Margate and Long Sands Site of Community Importance (SCI) MMO Fisheries Assessment

August 2017

Contents

1. Summary

Table 1. Summary of the outcomes of this assessment of the impact of commercial fishing in this SCI.

Sub-features	Matrix Gear Type	Part A Outcome	Part B Outcome	In combination Assessment
Subtidal coarse sediment and **Subtidal mixed sediments** and **Subtidal sand**	Beam trawl (whitefish)	LSE	Adverse effect (in some areas)	Adverse effect (in some areas)
	Beam trawl (shrimp)			
	Beam trawl (pulse/wing)			
	Heavy otter trawl			
	Multi-rig trawls			
	Light otter trawl			
	Pair trawl			
	Suction (cockles)			
	Mussels, clams, oysters	No LSE	No adverse effect	No adverse effect
	Pump scoop (cockles, clams)			
	Gill nets	No LSE	No adverse effect	
	Trammel nets			
	Entangling nets			
	Drift nets (demersal)			
	Pots/creels (crustacea/gastropods)			

2. Introduction

Table 2. Name and legal Status of site

Name of site	Legal status
Margate and Long Sands	Site of Community Importance (SCI)

The boundary of Margate and Long Sands European Marine Site (EMS)[1] encloses a series of sandbanks, the largest of which is Long Sand which lies in a north east – south west orientation along the line of the tidal flows entering the Thames estuary from the North Sea. Margate Sand lies to the south west of Long Sand, orientated east-west approximately along the line of the predominant tidal flow in the southern part of the Thames estuary which comes from the English Channel (**Figure 1**). The extent and position of Margate Sand has changed very little over time, however in common with most sandbanks, other banks within the site (including Long Sand) are dynamic and fairly mobile (Natural England, 2016).

The fauna of the sandbank crests is characteristic of species-poor, mobile sand environments and is dominated by polychaete worms and amphipods. In the troughs and slopes, a higher diversity of polychaetes, crustacea, molluscs and echinoderms is found, with mobile epifauna including crabs and brown shrimp, squid and commercially important fish species such as sole and herring. There

[1] Margate and Long Sands is a Site of Community Importance (SCI). SCIs are sites that have been adopted by the European Commission but not yet formally designated by the government of each country. The umbrella term European marine site is used in this document to avoid confusion.

is a significant amount of the reef-forming Ross worm (*Sabellaria spinulosa*) at this site, which when formed as a reef have the potential to qualify as an Annex I habitat (biogenic reef)[2].

This assessment covers the Margate and Long Sands sandbank feature throughout the site, including the portion of the site inshore of 6 nautical miles (nm) and the portion between 6 and 12nm offshore. MMO owns this assessment with input from Kent and Essex Inshore Fisheries and Conservation Authority (IFCA). Any fisheries management measures required in the 6 to 12nm portion of the site will be implemented by MMO, and inshore of 6 nm by Kent and Essex IFCA.

To further inform the sites conservation objectives, Natural England commissioned a study to establish the benthic species composition and associated biotopes of the sandbank feature (Bhatia, 2015). This study has resulted in a biotope map for Margate and Long Sands EMS. When looking at the impact of anchored nets/lines, demersal trawls, dredges, hydraulic dredges and traps on the sandbank feature, the sensitivity information from this study has informed our analysis and conclusions. Annex 7, figure 2 displays the features that are thought to be the most sensitive to ongoing fishing activities based on Natural England's advice. For further information on the biotope sensitivities, please see Annex 7.

Table 3. Qualifying features

Feature	Sub-feature	Matrix sub-feature[3]	Conservation objectives/General management approach
1110 Sandbanks which are slightly covered by sea water all the time	Subtidal coarse sediment	Subtidal mixed sediments used as it is the most precautionary.	Maintain or restore: • the extent and distribution of qualifying natural habitats • the structure and function (including typical species) of qualifying natural habitats • the supporting processes on which qualifying natural habitats
	Subtidal mixed sediments		
	Subtidal sand		

2.1 Sandbanks which are slightly covered by sea water all the time

The Margate and Long Sands EMS sandbank feature extends to the boundary of the site (excluding drying areas) and is in depths of less than 25m below chart datum (BCD).

The fauna of the sandbanks is generally low diversity polychaete-amphipod communities which are typical of mobile sandy sediments. This is particularly true of the shallower sections of bank crests, although slightly higher diversity communities are found on the deeper sections of the banks. In the gravelly substrates in the troughs, more diverse communities of infauna and epifauna are present. Troughs between sandbanks, particularly the Queens Channel, support richer communities of echinoderms, crustacean and bivalve molluscs, as well as abundant infauna and aggregations of *S. spinulosa*. The area is known to be a spawning and nursery ground for a number of species of fish, including sole and herring (Natural England, 2012).

[2] JNCC site details: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030371
[3] See section 2.2 for more detail about the Matrix.

Crustaceans are also widespread across the site. The most common crustacean is the brown shrimp with the common hermit crab as the next most common species found. Other species widely recorded were crabs and pink shrimp (mainly outside 6nm). Echinoderm species are widespread across the Long Sand but with a relatively low diversity of species and abundance. Species include the common starfish, the green sea-urchin, and the brittlestars. Other species recorded are the encrusting bryozoans and hydroids living on the shells of hermit crab (RPS Group PLC, EMU LTD, 2006). The European common squid was also frequently recorded (Natural England, 2012).

Long Sand is a nursery ground for a wide variety of fish, such as sole, plaice, dab, herring, whiting, pout, pogge, horse mackerel, sprats, sea bass and a variety of rays. Fish of high importance as prey for other fish and birds include sprats and herrings, gobies (mainly sand gobies and transparent gobies), sand eels, and flatfish of various species (RPS Group PLC, 2005; EMU LTD, 2006). Margate Sand site is likely to be of particular importance as a spawning area for herring, and possibly for sand eel (BMT Cordah, 2003).

Feature extent

Natural England have advised ([needs correct reference from NE advice]) that the seabed of the whole site (except drying areas) is to be assessed as sandbank feature. This is because the enhanced biological evidence available at this site (Bhatia, 2015) shows that the ecological communities throughout the site support the condition of the topographical sandbanks (e.g. Long Sand).

Sub-feature: Subtidal coarse sediment

This habitat is located predominantly in the southern section of the site, running offshore parallel from Birchington-on-Sea to Herne Bay and extending further offshore into the Thames estuary to a distance of approximately 15km. This subfeature also appears towards the northern end of the site, and is closely associated with subtidal mixed sediments. Sands and gravels typically provide an ideal habitat for many benthic marine species, as well as burrowing communities (Joint Nature Conservation Committee, 2014).

Sub-feature: Subtidal mixed sediment

This subfeature is less extensive within the Margate and Long Sands EMS and is only located at the north eastern tip of the site. This relatively small area of subtidal mixed sediment is surrounded predominantly by subtidal sand, but also abuts a small occurrence of subtidal coarse sediments. Consisting of mixed gravelly sands and muddy sands, this subfeature provides an ideal habitat for many benthic marine species including a range of bivalves and polychaete worms (Natural England, 2016, Bhatia, 2015).

Sub-feature: Subtidal sand

Subtidal sand is found throughout the site and forms the majority of the sediment type within Margate and Long Sands EMS. This subfeature is heavily influenced by the strong tidal currents within the site and as a result, parts of this subfeature are highly mobile. Typically this subfeature supports communities of lower diversity, particularly around the crests of the sandbanks (Natural England, 2016).

Biotope mapping and detail

In 2015 Natural England commissioned the Institute of Estuarine and Coastal Studies (IECS) (Bhatia, 2015) to undertake a monitoring study of the site in order to establish the benthic species composition and associated biotopes of the sandbank feature (annex 1). The result of this survey alongside Natural England advice on how to interpret the data has been used to inform the assessment of gear impact, on the sites qualifying feature and sub-features.

While sub-features may be classed as either sensitive or not-sensitive to a particular level of pressure, biotope areas may vary in terms of their sensitivity. This depends on species richness and where in the Annex 1 feature the biotope is found.

The sensitivity of the biotopes within the site varies depending on their location. Species present in more stable areas (troughs) will be more prone to disturbance and therefore more sensitive to fishing activity (figure 2).

For example the biotope SS.SSA.lMuSa.FfabMag is characterised by burrowing bivalves and worms. When it is found in subtidal mixed sediments and subtidal course sediment communities within channels/troughs or on the slopes of sandbanks then the biotope tends to be more sensitive than when located elsewhere eg on sandbank crests. Survey sample points at different locations within biotope areas were used to attribute sensitivity across the sandbank feature.

The Bhatia 2015 study identified a diverse range and abundance of fauna with polychaetes, crustaceans and molluscs dominating the faunal assemblages. Distribution of taxa was attributed to habitat preference with more sensitive species (deposit feeders and burrowing species) such as *Abra alba* being present in more stable areas mainly within the troughs between sandbanks and the area in deeper waters on the Long Sand Head section and in areas identified within the 6nm limit.

Abundant presence of *Lanice conchilega* was found within the site which is an indicator of a mobile stable habitat which can further establish more biodiversity within the site. This is further supported by the presence of *S. spinulosa* in the Long Sand Head area within the subtidal mixed sediment area of the site (figure 1). Notable changes of biotope composition were evident from the previous study in 2006 that mud or mixed sediments have increased the diversity of the site with the potential for the development of *S. spinulosa* reef especially within the *L. conchilega* area within the Long Sand Head area. *S. spinulosa* is an important component of the overall community of species and can contribute to increased species diversity and abundance by attracting other species into the area.

L. conchilega within the 6nm limit are correlated with the hydrodynamic system within the tide swept infralittoral sand and is therefore more naturally adapted to physical disturbance. This is also the case for biotopes present in the subfeature subtidal sands and coarse sediments within the site (annex 1).

Recoverability of all biotopes are generally high due to high spat release but recruitment success very much depends on larval and post settlement mortality. Spawning stages varies depending on the biotope but generally falls between August (highest) and February (lowest). *Fabulina fabula* is generally long lived and has a low turnover. Physical disturbance may exacerbate mortality of new recruits through starvation. Recoverability of biotopes especially *Magelona mirabilis* is more successful in areas with an already established mature colony therefore ongoing disturbance from fishing activities may perturb the development of mature species.

Bivalve molluscs such as *Abra alba* and *Mucula nitidosa* inhabit more stable sediments in low energy environments. These deposit feeders can also recover quickly but larval and post

settlement mortality can vary from 30 – 90%, therefore recruitment is infrequent. Summer recruits are more successful than autumn recruits as maturity will be delayed until the following year which minimises recruitment success. Biotopes associated with more mobile areas are species poor and naturally adapted to disturbance.

Annex 7 provides further information on the specific biotopes present[4].

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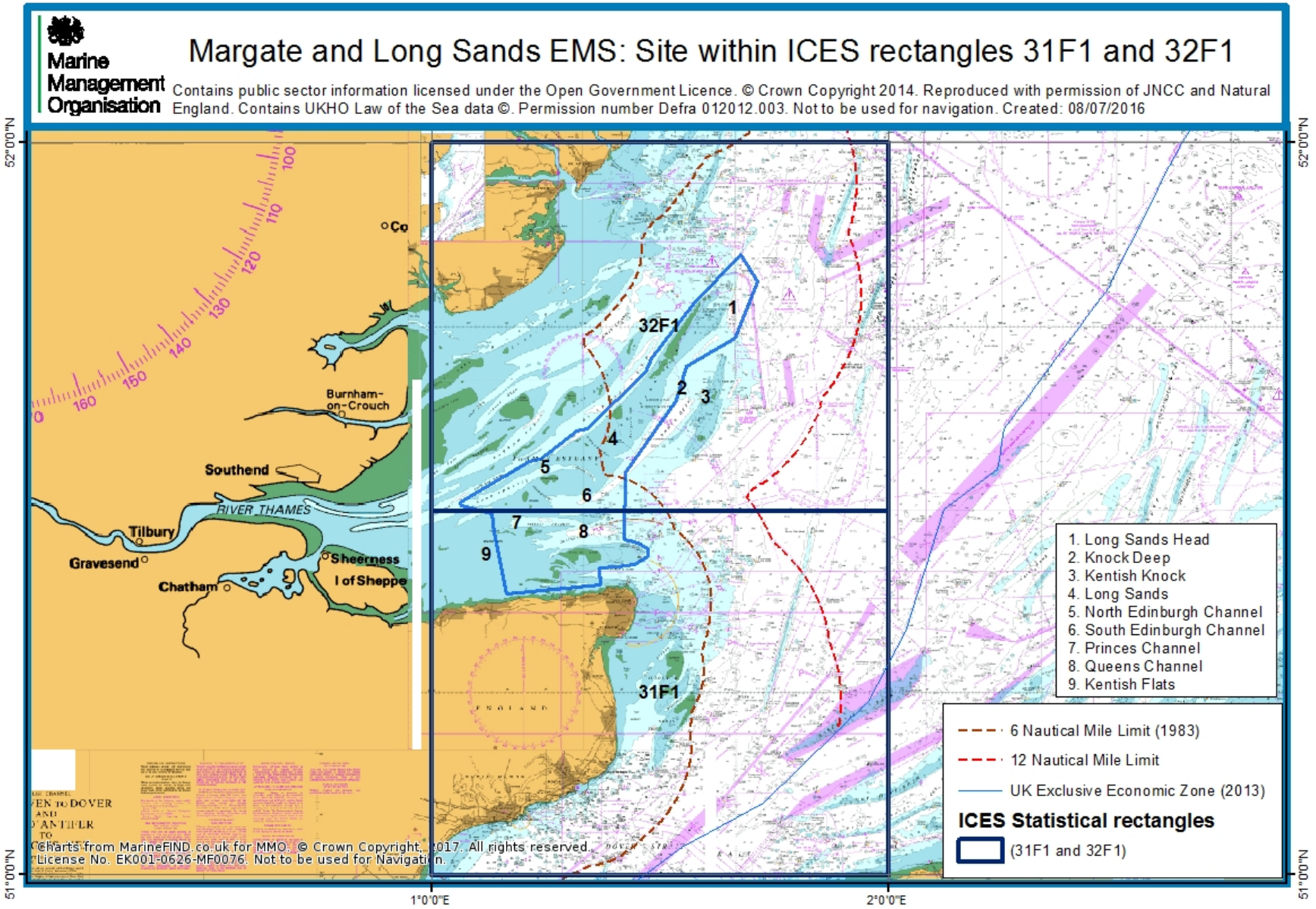
Site conditions

The sandbank feature is exposed to wave action and strong tidal flows, which includes disturbance by storms. This site is considered to be generally highly variable but with more stable areas within the troughs, between the banks and in areas towards the boundary of the site (Bhatia 2015).

[4] JNCC http://www.jncc.gov.uk/marine/biotopes/

Figure 1: Margate and Long Sands EMS



2.2 Scope of this assessment - fishing activities assessed

This assessment covers the entire Margate and Long Sands EMS, except the drying areas. All fishing activity/feature interactions at this site identified as 'amber' in the Matrix of fisheries gear types and European marine site protected features[5] (hereafter 'the Matrix') were considered for inclusion in this assessment. Fishing activity-feature interactions identified as 'green' are also assessed if there are in combination effects with other activities.

Table 4 shows the fishing activities with amber interactions assessed at this site for each sub-feature. The 'matrix gear type' column shows the categories used in the Matrix. These are matched to the 'aggregated method' categories used in Natural England conservation advice packages.

Table 4. Fishing activities with amber interactions included for assessment

Sub-features	Matrix Gear Type	Natural England Aggregated Method
Subtidal coarse sediment And **Subtidal mixed sediments** And **Subtidal sand**	Anchor seine	Demersal seine
	Scottish/fly seine	
	Beam trawl (whitefish)	Demersal trawl
	Beam trawl (shrimp)	
	Beam trawl (pulse/wing)	
	Heavy otter trawl	
	Multi-rig trawls	
	Light otter trawl	
	Pair trawl	
	Scallops	Dredges
	Mussels, clams, oysters	
	Pump scoop (cockles, clams)	
	Suction (cockles)	Hydraulic dredges
	Pots/creels (crustacea/gastropods)	Traps
	Cuttle pots	
	Fish traps	
	Gill nets	Anchored nets/lines
	Trammels	
	Entangling	
	Drift nets (demersal)	
	Beach seines/ring nets	Shore-based activities
	Shrimp push-nets	
	Fyke and stake nets	
	Bait dragging	

Commercial sea fishing has the potential to vary in nature and intensity over time. This assessment considers a particular range of recent and likely future activity based on activity levels and type as identified in section 4.1.

To ensure that the conservation objectives of the site are not hindered should future activity occur outside of this range, the MMO will monitor activity at this site, and will review this assessment

[5] www.gov.uk/government/publications/fisheries-in-european-marine-sites-matrix

periodically and if fishing patterns change significantly. See **section 6 and 7** for more information on ongoing monitoring and control at this site.

Typical species associated with features are important when assessing the impacts of activities on site integrity. To assess the impacts of fishing gear on typical species associated with the sandbank feature of this site, the MMO has used biotope information from Bhatia (2015).

3. Part A Assessment

Table 5. Advice packages used for assessment

Feature	Package	Link
Sandbanks which are slightly covered by sea water all the time	SCI: Margate and Long Sands	https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK0030371&SiteName=gate&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=

Part A of this assessment was carried out in a manner that is consistent with the likely significant effect test required by article 6(3) of the Habitats Directive[6].

For each fishing activity, a series of questions were asked[7]:

1. Does the activity take place, or is it likely to take place in the future?
2. What are the potential pressures exerted by the activity on the feature?
3. Are the effects/impacts of the pressures likely to be significant?

For each activity assessed in Part A, there were two possible outcomes for each identified pressure-feature interaction:

1. The pressure-feature interactions were not included for assessment in Part B if:
    a. the feature is not exposed to the pressure, and is not likely to be in the future; or
    b. the effect/impact of the pressure is not likely to be significant.

2. The pressure-feature interactions were included for assessment in Part B if:
    a. the feature is exposed to the pressure, or is likely to be in the future; and
    b. the potential scale or magnitude of any effect is likely to be significant; or
    c. it is not possible to determine whether the magnitude of any effect is likely to be significant.

3.1 Activities not taking place

Table 6 shows activities which are excluded from further assessment as they do not take place and are not considered likely to take place in the future.

[6] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992L0043&from=EN

[7] The test for likely significant effect under article 6(3) of the Habitats Directive is not required for activities which are directly connected to or necessary to the management of the site. Fishing activities are considered to be not directly connected to or necessary to the management of the site unless otherwise indicated.

Table 6. Activities not taking place in site and not likely to take place in the future

Interaction			Justification
Feature	**Gear type**	**Sub type**	
Sandbanks which are slightly covered by sea water all the time	Towed (demersal)	Anchor seine	Activity does not occur at the site*
		Scottish/fly seine	
	Dredges (towed)	Scallops	
	Static - pots/traps	Cuttle pots	
		Fish traps	
	Seine nets and other	Beach seines/ring nets	
		Shrimp push-nets	
		Fyke and stake nets	
	Miscellaneous	Bait dragging[8]	

*Activities either intertidal/inshore, beach seines/ring nets, shrimp push-nets, fyke and stake nets, expert opinion has informed the MMO that activities do not take place.

3.2 Potential pressures exerted by the activities on the feature

For the remaining activities, potential pressures were identified using Natural England's draft conservation advice package identified in table 5 and associated advice on operations tables. All pressures identified other than those categorised as 'not relevant' were included (table 7).

Table 7. Potential pressures on the feature

Sub-feature	Aggregated method	Potential pressures
Subtidal coarse sediment and **Subtidal mixed sediments** and **Subtidal sand**	• Anchored nets/lines • Demersal trawl • Dredges • Hydraulic dredges • Traps	Abrasion/disturbance of the substrate on the surface of the seabed
		Introduction of other substances (solid, liquid or gas)
		Introduction or spread of non-indigenous species
		Litter
		Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion
		Removal of non-target species
	• Anchored nets/lines • Demersal trawl • Dredges • Traps	Organic enrichment
	• Demersal trawl • Dredges • Hydraulic dredges	Changes in suspended solids (water clarity)
		Physical change (to another seabed type)
		Siltation rate changes (High), including

[8] Bait dragging does not take place in the UK outside of Poole Harbour

		smothering (depth of vertical sediment overburden)
		Siltation rate changes (Low), including smothering (depth of vertical sediment overburden)
	• Dredges • Hydraulic dredges	Introduction of microbial pathogens

3.3 Significance of effects/impacts

To determine whether the effect of each pressure is likely to be significant, the sensitivity assessments and risk profiling of pressures from Natural England's Advice on Operations were used (table 8). Tables have been combined for sub features where they can to save on repetition.

Table 8. Summary of pressures from specific activities on Subtidal coarse sediment, Subtidal mixed sediments and subtidal sand taken to Part B

Potential pressures	**Anchored nets/lines**			**Demersal trawl**					**Dredges**		**Hydraulic dredges**	**Traps**
	Gill nets	Trammel nets	Entangling nets	Beam trawl (whitefish/ shrimp/ pulse)	Heavy otter trawl	Multi-rig trawls	Light otter trawl	Pair trawl	Mussels, clams, oysters	Pump scoop (cockles, clams)	Suction (cockles)	Pots/creels (crustacea/ gastropods)
Abrasion/ disturbance of the substrate on the surface of the seabed	LSE – abrasion may result from anchors or footlines			LSE – abrasion from gear contacting the seabed							LSE – abrasion form water injection	LSE - from pots, lines and weights/ anchors
Introduction or spread of non-indigenous species	No LSE – Ballast water is the main vector for the transmission of non-indigenous species. Fishing vessels less than 45m must have permanent ballast and thus this vector is not available[9]											
Litter	No LSE – Although fishing gear may be lost at this site which could potentially cause abrasion and removal of target and non-target species, due to the strong tidal currents and oceanic swells at the site it is unlikely to persist at the site for long enough to cause a significant impact											
Penetration and/or disturbance of	No LSE – Only the anchors will penetrate the seabed and this will be minor and			LSE - Gears are designed to interact with the seabed								No LSE - Only the anchors will

[9] www.gov.uk/government/uploads/system/uploads/attachment_data/file/441098/MGN_501_Combined.pdf

the substrate below the surface of the seabed, including abrasion	localised		penetrate the seabed and this will be minor and localised
Removal of non-target species	LSE – nets may catch crustacea or entangle and remove branching epifauna identified as key species at this site	LSE – gears are non-selective	LSE – Pots may remove
Organic enrichment	No LSE – Margate and Long Sands is subject to strong tides and currents and nutrients will be moved out of the area quickly		
Changes in suspended solids (water clarity)	No LSE – interaction with the seabed is minor and will create localised changes in sediment which will disperse quickly	LSE - This pressure may result from physical disturbance of the sediment, along with hydrodynamic action caused by the passage of towed gear, leading to entrainment and suspension of the substrate behind and around the gear components	No LSE – interaction with the seabed is minor and will create localised changes in sediment which will disperse quickly
Physical change (to another seabed type)	No LSE – Only the anchors will penetrate the seabed and this will be minor and localised	No LSE – These gears are used on sandbank which will remain as sandy substrates after fishing has occurred	No LSE – Only the anchors will penetrate the seabed and this will be

			minor and localised
Siltation rate changes (Low), including smothering (depth of vertical sediment overburden)	No LSE – interaction with the seabed is minor and will create localised changes in sediment which will disperse quickly	LSE - This pressure may result from physical disturbance of the sediment, along with hydrodynamic action caused by the passage of towed gear, leading to entrainment and suspension of the substrate	No LSE – interaction with the seabed is minor and will create localised changes in sediment which will disperse quickly
Introduction of microbial pathogens	No LSE		

4. Part B Assessment

Part B of this assessment was carried out in a manner that is consistent with the appropriate assessment required by article 6(3) of the Habitats Directive.

Table 9 shows the fishing activities and pressures included for assessment in Part B. Pressures with similar potential impacts to a particular feature were grouped to save repetition during this assessment.

Table 9. Fishing activities and pressures included for Part B

Aggregated Method	Fishing Gear Type	Pressures
Anchored nets/lines	Gill nets Trammels Entangling Drift nets (demersal)	• Abrasion/disturbance of the substrate on the surface of the seabed • Removal of non-target species
Demersal trawl	Beam trawl (whitefish) Beam Trawl (shrimp) Beam trawl (pulse/wing) Heavy otter trawl Light otter trawl Multi-rig trawls Pair trawl	• Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion • Removal of non-target species • Changes in suspended solids (water clarity) • Siltation rate changes (low), including smothering (depth of vertical sediment overburden)
Dredges	Mussels, clams, oysters	• Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion • Removal of non-target species • Changes in suspended solids (water clarity) • Siltation rate changes (low), including smothering (depth of vertical sediment overburden)
Hydraulic dredges	Suction (cockles)	• Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion • Removal of non-target species • Changes in suspended solids (water clarity) • Siltation rate changes (low), including smothering (depth of vertical sediment overburden)
Traps	Pots/creels (crustacea/gastropods)	• Abrasion/disturbance of the substrate on the surface of the seabed • Removal of non-target species

The Important targets for favourable condition were identified within Natural England conservation advice supplementary advice tables. ‘Important’ in this context means only those targets relating to attributes that will most efficiently and directly help to define condition.

Table 10 shows which targets were identified as important. The impacts of pressures on features were assessed against these targets to determine whether the activities causing the pressures are compatible with the site's conservation objectives.

Table 10. Important favourable condition targets for identified pressures

Attribute	Target	Importance/justification
Distribution: presence and spatial distribution of biological communities	Maintain the presence and spatial distribution of subtidal sandbank communities.	Important for all pressures identified.
Extent and distribution	Maintain the total extent and spatial distribution of subtidal sandbanks to ensure no loss of integrity, while allowing for natural change and succession..	Pressures do not affect extent and distribution of subtidal sandbanks.
Supporting processes: energy / exposure	Maintain the natural physical energy resulting from waves, tides and other water flows, so that the exposure [High / Medium / Low] does not cause alteration to the biotopes, and stability, across the habitat	Pressures do not alter subtidal sandbank energy or exposure.
Structure and function: presence and abundance of key structural and influential species	[Maintain OR Recover OR Restore] the abundance of listed typical species, to enable each of them to be a viable component of the habitat.	Important for all pressures identified.
Structure: non-native species and pathogens	Restrict the introduction and spread of non-native species and pathogens, and their impacts.	Pressures will not result in the introduction of INNS at a significant level.
Supporting processes: sediment contaminants	Restrict surface sediment contaminant levels to concentrations where they are not adversely impacting the infauna of the feature (and each of its subfeatures).	Pressures do not alter sediment contaminants.
Structure: volume	Maintain the existing (where no previous evidence exists) or best-known (where some evidence exists) volume of sediment in the sandbank, allowing for natural change.	Important for all pressures identified.
Structure: topography	Maintain the presence of topographic features, while allowing for natural responses to hydrodynamic regime, by preventing erosion or deposition through human-induced activity.	Important for all pressures identified.
Structure: species composition of component communities	Maintain the species composition of component communities.	Important for all pressures identified.
Supporting processes:	Maintain the natural physico-chemical properties of the water.	Pressures do not affect physic-chemical

physico-chemical properties		properties.
Supporting processes: sediment movement and hydrodynamic regime	Maintain all hydrodynamic and physical conditions such that natural water flow and sediment movement are not significantly altered or prevented from responding to changes in environmental conditions.	Important for abrasion/ penetration/ disturbance of the surface of the seabed may affect sedimentation rate.
Supporting processes: water quality - contaminants	Restrict aqueous contaminants to levels equating to (High / Good) Status (according to Annex VIII and X of the Water Framework Directive), avoiding deterioration from existing levels	Pressures do not affect water quality.
Supporting processes: water quality - dissolved oxygen	Maintain the dissolved oxygen (DO) concentration at levels equating to High Ecological Status (specifically ≥ 5.7 mg per litre (at 35 salinity) for 95 % of the year), avoiding deterioration from existing levels.	Pressures do not affect water quality.
Supporting processes: water quality - nutrients	Maintain water quality at mean winter dissolved inorganic nitrogen levels where biological indicators of eutrophication (opportunistic macroalgal and phytoplankton blooms) do not affect the integrity of the site and features, avoiding deterioration from existing levels.	Pressures do not affect water quality.
Supporting processes: water quality - turbidity	Maintain natural levels of turbidity (e.g. concentrations of suspended sediment, plankton and other material) across the habitat.	The site is already highly mobile with high turbidity. Therefore fishing will not elevate significantly beyond background

4.1 Activity description: Anchored nets/lines, demersal trawl, dredges, hydraulic dredges and traps

4.1.1 Fisheries access/existing management

UK vessels operate throughout this site. French and Belgium vessels have access between the 6 and 12nm limits, with Belgian vessels (targeting demersal fish) being the most active other Member State (OMS) fleet within the site.

No management measures were required for 'red' interactions as part of the revised approach to marine protected area (MPA) management. However, there are measures in place which cover the Margate and Long Sands EMS, detailed below:

- **From 0 – 6nm: Kent and Essex IFCA byelaws[10]**

    - Kent and Essex IFCA Vessel Size and Engine Power Byelaw prohibits fishing from vessels over 17m in length and restricts engine power to a max of 221 kW (or for de-rated engines; 243 kW before de-rating) for vessels using towed fishing gear.

    - Kent and Essex IFCA currently regulates the cockle fishing within its district (the southern part of the EMS), using the Thames Estuary Cockle Fishery Order 1994 and the Kent and Essex IFCA Cockle Fishery Flexible Permit Byelaw. Both these fisheries have an annual Appropriate Assessment undertaken as part of the fisheries management process and as such we would refer you to these documents when regarding the impact of cockle dredging on the Margate and Long Sands EMS.

    - Kent and Essex IFCA Whelk Permit Byelaw restricts fishers to a pot limit of either 10 or 300 pots and requires permit holders to provide data on the intensity of whelk potting.

    - Kent and Essex IFCA Parlour Pots – Crabs and Lobsters Byelaw, which states parlour pots must be fitted with at least one unobstructed escape gap.

    - Kent and Essex IFCA Marking Pots and Traps Byelaw states that traps shall be clearly marked at all times with the letters and numbers of the vessel to which they belong or the owners name and address.

    - Kent and Essex IFCA Berried Lobster Byelaw prohibits a person from removing any berried lobster from a fishery.

    - Kent and Essex IFCA Placing and Use of Fixed Engines Byelaw restricts net length, stating that 'no net or fleet of nets shall exceed 1000m in length', with vessels able to shoot up to 5000m of nets in separate locations.

- **From 6 – 12nm:**

    - The MMO and Cefas manage the Thames Estuary and Blackwater Herring fishery, setting herring quota and minimum mesh size (54mm)[11].

[10] Kent and Essex IFCA byelaws: http://www.kentandessex-ifca.gov.uk/i-want-to-find-out-about/regulations/keifca-byelaws/

4.1.2 Evidence Sources

To determine the levels of fishing activity, the following data sources were used:

- Vessel monitoring system (VMS)
- Fisheries landings data
- Fishermap
- Inshore fisheries sightings activity data
- National Federation of Fishermen's Organisations (NFFO) project: Supporting risk-based fisheries assessments for MPAs - Assessment of Otter Trawling Activity in Margate and Long Sands Site of Community Importance (SCI) (2015)
- Expert opinion
- Spatial footprint analysis using p-values

Landings data were available for UK vessels only, and are available at an ICES rectangle level. For vessels using VMS, landings were linked to vessels' VMS reports to estimate the landings derived from within Margate and Long Sands EMS. For vessels not using VMS, landings from within the site were estimated based on the area of the site as a proportion of the two ICES rectangles within which it sits.

For more information about the data sources, please see the MMO MPA assessment methodology.

Confidence in the data sources used is detailed in table 11.

Table 11. Summary of generic confidence associated with fishing activity evidence

Evidence source	Confidence	Description, strengths and limitation
VMS data	High / Moderate	• Confidence in VMS is high for describing activity relating to vessels over 15m in length. But VMS information was not developed specifically for management of MPAs, and does not describe activity in smaller vessels. • There are assumptions in the processing that speed of less than 6 knots is "fishing speed". • VMS records the location, date, time, speed and course of the vessel. Fishing gear information has to be linked to the VMS data itself by matching the logbook information where possible, using the fleet register which may not be up to date or local marine officer knowledge of the said vessel.
Fisheries landings data	High	• Landings from all vessels were spatially attributed based on the patterns of fishing observed in vessels of 12m length or over. Therefore it was assumed that under 12m vessels show the same patterns of fishing as those 12m and over; • VMS was introduced and implemented to the UK 12-15m length fleet from 2014. Previously VMS consisted

[11] www.gov.uk/government/uploads/system/uploads/attachment_data/file/459118/23con.pdf

		of the 15m length or over fleet. • Data processing takes account of variable reporting rates by using the time between reports to weight each individual report. However, it was assumed that each report (accounting for variable reporting rates) represents an equal amount of landings; • Linking of landings data to VMS data assumed that all reports under 6 knots were assumed to represent fishing activity, and no reports over 6 knots were assumed to be fishing.
Fishermap	Low	• The data was collected in 2012 and are therefore relatively dated. • A condition of the research was that only those interviewees who explicitly gave permission for their data to be shared would have their own mapping represented in the final product shared with third parties. This equated to approximately 50% of responses. • The data are self-reported estimates • The number of skippers who allowed their data to be used represent just over one fifth of the number of licensed under 15m fishing vessels registered in England.
Inshore fisheries sightings activity data	Moderate	• Based on recent work to describe fishing activity, but is limited by raw data and other limitations highlighted in the report.
Expert judgement	Low / Moderate	• Depends on the area, and the knowledge of the area from MMO and IFCA staff.
Spatial footprint	Moderate/High	• Spatial footprint values do not include information for non-VMS vessels. • The methodology used to calculate spatial footprints requires 'matching' of VMS data to specific gear types held on UK or EU fishing fleet registers. This therefore relies on these registers being kept up to date.

4.1.3 Fishing gear types used

Aggregated method: Anchored nets/lines

Inshore of 6nm, fixed netters mainly target thornback rays but also cod. Drift netters target cod, sole and herring at different times of the year. There is activity on the site all year around, peaking in the summer months[12].

Anchored nets/lines type:

Gillnets, entangling nets, demersal drift nets and trammel nets

These nets are set on the seabed by either weights or anchors and are generally heavier than those set on longlines. The gill net has a leadline in order to hold it on the seabed and is held

[12] Kent and Essex IFCA Comms

vertical by a floatline. These nets are generally set up to 2 kilometres wide (Grieve et al, 2014); within the Kent and Essex IFC District the 'placing and use of fixed engines byelaw'[13], restricts net length, stating that 'no net or fleet of nets shall exceed 1000m in length', with vessels able to shoot up to 5000m of nets in separate locations. Trammel nets are similar to a gill net but are made up of three layers of netting. They are made up of two outer layers of large mesh with a sheet of fine small mesh sandwiched between them.

Aggregated method: Demersal trawl

The majority of the fishing activity occurs around the Queens and South Edinburgh Channels and along the contours of the eastern edge of Long Sand to Long Sand Head sandbank (annex 2).

In these areas the main mobile demersal towed gears are trawls (beam, pair and otter trawls).

Demersal trawl types:

Beam trawls

Beam trawl nets are kept open by a beam which varies in length from 4 to 12m depending on the size of the vessel. Trawl heads support the beam and are fitted with sole plates which are constantly in touch with the seabed during fishing. Tickler chains or chain matrices are used depending on the ground; therefore the weight of the gear varies.

Otter Trawls

Demersal otter trawls feature a variety of designs and riggings depending on the nature of the ground to be fished and the target species.

Otter trawl rigs consist of netting divided into wings, belly and cod-end. To the sides of the net wings, a pair of otter boards, or trawl doors, open the net horizontally and depress the trawl to the seabed. They also stimulate the fish to swim into the path of the trawl, sometime through the creation of a sediment cloud. Cables known as bridles and sweeps connect the otter boards to the net wings and these can be from a few meters up to a few hundred meters long. The front of the trawl is framed on the top by a head line, which frequently has floats attached to keep the mouth of the net open, and a ground rope usually constructed of wire. The ground rope will often have associated ground gear attached to it to protect the net from damage and prevent entanglement with the bottom. Ground gear can vary from rock hoppers to bobbins of various dimensions. Tickler chains may also be attached to the net opening, and mechanically stimulate fish through contact with the bottom.

Light otter trawl

A light otter trawl is defined in the managing fisheries in MPA gear glossary as an otter trawl gear which does not use any of the following:

- sheet netting of greater than 4mm twine thickness;
- rockhoppers or discs of 200mm or above diameter;
- a chain for the foot/ground line (instead of wire);

[13] http://www.kentandessex-ifca.gov.uk/i-want-to-find-out-about/regulations/keifca-byelaws/byelaws-a/

- multiple tickler chains.

Multi-rig trawls

Multi-rig trawls tow more than one beam or otter trawl at any one time. The number of nets used is dependent on the target fishery for example, when targeting nephrops, three otter trawls side by side using four warps and two sets of trawl doors may be used (Seafish, 2015).

Pair trawls

Pair trawls use two boats to tow one trawl. Each vessel only tows one warp, and it is the distance between the two boats which holds the net open, usually negating the need for otter boards. This allows vessels of moderate engine power to tow a comparatively large trawl. The addition of a heavy wire sweep between the warps and bridles ensures good bottom contact, with the remainder of the gear set up very similar to that of an otter trawl.

Aggregated method: Dredges

Dredges types:

Mussels, clams, oysters

Dredges comprise of various types of gear that can include the use of metal toothed bars or blades, which dig into the seabed and scoop molluscs into a net. They target shellfish that live either on or (more commonly) within the sediment. Cockles (*Cerastoderma edule*), mussels (*Mytilus edulis*) and oysters (*Ostrea edulis*) can be harvested with dredges of different types.

Aggregated method: Hydraulic dredges

Hydraulic dredge types:

Suction (cockles)

Hydraulic dredges use suction to bring burrowing bivalves (cockles, mussels) to the surface.

Aggregated method: Traps

Within the site the majority of potting for lobsters takes place from May to September. Whelk potting can be year round with bad weather limiting effort in winter months.

Trap types:

Pots/creels

The main pots used in this area are parlour pots, used to target crabs, lobsters and whelks. An anchor is fixed to each end of a string of pots to ensure contact with the seabed. The back rope connects the pots (Grieve et al 2014).

4.1.4 Fishing activity levels

4.1.4.1 Demersal trawls, dredging and hydraulic dredges

VMS and landings data

VMS data from 2009 to 2015 were used in this assessment. VMS shows activity from vessels 15m and over for all years and vessels from 12 to 15m in length from 2014. Margate and Long Sands EMS sits within International Council for the Exploration of the Sea (ICES) rectangles 31F1 and 32F1 (figure 1). Annexes 2a-g show VMS reports from UK, French and Belgian vessels grouped by gear type.

Belgium are the most active other Member State (OMS) fishing within the site; predominantly using beam and otter trawl within the Fisherman's Gat section and on/around the Long Sand Head area. This fishery peaks in months April to June each year. French vessels have limited activity within the site.

UK vessels fishing in this area predominantly land into five ports: Ramsgate, Margate, Broadstairs, Herne Bay and Whitstable. The majority of the estimated annual UK landings over seven years (between 2009 and 2015) within the Margate and Long Sands EMS are from demersal species and molluscs (annex 6).

The majority of towed gear landings from the site were from dredges and otter trawls. The annual average of landings was 88.6 tonnes for dredges and 40 tonnes for otter trawls (annex 6).

Molluscs (such as cockles, whelk, mussels and oysters) made up the majority of landings by species group, with an annual average of 188.9 tonnes landed. Demersal species (such as cod, haddock and sole) made up most of the rest of landings by species group. This is consistent with the high levels of dredging and trawling within the site.

Table 12. Number of UK VMS vessels using demersal towed gear Margate and Long Sands EMS

Gear Type	Vessel size	2009	2010	2011	2012	2013	2014	2015
Demersal Trawls	12-15m	-	-	-	-	-	3	10
	15m and over	16	14	5	5	5	2	4
	Total	-	-	-	-	-	5	14
Demersal seines	12-15m	-	-	-	-	-	0	0
	15m and over	1	2	2	1	1	2	2
	Total	-	-	-	-	-	2	2
Dredges	12-15m	-	-	-	-	-	7	10
	15m and over	0	0	0	1	0	0	1
	Total	-	-	-	-	-	7	11

Fishermap

In order to identify the potential bottom towed gear and dredging activity from smaller vessels, Fishermap data (annex 3a/b) has been used as an additional tool to assess effort.

Table 13. Number of fishing vessel visits per year over each of the sandbank areas – inshore of 12nm limit by gear type

Sandbank	Number of fishing vessel visits per year by gear type	
	Bottom towed	Dredges
Long Sand Head	51-70	0
Knock Deep	51-60	0
Fisherman's gat	41-70	0-10 per month
South Edinburgh Channel	31-40	0-20
Queens Channel	61-70	0-30
Prince's Channel	41-60	21-30

Fishermap indicates that the majority of the non-VMS towed gear vessels operate on the eastern contours of the Long Sand sandbanks, Long Sand Head and within the Queens Channel which further supports the VMS data (annex 3a).

However, given the inherent limitations with Fishermap data, more weight is given to expert opinion for this case. Kent and Essex IFCA indicate a different level of dredging activity to which is displayed within Fishermap data. This is based on officer sightings and landings data.

Inshore fisheries sightings activity data

Defra project MB0117 calculated sightings per unit effort calculated from a range of sightings data (annex 4a) further confirms that the main areas of fishing within the site is within the channels within the 6nm limit and on the tip of the Long Sand Head section of the sandbank.

Supporting Risk-Based Fisheries Assessments for MPAs: Assessment of otter trawling activity in Margate and Long Sands SCI[14]

The NFFO assessment calculated biotope exposure to otter trawling using two methods:

- Vessels of 15m and over (vessels with VMS) - swept area over each of the biotopes, seasonality of activity and footprint of gear components were all used to analysis the frequency of impact across the site;
- Vessels under 15m - swept area compared to the area of each biotope, and seasonality were considered. 12 interviews with skippers of this fleet gathered information on vessel size, gear, and levels of effort, including distribution and intensity of fishing activity within the site. This was used to analyse swept area on individual biotopes, and scaled up to reflect the whole under-15m fleet.

Table 14 shows the findings from the NFFO assessment of otter trawling.

[14] http://www.abpmer.co.uk/media/1331/r2551c-mls-assessment_18dec15_final.pdf

Table 14. Area of each habitat impacted by high, medium and low impact gear components of over-15m otter trawls (UK and non-UK) in Margate and Long Sands EMS from VMS footprint polygons (2009–2013)

Biotope	Habitat Area (km^2)	Area impacted (total) (km^2)		High impact gear component (trawl doors)		Medium impact gear component (skids)		Low impact gear component (ground rope)	
		Area impacted (total) (km^2)	% habitat area impacted	Area impacted (High) (km^2)	% habitat area impacted	Area impacted (medium) (km^2)	% habitat area impacted	Area impacted (low) (km^2)	% habitat area impacted
SS.SCS.ICS.SLan	112.3	20.6	18%	2.6	2%	0.3	<1%	17.7	16%
SS.SCS.ICS.HeloMsim	2.4	0.0	0%	0.0	0%	0.0	0%	0.0	0%
SS.SSa.IFiSa	16.9	0.3	2%	0.0	0%	0.0	0%	0.2	1%
SS.SSa.IFiSa.IMoSa	19.3	0.2	1%	0.0	0%	0.0	0%	0.2	1%
SS.SSa.IFiSa.NcirBat	291.9	18.2	6%	1.1	<1%	0.2	<1%	16.9	6%
SS.SSa.IMuSa	14.9	0.9	6%	0.1	<1%	0.0	0%	0.9	6%
SS.SSa.IMuSa.FfabMag	80.5	17.7	22%	1.7	2%	0.3	<1%	15.7	19%
SS.SSa.CFiSa	58.0	7.1	12%	0.5	1%	0.1	<1%	6.4	11%
SS.SSa.CMuSa.AalbNuc	42.5	11.1	26%	1.1	3%	0.3	1%	9.7	23%
SS.SBR.PoR	9.1	7.2	79%	0.9	10%	0.3	3%	6.0	66%
Total	**647.6**	**83.2**	**13%**	**8.1**	**1%**	**1.5**	**<1%**	**73.6**	**11%**

It indicates that the biotopes most impacted as a percentage of habitat are polychaete worm reefs (SS.SBR.PoR, 79%), *Abra alba* and *Nucula nitidosa* (SS.SSa.CMuSa.AalbNuc, 26%) and *Fabulina fabula* and *Magelona mirabilis* (SS.SSa.IMuSa.FfabMag, 22%). The habitats and biotopes that are impacted over the largest proportion of their area by trawl doors are 10%, 3% and 2% respectively. These percentages do not include multiple passes of gear.

Frequency of impact was most prevalent within the channels inside 6nm with the channels being potentially fished monthly and the Long Sand Head section approximately every 2 months. It states that otter trawling activity peaks from Feb – Apr and Nov – Dec.

Conclusions of this assessment, including how VMS analysis indicates that large parts of the site are not fished at all and that there are small areas where fishing activity appears to be more concentrated, are consistent with the finding of the MMO. For the under 15m fleet, the NFFO report supports the Kent and Essex IFCA sightings data, when compared to the Marine Conservation Zone (MCZ) fisheries model, with a portion of the site seemingly used more than other parts inshore of 6nm.

Expert opinion (including Kent and Essex IFCA sightings data)

MMO and IFCA expert opinion indicate that there are approximately 10 to 15 otter trawlers between the 0 and 6nm limit. Two of these vessels occasionally pair trawl. These vessels vary in length from between 9 and 17m with an engine size of 221kW. These vessels will generally carry out one to three tows per trip and use tickler chains, sweeps, trawl weights, otter doors and weighted ground ropes to target cod, sole, thornback rays, whiting, herring and sprats and fish throughout the year. The main otter trawling gear used within the site is single rig targeting cod and bass and triple rig targeting sole.

Three 22m vessels beam trawl with an engine size of 221kW. Two of the trawlers have multiple tickler chains or chain mats. Kent and Essex IFCA byelaws limit maximum vessel size to 17m and engine size to 221kW[15], but three vessels have grandfather rights are therefore exempt from this requirement. It is estimated that they fish within the 6nm limit occasionally (fewer than 10 days per year). These vessels operate on the edges of or between the sandbanks[16].

There are two UK beam trawlers which fish for sole and shrimp between the 6 and 12nm limits and additional Belgian beam or otter trawl vessels who fish in the area. These vessels are active all year round and are over 10m in length.

There are around 25 over 10m length otter trawlers targeting sole, skate, cod, herring and sprat. French vessels are also present fishing alongside and around the sandbank between the 6 and 12nm limits.

Kent and Essex IFCA sightings data (annex 5a) further confirms that the main fishing is trawling (beam and otter trawling). Due to Kent and Essex IFCA surveillance being predominantly within their district activity is mainly documented in or around the 6nm limit. It confirms that the main activity is within the channels of the site. The primary fishing seasons are spring and autumn, with the target species being sole and skate, however, fishing occurs all year round[17].

Dredging activity is low within the site, 1 vessel ≥under 15m recorded in five years, with suction dredging managed via a Kent and Essex IFCA byelaw, in the 0-6nm limits (see **section 9.1**).

Overall data sources confirm that the majority of fishing activity occurs within the channels within 6nm and on the Long Sand Head section of the sandbank between 6 and 12nm (annex 2b).

4.1.4.2 Traps

The main potting activity in the site is for whelks; which can take place all year with bad weather limiting effort in winter months. Potting for lobster and crab takes place from May to September. Activity from fishing with traps is low within the site, with a little more occurring outside of the site.

VMS and landings data

The estimated average annual landings from potting within Margate and Long Sands EMS for 2009 to 2015 are 76.06 tonnes.

Landings from potting within the site are estimated to have risen from 13.69 tonnes in 2009 to a peak of 119.03 tonnes in 2013 and 115.33 tonnes in 2015. This substantial increase too place despite Kent and Essex IFCA restricting the number of whelk pots in their district (ie inshore of 6nm) to a limit of either 10 or 300 pots. The number of parlour pots permitted to be worked within the site is currently unmanaged but there is little activity within the site (annex 5b). Inshore of 6nm pots must have an escape gap fitted, as per the Kent and Essex IFCA byelaw. The majority of fishing effort is from vessels under 10m in length (table 15). This is confirmed by the VMS data, with only one potting vessel over 15m and five 12-15m potting vessels recorded within the site from 2009 to 2015.

[15] http://www.kentandessex-ifca.gov.uk/i-want-to-find-out-about/regulations/keifca-byelaws/byelaws-a/
[16] Kent and Essex IFCA officer
[17] Kent and Essex IFCA officer

Table 15. Number of UK VMS vessels potting within Margate and Long Sands EMS

Gear Type	Vessel size	2009	2010	2011	2012	2013	2014	2015
Potting	12-15m	-	-	-	-	-	1	4
	15m and over	1	0	0	0	0	0	0
	Total	-	-	-	-	-	1	4

Fishermap

Fishermap data (annex 3c) indicates that potting is carried out across the whole site, north of the Queens Channel to Long Sand Head, but generally at low levels; confidence is considered to be low for these data.

Inshore fishing sightings activity data

The sightings data for potting on the sandbank feature shows potting activity within the site is inside the 6nm limit, and is recorded at low levels (annex 4b). This is consistent with Kent and Essex IFCA expert opinion.

Expert opinion

There are 10 to 15 whelk potters within the 6nm limit. These vessels are mainly under 10m length and are limited to 300 whelk pots per soak[18]. This fishery occurs all year round but is weather dependent.

There are approximately five lobster/crab potters within the 6nm limit and are mainly under 10m length and work approximately 150 pots per trip. This fishery is seasonal, occurring from May to September[19].

Potting primarily occurs within the 6nm limit and is generally smaller vessels but there are some over 10m visiting vessels who fish in the area. Quantity of gear can vary from 50 to 1,000 pots per vessel depending on species and ground[20].

Kent and Essex IFCA sightings data suggest that most of the whelk potting fishery is outside of the site with the majority within the site being along the Southern edge of the site. There is limited potting for crustaceans in the site (annex 5b).

4.1.4.3 Anchored nets/lines

VMS and landings data

Estimate annual average landings from netting (predominantly gill nets, trammel nets and drift nets) within Margate and Long Sands EMS are 55.44 tonnes. Landings estimates show stable landings with a peak of just over 60 tonnes in 2011 and a low of just under 48 tonnes in 2015.

[18] www.kentandessex-ifca.gov.uk/i-want-to-find-out-about/regulations/keifca-byelaws/keifca-district-byelaws/
[19] Kent and Essex IFCA officer
[20] MMO coastal officer

Over the years analysed there were no VMS reports from vessels using nets within Margate and Long Sands EMS. This indicates that all of the netting activity is from vessels under 15m (from 2009-2013) or under 12m (2014 and 2015) in length.

Fishermap

Fishermap data (annex 3d) shows low levels of activity over sensitive biotopes within the site. With higher levels of activity recorded over drying areas.

Inshore fishing sightings activity data

Defra project MB0117 further confirms that there are low levels of netting activity within the site (annex 4c).

Confidence in the data varies depending on surveillance effort. The data confidence within this area, in particular within 6 nm, is classed as moderate and within the 6 to 12 nm limit is classed as low - moderate.

Expert Opinion

Within the 0 to 6nm limit, fixed netters mainly target thornback rays but also cod. There is activity on the site all year around, peaking in the summer months[21].

4.1.5 Spatial Footprint Analysis

Analysis was undertaken of the total spatial footprint of fishing gear used each year. The total spatial footprint of a particular gear group was then compared to the total area of the site, producing a ratio (p). A p value of less than 1 means that the total spatial footprint of the gear in a given year was smaller than the total area of the site. A p value of more than one means that the total spatial footprint of the gear in a given year was greater than the total area of the site. The spatial footprint analysis used in this assessment is based on a report commissioned by Defra's Impact Evidence Group on the feasibility of using a spatial footprint method in appropriate assessments[22] (report reference: MMO1108).

Estimates of the p values for each fishing gear at this site are displayed in tables 16 and 17. The assumptions used when calculating footprints are displayed in annex 9.

Data showed a small amount of potting within the site. Potting was only recorded in 2011 and 2015 and was estimated at p value 0 for both years. This indicates very low levels of potting throughout the site.

The p values for netting over the years 2009 to 2015 was estimated at 0.00203 within of the site, and this was only recorded in 2010 and 2012. MMO considers this value to be insignificant.

The p values for demersal trawls over the years 2009 to 2015 within the site was estimated at 0.72997 over the seven year period. This ranges from a low of p value of 0.06043 in 2015 to a

[21] Kent and Essex IFCA officer
[22] MARG Ltd in association with Envision Mapping Ltd, 2015

high of p value 0.15180 in 2010. It also appears that p values have been decreasing significantly since 2012.

The p value for dredging over the seven year period was estimated at 0.00049, and was only recorded in 2009 and 2010.

The p value for hydraulic dredging over the seven year period was estimated at 0.01000. This activity was recorded in 2012, 2014 and 2015, peaking in 2015.

It is highly likely that certain parts of the site are likely to be subject to more frequent levels of potting, netting and demersal trawls. However, p values should be treated with a high degree of caution as they rely on numerous assumptions about size and behaviour of gear, and frequency of use.

Nevertheless the levels calculated for the footprint of demersal trawls in this site indicates varying levels of interaction with qualifying site features, and periods for recovery for the site between episodes of interaction are not sufficient for demersal trawl fishing gear types.

Table 16. Annual percentage of site directly under the footprint of the fishing gear

Year	Gear	Impacted surface area (km^2)	Sum impacted surface area (km^2)	% of total area
2009	DRB	0.06372	47.38672	7.30850
2009	OTB	5.07194		
2009	TBB	42.25106		
2010	DRB	0.25488	62.47277	9.63524
2010	GN	0.40996		
2010	TBN	0.10668		
2010	OTB	19.60088		
2010	TBB	42.10037		
2011	FPO	0.01332	50.90339	7.85088
2011	TBN	0.32003		
2011	OTB	7.27820		
2011	TBB	43.29184		
2012	GNS	0.90656	58.82347	9.07240
2012	HMD	0.28180		
2012	OT	0.71669		
2012	OTB	34.34412		
2012	TBB	22.57430		
2013	OTB	14.28182	36.75993	5.66952
2013	TBB	22.47811		
2014	HMD	0.14090	35.31238	5.44626
2014	OT	4.57684		
2014	OTB	11.85504		
2014	TBB	18.73960		
2015	FPO	0.00015	33.31677	5.13848
2015	HMD	1.55840		
2015	OT	0.88208		
2015	OTB	12.20920		
2015	TBB	18.66694		

Table 17. 'P' values indicating proportion of the site that has been contacted by the gear

Year	Gear	Turned over area (km2)	Sum turned over area (km2)	P	Sum P
2009	DRB	0.06372	65.41312	0.00010	0.10089
2009	OTB	5.07194		0.00782	
2009	TBB	60.27746		0.09297	
2010	DRB	0.25488	92.45058	0.00039	0.15282
2010	GN	0.40996		0.00063	
2010	TBN	0.10668		0.00016	
2010	OTB	32.69194		0.05042	
2010	TBB	58.98712		0.10121	
2011	FPO	0.01332	86.80034	0.00002	0.13627
2011	TBN	0.32003		0.00289	
2011	OTB	7.38739		0.01139	
2011	TBB	79.07961		0.12197	
2012	GNS	0.90656	90.82506	0.00140	0.14008
2012	HMD	0.28180		0.00043	
2012	OT	0.71669		0.00111	
2012	OTB	60.53246		0.09336	
2012	TBB	28.38755		0.04378	
2013	OTB	14.82990	49.66917	0.02287	0.07661
2013	TBB	34.83927		0.05373	
2014	HMD	0.14090	42.83641	0.00022	0.06607
2014	OT	4.63090		0.00714	
2014	OTB	12.07341		0.01862	
2014	TBB	25.99120		0.04009	
2015	FPO	0.00015	45.23986	0.00000	0.06977
2015	HMD	6.05868		0.00934	
2015	OT	0.88208		0.00136	
2015	OTB	13.78244		0.02126	
2015	TBB	24.51652		0.03781	

4.2 Abrasion/Physical Damage - pressure assessment

4.2.1 Pressure: Abrasion/disturbance of the substrate on the surface of the seabed

The sensitivity of the sandbank features to physical damage is through changes in suspended sediment, surface abrasion (<25mm), shallow abrasion (>25mm), surface and sub-surface penetration[23].

The sensitivity varies depending on the substrate. Mixed sediments are more susceptible to surface and sub-surface penetration than subtidal sand and subtidal coarse sediments (Tillin et al, 2010). Gravelly muddy sands are more stable than dynamic sand communities and are therefore more sensitive to physical damage and recoverability/resilience tends to be lower (Tillin et al, 2010).

Tidal currents are strong within the Margate and Long Sands EMS, and sediment mobility around the crests of sandbanks is high. The dynamic crests of the sandbanks are characterised by polychaete-amphipod communities of low biodiversity. The effects of demersal trawling on seabed gravel communities can vary depending on how dynamic the environment is (wave action/tidal streams) with more mobile sand being less sensitive than the more stable sediments due to the more developed epifauna and infauna (Lambert et al 2014, Hall et al 2008). The infaunal communities are adapted to this environment by being able to rapidly re-bury themselves into this dynamic environment. Areas of reduced sediment movement support communities of attached bryozoans, hydroids and sea anemones. Sand mason worms and keel worms along with bivalves and crustaceans are also associated with this subfeature (annex 1) (Lambert et al, 2014). The increased recoverability of the sandbanks depends on tidal current speed and the closeness of areas with high abundance of species that can re-colonise from high wave movement (Lambert et al, 2014).

Sand and gravel communities with long lived bivalves are highly sensitive to beam trawling at low to high levels of fishing effort (Hall et al, 2008). It is recognised that the troughs within the Margate and Long Sands sandbanks contain the more gravelly areas and will have a wider diversity of epifauna (including bryozoans, mussels etc) than the dynamic sand communities[24] and therefore could potentially be impacted by these gears. These areas are mainly on a proportion of the Long Sands Head and within the 6nm limit (figure1, annex 7).

Hydraulic dredging (suction dredging) can potentially occur for cockles within the 6nm limit and has the potential to physically remove sediment from the site. The impacts of non-mechanical dredges in a number of publications considered this type of fishing as one of the most damaging of the bottom towed gears due to the deep penetration and potential to physically remove the top layers of seabed (Collie et al 2000, Roberts et al 2010, Grieve et al 2011, Gubbay and Knapman 1998). The level of impact depends on the type of gear, effort, footprint and conditions of the site.

[23] http://jncc.defra.gov.uk/pdf/IDRBNR_Reg%2035_Conservation%20Advice_v4.0.pdf
[24] http://jncc.defra.gov.uk/pdf/IDRBNR_Reg%2035_Conservation%20Advice_v4.0.pdf

The Kent and Essex IFCA closure of cockle beds byelaw[25] currently prohibits the fishing for cockles outside the Thames Estuary cockle fishery order area (i.e. the southern part of the EMS) and an annual appropriate assessment is carried out for this fishery within the site[26] .

VMS data (≥15m) shows that dredging does not currently occur in the site, with only one vessel recorded in 2012, over a two day period. Fishermap confirms low activity levels within 6-12nm; whilst slightly higher levels of dredging are shown for the inshore, this isn't supported by Kent and Essex IFCA and as detailed above, hydraulic dredging is managed.

The impact of demersal trawls varies depending on the weight of the gear used (Tilin et al 2010, Grieve et al 2011). For example, the shoes of a "flatfish" beam trawl can penetrate the seabed up to 6cm, and the tickler chain/ground gear from 2–2.2cm. The gear used within the EMS, with a number of trawlers using tickler chains and chain mats. There is also the potential for larger vessels (over 17m length) with grandfather rights to fish within the 6nm limit and larger UK and non-UK vessels which have the potential to use heavier gear outside the 6nm area.

Evidence suggests that sensitivity of sandbanks to otter trawling varies depending on the type of sediment and the stability of biotopes present within these areas (Hall 2008, Tillin 2010, Grieve et al 2011). For example species close to the surface, larger less mobile species and animals not covered by a shell (Bolam et al 2014, Magda et al 2000) are more prone to physical damage from mobile gears. The biotopes within the stable sandbanks are generally close to the surface with the sand mason worms protruding above the sediment (Hall et al 2008).

Light otter trawling is less damaging than heavier gears such as beam trawlers and is thought to be highly sensitive at high levels of fishing, moderate at moderate levels and not sensitive at other levels on stable species rich mixed sediments (Hall et al 2008).

Pair trawling occurs at low levels within the site (annex 6) and have similar impacts to that of light demersal trawls (Hall et al 2008). As these fisheries are bottom contacting they cumulatively will impact the more stable areas within the site with other fishing activities.

Beam trawling for shrimp potentially occurs within the site. The gear used tends to be lighter than other beam trawlers with light rollers and no tickler chains with a variety of single and twin beamed vessels. The main pressure from this activity is surface abrasion.

Five percent of a Member State's beam trawl fleet can register to use a pulse gear, a semi-pelagic beam trawl which uses electric currents to flush target species out of the benthos. Only vessels that operate in ICES rectangles IVb and IVc of the North Sea can apply to use pulse gear. The pulse fishery can potentially occur in the Margate and Long Sands site, however there are currently no vessels able to use pulse gear within 6nm due to access rights and size limitations.

The evidence on the impacts of pulse trawling is limited but as a result of the lighter gear, limited contact with the seabed and lower trawl speed of the gear the risk of physical damage of the seabed through abrasion is lower than beam trawling with tickler chains (van Marlen et al 2013).

Seabed energy is also a factor which needs to be considered. Higher energy areas are more naturally adapted to disturbance and therefore can recover quicker the areas of low energy (Bolam

[25] http://www.kentandessex-ifca.gov.uk/i-want-to-find-out-about/regulations/keifca-byelaws/
[26]http://www.kentandessex-ifca.gov.uk/i-want-to-find-out-about/regulations/keifca-byelaws/

et al 2014). This site in particular has areas which are naturally adapted to disturbance (subtidal sand and subtidal coarse sediments) than other areas which are more sensitive to physical damage.

The sensitivity of the sandbank features to physical damage from static gears is through surface abrasion from pots, through deployment, movement of gear on the benthos due to tide, current and storm activity; and as the gear is dragged along the seafloor on retrieval.

It is generally thought that potting in subtidal mixed sediments with long lived bivalves has low sensitivity at low to moderate fishing intensity and moderate at high levels (Hall et al 2008). There is potential however, for more fragile epifauna to be damaged through snagging and entanglement especially at high levels of fishing (Hall et al 2008, Roberts et al 2010).

Secondary evidence suggests that static gears have a relatively low impact on benthic communities in comparison to towed gears, as a result of the small footprint of the seabed affected and an even smaller impact if the area is actively trawled (Roberts et al 2010).

The main impact from netting is the anchors and the sweep of the foot rope. While the anchors hold the gear in position the net is still free to move with the current and will drag back and forth along the seabed. The anchors may also be dragged if the force on the net is high.

The amount of netting activity at the site is low and has a low P value of 0.00203 for the fleet. With such a low amount of vessels using the site and the minimal area of the seabed being contacted by the gear there is not likely to be an adverse effect on the site from this type of fishing.

For bottom towed fishing activities, due to ongoing activity within the sensitive parts of the sandbank feature, MMO cannot conclude non-adverse effect on the site for demersal gears.

Table 18. Abrasion/disturbance assessment

Pressure	**Interest feature**	**Favourable condition target**	**Activity**	**Compatible with the conservation objectives?[27]**
Abrasion/ disturbance of the substrate on the surface of the seabed	Sandbanks (Subtidal coarse sediment / Subtidal mixed sediments / Subtidal sand)	Maintain the presence and spatial distribution of subtidal sandbank communities	Anchored nets/lines	Y
			Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N
			Traps	Y
		[Maintain OR Recover OR Restore] the abundance of listed typical species, to enable each of	Anchored nets/lines	Y
			Demersal trawl	N
			Dredges	Y – does not

[27] Determination based on level of risk on sensitive parts of the sandbank feature

		them to be a viable component of the habitat		occur in site
			Hydraulic dredges	N
			Traps	Y
		Maintain the existing (where no previous evidence exists) or best-known (where some evidence exists) volume of sediment in the sandbank, allowing for natural change	Anchored nets/lines	Y
			Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N
			Traps	Y
		Maintain the presence of topographic features, while allowing for natural responses to hydrodynamic regime, by preventing erosion or deposition through human-induced activity	Anchored nets/lines	Y
			Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N
			Traps	Y
		Maintain the species composition of component communities	Anchored nets/lines	Y
			Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N
			Traps	Y
		Maintain all hydrodynamic and physical conditions such that natural water flow and sediment movement are not significantly altered or prevented from responding to changes in environmental conditions.	Anchored nets/lines	Y
			Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N
			Traps	Y

4.2.2 Pressure: Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion

The chains of beam trawls penetrate the upper few centimetres of the sediment which can impact the surface dwelling biotopes within the sediment (Grieve et al 2014). These impacts will be more

evident within the more stable areas; areas more exposed to tidal currents and wave action and will be naturally more adapted to disturbance and therefore recoverability will be quicker (Grieve et al 2014, Magda et al 2000, Bolam et al 2014).

The magnitude of the pressure will depend on the towing speed with beam trawl pressure from trawl heads varying from 0.2 to 1.1 N/cm^2. If the sole plate is tilted the pressure can be increased up to 3 times. Contact with the seafloor will vary depending on the fishing grounds with more contact over harder ground (Fonteyne, 2000).

There are more than 15 otter trawlers who work in the area including Belgian and French vessels. The otter trawl gear used within the site is mainly single and triple rigs. Single riggers mainly target cod and bass and use a footrope (rope and chain) with a sweep and bridle. The triple riggers use a footrope with bobbins and otter boards to target sole.

Evidence suggests that there is no detectable impact from otter trawling on sand and gravel communities (Kaiser et al 2006), however earlier evidence suggests that there may be some detectable (Collie et al 2000, Kaiser et al 2002) impacts but the magnitude impact increases depending on the size of gear, area fished and depth of fishing. The main physical impacts from otter trawls are from the penetration of the otter boards/doors which can penetrate the sediment between 0.7 – 1.9cm depending on the width of gear (Grieve et al 2011).

Bridles and sweeps may also have contact with the seafloor with longer bridles coming into contact more frequently than shorter bridles which are mainly used in rougher ground. These can therefore impact on species close to the surface. The ground ropes of an otter trawl may also have contact with the seabed (to varying degrees) and can have similar impacts than bridles (Grieves et al 2014).

For bottom towed fishing activities, due to ongoing deterioration from this activity, and the fishing effort within the subtidal mixed sediments area, MMO cannot conclude non-adverse effect on the site for demersal gears.

Table 19. Penetration and/or disturbance of the substrate assessment

Pressure	Interest feature	Favourable condition target	Activity	Compatible with the conservation objectives?
Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion	Sandbanks (Subtidal coarse sediment / Subtidal mixed sediments / Subtidal sand)	Maintain the presence and spatial distribution of subtidal sandbank communities	Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N
		[Maintain OR Recover OR Restore] the abundance of listed typical species, to enable each of them to be a viable component of the habitat	Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N

		Maintain the existing (where no previous evidence exists) or best-known (where some evidence exists) volume of sediment in the sandbank, allowing for natural change	Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N
		Maintain the presence of topographic features, while allowing for natural responses to hydrodynamic regime, by preventing erosion or deposition through human-induced activity	Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N
		Maintain the species composition of component communities	Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N
		Maintain all hydrodynamic and physical conditions such that natural water flow and sediment movement are not significantly altered or prevented from responding to changes in environmental conditions.	Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N

4.3 Removal of non-target species

The sensitivity of the features to biological disturbance is classed by Natural England as moderate[28]. Removal of target and non-target species by bottom towed gears can potentially have a significant impact on the species composition from larger long lived species to smaller short-lived species (Schratzberger et al 2002, Queiros et al 2005). By-catch of fish species and molluscs may have an impact on the structure and function of benthic communities (Jennings and Kaiser 1998; Kaiser et al 2006).

MMO conclude that current activity will not have an adverse effect on the removal of target and non-target species however the potential use of pulse fishing in the future will need to be fully - monitored and understood.

The direct effects of static gears will include removal of target species such as crabs and lobsters which have a role in maintaining the diversity of the habitat. Removal of target and non-target species can have significant impacts on the structure and functioning of benthic communities over and above the physical effects of fishing methods, particularly as some fish species fill upper roles in the trophic web[29].

The potting effort within the 6nm limit is generally in moderate levels of activity. The whelk fishery is already managed by Kent and Essex IFCA[30]. Potting within the 6 – 12nm is low – moderate.

Due to the low sensitivity of the feature from potting at moderate levels it is concluded that the current fishing effort will not adversely affect (alone) the site. Any increases in effort should be monitored and reviewed by the relevant regulator.

As the foot rope of a net interacts with the seabed it may remove organisms living on the surface or under the surface, leaving the net to catch mobile species. The fauna of the bank crests is characterised by species poor environments and is dominated by polychaete worms and amphipods. The troughs are characterised by higher densities of polychaetes, crustacean, molluscs and echinoderms. Mobile fauna include crabs, brown shrimp, squid, sole and herring. Any of these may be caught in the net or damaged by the movement of the net. However, the amount of netting activity at the site is low given the low P value of 0.00140 for the fleet in the highest year (2012). With such a low amount of vessels using the site and the minimal area of the seabed being contacted by the gear an adverse effect on the site from this type of fishing is unlikely.

[28] http://jncc.defra.gov.uk/pdf/IDRBNR_Reg%2035_Conservation%20Advice_v4.0.pdf
[29] http://publications.naturalengland.org.uk/publication/3251957
[30] http://www.kentandessex-ifca.gov.uk/i-want-to-find-out-about/regulations/keifca-byelaws/

Table 20. Removal of non-target species assessment

Pressure	Interest feature	Favourable condition target	Activity	Compatible with conservation objectives?
Removal of non-target species	Sandbanks (subtidal sand / subtidal mixed sediment / subtidal coarse sediment)	Maintain the presence and spatial distribution of subtidal sandbank communities	Anchored nets/lines	Y
			Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N
			Traps	Y
		[Maintain OR Recover OR Restore] the abundance of listed typical species, to enable each of them to be a viable component of the habitat	Anchored nets/lines	Y
			Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N
			Traps	Y
		Maintain the species composition of component communities	Anchored nets/lines	Y
			Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N
			Traps	Y

4.4 Siltation rate changes (Low), including smothering (depth of vertical sediment overburden) and changes in suspended solids (water clarity)

Towed gears will generate a plume of suspended sediment as the gear is pulled across the seabed. The amount of material brought into suspension is dependent on the gear being used and the makeup of the sea bed (O'Neill and Summerbell, 2011). Coarser sediments, such as muddy sand, have been shown to produce a plume similar to background levels of sedimentation (O'Neill and Summerbell, 2011).

Margate and Long Sands sandbanks are categorised as subtidal coarse sediment, subtidal mixed sediment and subtidal sand. Subtidal coarse and subtidal mixed sediment produce less of a plume than subtidal sand.

The trawling gear with the largest swept area at the site is Beam trawling which had a peak p value of 0.12197 in 2011. This equates to a turned over area of 79.07961km^2 for that year. Plumes can persist for several hours after fishing activity has ceased (Martin et al 2014). However Margate is subject to wave action and this will help disperse the plumes and generally provide a dynamic sediment system.

The communities that live on sandbanks will be adapted for some level of sedimentation. As the plume eventually degrades to background levels the main impacts will be immediately behind the head of the gear (O'Neill and Summerbell, 2011). Most organisms in this area will be affected more by the physical destruction caused by the fishing gear which has been discussed in section 9.1 and 9.2.

Table 21. Siltation rate changes and changes in suspended solids assessment

Pressure	Interest feature	Favourable condition target	Activity	Compatible with conservation objectives?
Siltation rate changes (Low), including smothering (depth of vertical sediment overburden) and Changes in suspended solids (water clarity)	Sandbanks (subtidal sand / subtidal mixed sediment / subtidal coarse sediment)	Maintain the presence and spatial distribution of subtidal sandbank communities	Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N
		[Maintain OR Recover OR Restore] the abundance of listed typical species, to enable each of them to be a viable component of the habitat	Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N
		Maintain the existing (where no previous evidence exists) or best-known (where some evidence exists) volume of sediment in the sandbank, allowing for natural change	Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N
		Maintain the presence of topographic features, while allowing for natural responses to hydrodynamic regime, by preventing erosion or deposition through human-induced activity	Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N
		Maintain the species composition of component communities	Demersal trawl	N
			Dredges	Y – does not occur in site
			Hydraulic dredges	N

4.5 Fisheries management measures

Adverse effect from towed fishing activities as a result of the following pressures cannot be ruled out in the most sensitive parts of the site:

- Abrasion/disturbance of the substrate on the surface of the seabed AND Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion
- Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion
- Removal of non-target species
- Changes in suspended solids (water clarity)
- Siltation rate changes (low), including smothering (depth of vertical sediment overburden)

Therefore fisheries management measures will be introduced by the appropriate regulators to ensure that these fishing activities are excluded from the most sensitive part of the site. Section 6 contains further details of these measures.

4.6 Part B conclusion (fishing alone)

MMO concludes, taking into account the introduction of management areas for bottom towed fishing gear outlined in section 6, that the fishing activities assessed are, alone, not adversely affecting the conservation features of the Margate and Long Sands EMS.

5. Part C Assessment

This section assesses the effects of activities considered as compatible with the conservation objectives of Margate and Long Sands EMS in combination with other relevant activities taking place which includes the following**:**

- fishing activity/pressure combinations which were excluded in Part A of this assessment but which may have an effect on conservation features;
- fishing interactions assessed in Part B but not resulting in adverse effect;
- fishing activities with interactions at the site identified as being in green status in the Matrix; and
- plans and projects (see table 22).

Bottom towed fishing gear is not assessed in-combination in the areas where an adverse effect from the gear on the site cannot be ruled out. However, bottom towed gear will be assessed in-combination in the other parts of the site.

5.1 Pressures exerted by fishing and plans or projects

Plans or projects with the potential to affect Margate and Long Sands EMS in combination with fishing activities are displayed in table 22.

Table 22. Plans and projects considered in combination with fishing activities included in this assessment

Relevant activity	Description
Offshore Wind Farm (OWF) London Array Limited export cable Operation & Maintenance (O & M) Marine licence	L/2016/135/1 – licence for inter-array cable repair.
Offshore Wind Farm London Array Limited O&M Marine licence	Application MLA/2017/00096 for operation & maintenance activities for wind turbines, their foundations and offshore substations (maintained by applicant), and its meteorological mast inside the Margate and Long Sands EMS.
Tarmac Marine Dredging LTD CEMEX UK Marine Ltd, Hanson Aggregates, Britannia	Aggregate dredge licences at Long Sand Head and Cutline: • MLA/2013/00298/2 area 508, • MLA/2013/00297/3 area 510/1 • MLA/2013/00296/3 area 509/3.

Aggregates Ltd (Licenced)	• Area 447 (status - abandoned)
Power Cables: OWF interlink cables (Licenced) and Submarine cable	Application L/2011/00152/34 – licence for London Array offshore windfarm construction which includes transmission and interlink cables.
Disposal sites	Open disposal site ID: TH080 (named North Edinburgh) inside Margate and Long Sands EMS.
Anchorage sites	Anchor sites ID: 518537,515740,515742 and 515747 inside the MLS site. Anchor Berth ID: 518646 inside Margate and Long Sands EMS.

To identify the specific pressures that the above activities exert on the feature of this site the MMO has used the Advice on Operations (AoO) section in Natural England's conservation advice package for Margate and Long Sands EMS. This required identified activities to be matched against the activity categories used in Natural England's advice. Table 23 shows how the activities were matched.

Table 23. Categories from Natural England AoO used to inform pressures information for identified activities and Amber and Green fishing activities.

Name of Activity	NE AoO Operation	Activity
Power cables	CABLES	Power cable: operation and maintenance **and** Telecommunication cable: Operation and Maintenance
Disposal sites	PORTS AND HARBOURS (construction; and maintenance)	Capital dredging disposal **and** maintenance dredging disposal
Windfarm cables	CABLES	Power cable: operation and maintenance
Windfarm operation	ELECTRICITY FROM RENEWABLE ENERGY SOURCES	Offshore wind: operation and maintenance
Aggregates dredging	AGGREGATESEXTRACTION	Aggregate dredging
Anchor sites	PORTS AND HARBOURS (operation)	Berths/moorings/anchorages
Demersal trawl	FISHING	Demersal trawl
Hydraulic dredges	FISHING	Hydraulic dredges
Anchored nets and lines	FISHING	Anchored nets/lines
Demersal	FISHING	Anchored nets/lines

longlines		
Commercial diving	FISHING	Diving
Pots	FISHING	Traps

Information in the Margate and Long sands SCI conservation advice package was used to determine which pressure-feature interaction to include in this part of the assessment.

A list of pressures has been collated from fishing activity, and it is only those pressures that have been discussed below. Equally if a multiple plans or projects give off a pressure that fishing does not contribute towards, those pressures are not within the scope of this assessment.

All pressure feature interactions from fishing other than those identified as “Not Relevant” (the evidence base suggests that there is no interaction of concern between the pressure and the feature OR the activity and the feature could not interact) have been considered. For a pressure to be discussed below at least one of the plans or projects must exert that pressure as well.

From these considerations the below pressures have been screened out of further assessment:

- Above water noise
- Collision ABOVE water with static or moving objects not naturally found in the marine environment (e.g., boats, machinery, and structures)
- Collision BELOW water with static or moving objects not naturally found in the marine environment (e.g., boats, machinery, and structures)
- Electromagnetic changes
- Emergence regime changes, including tidal level change considerations
- Genetic modification & translocation of indigenous species
- Habitat structure changes - removal of substratum (extraction)
- Introduction of other substances (solid, liquid or gas)
- Physical loss (to land or freshwater habitat)
- Radionuclide contamination
- Removal of target species
- Smothering and siltation rate changes (Heavy)
- Temperature changes
- Vibration
- Water flow (tidal current) changes, including sediment transport considerations
- Wave exposure changes

5.2 In-combination pressure discussion for remaining pressures

5.2.1 Abrasion/disturbance of the substrate on the surface of the seabed

This pressure is relevant for all gears and all plans or projects.

Sensitivity of the Margate and Long Sands EMS conservation feature to physical damage from static gears and anchored nets/lines is through surface abrasion from pots, through deployment, movement of gear on the benthos due to strong tidal current and storm activity; and as the gear is dragged along the seafloor during retrieval during fishing activities. However, the low fishing effort of these gears is not at levels adversely affecting the Margate and Long Sands EMS conservation features. Additionally, the MMO understands that bottom towed gear is the gear that exerts this pressure the most and this is the gear that has the potential to cause this pressure the most. All other gears and plans or projects together do not significant increase the pressure exerted from that which bottom towed gear exerts alone.

A minor interaction that vessels have with the features of the site is if fishing vessels anchor in the Margate and Long Sands EMS, however the MMO believe that levels of anchoring by fishing vessels are not at levels adversely affecting the conservation features.

Another cause of this pressure is from fishing or other vessels via propeller wash. The MMO consider the Margate and Long Sands EMS water depth (≤ 25m below chart datum) in the channels between sandbanks sufficient to negate propeller wash and there to be no adverse effect to the conservation features of this site from this pressure. In the shallower water on crests of sandbanks, there is also no adverse effect from propeller wash, as the biotope communities of subtidal sand on sandbank crests are wave swept high energy areas, and not as sensitive as those for subtidal course sediment and subtidal mixed sediment tend to be in the channels of the Margate and Long Sands EMS site.

There is one open disposal site within Margate and Long Sands EMS; TH080 (North Edinburgh Channel). A full site characterisation was done in order to licence this disposal site, and it has taken into account the conservation features of Margate and Long Sands EMS , and the disposal activity does not elevate abrasion of substrate levels to cause an adverse effect in combination with fishing activity as the disposal site is currently not being used. Port of London Authority (PLA) acknowledged that if the disposal site is to be used in future, they would undertake an HRA before doing so, and in addition the disposal event would require a marine licence from the MMO.

Adjacent disposal sites within 5km of the Margate and Long Sands EMS will not cause this pressure as there is no significant pathway for disturbance within the Margate and Long Sands EMS.

The current aggregates dredging licences have a condition requiring applicants to ensure no extraction of material representing Annex 1 sandbank habitat takes place. Due to the exclusion of bottom towed gear and aggregates dredging from these sensitive biotope areas by the proposed byelaw management and marine licence mitigation, pressure from the remaining anchored pots and nets is insignificant due to low fishing effort by these gear types. Advice from Natural England

indicates that all areas that are particularly sensitive are covered in the proposed management area.

Therefore, the MMO conclude that there is no adverse effect from fishing, in combination with other plans or projects, from this pressure, when including the proposed byelaw management detailed section 6.

5.2.2 Barrier to species movement.

This pressure is relevant for anchored nets and lines, demersal longlines and all plans or projects.

All licensed plans or projects have the potential to disrupt movement of the species that are found within the sandbank feature. However the volume at which fishing occurs and the fact that any licenced activity would be limited in the time that impacts would be apparent means that impacts would be significantly less than 50% of the area of the site (as the specified benchmark).

Therefore, the MMO conclude that there is no adverse effect from fishing, in combination with other plans or projects, from this pressure.

5.2.3 Changes in suspended solids (water clarity)

This pressure is relevant for bottom towed gear and all plans or projects

This pressure is mainly caused by any physical disturbance of the sediment, coupled with artificial hydrodynamic action caused by the passage of towed gear, leading to suspension of the substrate behind and around the gear (Sewell et al, 2007). However, the impacts of non-towed gear (anchored nets/lines and traps, as well as demersal longlines used in Margate and Long Sands EMS), most have anchors which penetrate and drag in the sediment and suspend solids locally, but are generally considered as causing less suspended solids than caused by bottom towed gear.

For this pressure the MMO is primarily concerned with organisms that make up the typical species and biotope communities within conservation features. Turbid plumes can reduce light levels and smother feeding and respiratory organs (Kaiser *et al*, 2001). Prolonged exposure to this pressure may result in changes in sediment composition through suspension and transport of finer material (Kaiser *et al*, 2001).

The quantity of suspended material and its spatial and temporal persistence depends on factors associated with gear and sediment type, intensity of the activity and the background hydrographic conditions. However, MMO's opinion is that as bottom towed gear will be excluded from sensitive biotope areas via byelaw management proposed in Section 6, this pressure will occur at a level not capable adversely affecting the conservation features outside of those most sensitive areas.

The Port of London Authority (PLA) considers the disposal site within Margate and Long Sands EMS to be disused and likely to remain disused and does not currently cause this pressure. Adjacent disposal sites outside Margate and Long Sands EMS within 5km may cause this pressure, however, any disposal campaigns would be limited in nature, and the typical biotope

communities of the conservation features are tolerant to changes in water clarity given that most parts of the sandbank feature are exposed to wave action and the tidal current movements of Margate and Long Sands EMS. Other plans or projects exert this pressure at lesser levels, which are not capable of effecting features on a significant level.

Therefore, the MMO conclude that there is no adverse effect from fishing, in combination with other plans or projects, from this pressure, when including the proposed byelaw management detailed section 6.

5.2.4 Deoxygenation

This pressure is relevant for bottom towed gear, anchored nets and lines, demersal longlines, pots, windfarm cables, disposal sites and power cables. Discards are not spatially concentrated at this site and it is not an area of low flow so the conditions for localised hypoxia or anoxia of the sea bed are not present. Given the size and dynamics of the site the combined effects of fishing and plans or projects would not reduce oxygen concentration over a prolonged period, capable of affecting the Water Framework Directive status.

Therefore, the MMO conclude that there is no adverse effect from fishing, in combination with other plans or projects, from this pressure.

5.2.5 Hydrocarbon & PAH contamination. Includes those priority substances listed in Annex II of Directive 2008/105/EC.

This pressure is relevant for all gears and all plans or projects. Deliberate releases are already prohibited. Accidental discharges from fishing vessels and maintenance vessels leading to significant releases are extremely rare.

Therefore, the MMO conclude that there is no adverse effect from fishing, in combination with other plans or projects, from this pressure.

5.2.6 Introduction of light

This pressure is relevant for all gears and all plans or projects. At the depth that Margate and Long sands EMS is located there would only be insignificant levels of light reaching the feature from fishing and works vessels on the surface. There is the potential for light to reach the feature from benthic operations; however these effects would be extremely isolated and short in duration.

Therefore, the MMO conclude that there is no adverse effect from fishing, in combination with other plans or projects, from this pressure.

5.2.7 Introduction or spread of invasive non-indigenous species (INIS)

This pressure is relevant for all gears and all plans or projects. Ballast water is the main vector for the transmission of non-indigenous species. Fishing vessels less than 45m must have permanent ballast and thus this vector is not available.

There is the potential for INIS to transit to the site on the hull of maintenance vessels. However the MMO do not consider this a significant pathway. MMO therefore conclude that there is no adverse effect from fishing, in combination with other plans or projects, from this pressure.

5.2.8 Nutrient enrichment

This pressure is relevant for bottom towed gear, windfarm cables, disposal sites and power cables. As Margate and Long sands EMS is subject to a large tidal range (5m), excess nutrients will be removed from the area. Therefore, the MMO conclude that there is no adverse effect from fishing, in combination with other plans or projects, from this pressure.

5.2.9 Penetration/disturbance of substrate below surface of seabed, including abrasion.

This pressure is relevant for all gears and all plans or projects

The MMO has discussed abrasion/disturbance of the substrate on the surface of the seabed above and consider this current pressure be similar in impacts. As penetration can only occur after abrasion occurs to the feature, the MMO conclude that all of the narrative in section 5.2.1 on abrasion is relevant here.

Therefore, the MMO conclude that there is no adverse effect from fishing, in combination with other plans or projects, from this pressure, when considering the proposed byelaw management detailed section 6.

5.2.10 Physical change (to another sediment or seabed type)

This pressure is relevant for bottom towed gear and all plans or projects. However these gears and plans or projects operate on sandbank which will remain as sandy substrates after the pressure has occurred.

Therefore, the MMO conclude that there is no adverse effect from fishing, in combination with other plans or projects, from this pressure.

5.2.11 Removal of non-target species

This pressure is relevant for bottom towed gear, anchored nets and lines, demersal longlines, pots and aggregates dredging. This pressure has the potential to affect the typical species of the features of the site. The MMO considers that any increased sedimentation within the sites due to the aggregate dredging will not elevate sediment levels beyond back ground levels thus displacing species from the site. Therefore, the MMO conclude that there is no adverse effect from fishing, in combination with other plans or projects, from this pressure.

5.2.12 Smothering and siltation rate changes (Low)

This pressure is relevant for bottom towed gear and all plans or projects. For this pressure the MMO is also primarily concerned with organisms that make up the typical species and biotope

communities within conservation features. Agitation and subsequent deposition of sediment can affect the settlement, feeding, and survival of benthic species via smothering of feeding and respiratory organs (O'Neill & Summerbell, 2011).

The more mobile species making up typical biotope species can avoid smothering events by moving from affected areas, however, if affected areas are disturbed often it may discourage even mobile species from returning or hinder their survival. However, MMO's opinion is that when all interactions are considered, these interactions will not significantly increase this pressure above that of bottom towed gear.
Similar to other pressures discussed in this section, the quantity of suspended material and its spatial and temporal persistence depends on factors associated with the gear, sediment type, intensity of the activity and the background hydrographic conditions. Given the type of fishing methods (anchored nets/lines, traps, demersal longlines and that bottom towed gear will be excluded from sensitive areas as per proposed byelaw management detailed in section 6 the MMO conclude that there is no adverse effect from fishing, in combination with other plans or projects, from this pressure, when considering the proposed byelaw management detailed section 6.

5.2.13 Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals). Includes those priority substances listed in Annex II of Directive 2008/105/EC and Transition elements & organo-metal (e.g. TBT) contamination Includes those priority substances listed in Annex II of Directive 2008/105/EC

This pressure is relevant for all gears and all plans or projects. The potential source is from vessel hull antifouling treatments. TBT has been banned on vessels under 25m since 1987. Copper wash can enter the marine environment but due to the strong tidal currents at this site, they are not likely to accumulate here raising levels of those compounds beyond those of background levels.

Therefore, the MMO conclude that there is no adverse effect from fishing, in combination with other plans or projects, from this pressure.

5.2.14 Underwater noise changes

This pressure is relevant for all gears and all plans or projects. However this pressure is only relevant to *Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment and *Sertularia cupressina* and *Hydrallmania falcata* on tide-swept sublittoral sand with cobbles or pebbles. These biotopes are not under the footprint of fishing activity. As such there is no pathway for disturbance as a result of activities within the scope of this assessment.

Therefore, the MMO conclude that there is no adverse effect from fishing, in combination with other plans or projects, from this pressure.

5.2.15 Visual disturbance

This pressure is relevant for all gears and all plans or projects. However this pressure is only relevant to the sub tidal sub mixed sediment sub feature for *Aphelochaeta* spp. and *Polydora* spp.

in variable salinity infralittoral mixed sediment. As such there is no pathway for disturbance to that sub feature as a result of activities within the scope of this assessment as this is not a variable salinity environment. Although there is a pathway for disturbance within the sub tidal sand sub feature levels of impacts are significantly lower than the benchmark.

Therefore, the MMO conclude that there is no adverse effect from fishing, in combination with other plans or projects, from this pressure.

5.3 Part C conclusion (fishing in-combination with relevant activities)

MMO concludes, taking into account the introduction of management areas for bottom towed fishing gear outlined in section 6, that fishing activities in combination with other relevant activities are not adversely affecting the conservation features of the Margate and Long Sands EMS.

6. Fisheries management measures

MMO have determined that bottom-towed fishing over the sensitive areas of sandbank (Annex 7, figure 2) is not compatible with the conservation objective to maintain the sandbanks in favourable condition without the introduction of suitable management measures.

Therefore, the following management measures will be introduced:

- An MMO byelaw to prohibit all bottom-towed fishing over the sensitive areas of sandbank in the 6 to 12nm portion of this site.

- A Kent and Essex IFCA byelaw to prohibit bottom-towed fishing over the sensitive areas of sandbank within the 0-6nm portion of the site.

Annex 10 includes a map showing these management measures.

7. Review of this assessment

MMO will review this assessment every two years or earlier if significant new information is received.

Such information could include:

- updated conservation advice;
- updated advice on the condition of the feature;
- significant change in activity levels.

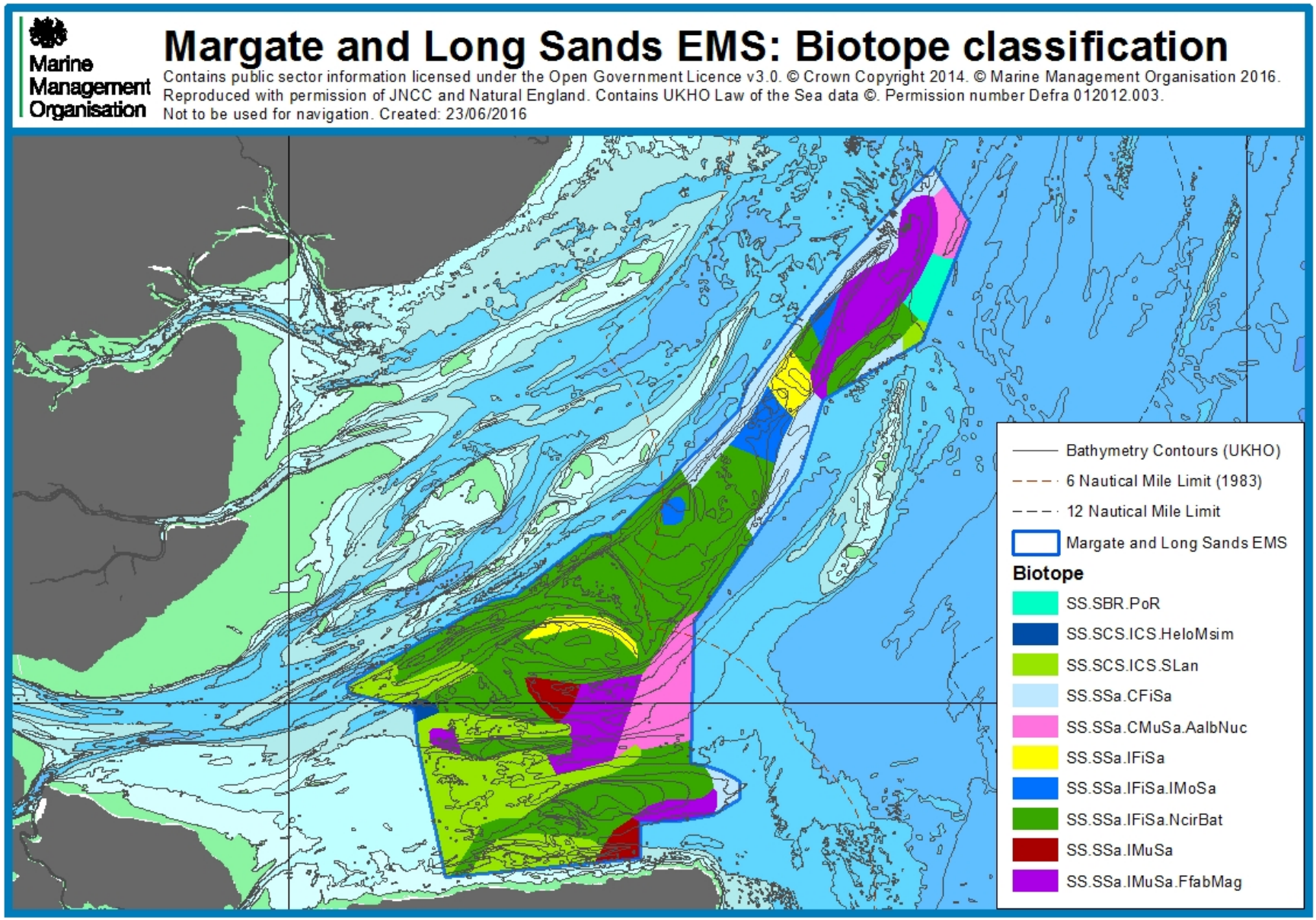
To coordinate the collection and analysis of information regarding activity levels, and to ensure that any required management is implemented in a timely manner, a monitoring and control plan will be implemented for this site. This plan will be developed in line with the MMO Monitoring and Control Plan framework.

Monitoring of activity levels will occur through a combination of surface surveillance and ongoing monitoring of VMS and landings data. Should activity levels increase significantly or in a manner that could affect the site features, this will trigger further investigation into the level and distribution of the activity, including consultation with Natural England regarding current site condition. Any subsequent evidence gathered would be used to assess the need for further management measures.

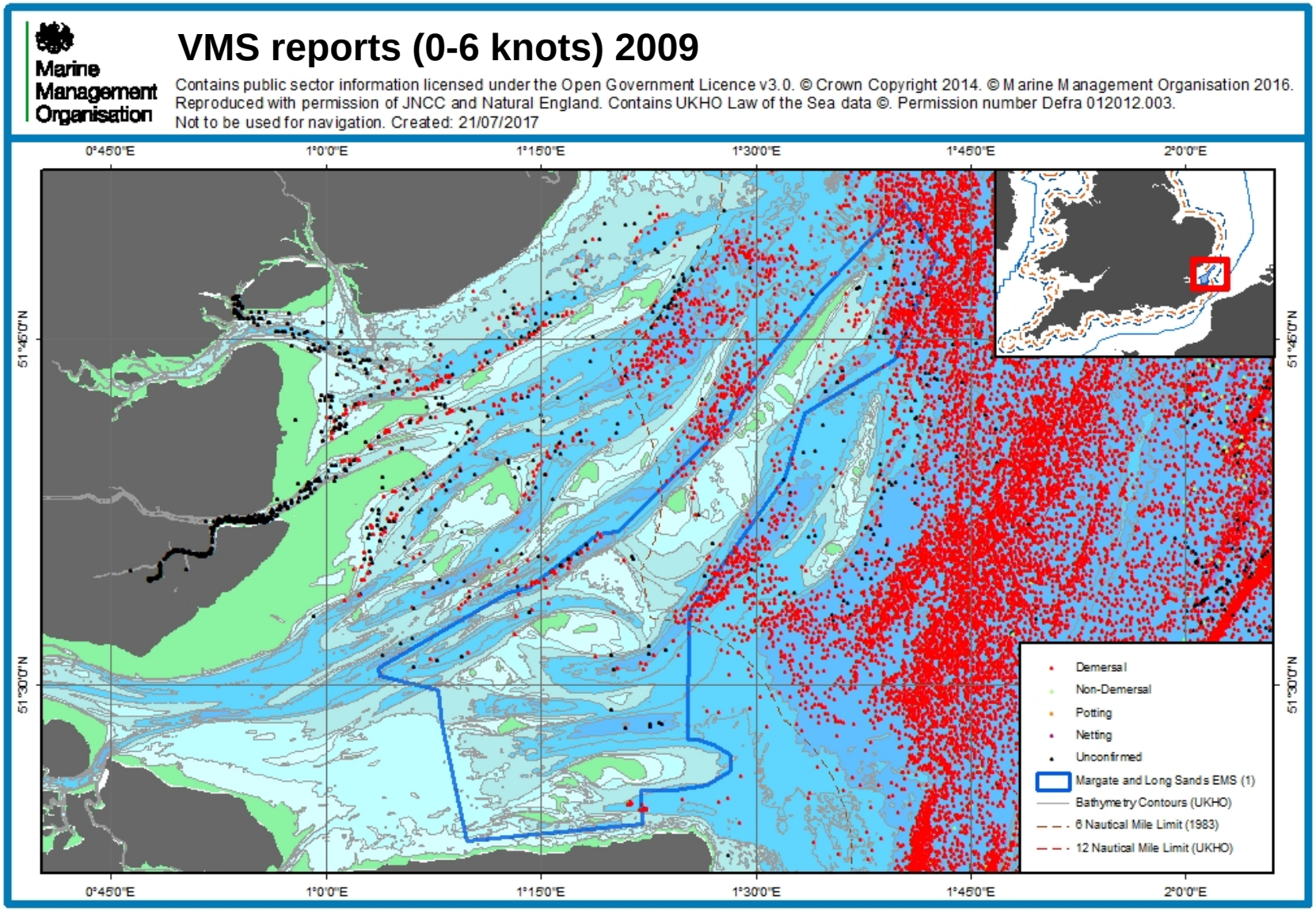
Possible management measures include an MMO emergency byelaw, which can be implemented immediately for up to 12 months, or a (non-emergency) MMO byelaw which would be subject to public consultation before implementation.

An overview of the monitoring and control process is illustrated in Annex 8.

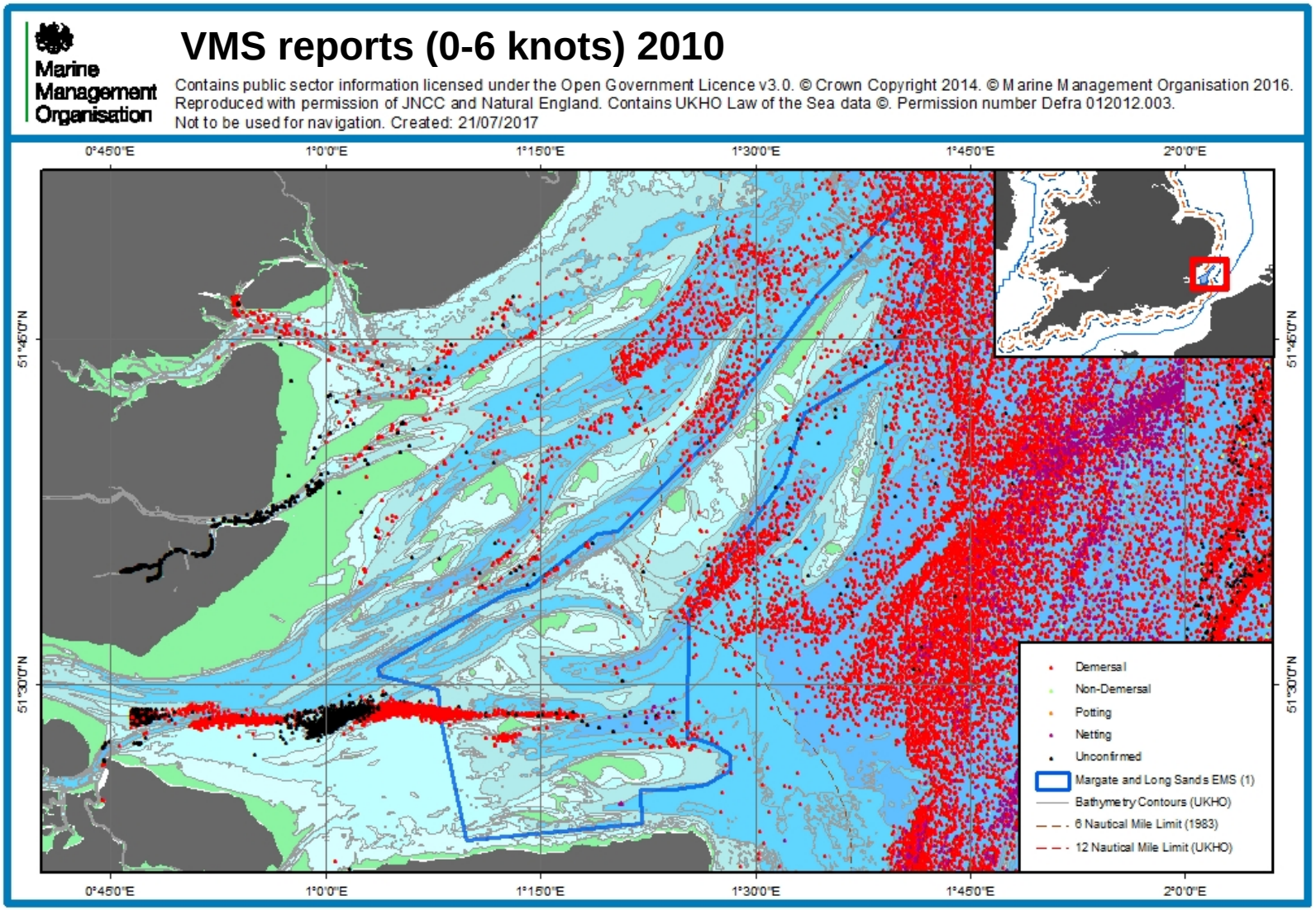
Annex 1. Margate and Long Sands EMS biotope map



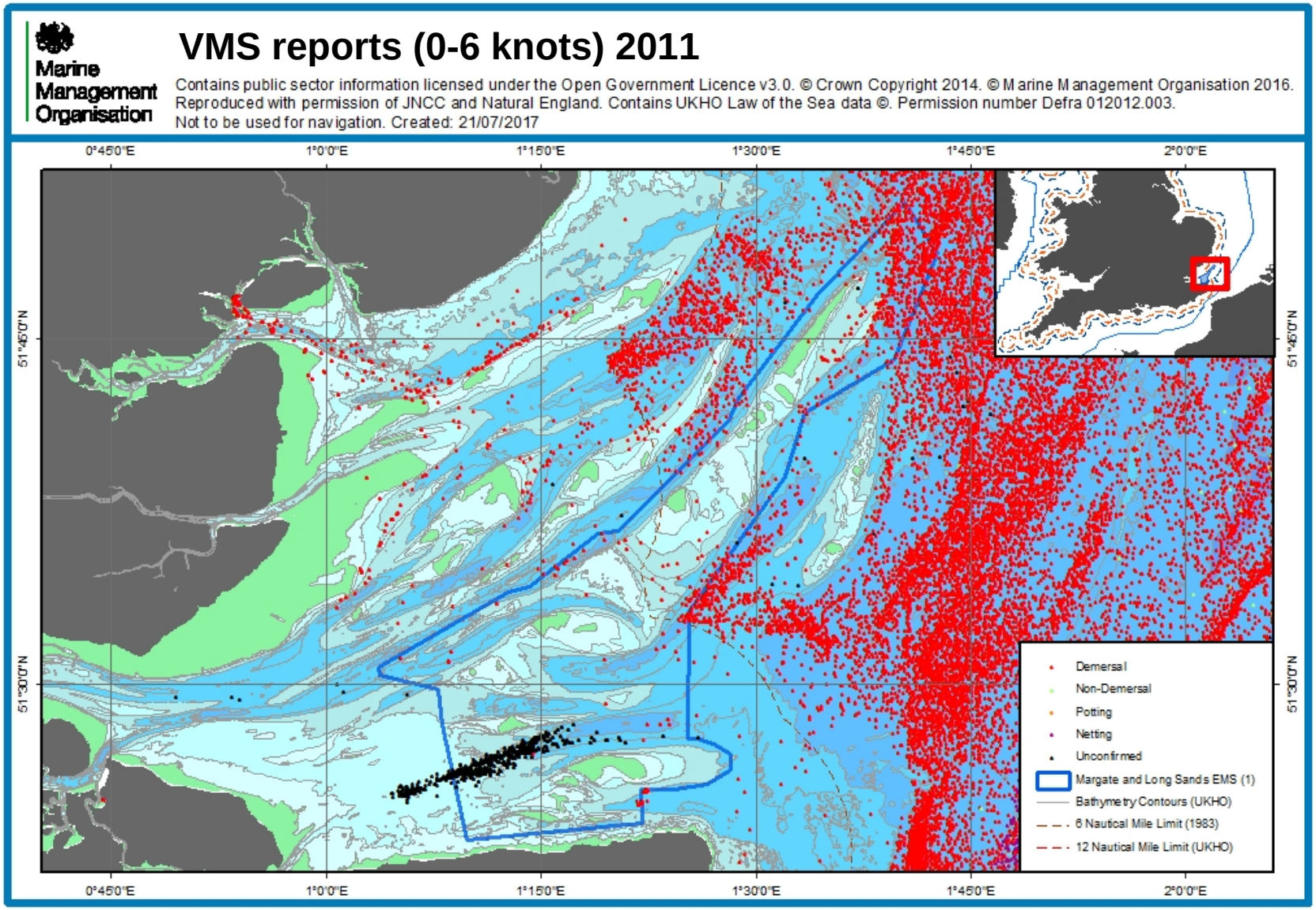
Annex 2a. VMS (0 to 6 knots) 2009



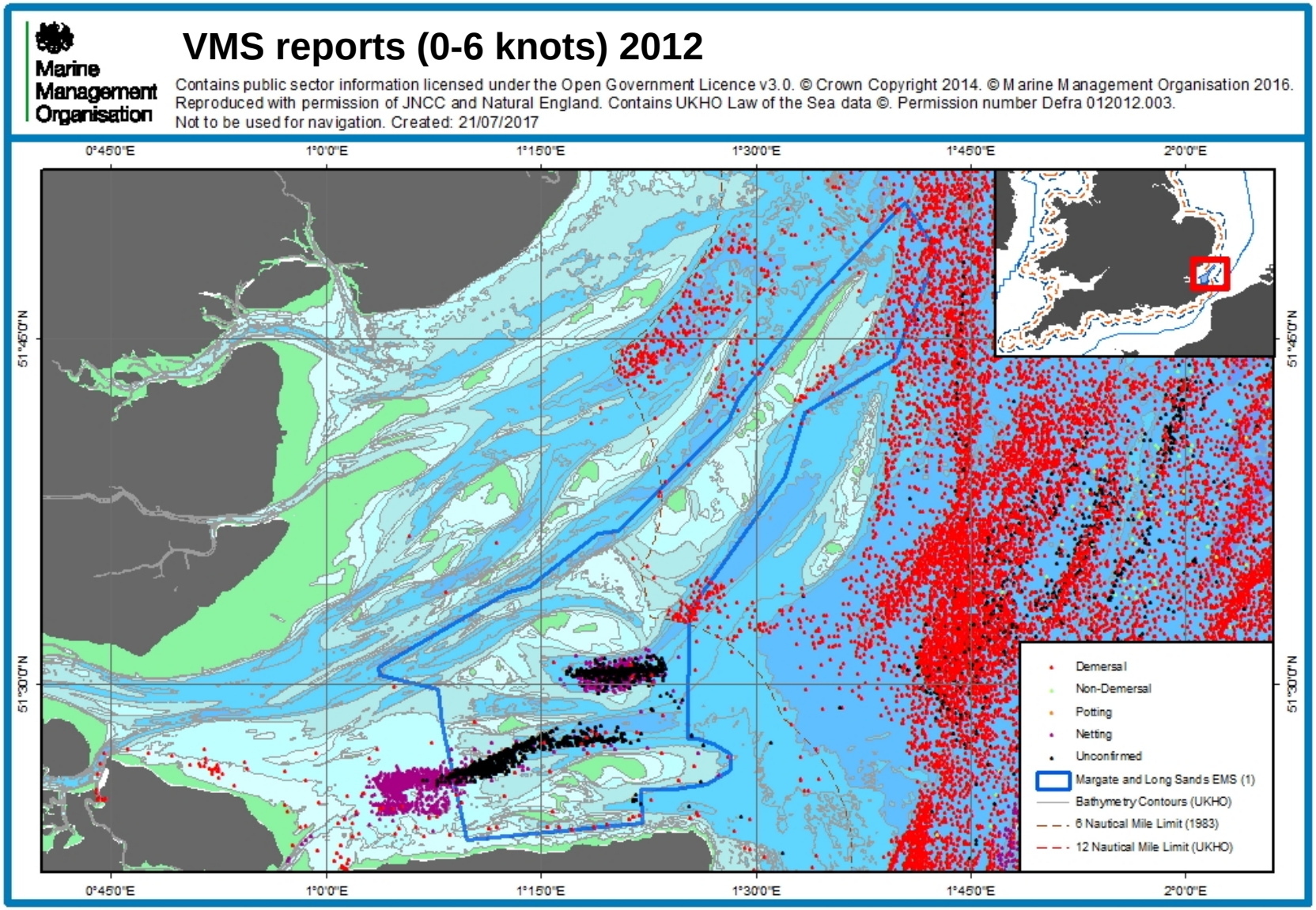
Annex 2b. VMS (0 to 6 knots) 2010



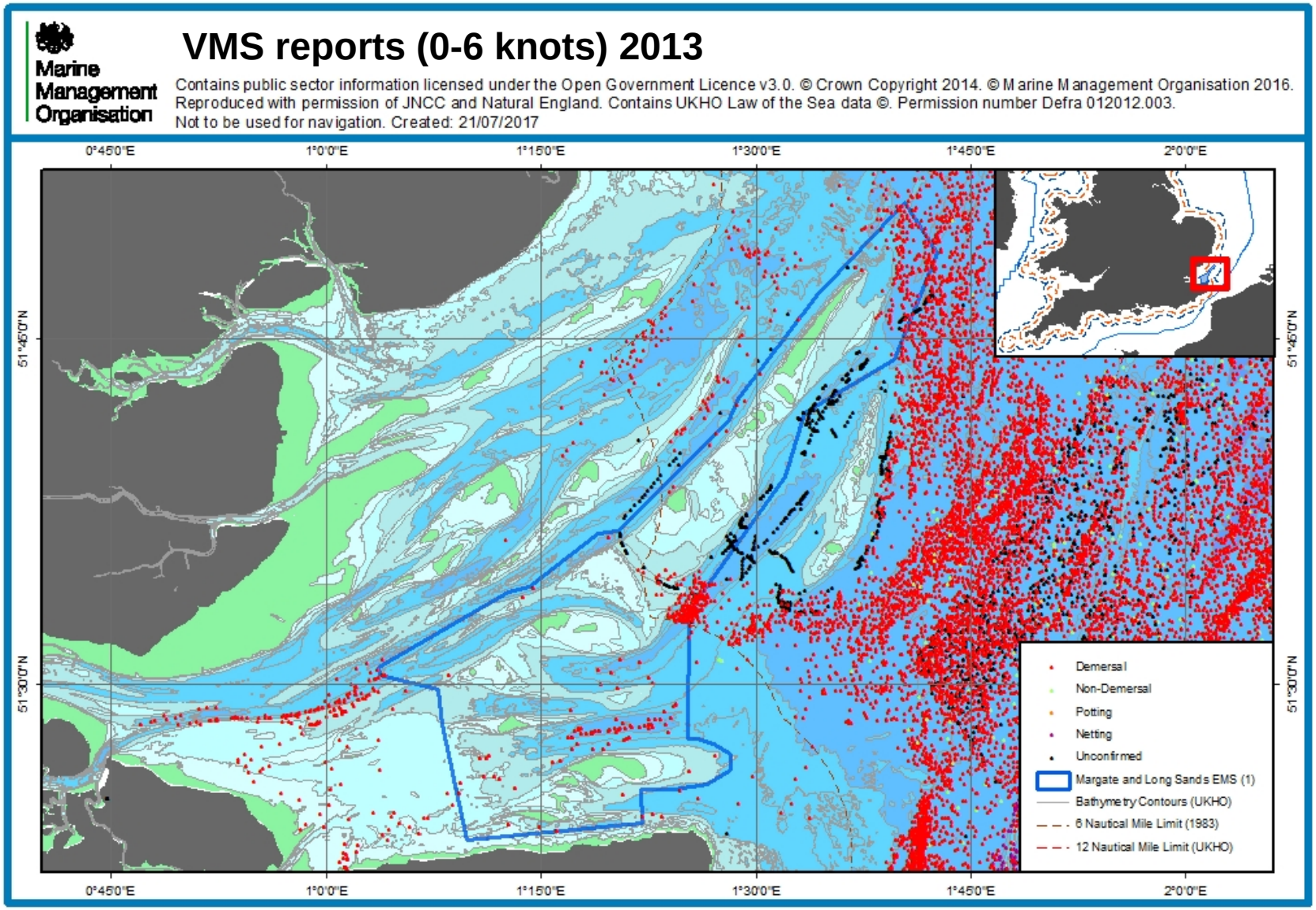
Annex 2c. VMS (0 to 6 knots) 2011



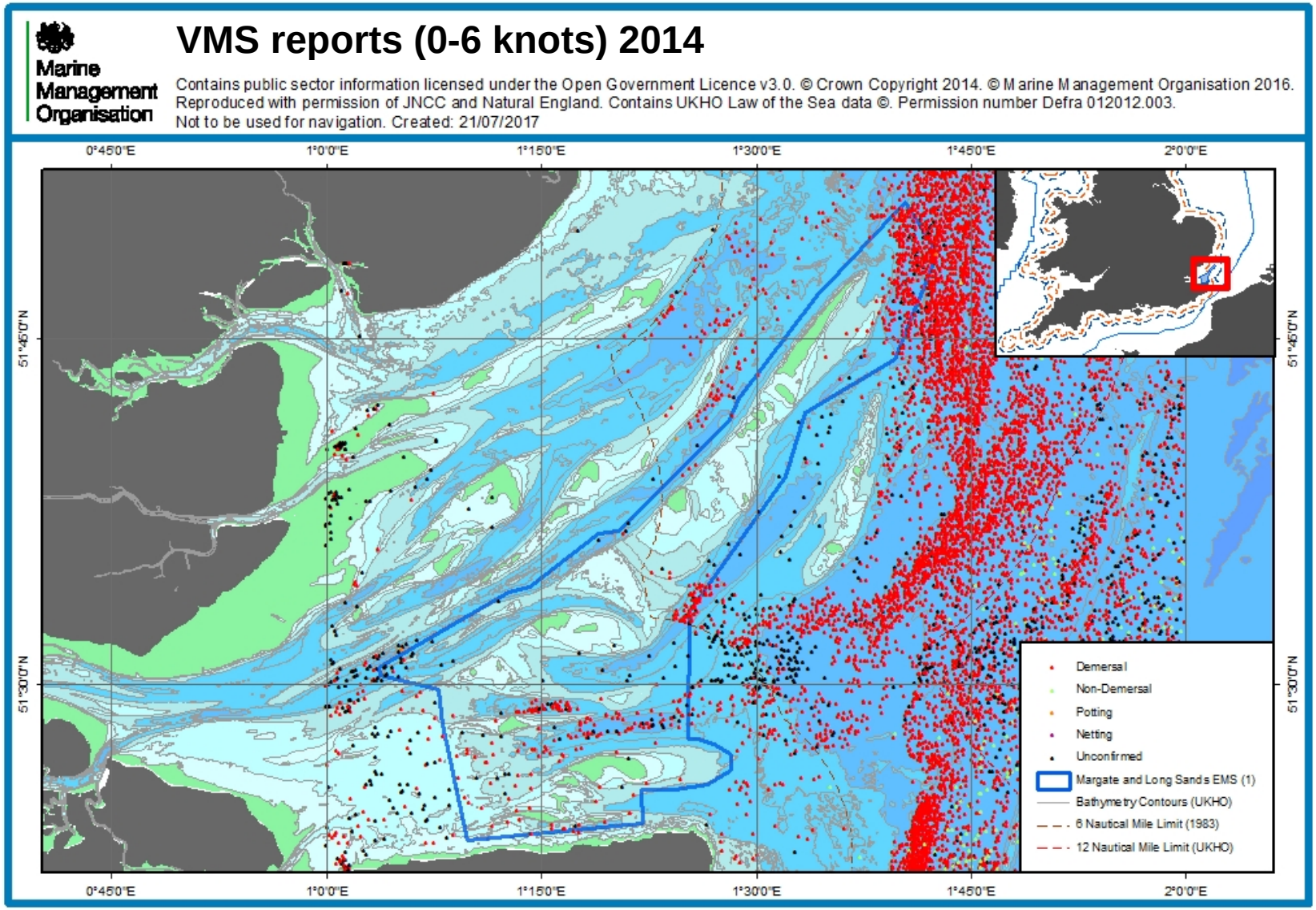
Annex 2d. VMS (0 to 6 knots) 2012



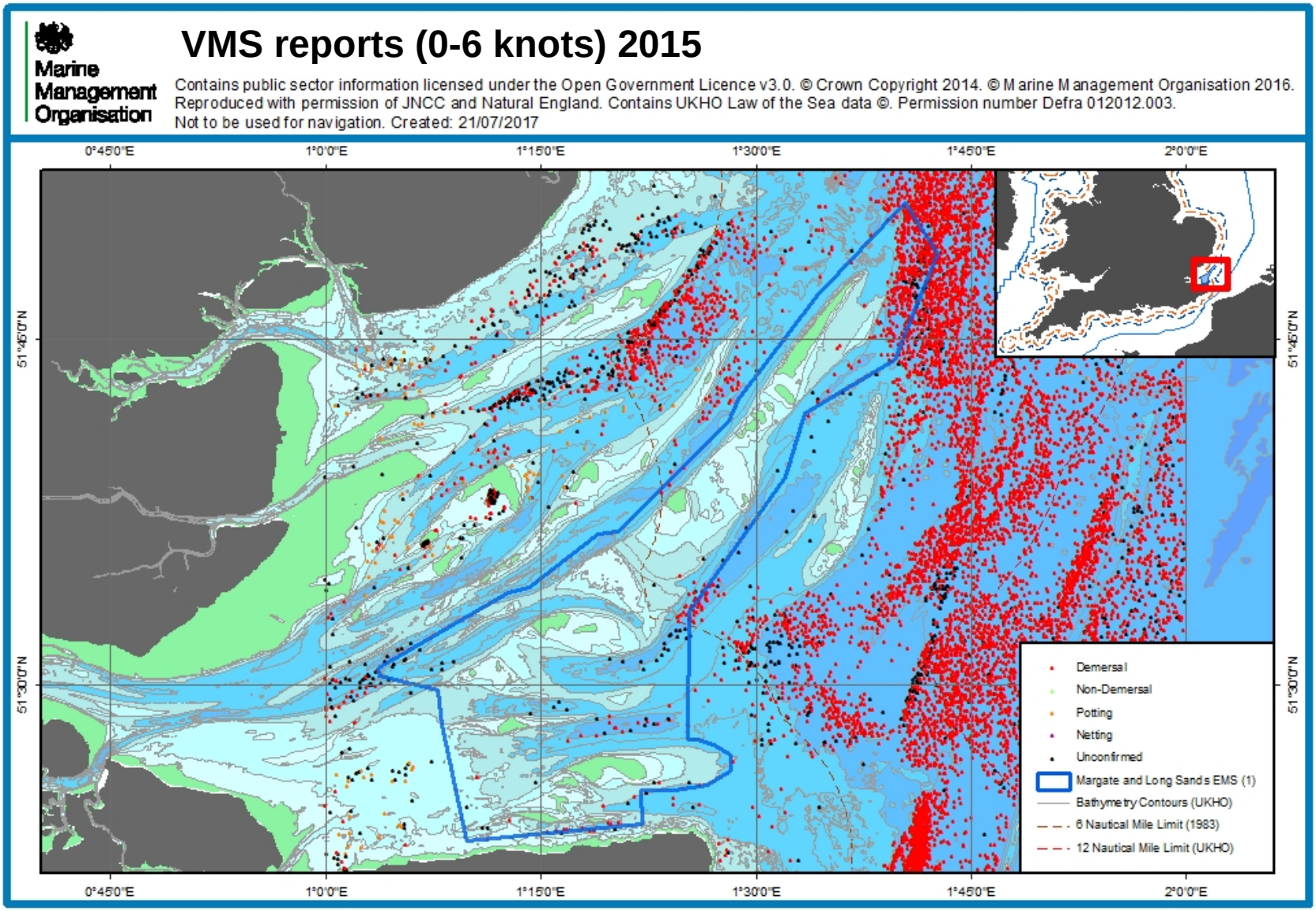
Annex 2e. VMS (0 to 6 knots) 2013



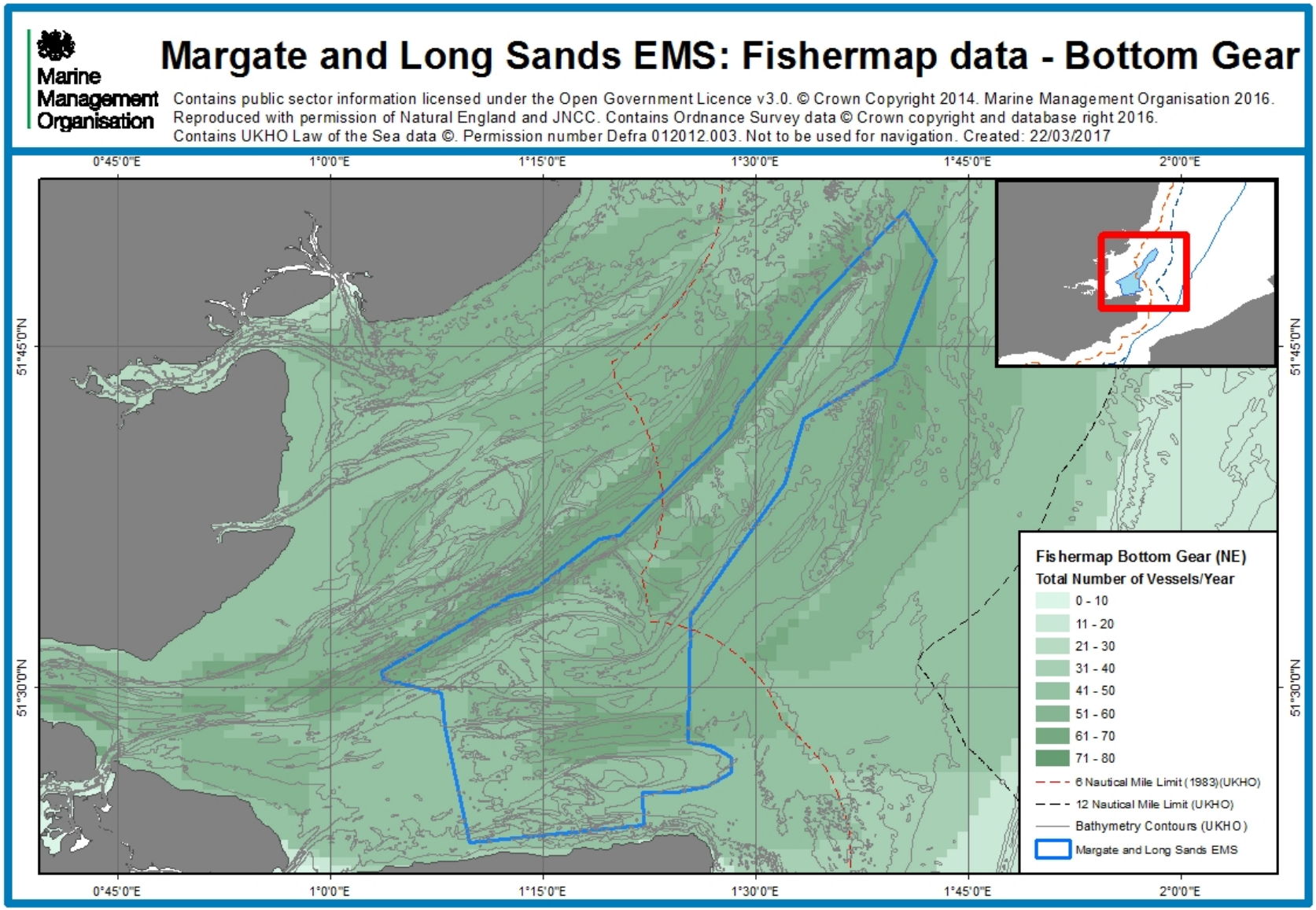
Annex 2f. VMS (0 to 6 knots) 2014



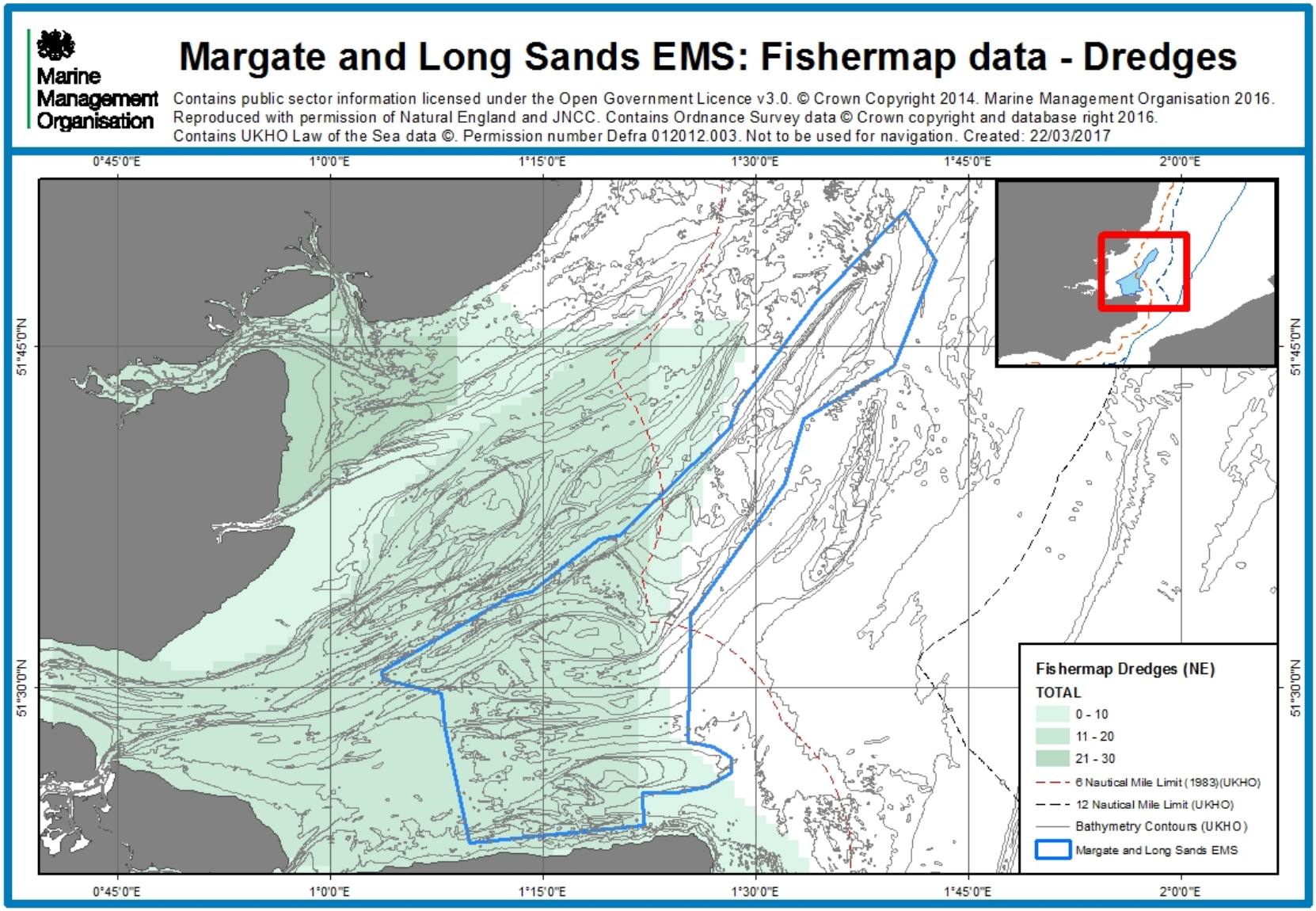
Annex 2g. VMS (0 to 6 knots) 2015



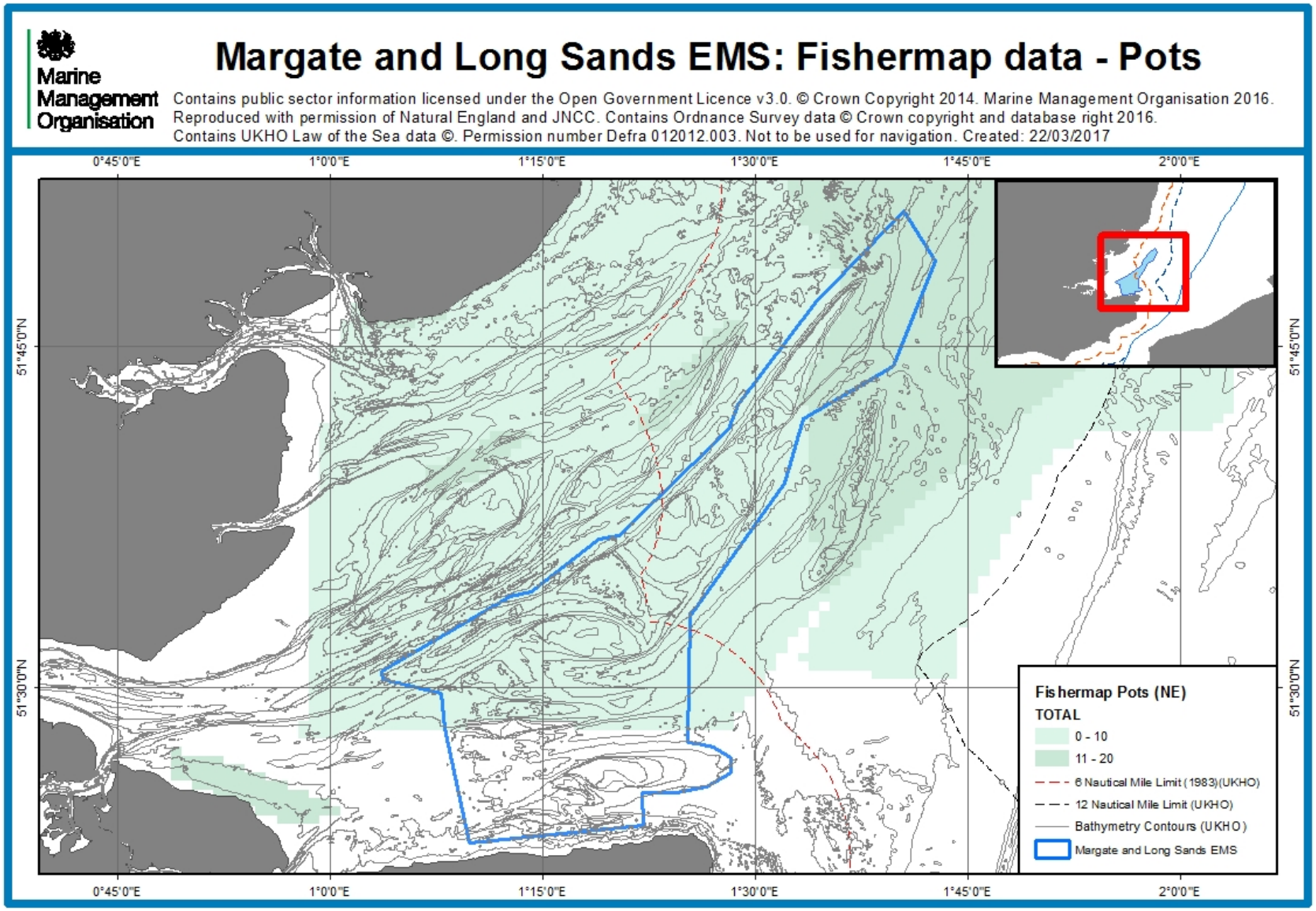
Annex 3a. Fishermap chart - Bottom gear



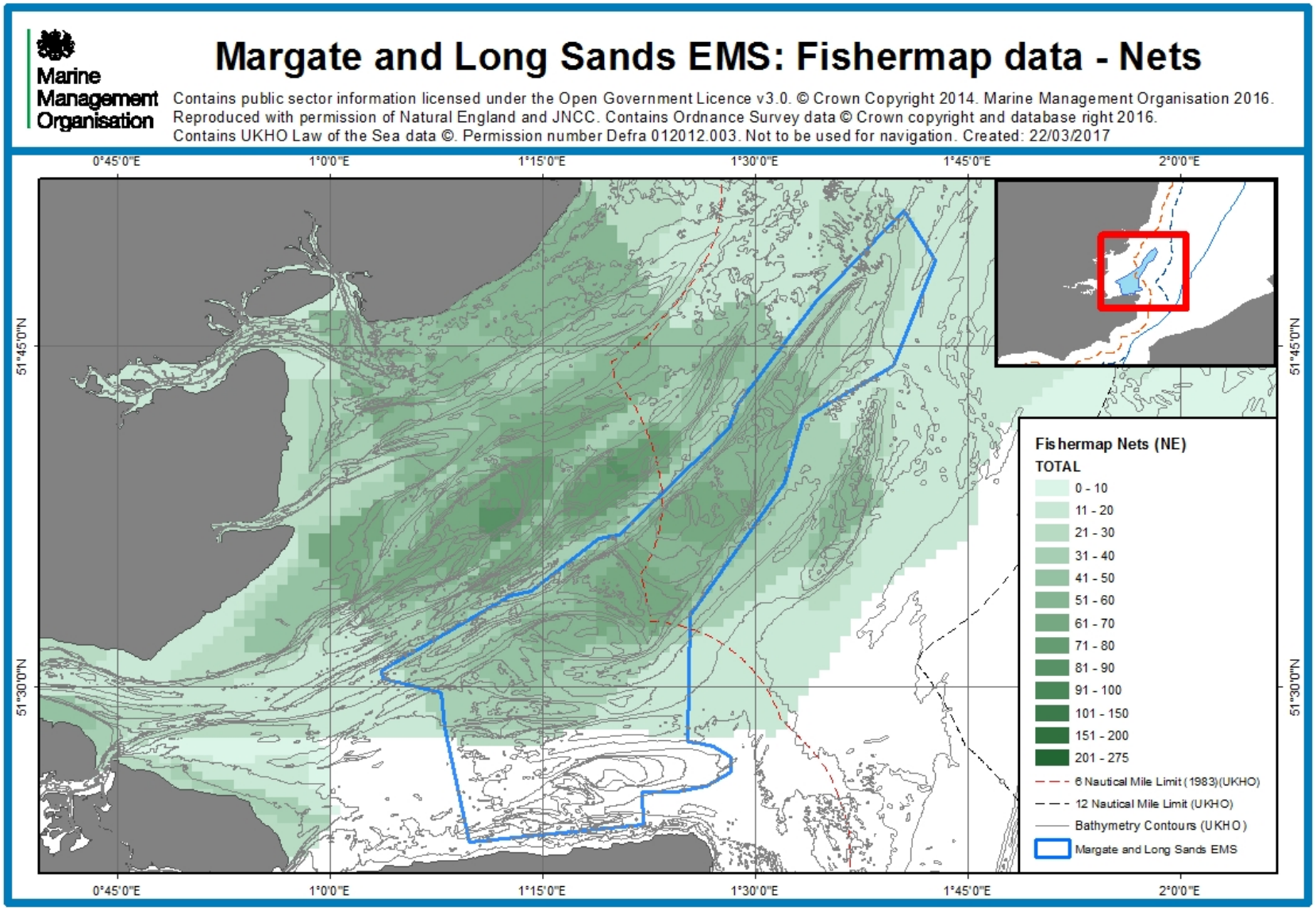
Annex 3b. Fishermap chart - Dredges



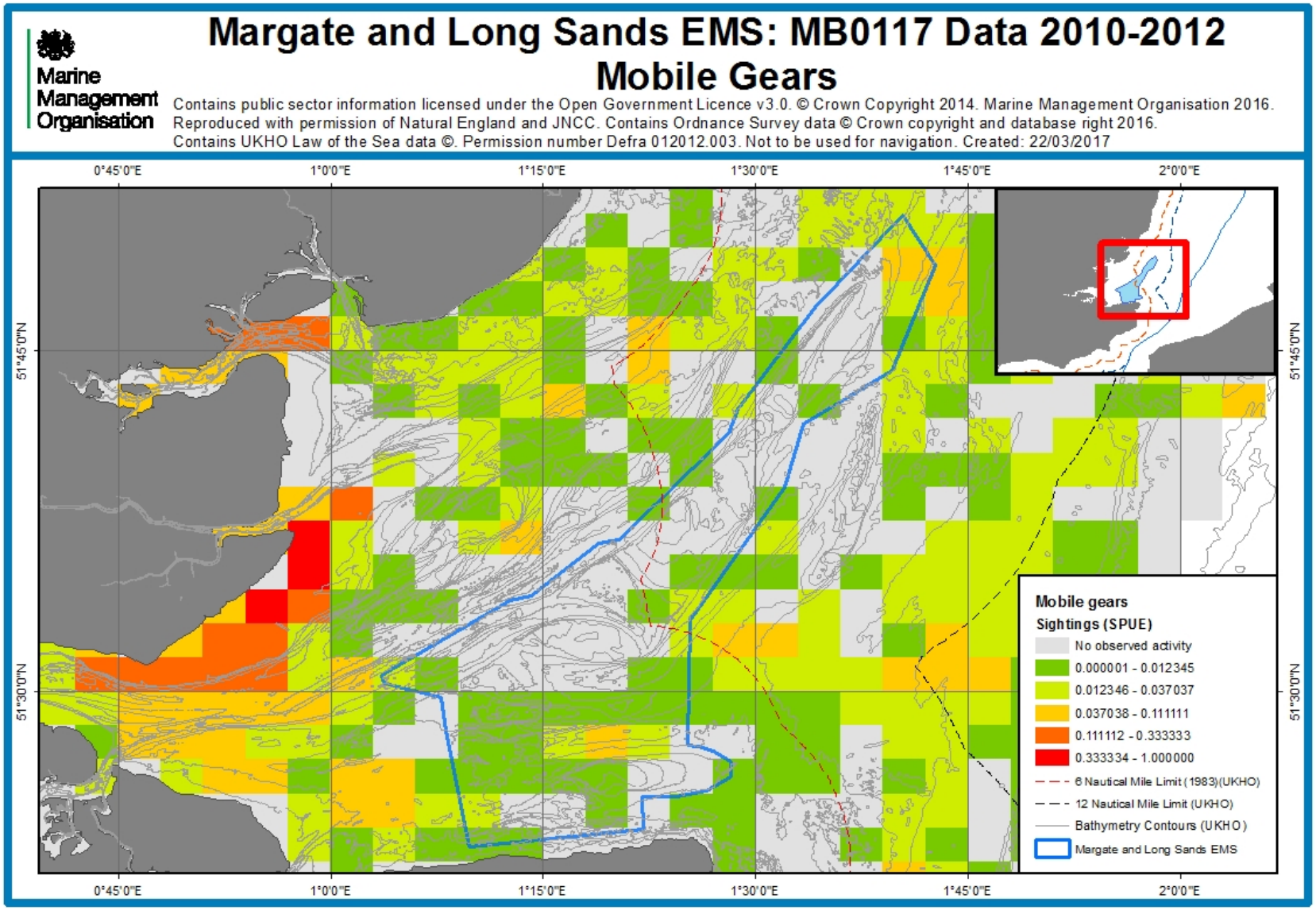
Annex 3c. Fishermap chart - Potting



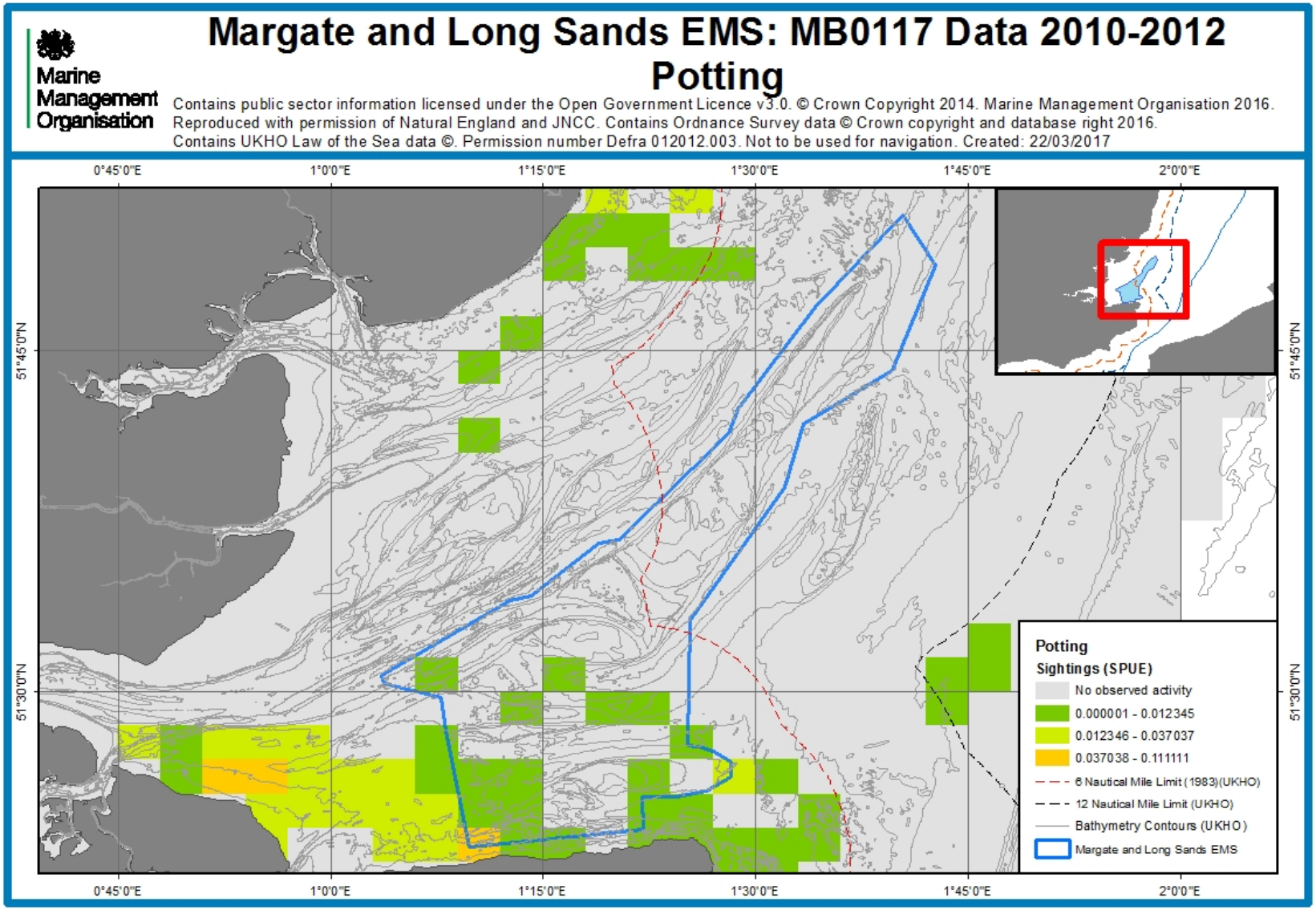
Annex 3d. Fishermap chart – Netting



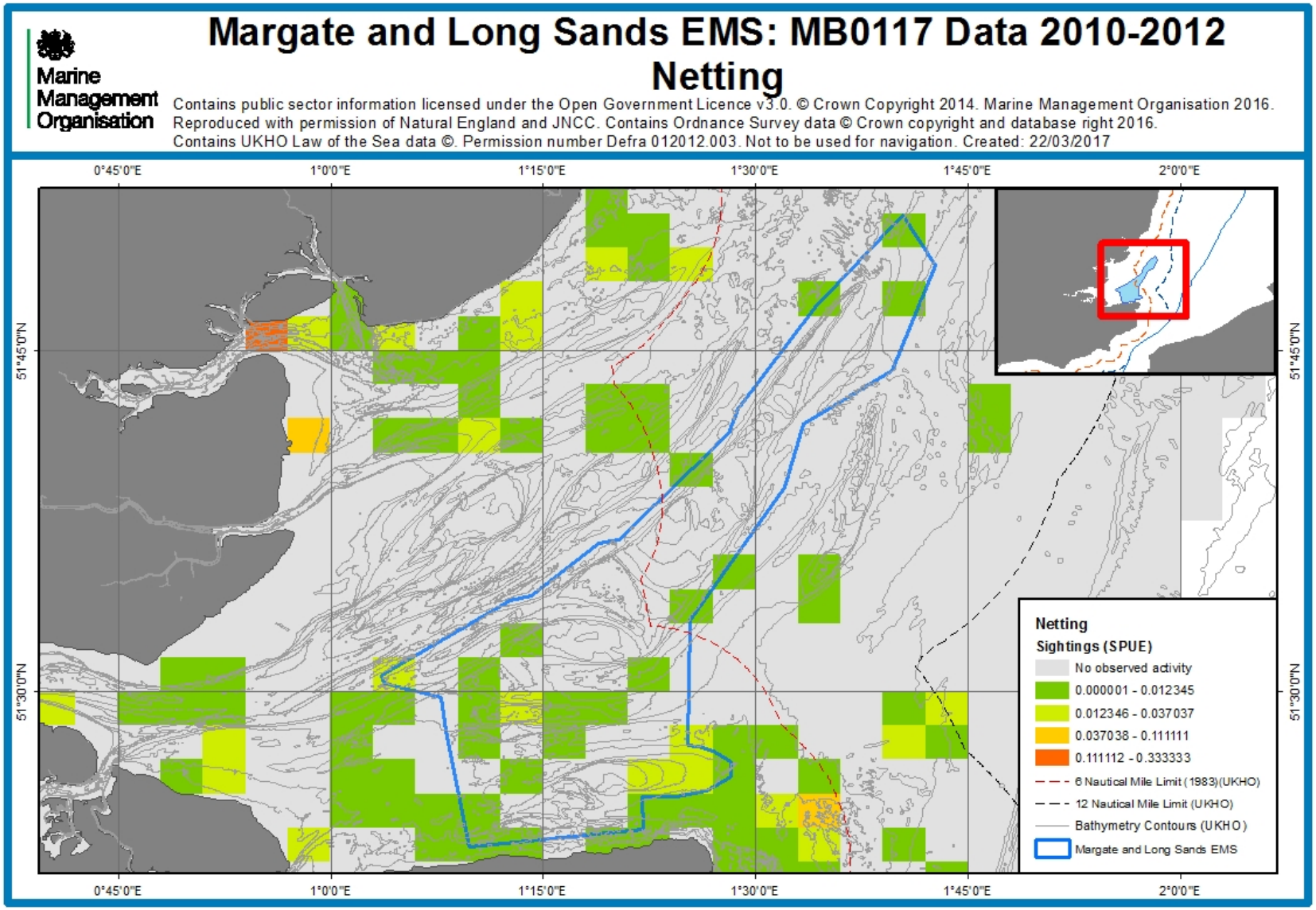
Annex 4a. Sighting data per unit effort for mobile gears within Margate and Long Sands EMS



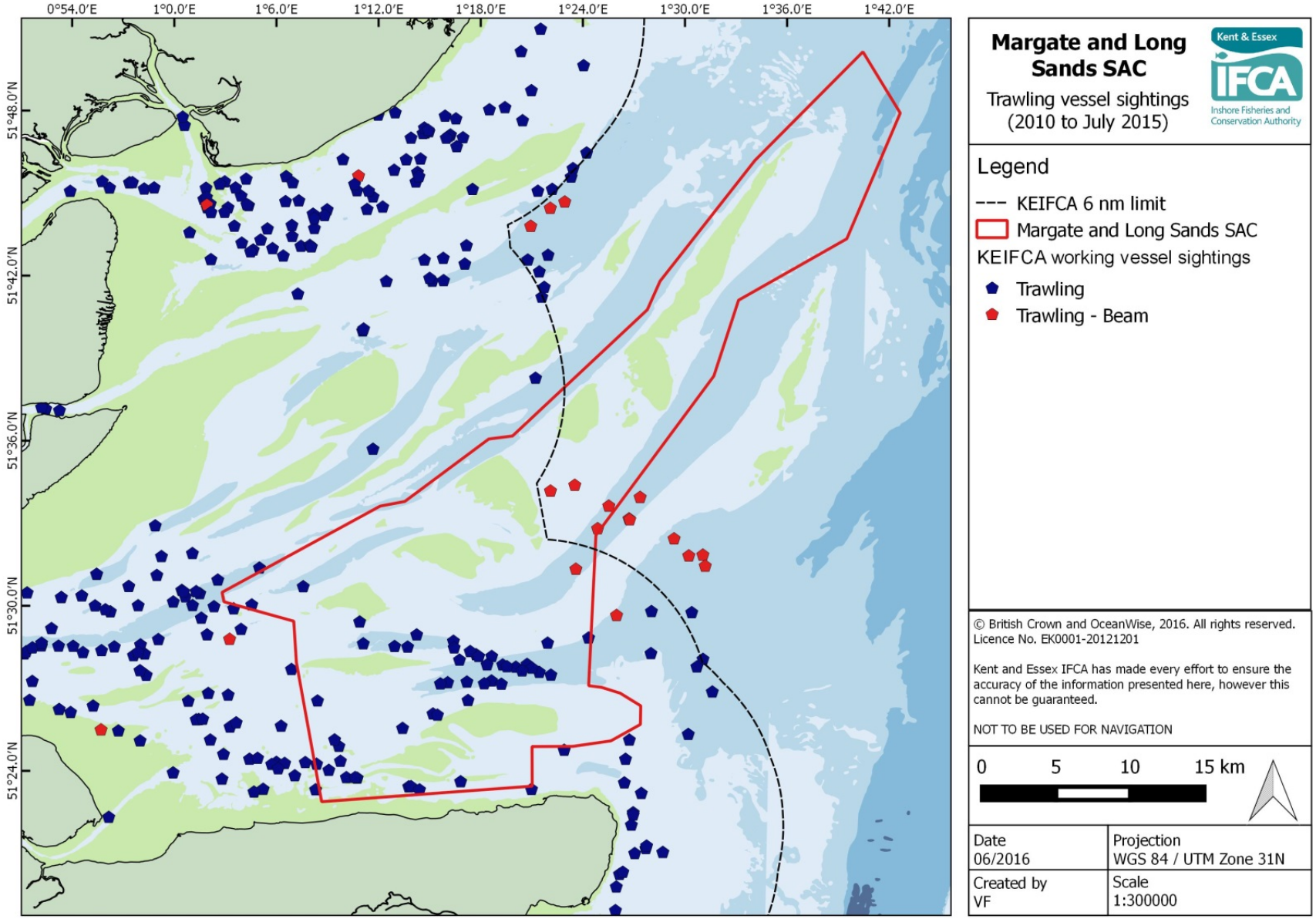
Annex 4b. Sighting data per unit effort for potting within Margate and Long Sands EMS



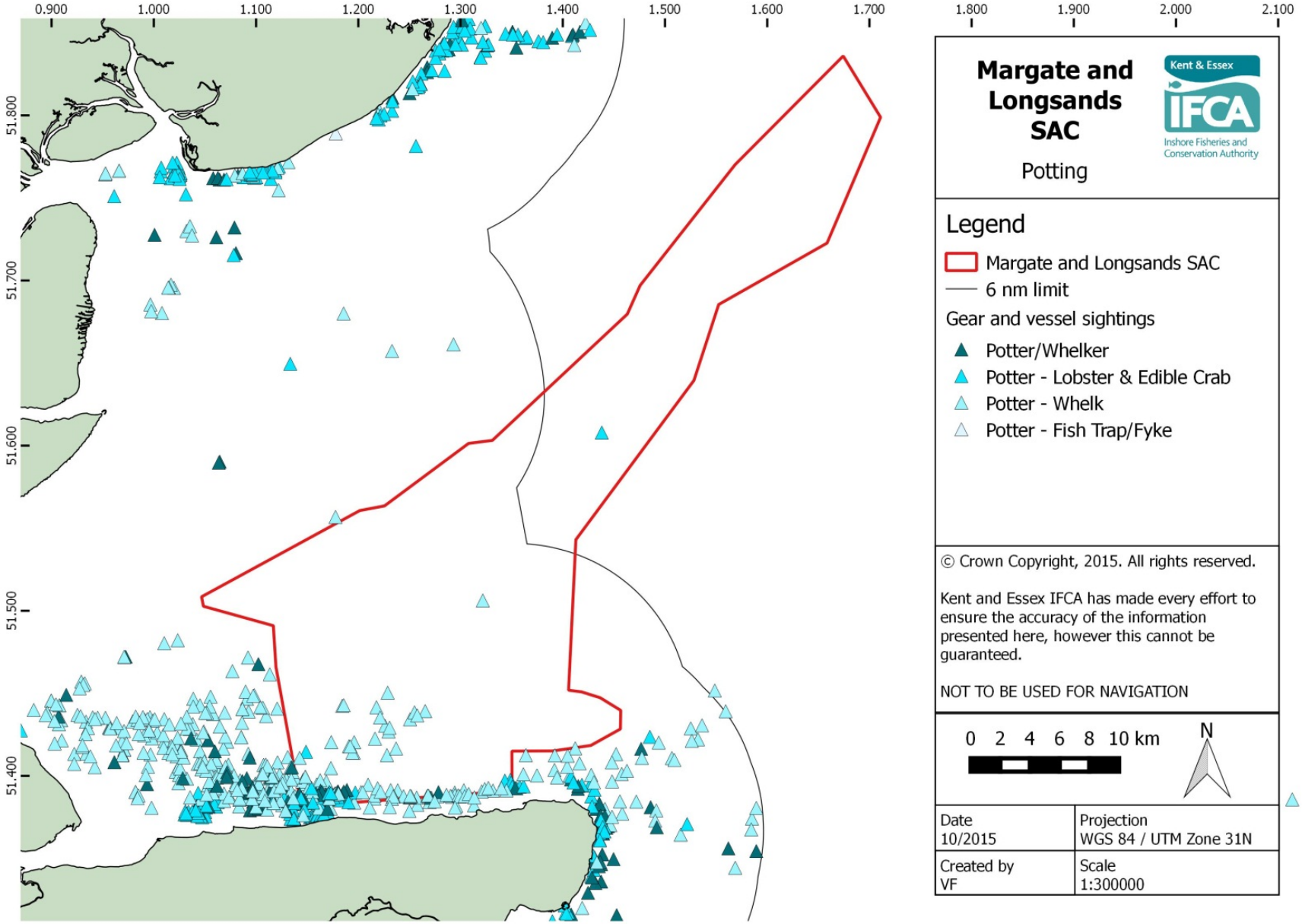
Annex 4c. Sighting data per unit effort for netting within Margate and Long Sands EMS



Annex 5a. Kent and Essex IFCA trawling sightings data (2010 – 30/07/2015)



Annex 5b. Kent and Essex IFCA potting sightings data (2010 – 30/07/2015)



Annex 6. Estimates of UK landings from Margate and Long Sands EMS

Table 24: Estimated UK landings from Margate and Long Sands EMS by gear

Gear Group	Gear	2009	2010	2011	2012	2013	2014	2015	Total	Average
Demersal Towed	Beach seines	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.02	0.00
	Beam trawls	0.72	1.50	0.71	0.29	1.89	0.11	0.16	5.36	0.77
	Boat dredges	7.71	10.28	16.87	8.69	388.57	3.22	38.13	473.47	67.64
	Otter trawls - bottom	8.13	4.33	7.30	7.51	3.15	5.83	1.85	38.10	5.44
	Otter trawls (not specified)	19.66	15.54	25.65	28.27	30.73	22.67	25.37	167.89	23.98
	Otter twin trawls	12.50	13.08	12.41	12.52	8.12	7.67	10.36	76.66	10.95
	Pair trawls - bottom	0.00	0.01	0.00	0.00	0.14	0.00	0.00	0.14	0.02
	Mechanized dredges	0.00	0.00	0.00	0.12	146.22	0.36	0.00	146.70	20.96
Lines	Hand fishing	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.04	0.01
	Handlines and pole-lines	0.00	0.02	0.00	0.00	0.00	0.17	0.00	0.19	0.03
	Hooks and lines	0.02	0.23	0.06	0.31	0.14	0.12	0.06	0.93	0.13
	Longlines	6.52	5.01	1.23	2.07	1.78	1.09	0.40	18.10	2.59
Nets	Driftnets	6.58	8.15	6.83	14.08	10.19	9.03	8.29	63.15	9.02
	Gillnets	36.59	36.75	29.80	21.23	19.28	18.62	23.35	185.64	26.52
	Gillnets and entangling nets	1.18	0.82	0.27	0.08	0.24	0.09	0.05	2.74	0.39
	Lift nets	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.10	0.01
	Set gillnets	3.70	4.10	10.76	8.43	9.89	6.07	4.58	47.52	6.79
	Trammel nets	10.39	5.80	12.85	13.08	14.42	20.69	11.68	88.91	12.70
Pelagic	Otter trawls - midwater	0.07	0.00	0.02	0.05	1.07	0.03	0.01	1.25	0.18
	Pair trawls - midwater	0.03	0.02	1.00	0.41	0.55	1.89	2.19	6.10	0.87
Pots	Pots	13.69	30.02	49.26	104.27	119.03	100.78	115.33	532.39	76.06
	Traps (not specified)	0.00	0.11	0.00	0.13	0.00	0.00	0.00	0.24	0.03
Unknown	Miscellaneous gear	0.00	0.00	95.22	102.22	28.55	0.00	0.00	225.99	32.28
Total		**127.47**	**135.76**	**270.31**	**323.85**	**783.96**	**198.45**	**241.82**	**2081.63**	

Table 25: Estimated UK landings from Margate and Long Sands EMS by species group

Species Group	2009	2010	2011	2012	2013	2014	2015	Total	Average
Crustacean	5.12	5.96	8.31	9.21	7.04	4.83	4.10	44.57	6.37
Demersal	103.72	90.76	101.49	89.67	95.58	87.38	81.61	650.22	92.89
Mollusc (excluding cockles)	20.95	38.19	154.53	194.89	657.79	103.48	152.44	1,322.27	188.90
Pelagic	0.89	1.47	2.75	9.38	7.90	2.77	3.67	28.82	4.12

Annex 7. Margate and Long Sands EMS biotope information

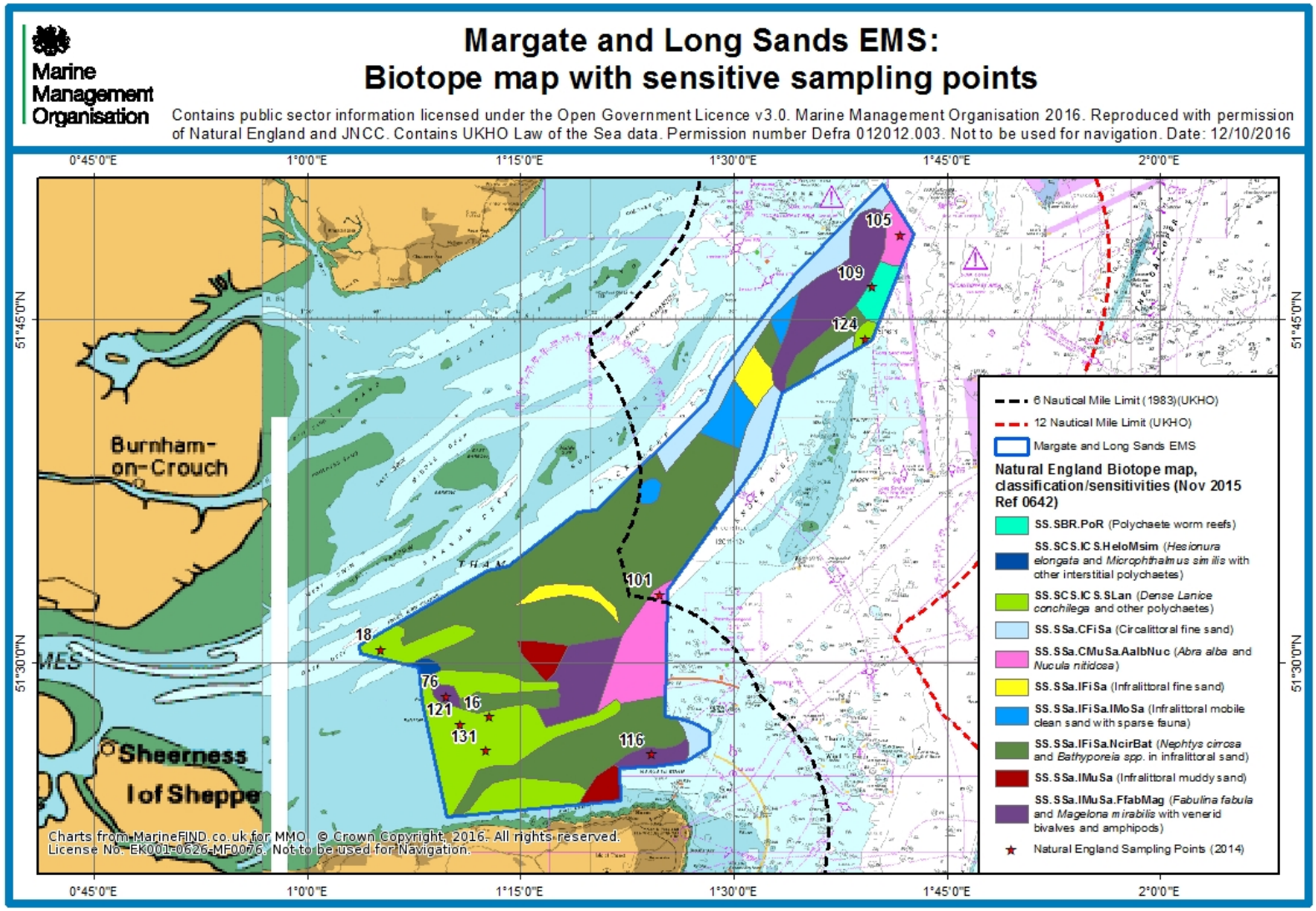
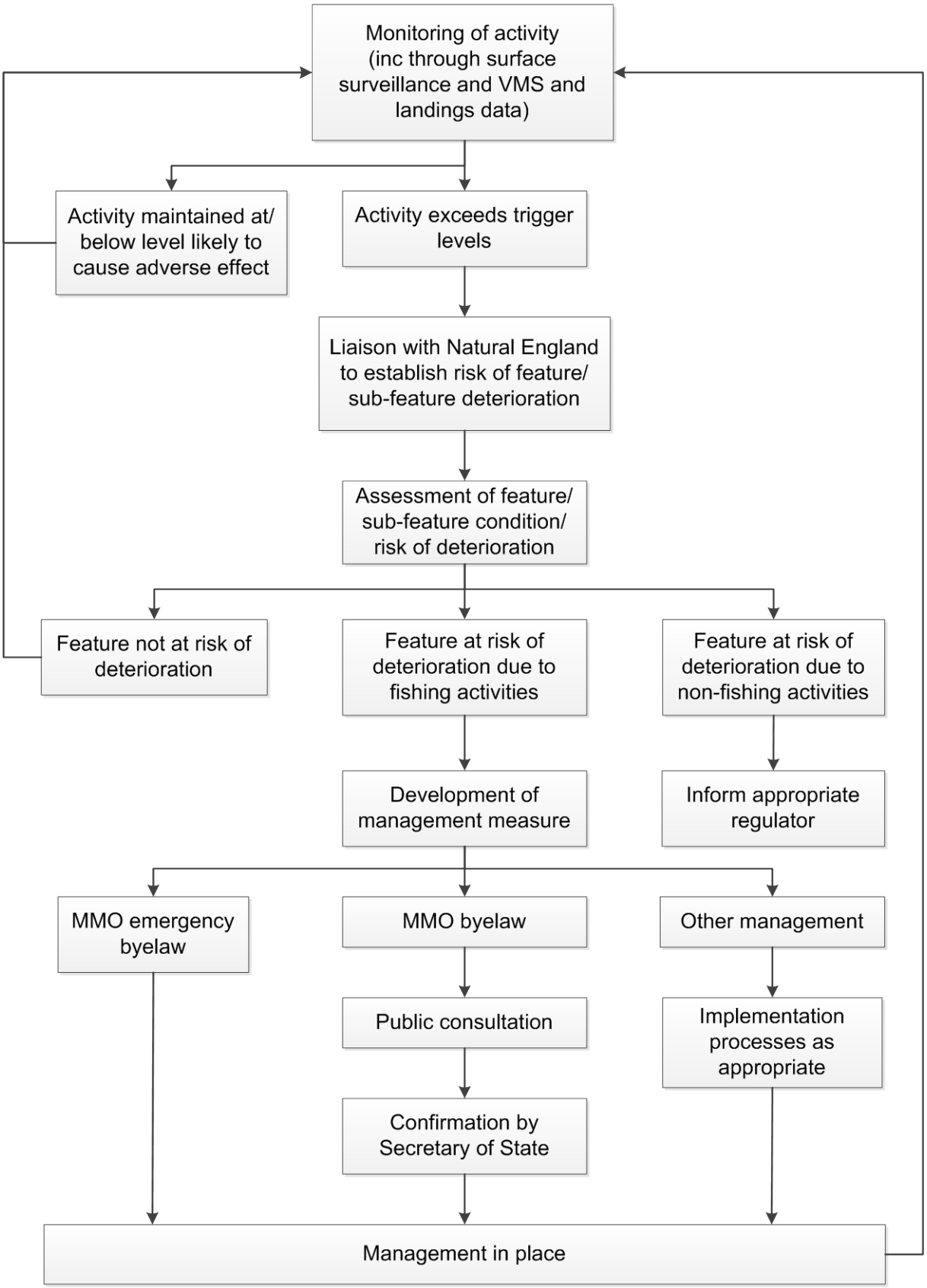


Table 26: Margate and Long Sands EMS biotopes

BIOTOPE	BIOTOPE DESCRIPTION
SS.SBR.PoR Polychaete worm reefs *Sabellaria spinulosa* and *Polydora spp* on stable circalittoral mixed sediment 	Sublittoral reefs of polychaete worms in mixed sediments found in a variety of hydrographic conditions. Such habitats may range from extensive structures of considerable size to loose agglomerations of tubes. Such communities often play an important role in the structural composition or stability of the seabed and provide a wide range of niches for other species to inhabit. Consequently polychaete worm reefs often support a diverse flora and fauna.
SS.SCS.ICS.HeloMsim *Hesionura elongata* and *Microphthalmus similis* with other interstitial polychaetes in infralittoral mobile coarse sand 	On infralittoral sandbanks and sandwaves and other areas of mobile medium-coarse sand, populations of interstitial polychaetes may be found. These habitats consist of loosely packed grains of sand forming waves up to several metres high often with gravel, or occasionally silt, in the troughs of the waves. These habitats support interstitial communities living in the spaces between the grains of sand, in particular hesionurid polychaetes.
SS.SCS.ICS.SLan *Dense Lanice conchilega* and other polychaetes in tide swept infralittoral sand 	Dense beds of *Lanice conchilega* occur in coarse to medium fine gravelly sand in the shallow sublittoral, where there are strong tidal streams or wave action.
SS.SSa.CFiSa Circalittoral fine sand 	Clean fine sands with less than 5% silt/clay in deeper water, either on the open coast or in tide-swept channels of marine inlets in depths of over 15-20m. The habitat may also extend offshore and is characterised by a wide range of echinoderms (in some areas including the pea urchin *Echinocyamus pusillus*), polychaetes and bivalves. This habitat is generally more stable than shallower, infralittoral sands and consequently supports a more diverse community.
SS.SSa.CMuSa.AalbNuc *Abra alba*, *Nucula nitida* and *Corbula gibba* in circalittoral muddy sand or slightly mixed sediment 	Non-cohesive muddy sands or slightly shelly/gravelly muddy sand characterised by the bivalves *Abra alba* and *Nucula nitidosa*. Other important taxa include *Nephtys* spp., *Chaetozone setosa* and *Spiophanes bombyx* with *Fabulina fabula* also common in many areas. The echinoderms *Ophiura albida* and *Asterias rubens* may also be present.
SS.SSa.IFiSa Infralittoral fine sand 	Clean sands which occur in shallow water, either on the open coast or in tide-swept channels of marine inlets. The habitat typically lacks a significant seaweed component and is characterised by robust fauna, particularly amphipods (*Bathyporeia*) and robust polychaetes including *Nephtys cirrosa* and *Lanice conchilega*.
SS.SSa. IFiSa.IMoSa Infralittoral mobile clean sand with sparse fauna	Medium to fine sandy sediment in shallow water, often formed into dunes, on exposed or tide-swept coasts often contains very little infauna due to the mobility of the

	substratum.
SS.SSalFiSa.NcirBat *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand 	Well-sorted medium and fine sands characterised by *Nephtys cirrosa* and *Bathyporeia* spp. (and sometimes *Pontocrates* spp.) which occur in the shallow sublittoral to at least 30 m depth. This biotope occurs in sediments subject to physical disturbance, as a result of wave action (and occasionally strong tidal streams).
SS.ssa.IMuSa Infralittoral muddy sand 	Non-cohesive muddy sand (with 5% to 20% silt/clay) in the infralittoral zone, extending from the extreme lower shore down to more stable circalittoral zone at about 15-20 m. The habitat supports a variety of animal-dominated communities, particularly polychaetes (*Magelona mirabilis*, *Spiophanes bombyx* and *Chaetozone setosa*), bivalves (*Fabulina fibula* and *Chamelea gallina*) and the urchin *Echinocardium cordatum*.
SS.IGS.FaS.FabMag *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves in infralittoral compacted fine sand 	This biotope is characterised by burrowing bivalves and worms. It may be sensitive to dredging when it is occurring on the more stable gravelly and muddy sand communities which will be more associated with the troughs. These biotopes are associated with areas of weak tidal streams.

Annex 8. Monitoring and Control Process


Monitoring of activity (inc through surface surveillance and VMS and landings data)
Activity maintained at/ below level likely to cause adverse effect
Activity exceeds trigger levels
Liaison with Natural England to establish risk of feature/ sub-feature deterioration
Assessment of feature/ sub-feature condition/ risk of deterioration
Feature not at risk of deterioration
Feature at risk of deterioration due to fishing activities
Feature at risk of deterioration due to non-fishing activities
Development of management measure
Inform appropriate regulator
MMO emergency byelaw
MMO byelaw
Other management
Public consultation
Implementation processes as appropriate
Confirmation by Secretary of State
Management in place

Annex 9. Assumptions used to calculate spatial footprint (p) values

Pots

- Size of pot: based on GAEL Force Lobster/Crab creel (609.6mm x 406.4mm)
- Number of vessels and days spent fishing: derived from VMS/landings records.
- Number of pots used by vessels: derived from local fisherman.

Nets (gill nets/trammel nets)

- Gear information: taken from report on a workshop on the physical effects of fishing activities on the Dogger Bank
- Number of vessels and days at sea: derived from VMS/landings records.
- Number of nets hauled: supplied by IFCA.

Dredging

- Based on a 16.28m scallop vessel with 2*6.7m dredge bars each with two shoes at 720mm wide. Each dredge bar has 8 * 76cm dredges. Info from http://www.seafish.org/media/Publications/SR509_Scallop_Dredge_Selectivity.pdf
- Number of vessels and days spent fishing: derived from VMS/landings records.
- Number of pots used by vessels: derived from local fisherman.

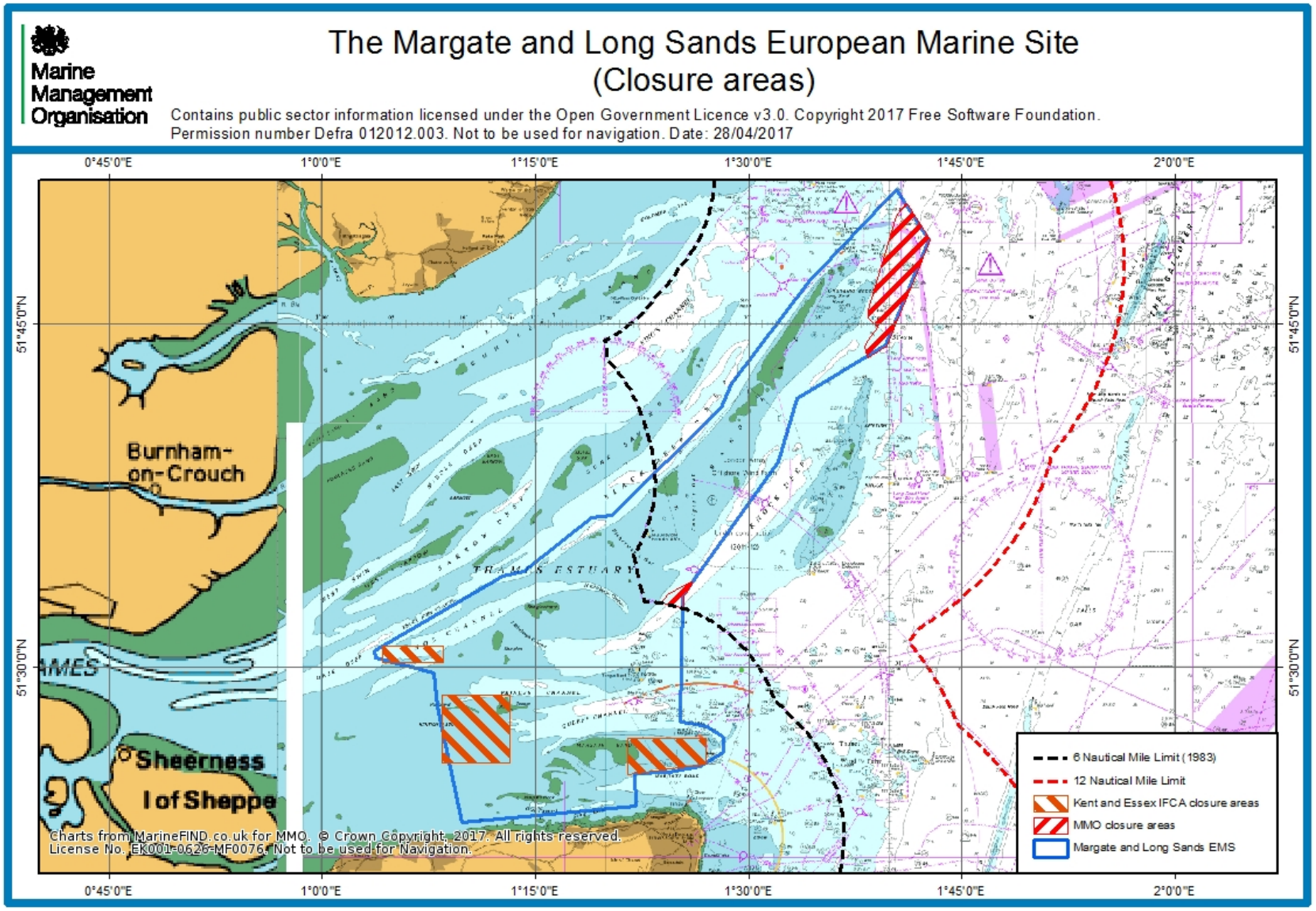
Bottom towed gear

- Beam trawler: Based on a vessel with one 12m trawl with two shoes at 720mm wide and with 60 % groundrope interaction. Info derived from seafish report on a workshop on the physical effects of fishing activities on Dogger Bank.
- Otter trawl: Based on a vessel with one 12m trawl with two 1.2m x0.65m otter boards and with 60 % groundrop interaction. Info derived from seafish report on a workshop on the physical effects of fishing activities on Dogger Bank.
- Number of vessels and days spent fishing: derived from VMS/landings records.
- Number of pots used by vessels: derived from local fisherman.

Hydraulic Dredging

- Based on 1 cage with a total width of 74". Data from http://spo.nmfs.noaa.gov/mfr444/mfr4441.pdf
- Haul duration 10.12 hours from http://www.seafish.org/media/Publications/SR348.pdf

Annex 10. Bottom Towed Gear Management Measures



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