:

i) Disturbance and displacement caused by human activity
ii) Competition for prey
iii) Changes in food availability
iv) Physical damage or loss of non-breeding habitat

As these impact pathways are consistent with those identified for clam dredging, please refer to Natural England's advice on the potential impacts of clam dredging within the Solent (ref. 132777) which has been provided in conjunction with this letter. Given that oyster dredging effort is focused upon sub-tidal habitats, it may be possible for SIFCA to screen out significant effects upon those designated bird features of the Solent and Southampton Water SPA and Ramsar site that utilise intertidal supporting habitats. Similarly, informal discussions with SIFCA indicate that oyster dredging is unlikely to interact with the roosting or nesting habitats of designated bird species. In both cases, Natural England recommends that further assessment is undertaken using vessel sightings, habitat mapping and species distribution data in order to ascertain that no significant impacts occur.

Additionally, there are a number of direct and indirect impacts that are not likely to have a significant effect upon features or supporting habitats of the SPA and Ramsar site. These impacts are discussed briefly below:

- Mortality: Bird mortality can occur from entrapment within active fishing gear, or from entrapment/ingestion of lost or discarded fishing gear. The main risk is presented to diving seabirds interacting with nets, lines and traps. Due to the bird species present in the site and the type of gear used for oyster dredging, Natural England do not consider this impact to have a significant effect upon the features of the SPA.

- Increased turbidity: Sediment mobilisation from dredging may result in increased turbidity, which can affect the success of birds feeding in the water column due to reduced visibility. The impact of increased turbidity will be determined by foraging strategies, with birds such as cormorants, mergansers and diving ducks being particularly at risk. Natural England has reviewed the potential impacts of increased

turbidity upon the bird features listed in section 2.2.2 and do not consider this to have a significant effect due to the nature of their foraging strategies.

4. Additional considerations

While it is acknowledged within research literature that shellfish dredging can have an adverse impact upon benthic habitats, evidence of the magnitude of this impact and its resultant effects upon shorebird populations remains relatively underdeveloped – particularly with respect to longer-term impacts (Wheeler et al. 2014). Furthermore, Natural England recognises that in comparison with clam dredging, empirical research on the impacts of oyster dredging is relatively limited. While some of the clam dredging literature may be of relevance to an assessment of oyster dredging impacts, we acknowledge that the magnitude and nature of these impacts will vary due to differences in the location of fishing activity and the type of gear used. On this basis, Natural England is willing to support SIFCA in undertaking primary research to explore the impacts of oyster dredging within the Solent; including collaboration in the supervision of a PhD project to explore the impacts of harvesting activities upon birds in the Solent.

In addition to the collation of primary data on the site-specific impacts of oyster dredging, Natural England recommends that SIFCA consider existing management of fishing activities (including compliance) when assessing impacts upon designated features. Through this process it may be possible to scope out potential impacts upon features where oyster dredging is prohibited, for example, within/adjacent to seagrass beds. Similarly, we recommend that SIFCA also consider the realistic evolution of the oyster fishery which may affect the type and/or magnitude of future impacts.

5. Summary

Natural England agrees with the Southern IFCA's prioritisation of oyster dredging within the Solent as a high risk amber activity for Defra's revised approach to the management of commercial fisheries within European Marine Sites. The advice provided in this letter identifies the principal features, sub-features and supporting habitats of the Solent Maritime SAC and Solent and Southampton Water SPA and Ramsar site that may be adversely impacted by oyster dredging activity. In addition to considering the impacts upon bird features and sub-tidal habitats previously identified by SIFCA, Natural England recommends that impacts upon intertidal habitats are also included in the assessment of oyster dredging in the Solent.

Natural England welcomes the opportunity to work collaboratively with SIFCA in assessing the magnitude of these impacts and their resultant effects upon site integrity. As noted previously, this assessment will require the collation and analysis of oyster dredging effort data, together with primary and secondary evidence on the impacts of this activity. Natural England would also be happy to work with SIFCA in developing management measures that may result from this assessment – including site-specific monitoring of fishing activity and impacts.

For any queries relating to the content of this letter please contact me using the details provided below.

Yours sincerely

R.D. Morgan.

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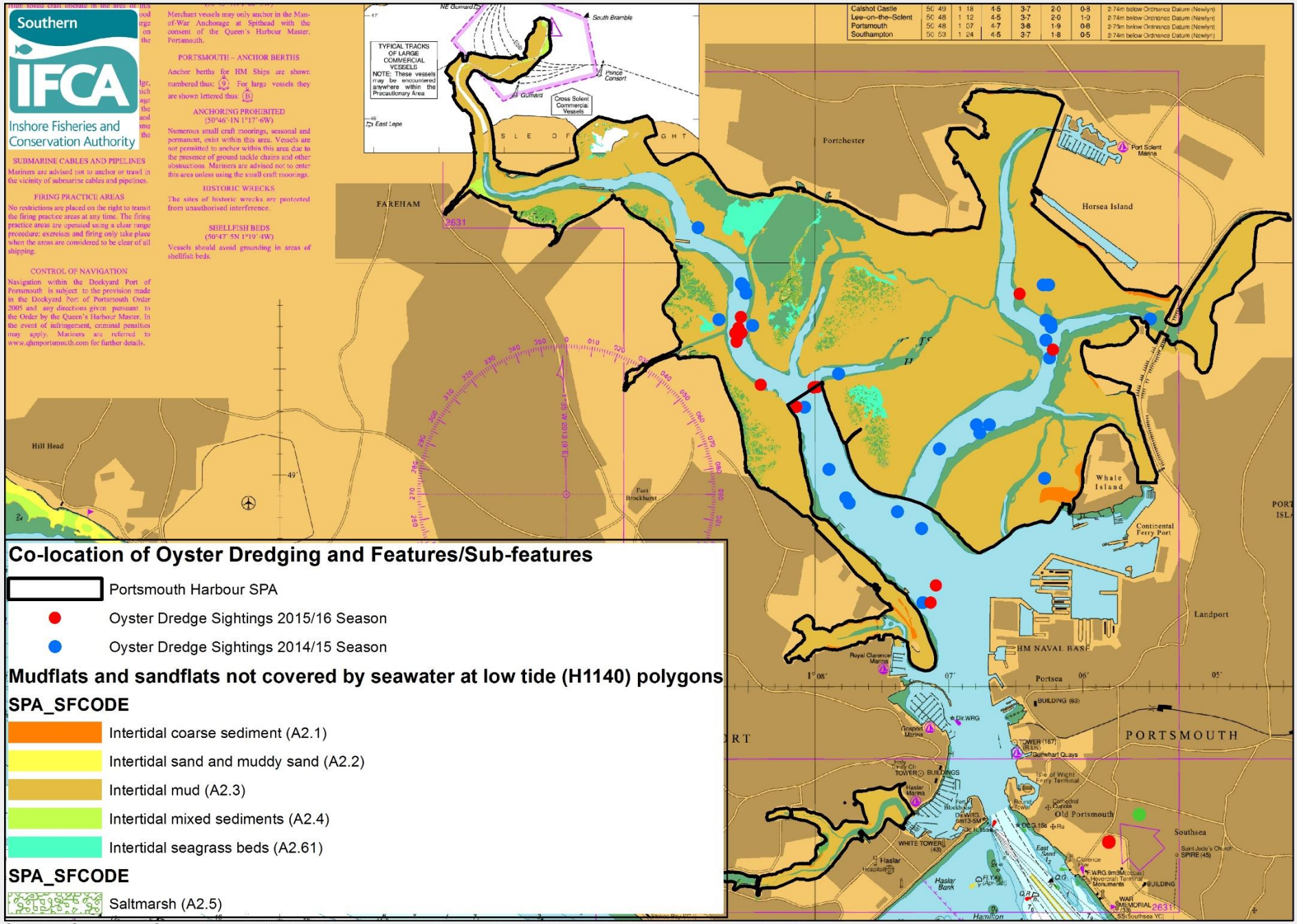
Tarnowski M. (2006). A literature review of the ecological effects of hydraulic escalator dredging. *Fish. Tech. Rep. Ser. 48:30.*

Wheeler, R., Stillman, R. A. S., & Herbert, R. J. H. (2014). *Ecological impacts of clam and cockle harvesting on benthic habitats and waterfowl.* Report to Natural England. Bournemouth University.

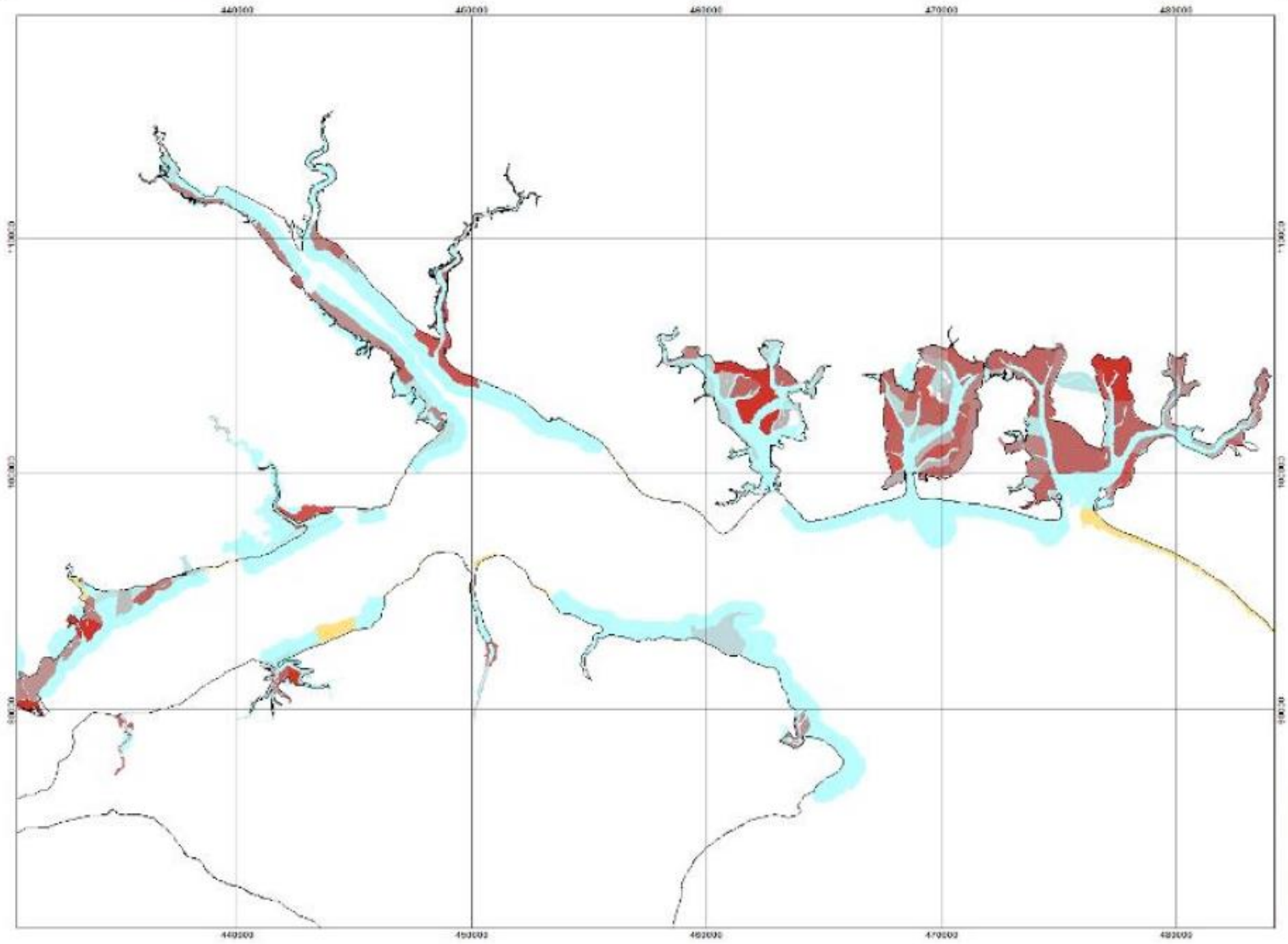
Annex 6: Co-Location of Fishing Activity and Site Feature(s)/Supporting habitat(s)



Annex 7: Low tide WeBS data distribution maps for Dunlin, Dark-bellied brent goose and Black-tailed godwit in the Solent taken from Stillman *et al*., (2009).

Map 22: Low tide WeBS data for dunlin

Solent disturbance and mitigation project: Phase I



25 November 2008

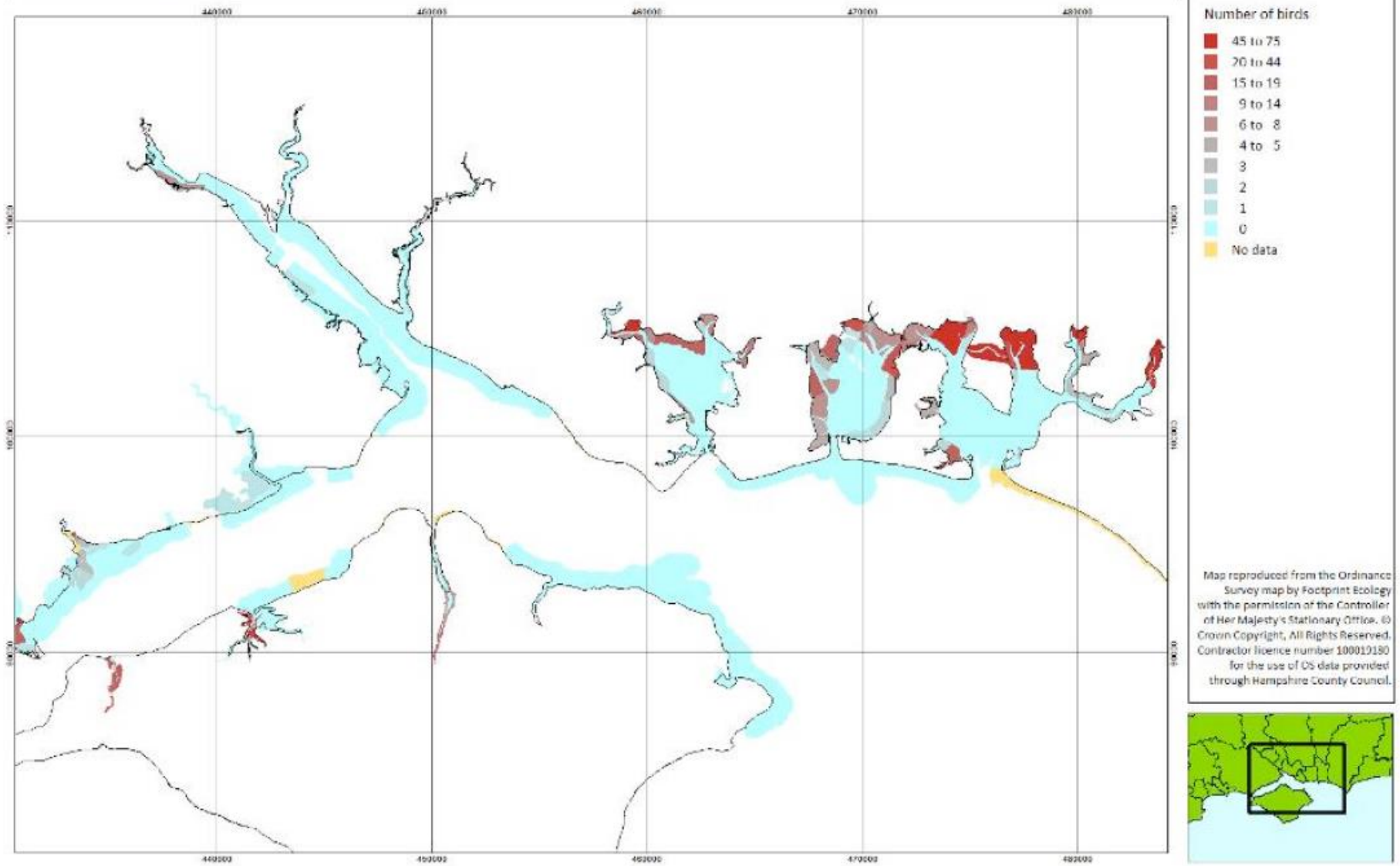
Scale 1:228500

Number of birds

- 1,000 to 2,500
- 500 to 999
- 250 to 499
- 150 to 249
- 100 to 149
- 60 to 99
- 30 to 59
- 10 to 29
- 1 to 9
- 0
- No data

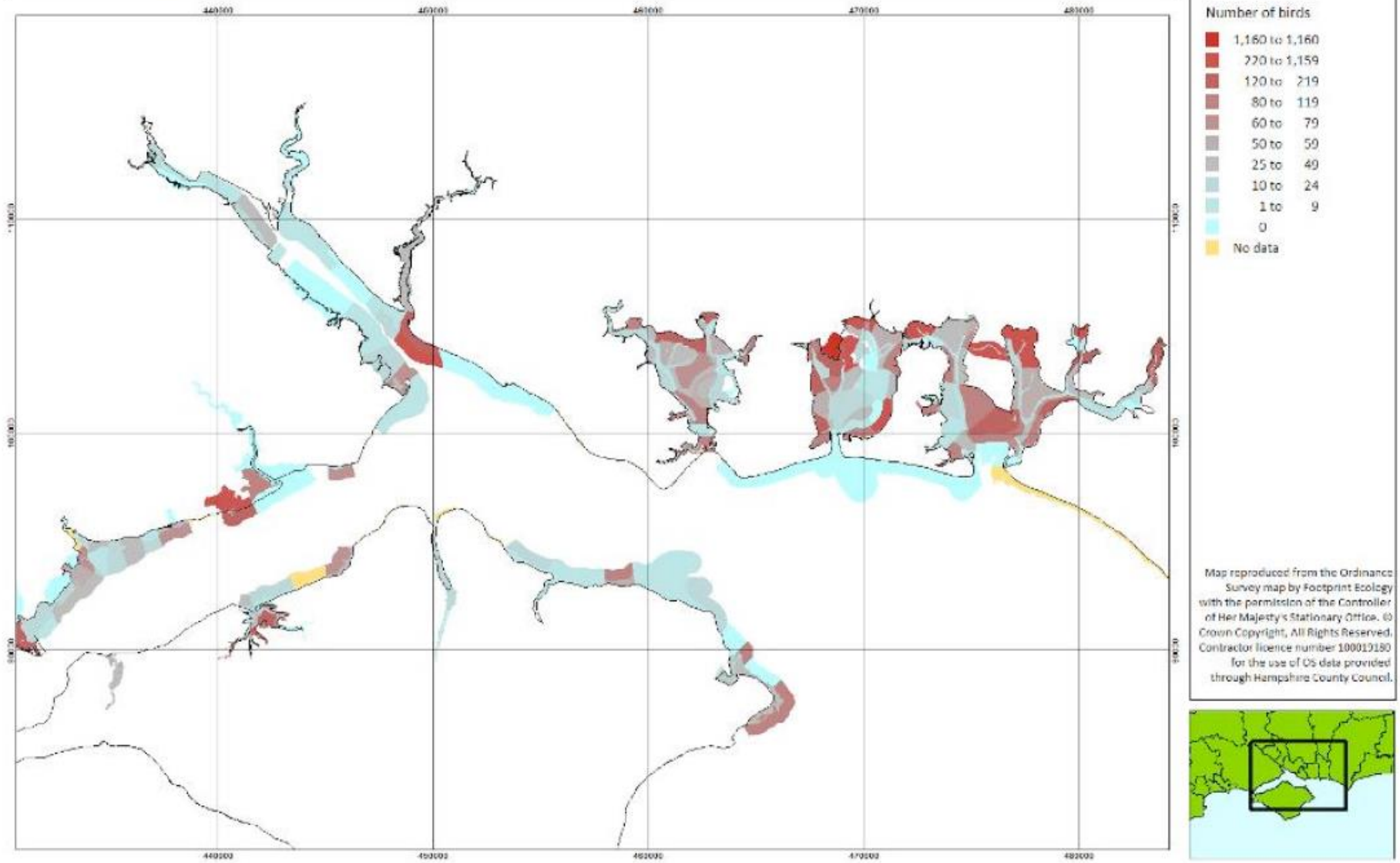
Map 23: Low tide WeBS data for black-tailed godwit

Solent disturbance and mitigation project: Phase I

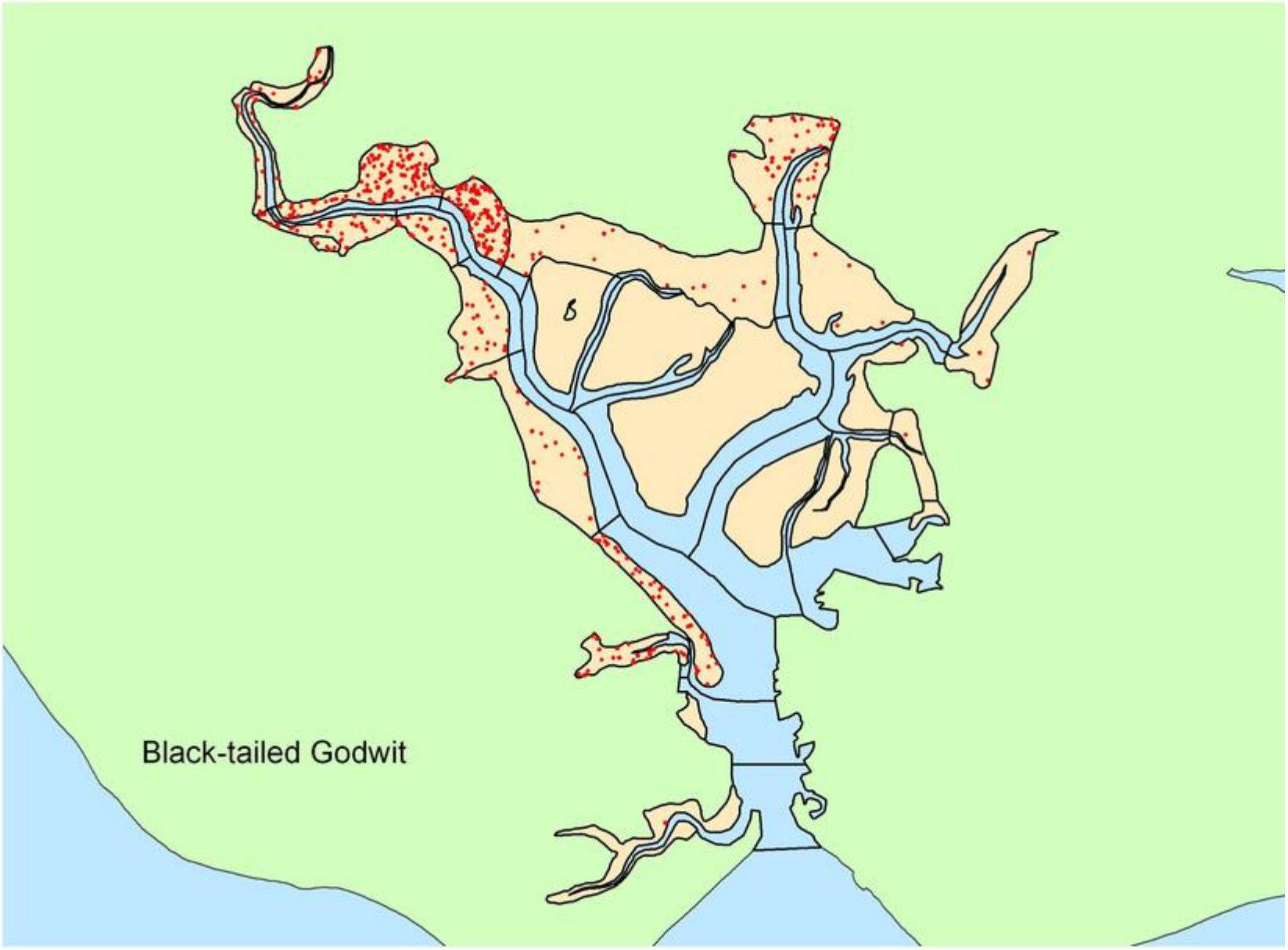


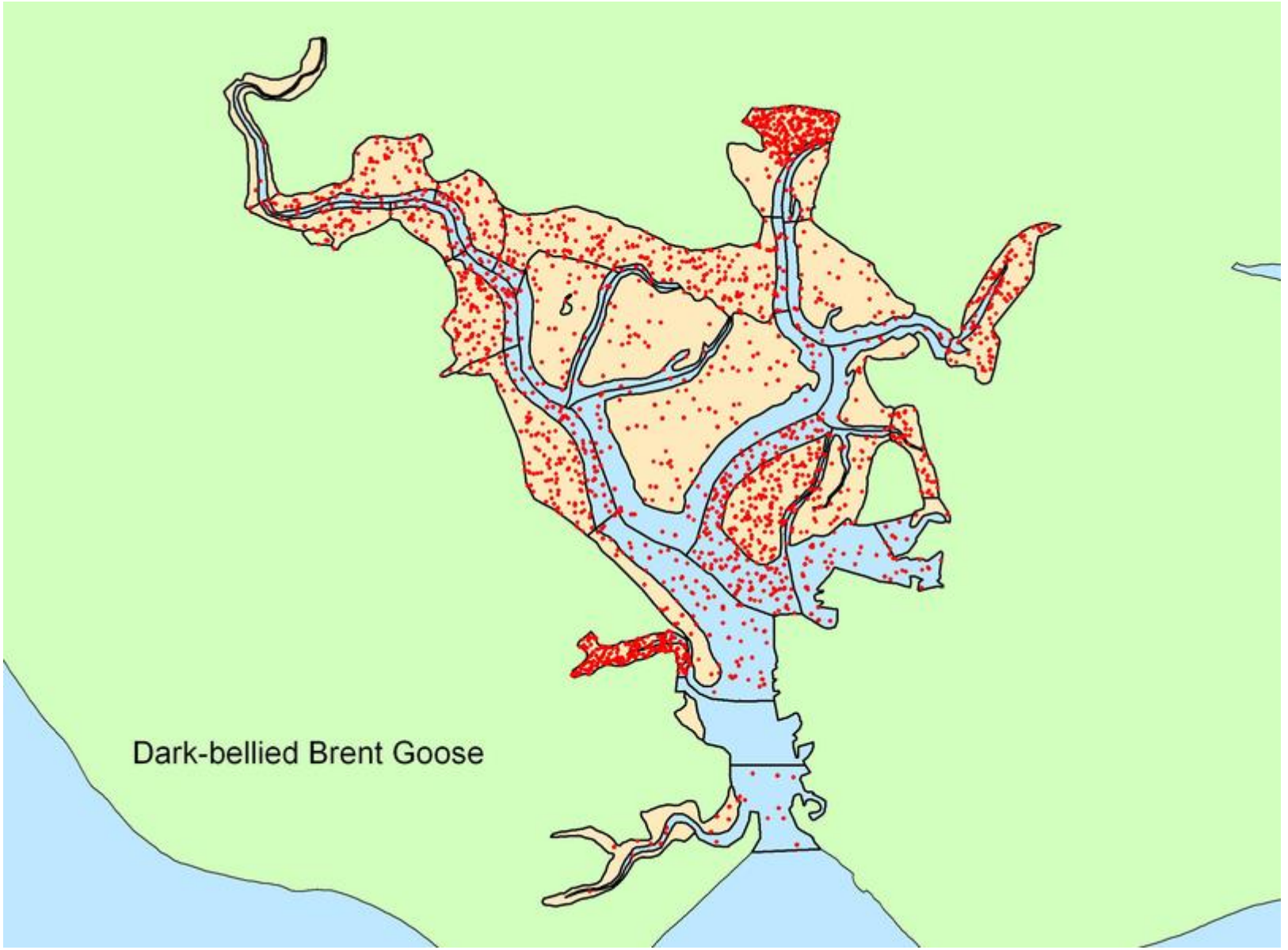
Map 13: Low tide WeBS data for dark-bellied brent goose

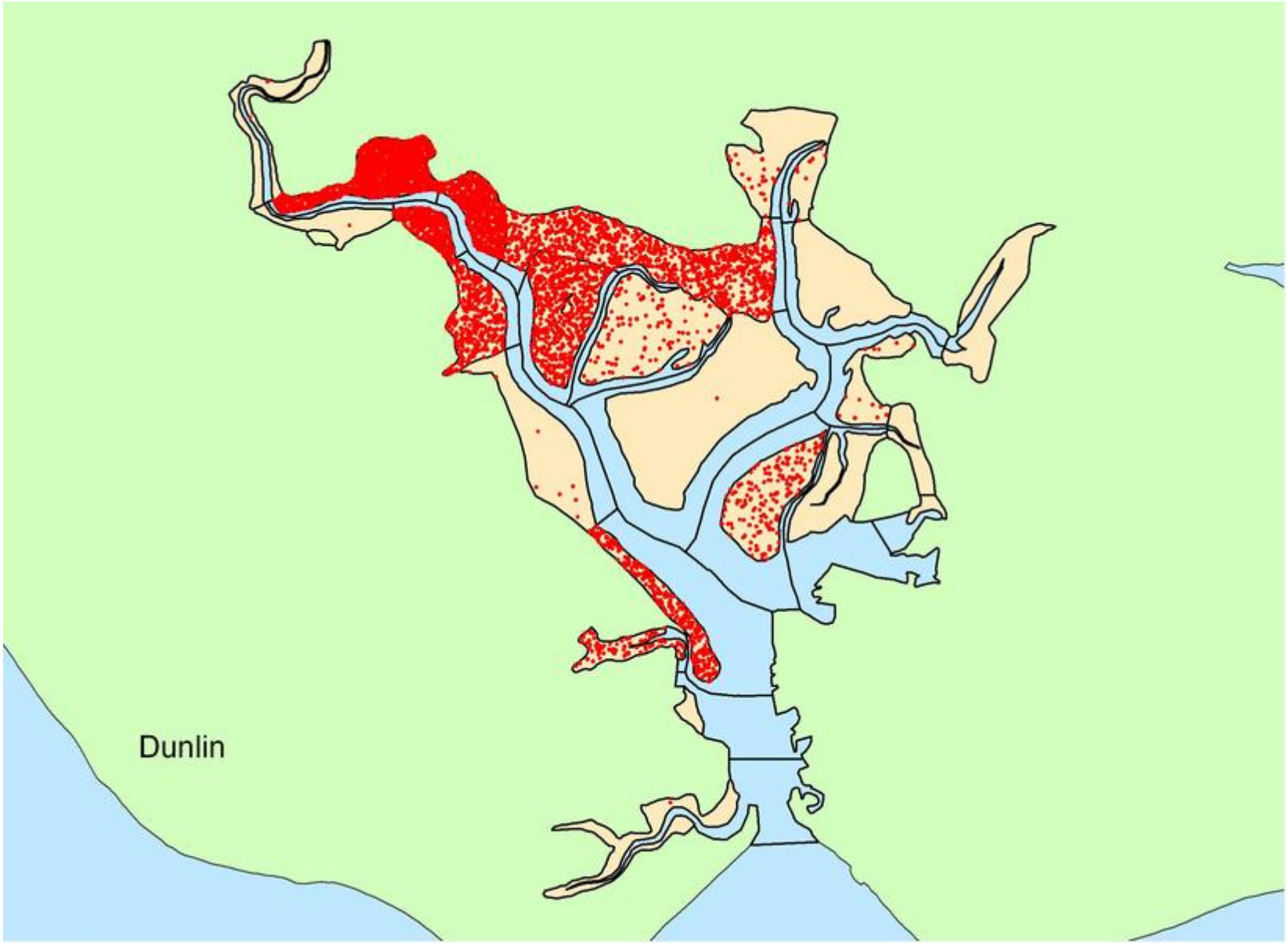
Solent disturbance and mitigation project: Phase I



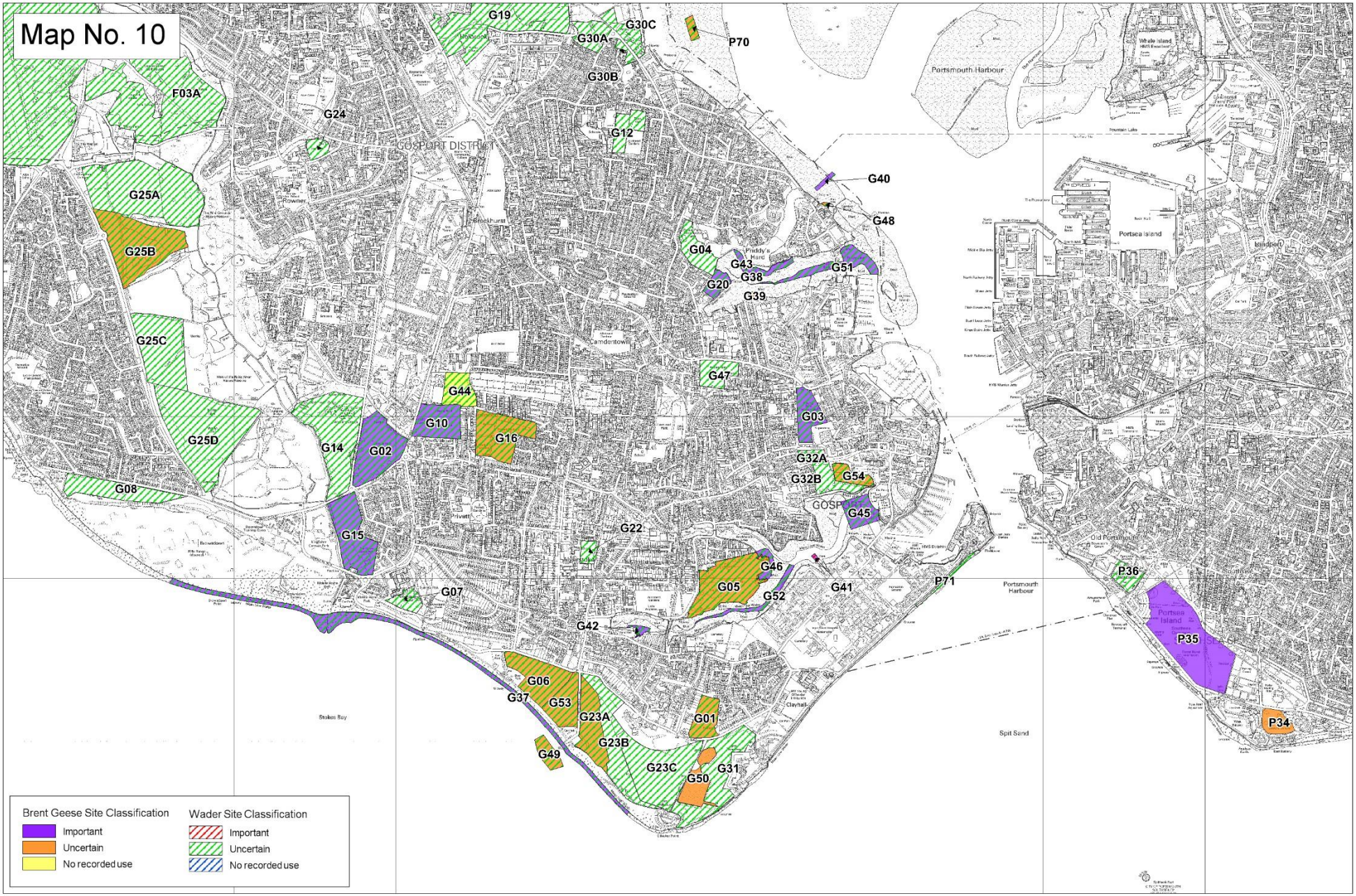
Annex 8: WeBS Low Tide Count (LTC) scheme point data distribution maps from 2008/09 for Black-tailed godwit, Dark-bellied Brent goose and Dunlin in Portsmouth Harbour. Taken from http://blx1.bto.org/webs-reporting/?tab=lowtide.


Black-tailed Godwit


Dark-bellied Brent Goose

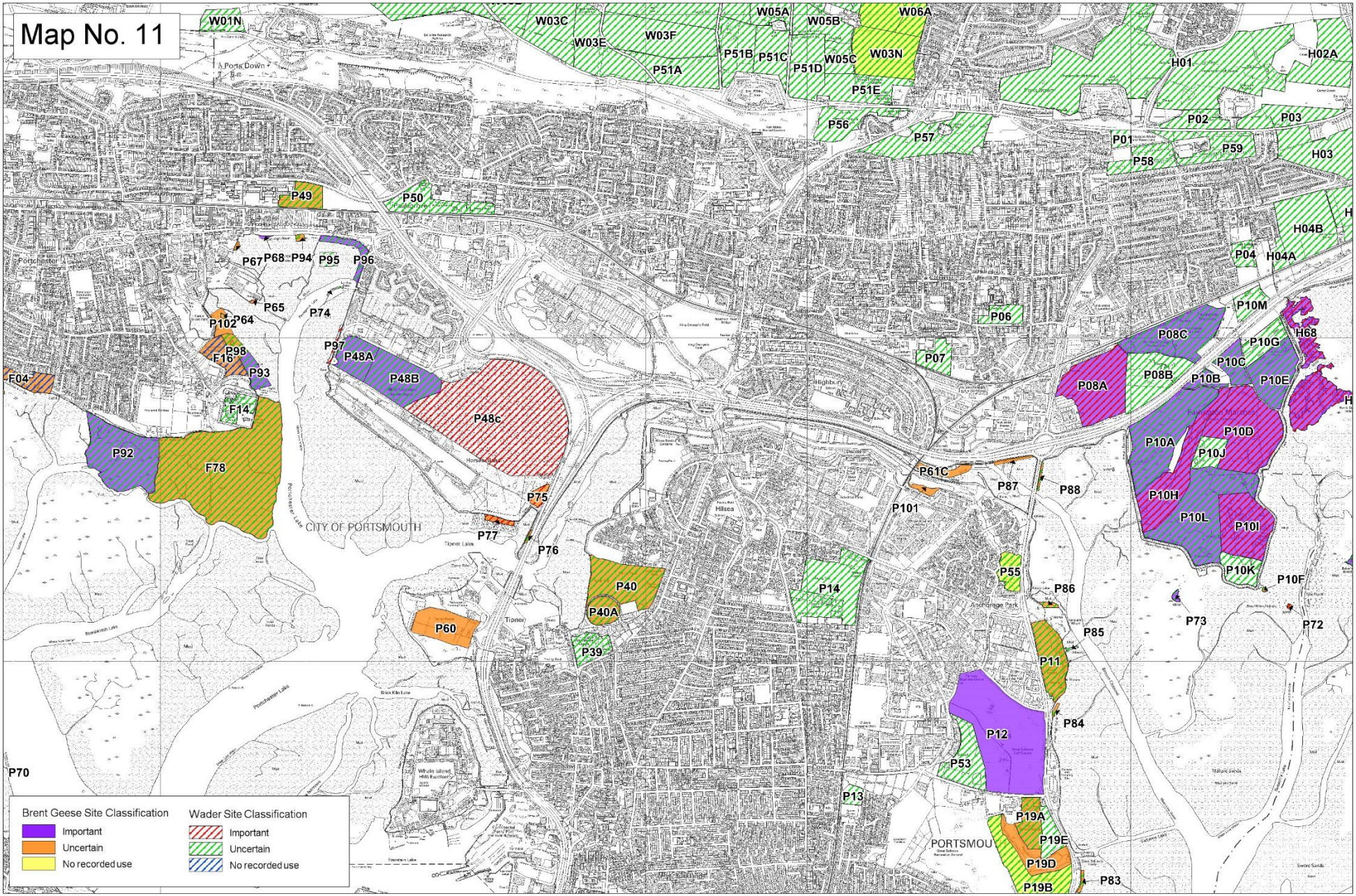

Dunlin

Annex 9: Bird roosting sites from the Solent Waders and Brent Goose Strategy. Taken from http://www.solentforum.org/forum/sub_groups/Natural_Environment_Group/Waders%20and%20Brent%20Goose%20Strategy/.



Current Use Analysis: Important Sites for Waders and Brent Geese

N



Current Use Analysis: Important Sites for Waders and Brent Geese

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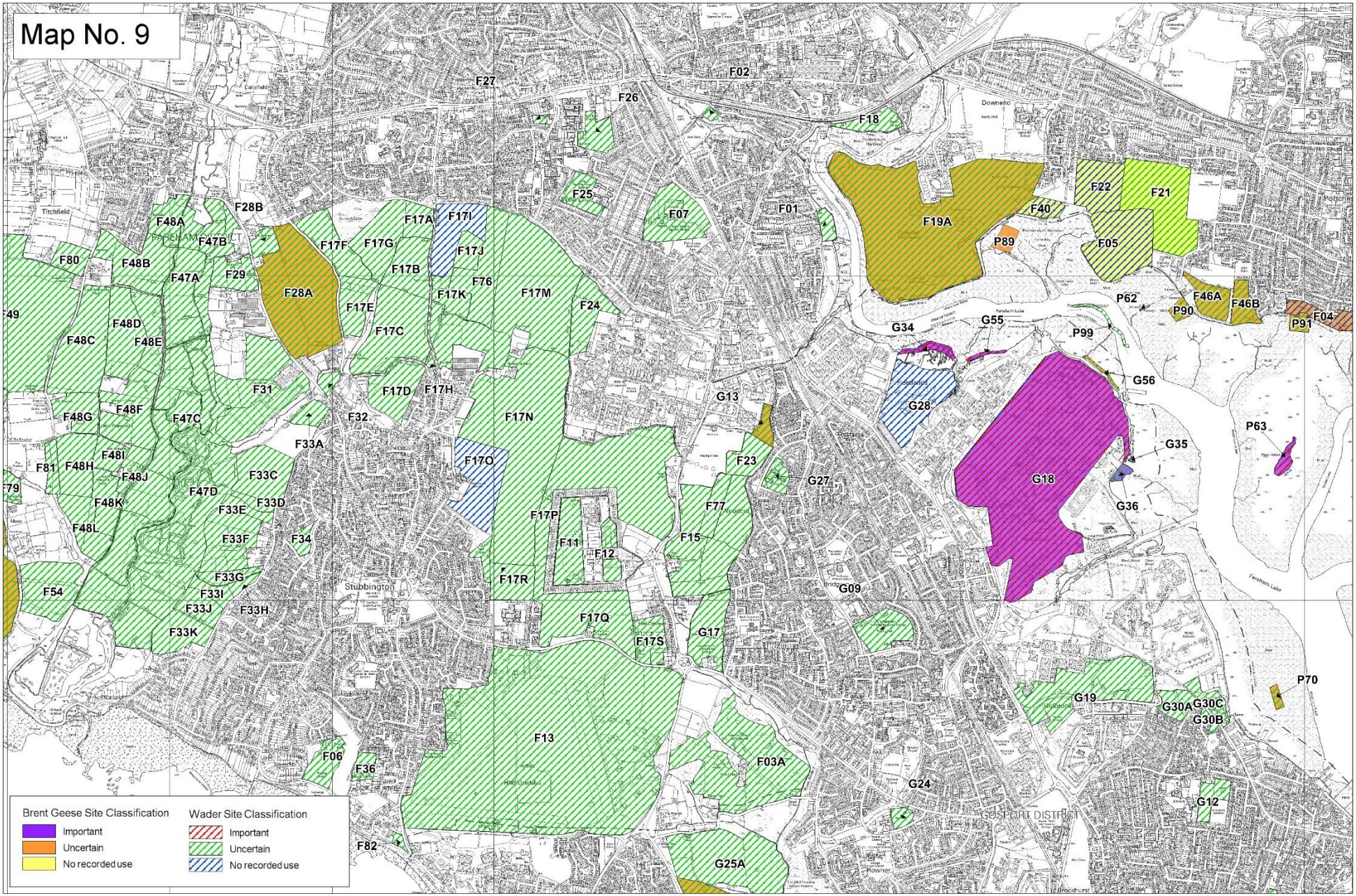


Current Use Analysis: Important Sites for Waders and Brent Geese

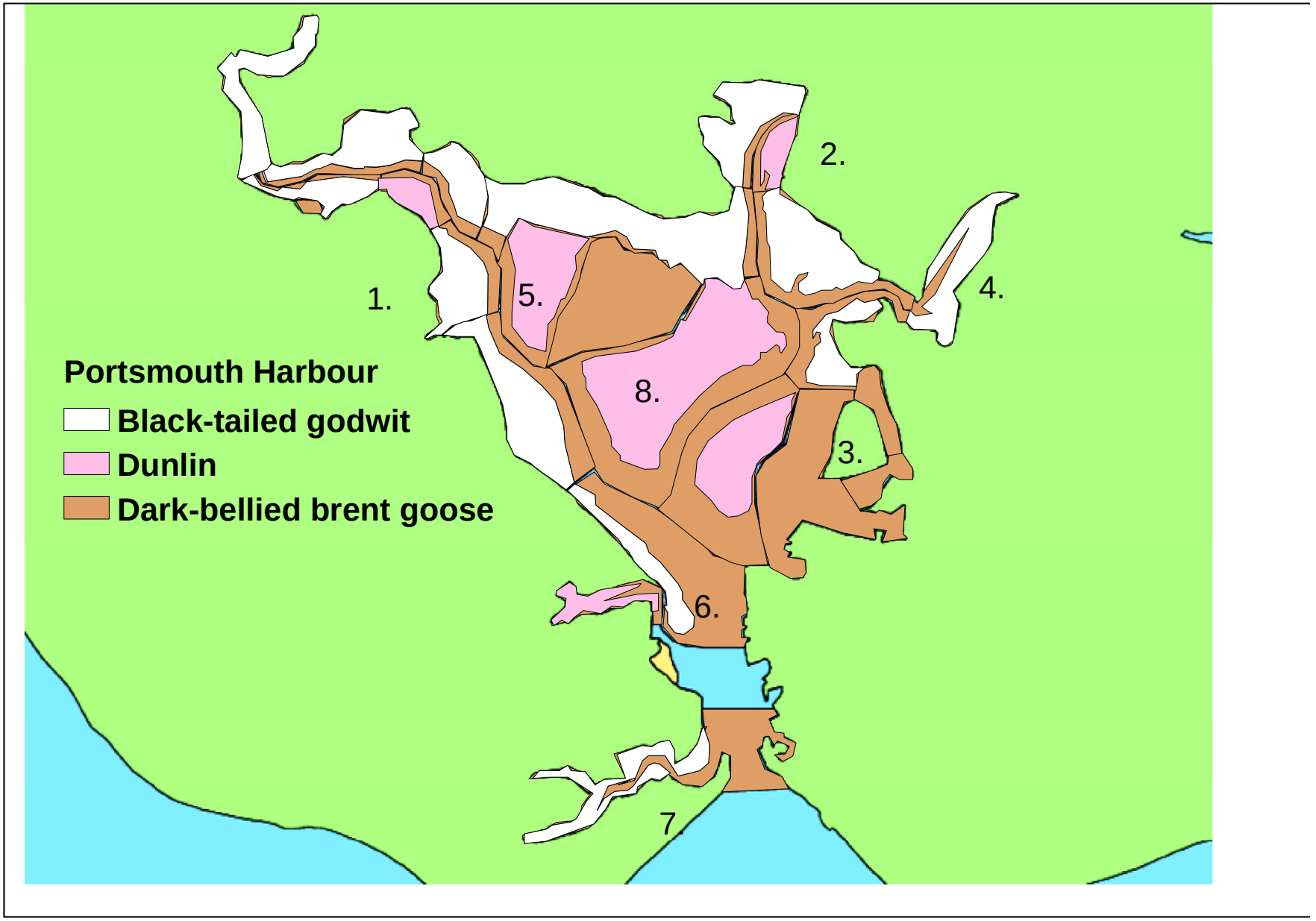
N

Annex 10: Important Feeding Sites for Overwintering Bird Species within Portsmouth Harbour. Taken from the Solent Overwintering Birds Workshop Report (Draft) (Natural England, In Press)

Portsmouth Harbour notes (map provided on page 77)

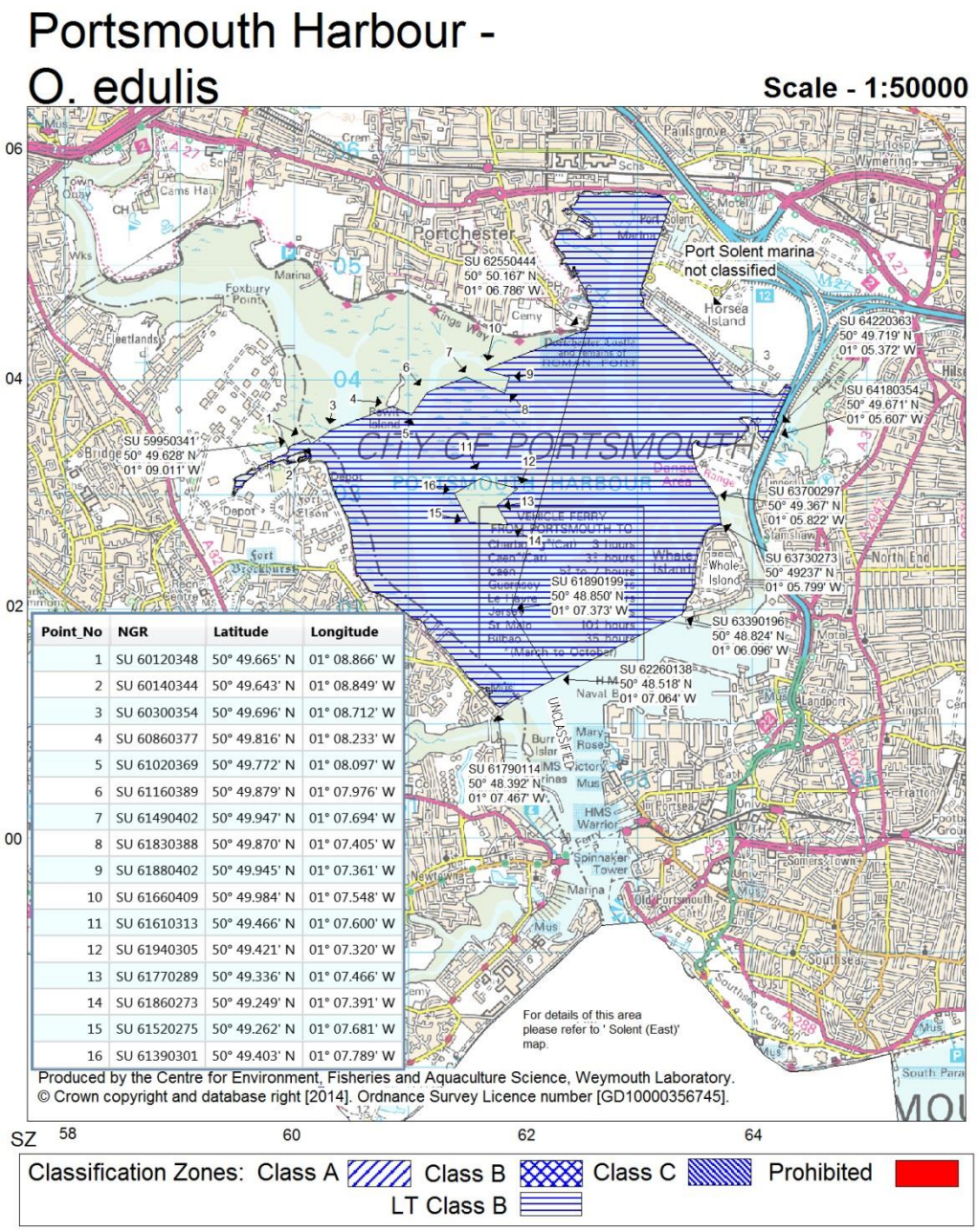
1. RNAD Gosport – grassland feeding by brent geese and godwit and roost on saltmarsh fringe by godwit and dunlin. Dunlin also roost on pontoons off Wicor Shore.
2. Dark-bellied brent geese - feed here on grassland – Port Solent.
3. Dark-bellied brent geese - Whale island - grassland feeding.
4. Black-tailed godwit - Can be important at certain times of year. Can vary depending on food supply – age dois of bivalves?
5. Dunlin - Pewitt Island roost.
6. Can be a Dunlin roost here – South Priddys Hard on string BS land.
7. Dunlin - roost on sea wall.
8. No Godwit counts as covered with water – hardly get data as often covered on neap tides.

Many of the black-tailed godwits feeding on Portsmouth Harbour roost at Farlington Marshes, also interchange with Titchfield Haven.
Much movement/interchange with Langstone Harbour/Farlington by dunlin.
Fareham Creek & Portchester were key sites for black-tailed godwit.
Lowest flats will hardly get data as often covered on neap tides
Portsmouth Harbour has very low mudflats so only uncovered on lowest tides. Low tide counts are on neaps so will miss use of these lower mudflats.
Langstone has high mudflats so little extra exposed toward extreme low water when some birds will move to Portsmouth Harbour.



SIFCA Reference: SIFCA/HRA/10/002

Annex 11: Classification of Bivalve Mollusc Production Areas interacting with the Portsmouth Harbour SPA



Point_No	NGR	Latitude	Longitude
1	SU 60120348	50° 49.665' N	01° 08.866' W
2	SU 60140344	50° 49.643' N	01° 08.849' W
3	SU 60300354	50° 49.696' N	01° 08.712' W
4	SU 60860377	50° 49.816' N	01° 08.233' W
5	SU 61020369	50° 49.772' N	01° 08.097' W
6	SU 61160389	50° 49.879' N	01° 07.976' W
7	SU 61490402	50° 49.947' N	01° 07.694' W
8	SU 61830388	50° 49.870' N	01° 07.405' W
9	SU 61880402	50° 49.945' N	01° 07.361' W
10	SU 61660409	50° 49.984' N	01° 07.548' W
11	SU 61610313	50° 49.466' N	01° 07.600' W
12	SU 61940305	50° 49.421' N	01° 07.320' W
13	SU 61770289	50° 49.336' N	01° 07.466' W
14	SU 61860273	50° 49.249' N	01° 07.391' W
15	SU 61520275	50° 49.262' N	01° 07.681' W
16	SU 61390301	50° 49.403' N	01° 07.789' W

Classification Zones: Class A | Class B | Class C | Prohibited | LT Class B

Classification of Bivalve Mollusc Production Areas: Effective from 22 October 2014

The areas delineated above are those classified as bivalve mollusc production areas under EU Regulation 854/2004.

Further details on the classified species and the areas may be obtained from the responsible Food Authority. Enquiries regarding the maps should be directed to: Shellfish Microbiology, CEFAS Weymouth Laboratory, Barrack Road, The Nothe, Weymouth, Dorset DT4 8UB.
(Tel: 01305 206600 Fax: 01305 206601)

N.B. Lat/Longs quoted are WGS84
Separate map available for Tapes spp. and M. mercenaria at Portsmouth

Food Authority: Portsmouth Port Health Authority

Annex 12. Table of recovery rates of prey species taken by bird species which may be impacted by changes in prey availability as a result of shellfish dredging in Portsmouth Harbour SPA. Taken from Ferns *et al*., (2000).

Species	% Change After Harvesting – Muddy Sand	% Change After Harvesting – Clean Sand	Recovery Period
Crangon crangon	-	-38%*	>86 days (muddy sand)
Macoma balthica	55%	-6%	0 days (muddy sand) >86 days (clean sand)
Cerastoderma edule	-35%	-15%	>86 days (muddy sand) 0 days (clean sand)
Hediste diversicolor	-	-33%*	-
Hydrobia ulvae	-60%	-56%	>86 days (muddy sand) 8 days (clean sand)

*Low abundances were found

Annex 13. Table of studies investigating the impacts of shellfish dredging and recovery rates.

Study	Location and Exposure	Gear Type and Target Species	Sediment Type	Recovery Period	Species-Specific Recovery
Ferns, P.N., Rostron, D.M. & Sima, H.Y. 2000. Effects of mechanical cockle harvesting on intertidal communities. *Journal of Applied Ecology*, 37, 464-474.	Burry Inlet, South Wales	Tractor-towed cockle harvester Common cockle -*Cerastoderma edule*	Intertidal clean sand and muddy sand	Recovery was considered with invertebrate sampling conducted 15 and 86 days after harvesting in both sediment types and 174 days in muddy sand only. Unfortunately sampling was not continued long enough to determine how long invertebrate communities took to recover. Movement of adults or passive transport as a result of sediment movements, was sufficient to allow recovery of modest invertebrate populations in clean sand, but inadequate to allow recovery of large populations in muddy sand. See species-specific recovery.	Muddy sand: *Pygospio elegans* - >174 days *Hydrobia ulvae* - >174 days *Nephtys hombergii* – 51 days *Bathyporeia pilosa* – 51 days *Lanice conchilega* – 0 days *Corophium arenarium* – 0 days *Macoma balthica* - >86 days Cerastoderma edule - >174 days *Pygospio elegans* - >86 days *Crangon creangon* - >86 days *Retusa obtusa* - >86 days Clean sand: *Bathyporeia pilosa* – 39 days *Macoma balthica* - <86 days Cerastoderma edule – 0 days *Pygospio elegans* - >86

					days *Nephtys homergii* - <86 days *Carcinus maenas* - <86 days
Kaiser, M.J., Edwards, B. & Spencer, B.E. 1996. Infaunal community changes as a result of commercial clam cultivation and harvesting. *Aquatic Living Resources*, 9, 57-63.	Whitestable, Kent, south-east England	Suction dredge Manila clam – *Tapes philippinarum*	Clay interspersed with patches of shell debris and lignin deposits (from local paper mill) overlaid with fine sand and silt. Exposed to prevailing north easterly winds.	Seven months after harvesting, no significant differences in infaunal communities were found between the harvested clam lay and either of the control sites (near and far). After seven months, sediment fractions in the harvested plot did not significantly differ from the sediment in control areas, as sedimentation had nearly restored sediment structure.	*Nephtys hombergii* contributed to the most similarity between samples taken from the clam lay 7 months after harvesting and was also dominant in control areas.
Hall, S.J. & Harding, M.J.C. 1997. Physical disturbance and marine benthic communities: the effects of mechanical harvesting of cockles on non-target benthic infauna. *Journal*	Auchencairn Bay, Solway Firth, Dumfries, Scotland	Suction dredge & tractor dredge Common cockle – *Cerastoderma edule*	Sediments generally become coarser in the centre of the bay and low water mark (median diameter = 3.5*ø*, 88*μ*m) (near to the study area). Silt/clay fraction (<62.5 *μ*m)	Suction dredge – statistically significant effects were present, but overall faunal structure in distributed plots recovered after 56 days. This occurred against a background of seasonal response. Tractor dredge – no statistically significant	Suction dredge - significant treatment (disturbed versus undisturbed) effects were reported for *Pygospio elegans* and *Cerastoderma edule*. There were also a significant time effect and significant time-treatment interaction for *Pygospio elegans*. Tractor dredge – mean

of Applied Ecology, 34, 497-517.			ranges from 25 to 60% in the centre.	effects on total abundance and number of species and overall faunal structure in distributed plots recovered after 56 days. This occurred against a background of general seasonal decline.	abundance of *P. elegans* remained higher in the undisturbed treatment until day 56. No significant treatment effect occurred for any species but a significant time treatment occurred for *P. elegans*, *Nepthys* sp. and *C. edule*, with a significant time treatment interaction for *P. elegans*.
Spencer, B.E., Kaiser, M.J. & Edwards, D.B. 1998. Intertidal clam harvesting: benthic community change and recovery. *Aquaculture Research*, 29, 429-437.	River Exe, England (see Spencer *et al*., 1996; 1997)	Suction dredge Manila clam – *Tapes philippinarum*	Unknown – study refers to stable sediment and protection from onshore winds by a sand dune bar.	Recovery of sediment structure and invertebrate infaunal communities occurred 12 months after harvesting. Four months after harvesting, significant differences between the harvested plot, previously net-covered plot and control plot were detectable (67% similarity between treatments), although there were indication of recruitment or migration. Eight months after harvesting, similarity between treatments increased to 85%, however significant differences were still	*Pygospio elegans* abundance was greater in the harvested plot than any other four months after harvesting, whilst *Nephtys hombergii* abundance remained lower.

				apparent between treatment and control plots (excluding previously net-covered plot and the harvested plot). Trenches (10 cm deep) left by suction dredging were infilled within 2 to 3 months.	
Peterson, C.H., Summerson, H.C. & Fegley, S.R. 1987. Ecological consequences of mechanical harvesting of clams. *Fishery Bulletin*, 85, 2, 281-298.	Back Sound, North Carolina, USA	'Clam kicking' – mechanical form of clam harvest involving the modification of boat engines to direct propeller wash downwards to suspend bottom sediments and clams into a plume and collected in a trawl net towed behind the boat. American hard shell clam - *Mercencaria mercenaria*	Seagrass bed and sandflat	Monitored the impact of different intensities of clam kicking, as well as clam raking, for up to four years. Clam harvesting had no impact on the density or species composition of small benthic macroinvertebrates, largely made up of polychaetes. The study concluded that polychaetes recover rapidly from disturbance and as such the communities are unlikely to be adversely affected by clam harvesting.	-

Annex 14. Table of recolonization strategies and reproductive seasons of potential key species in the Solent European Marine Site. These species were selected from the potential species list in Annex 15.

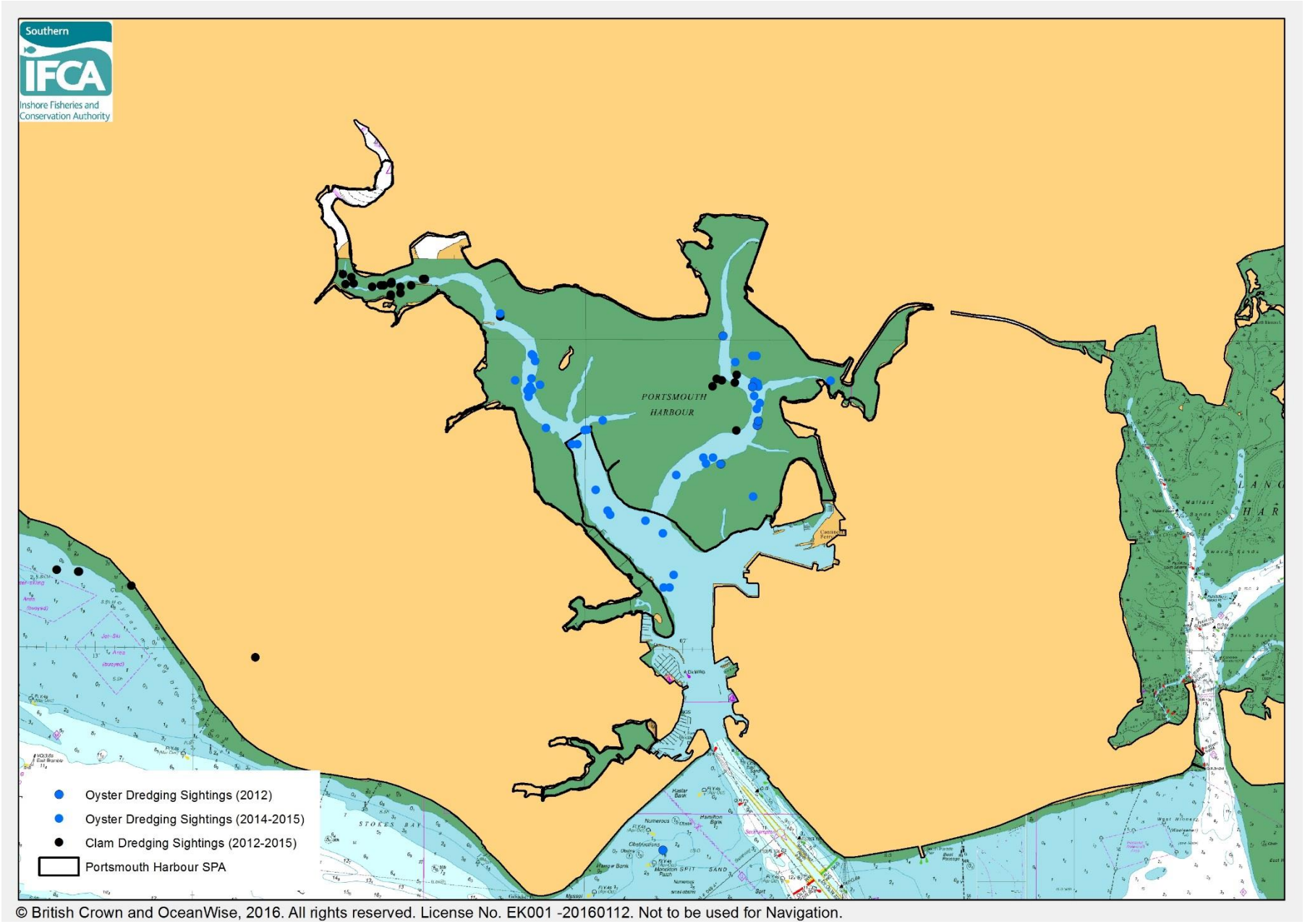
Species	Recolonization Strategy	Reproductive Season	References
Arenicola marina	Above-surface migration	Autumn to winter	McLusky *et al*. (1983) http://www.marlin.ac.uk/biotic/browse.php?sp=4238
Macoma balthica	Active migration of adults and larval settlement/recolonization	Spring and autumn	http://www.marlin.ac.uk/species/detail/1465 http://www.marlin.ac.uk/biotic/browse.php?sp=4272
Hydrobia ulvae	Active migration	March to October	http://www.marlin.ac.uk/habitats/detail/206/cerastoderma_edule_and_polychaetes_in_littoral_muddy_sand http://www.marlin.ac.uk/biotic/browse.php?sp=4186
Pygospio elegans	Larval recolonization	December to May or January to August	http://www.marlin.ac.uk/habitats/detail/206/cerastoderma_edule_and_polychaetes_in_littoral_muddy_sand http://www.marlin.ac.uk/biotic/browse.php?sp=6530
Hediste diversicolor	Adult migration and juvenile recruitment	Spring to summer	Lewis *et al*. (2002) http://www.marlin.ac.uk/biotic/browse.php?sp=4253
Scrobicularia plana	Larval recolonization	May to September	Lewis *et al*. (2002) Santos *et al*. (2011)
Nephtys hombergii	Passive and active migration	Variable; May and September (Tyne Estuary), throughout the year peaking in July and November (Southampton Water), August and September (Århus Bay, Denmark)	Hall and Harding (1997) http://www.marlin.ac.uk/biotic/browse.php?sp=4414

Annex 15. Potential Species List for the Solent European Marine Site (derived from SAC biotopes outlined in the Regulation 33 Conservation Advice Package and prey species of vulnerable (to shellfish dredging) SPA bird species).

SAC Species (Summary of key biotopes for SAC sub-features – Appendix XI):
Pontocrates spp.
Bathyporeia spp.
Lanice conchilega
*Corophium**
*Macoma balthica**
*Arenicola marina**
*Cerastoderma edule**
*Hediste diversicolor** (previously *Nereis diversicolor*)
Mya arenaria
Pygospio elegans
*Scrobicularia plana**
Streblospio shrubnsolii
Aphelochaeta marioni
Tubificoides
Nephtys hombergii

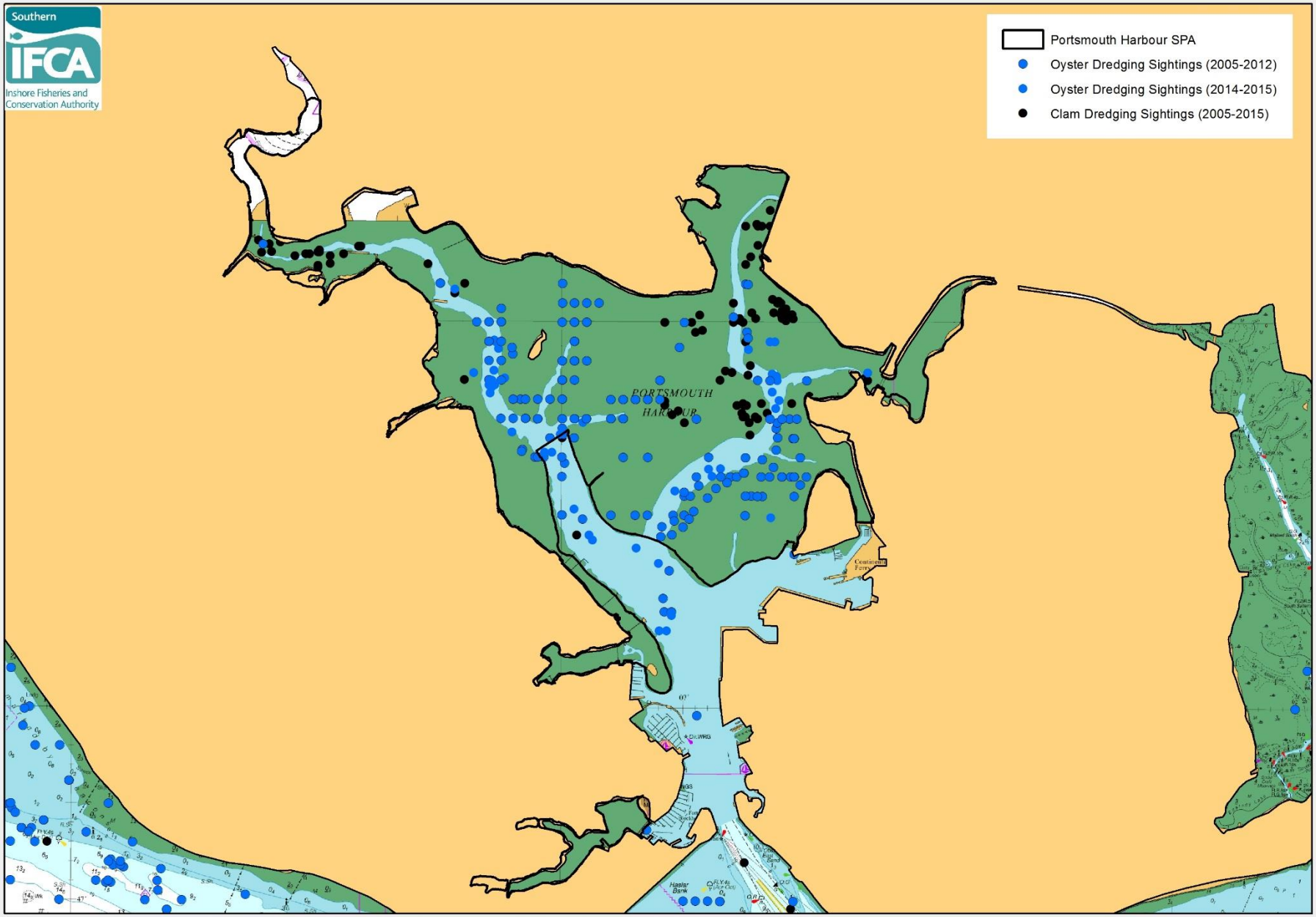
Prey species of potentially vulnerable (to shellfish dredging) SPA bird species*:
Cardium spp
Nereis spp
Crangon spp.
Carcinus spp.
Retusa obtusa
Corophium volutator
Gammarus spp.
Tubiflex spp.
Nerine spp.
Hydrobia ulvae

Annex 16: Co-location of Recent Clam Dredging (2012-2015) and Oyster Dredging (2012, 2014-2015) Sightings in the Portsmouth Harbour SPA



SIFCA Reference: SIFCA/HRA/10/002

Annex 17: Co-location of Recent Clam Dredging (2012-2015) and Oyster Dredging (2012, 2014-2015) Sightings in the Portsmouth Harbour SPA



Annex 18. New Management Measures for Bottom Towed Fishing Gear in the Solent EMS. Taken from Section 7 (Management Options) in the Chichester and Langstone Harbours SPA Clam Dredging Habitats Regulations Assessment (SIFCA Reference: SIFCA/HRA/10/001 v1.9).

7. Management options

In recognition of the potential pressures of clam dredging upon designated features, sub-features and supporting habitats, Southern IFCA is currently in the process of introducing new bottom towed fishing gear measures to manage shellfish dredging in the Solent European Marine Sites (SEMS). In the Portsmouth Harbour SPA, these measures consist of spatial and seasonal restrictions on shellfish dredging via the introduction of dredge fishing management areas.

Three dredge fishing management areas will be introduced by Southern IFCA; of which one (Portsmouth Harbour) will cover the designated features/supporting habitats of the Portsmouth Harbour SPA (figure 5). Within this dredge fishing management area, shellfish dredging will be prohibited for 35 weeks of the year during the spring, summer and autumn months (1st March to 31st October inclusive) in order to enable the recovery of infaunal communities and to maintain the structure of intertidal and subtidal habitats, as well as supporting breeding shellfish populations. As the summer months represent the period of highest biological activity for invertebrate infauna of mudflats, the closure of the clam fishery during this time will support these communities to recover from the effects of human and/or natural disturbance. The timescale for recovery of disturbed habitats from shellfish dredging is based on a number of different factors, including sediment type, associated fauna, rate of natural disturbance and the level/scale of impact (Robert *et al*., 2010; Jones, 1992). As such, determining a suitable period for recovery is particularly difficult and is further compounded by a lack of data on the condition and species that occur within the site. To help overcome these difficulties it is important to examine existing literature (which represents best available evidence) on recovery rates from similar activities to infer potential timescales for recovery, in conjunction with site specific knowledge. A total of five studies were examined, all of which cover the impacts of shellfish dredging on intertidal habitats and four of which are based in the UK (details given in Annex 13). Recovery rates range from no effect (thus no recovery needed) up to 12 months. Spencer *et al*. (1998) reported a recovery rate of up to 12 months, although inferred it was not possible to be certain that recovery had not occurred before as not all treatment replicates were taken 4 and 8 months after sampling. The authors speculated that the greater length of recovery when compared with similar studies that reported recovery rates of 56 days and 7 months after harvesting was related to the protected nature of the site (Spencer *et al*. 1998). This study highlights the importance of exposure (i.e. rate of natural disturbance) as a factor in determining recovery rates. The Solent harbour areas accessible to shellfish dredging, as illustrated in Figure 5, are subject to relatively large tidal fluctuations, in addition to currents and wind exposure and are therefore considered to be areas of moderate energy. Based on the level of disturbance and periods of recovery reported from other studies, it is anticipated that 35 weeks will provide a sufficient period to allow recovery of impacted habitats. It is however important to note there the difficulty in determining a period of recovery due to a number of data gaps, which will be made easier with condition data and any results from arising monitoring studies.

The summer months represent the period of highest biological activity for invertebrate infauna of mudflats and the closure to shellfish during this time will support the recovery of communities from the effects of human and/or natural disturbance. As such, the timing of the recovery period has been designed to allow for the quickest recovery possible, this is because the restoration of a community in temperate zones is likely to be more rapid if the cessation of sediment disturbance occurs prior to the spring-summer influx of recruits (Borja *et al*., 2010). This supports the timing of the reproductive season for key species within the site which generally occurs between spring and autumn (see Annex 14 for reproductive season of key species). Restricting shellfish dredging during winter is likely to aid restoration of infaunal communities if the main recolonisation mechanism is by those who undergo recolonization via by larval settlement. This supports the recolonization strategies used by a number of individual species, with a number of species employing both larval settlement and active or passive migration (i.e. *Macoma balthica*, *Hediste diversicolor*) (see Annex 14 for recolonization strategies of key species).

Shellfish dredging in the Portsmouth Harbour dredge fishing management area will be permitted for 120 days annually: from 1st November to 28th February inclusive. During this period, dredging will only be permitted between 07.00 and 17.00 each day in order to further manage fishing effort and to aid compliance

While it is acknowledged that clam dredging will continue to take place within the Portsmouth Harbour SPA, the short duration of the fishing season combined with the prohibition on fishing during the biologically productive summer months is considered sufficient to enable the physical and biological recovery of designated supporting habitats. On this basis, the restriction of clam fishing in the SPA to a 120 day period will not hinder the site from achieving its conservation objectives.

A network of permanent bottom towed fishing gear closure areas also forms part of the new bottom towed fishing gear measures to manage shellfish dredging in the Solent European Marine Sites. The network is designed to protect good examples of SAC features and by virtue also covers overlapping SPA supporting habitats outside of Portsmouth Harbour. The network of closure areas covers approximately 95.4 km^2 (including those in the original Bottom Towed Fishing Gear byelaw) and equates to approximately 33.9% of the Solent Maritime SAC. Portsmouth Harbour is not contained within the Solent Maritime SAC, unlike Langstone Harbour, Southampton Water and areas of the wider Solent and therefore, no new bottom towed fishing gear permanent closure areas will be introduced in Portsmouth Harbour. With respect to SPAs alone, the main concern surrounding shellfish dredging relates to the ‘food availability’ attribute, whilst attributes relevant to SACs include the following ‘distribution and extent of characteristic range of biotopes’, ‘Presence and spatial distribution of communities’, ‘Presence and abundance of typical species’ and ‘Species composition of component communities’. The Habitat Regulations Assessment therefore did not indicate the need to protect good examples of SPA habitat through permanent closures and it is believed the spatial and seasonal restrictions on shellfish dredging via the introduction of dredge fishing management areas are sufficient to maintain site integrity. With respect to food availability, the length of the closure is designed to allow for sufficient recovery of potential prey species and the timing of the closure coincides with the arrival of overwintering birds (September to November), thus ensuring sufficient food availability during this crucial period. In addition, there appears to be a lack of evidence to suggest a site-specific link between shellfish dredging and adverse effects on designated bird species as a result of reductions in food availability. Available scientific literature is largely focused on the decline of bird populations when the fishery and

bird species target the same species, which is not the case in Portsmouth Harbour. The monitoring strategy, proposed to take place in conjunction with the introduction of new bottom towed fishing gear management (see paragraph below), will help to address any concerns surrounding food availability during the open season. It is also important to remember a large proportion of Portsmouth Harbour is already prohibited to bottom towed fishing gear as part of management measures introduced for red risk gear-feature interactions (i.e. bottom towed fishing gear and seagrass beds). Such areas provide additional feeding areas not subject to bottom towed fishing gear.

7.1 Monitoring

To ensure shellfish dredging within the Portsmouth Harbour SPA continues to be managed in a manner consistent with the conservation objectives of the site Southern IFCA aims to monitor the impact of fishing activity upon designated features and sub-features. Monitoring will be undertaken in partnership with other organisations including Natural England, whose statutory duties include monitoring the condition of European Marine Sites, as well as other agencies where appropriate. The initial monitoring strategy will look to compare fished areas to non-fished (control) areas before and after the fishing season in relation to key attributes including sediment character and faunal composition. A formal monitoring plan incorporating the above strategy will finalised with Natural England prior to the implementation of management measures. It is important to note that any monitoring strategy is subject to resources and funding and any additional monitoring requirements, such as the monitoring of newly closed permanent areas, will be subject to such restrictions. Available data on bird populations (i.e. WeBs) will also be incorporated to allow monitoring of any potential impacts of new management on designated bird species. Monitoring may help to fill a number of data gaps including an indication of site condition (in the absence of condition data) and site specific recovery rates.

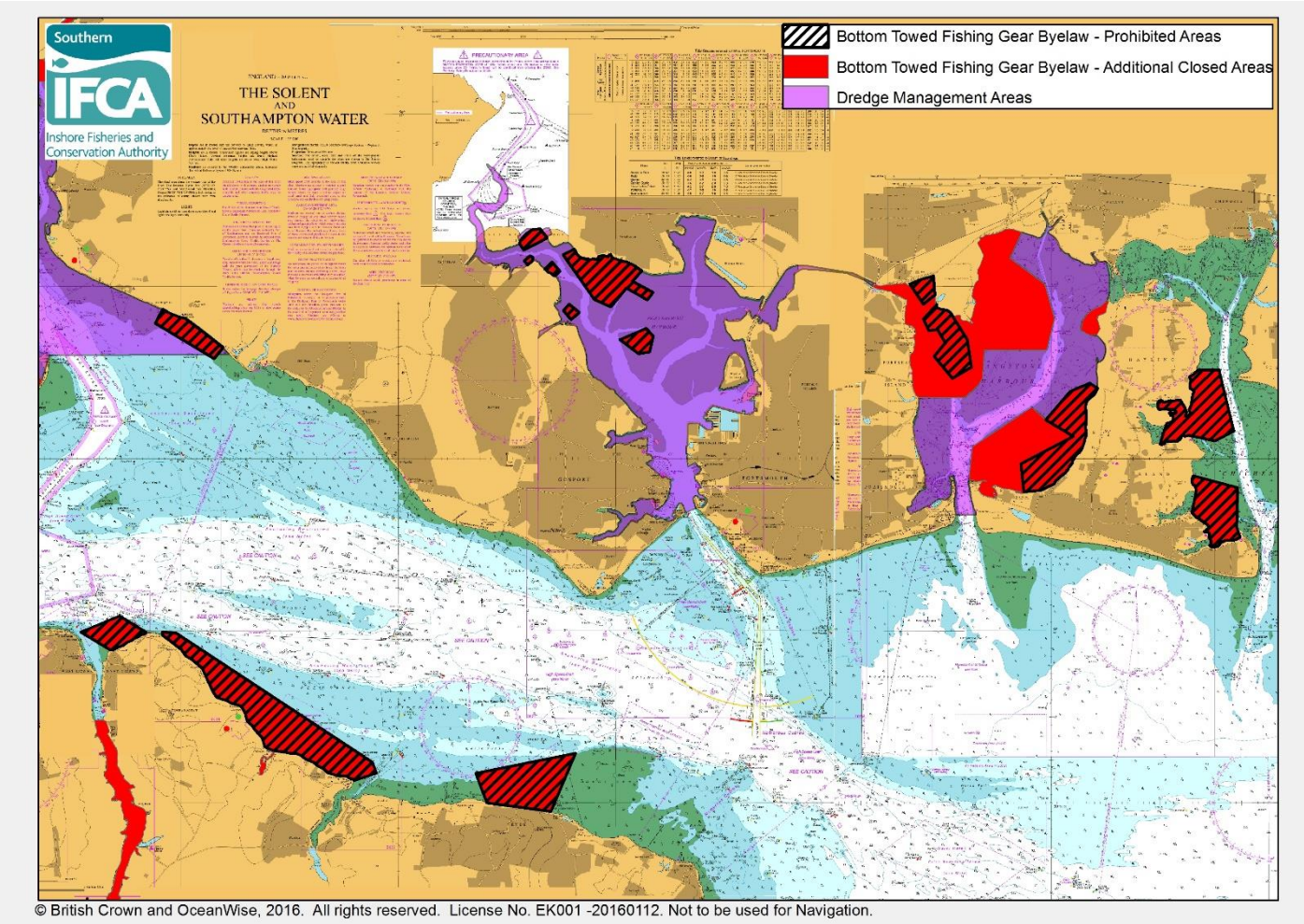


Figure 5. Proposed Portsmouth Harbour permanent bottom towed fishing gear closure areas and dredge fishing management area