



Hornsea Project Four: Environmental Statement (ES)

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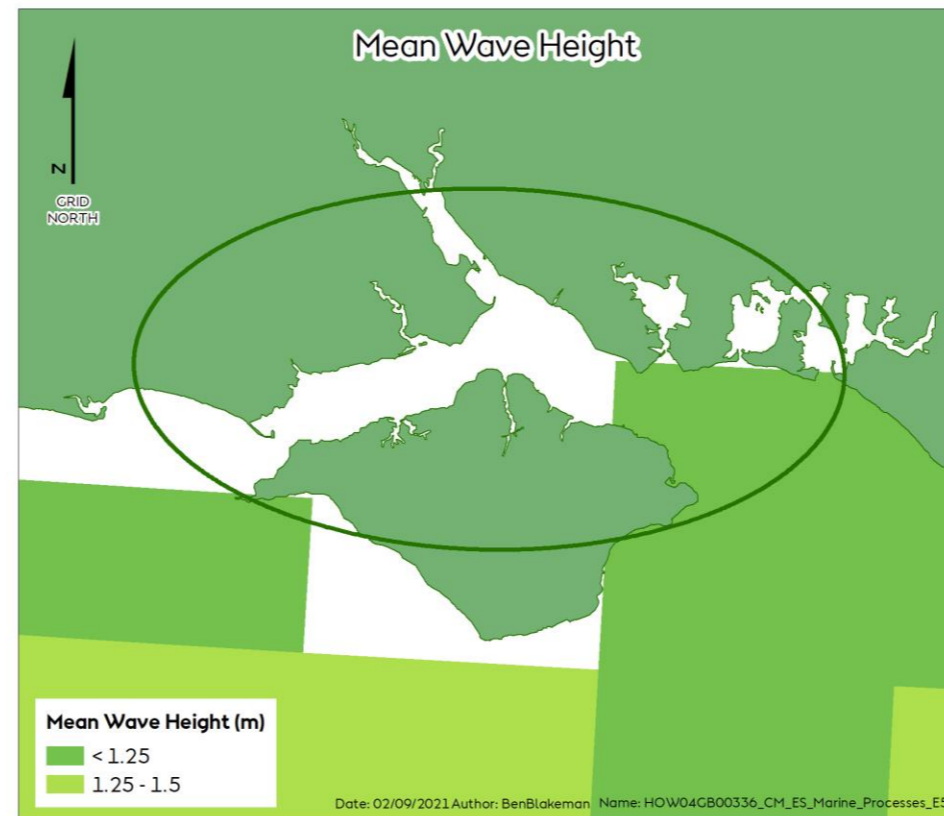
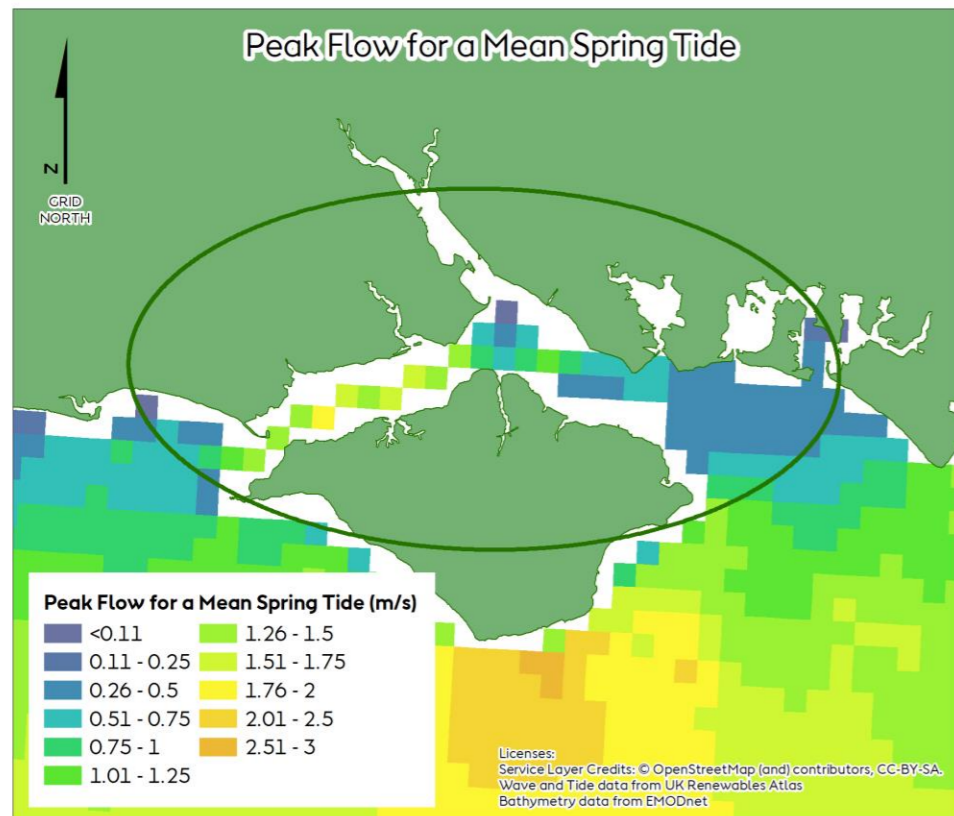
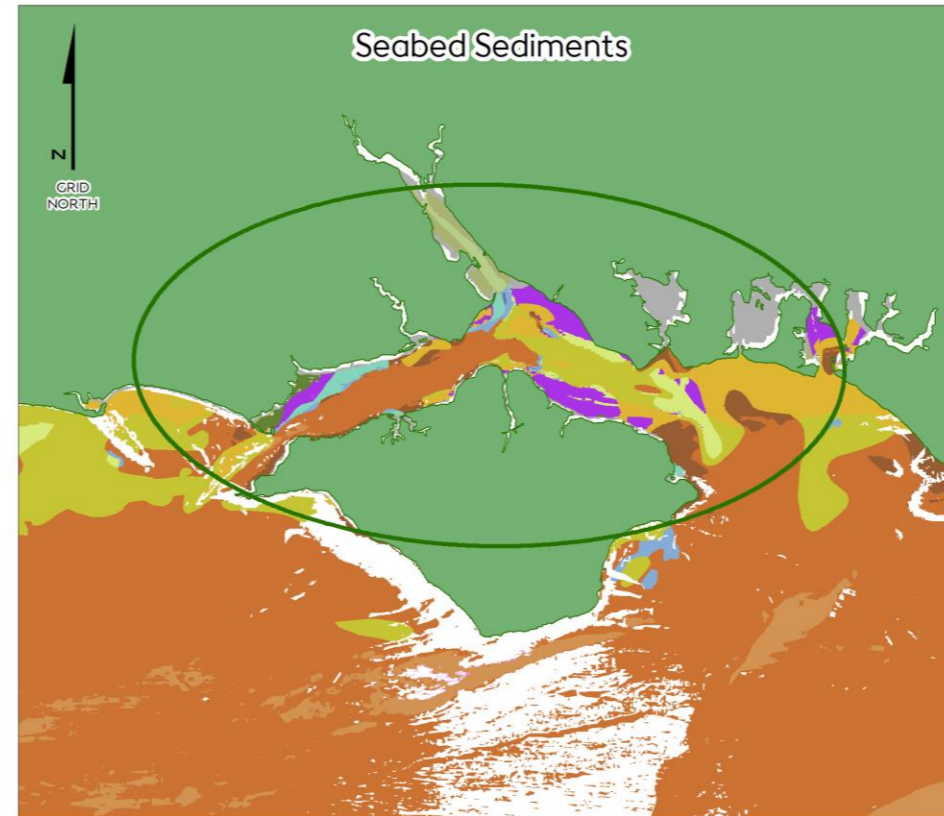
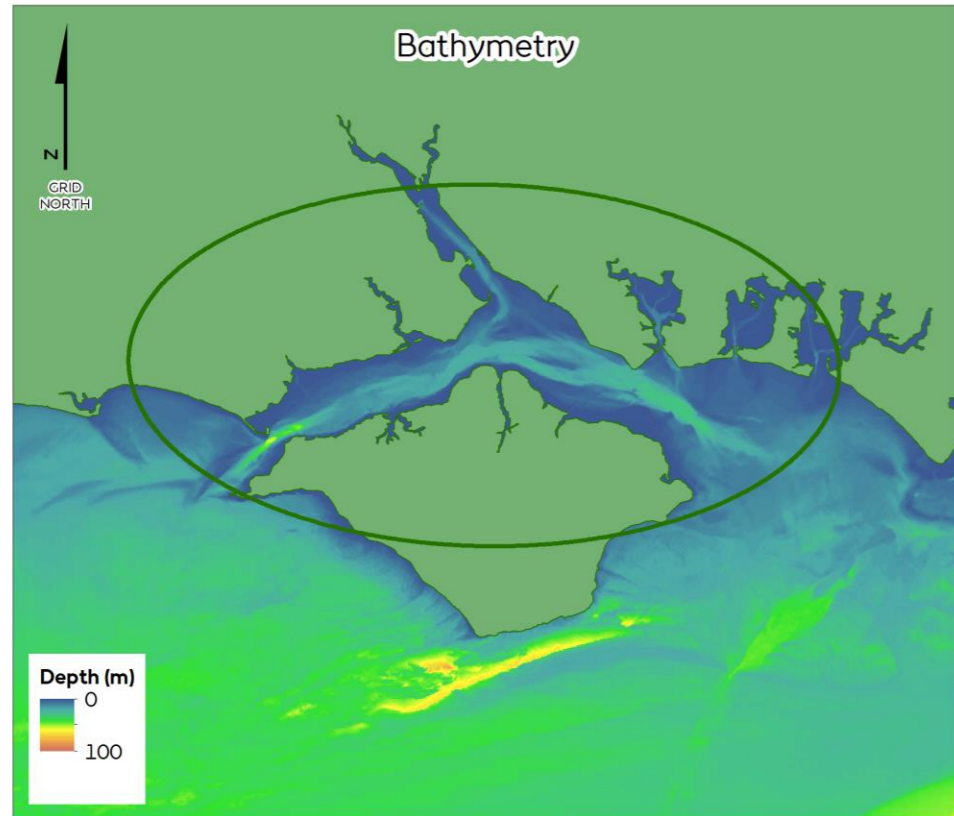
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Table 16: Summary of baseline environment in relation to the Area of Search E5 (The Solent) for resilience measure - fish habitat enhancement (seagrass).

Topic	Summary of Baseline Environment
Marine Geology, Oceanography and Physical Processes	<p>The baseline environment for physical processes is illustrated in Figure 64.</p> <ul style="list-style-type: none"> Seabed sediments vary within the AoS between coarse, mixed and sandy sediments with patches of mud and muddy sand. The flood tide within Southampton Water can last for up to 7.5 hours on a spring tide. High water then lasts for about 2 hours, followed by the ebb, which can be as short as 2.5 hours. Within Southampton Water the tidal excursion is strongly ebb dominant but reduces in magnitude towards the head of the estuary.
Benthic and Intertidal Ecology	<p>The baseline environment for benthic ecology is illustrated in Figure 65.</p> <ul style="list-style-type: none"> The subtidal habitat of the Solent is mainly composed of sands and gravels, which is a UK BAP priority habitat. The diversity of flora and fauna living in this habitat varies according to the level of environmental stress to which they are exposed. Sandier sediments are mainly found in the central Solent, which are typically colonised by burrowing worms, crustaceans, bivalve molluscs and echinoderms. Beds consisting of <i>Zostera marina</i> have been found in patches on the western Solent shore at Calshot Spit and Stanswood Bay (Hampshire Biodiversity Partnership, 2003), as well as in the entrance to the Medina and to the east, along the north coast of the Isle of Wight (ABPmer, 2015). The benthic environment in this region is characterised by a wide range of habitat types with deep circalittoral sand, circalittoral fine sand or circalittoral muddy sand, circalittoral coarse sediment, and deep circalittoral coarse sediment being the most common throughout the AoS (EMODnet, 2021). The invertebrate diversity is believed to be low across Southampton Water and the Solent. The Thorn Channel area is the most diverse, with a mean Shannon Weiner Diversity Index of 2.7. The invertebrate abundance and diversity in the main channel and its margins were very low as would be expected. Numerous designated sites are present within the AoS, including the Solent Maritime SAC and the Bembridge MCZ.
Fish and Shellfish Ecology	<p>The baseline environment for fish and shellfish ecology is illustrated in Figure 66.</p> <ul style="list-style-type: none"> A species composition survey was undertaken in September 2000 and approximately 36 species were recorded, with the most abundant being sea bass (<i>Dicentrarchus labrax</i>, 53.62%), bib (<i>Trisopterus luscus</i>, 13.34%), and black sea-bream (<i>Spondyliosoma cantharus</i>, 6.20%) (Pickett, et al., 2002). The AoS overlaps with spawning and nursery grounds for species including cod, whiting, mackerel, cod, plaice, sole and sandeel.
Marine Mammals	<p>The baseline environment for marine mammals is illustrated in Figure 67 (where data are available)</p> <ul style="list-style-type: none"> The two identified cetacean species known to regularly occur in this AoS are harbour porpoise (<i>Phocoena phocoena</i>) and minke whale (<i>Balaenoptera acutorostrata</i>). Additionally there are many sightings of unidentified cetacean species which could potentially be common dolphin (<i>Delphinus delphis</i>) or striped dolphin (<i>Stenella coeruleoalba</i>) (Hammond et al. 2017). Harbour seals have been observed within this AoS, however these numbers are extremely limited, with the highest abundance estimates suggesting <50 individuals within the AoS (SCOS, 2020).
Offshore and Intertidal Ornithology	<p>The baseline environment for offshore ornithology is illustrated in Figure 68.</p> <ul style="list-style-type: none"> Within the AoS there are four SPAs with offshore ornithology designated features, Chichester and Langstone Harbours SPA, Portsmouth Harbour SPA, Solent and Southampton Water SPA and the Solent and Dorset Coast SPA.

Topic	Summary of Baseline Environment
	<ul style="list-style-type: none"> Several species associated with these SPAs are widespread in the area, appearing at three of the four sites, and include: sandwich tern – (<i>Sterna sandvicensis</i>), brent goose (<i>Branta bernicla bernicla</i>), common tern (<i>Sterna hirundo</i>), and little tern (<i>Sterna albifrons</i>) (JNCC, 2015a, 2015c, 2015d, 2017b, 2020b).
Commercial Fisheries	<p>The baseline environment for commercial fisheries is illustrated in Figure 69.</p> <ul style="list-style-type: none"> The Solent is a mixed sea fishery, and the fishing effort varies between several different commercial species throughout the year. The inshore waters of have an important role as a nursery area for bass, with specific areas identified for protection, and for a range of other fin-fish and shellfish. Shellfishing is one of the main types of fisheries in the Solent. Commercial shellfish beds of the native oyster, <i>Ostrea edulis</i>, lie around the entrance to Southampton Water, around the approach channel in the Central Solent, and along the shallow subtidal shores of the East and West Solent (ABPmer, 2015).
Shipping and Navigation	<p>The baseline environment for shipping and navigation is illustrated in Figure 70.</p> <ul style="list-style-type: none"> The vessel density in the AoS varies from 1 to >222,000 route(s)/0.15 km²/ year. The majority of vessels occur to the North of the Isle of Wight (IOW), heading up into Southampton. High vessel densities extend to the West of the IOW with some distinct lanes heading to Bournemouth and continuing along to coast towards Weymouth. To the East of the IOW the routes disperse more, with one main route heading out into the English Channel (Marine Traffic, 2021).
Marine Archaeology	<p>The baseline environment for marine archaeology is illustrated in Figure 70.</p> <ul style="list-style-type: none"> Within the AoS, there are many different types of archaeological features including both ship and aircraft wrecks.



Hornsea Four

Compensation Measures
Areas of Search
Seagrass
E5: The Solent
Marine Processes

Compensation Measures Areas of Search

- Seagrass

EUNIS Habitats (UKSeaMap 2018)

- A4.12: Sponge communities on deep circalittoral rock
- A4.27: Faunal communities on deep moderate energy circalittoral rock
- A5.13: Infralittoral coarse sediment
- A5.14: Circalittoral coarse sediment
- A5.15: Deep circalittoral coarse sediment
- A5.23 or A5.24: Infralittoral fine sand or infralittoral muddy sand
- A5.25 or A5.26: Circalittoral fine sand or circalittoral muddy sand
- A5.27: Deep circalittoral sand
- A5.33 or A5.34: Infralittoral sandy mud or infralittoral fine mud
- A5.33: Infralittoral sandy mud
- A5.34: Infralittoral fine mud
- A5.35 or A5.36: Circalittoral sandy mud or circalittoral fine mud
- A5.35: Circalittoral sandy mud
- A5.37: Deep circalittoral mud
- A5.43: Infralittoral mixed sediments
- A5.44: Circalittoral mixed sediments
- A5.45: Deep circalittoral mixed sediments
- No EUNIS habitat assigned

Coordinate system: ETRS 1989 UTM Zone 31N

0 10 20 Kilometres
0 5 10 Nautical Miles

REV	REMARK	DATE
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Compensation Measures
Marine Processes
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Figure 64: Resilience Measures Areas of Search Seagrass E5: The Solent Marine Processes.

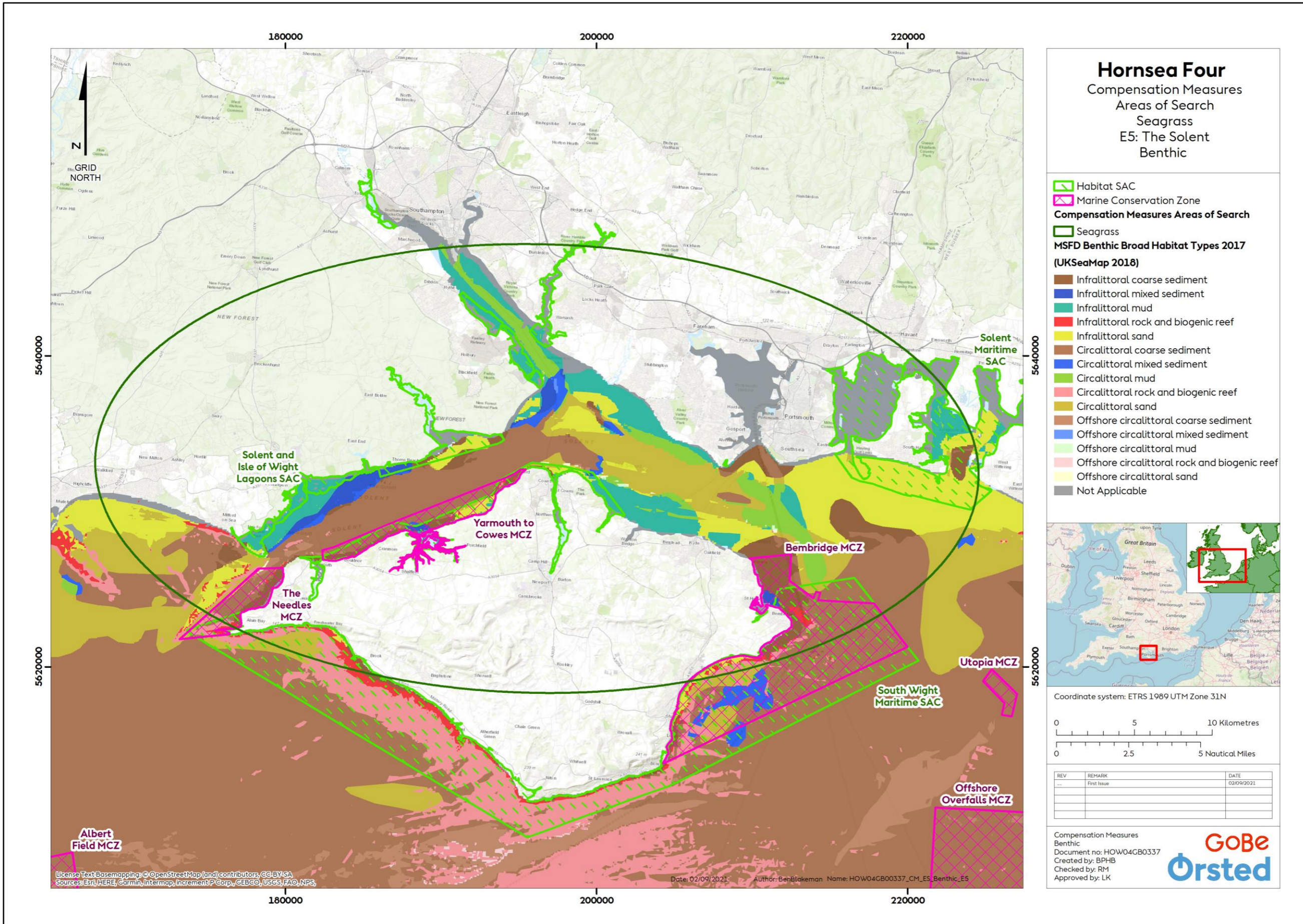


Figure 65: Resilience Measures Areas of Search Seagrass E5: The Solent Benthic.

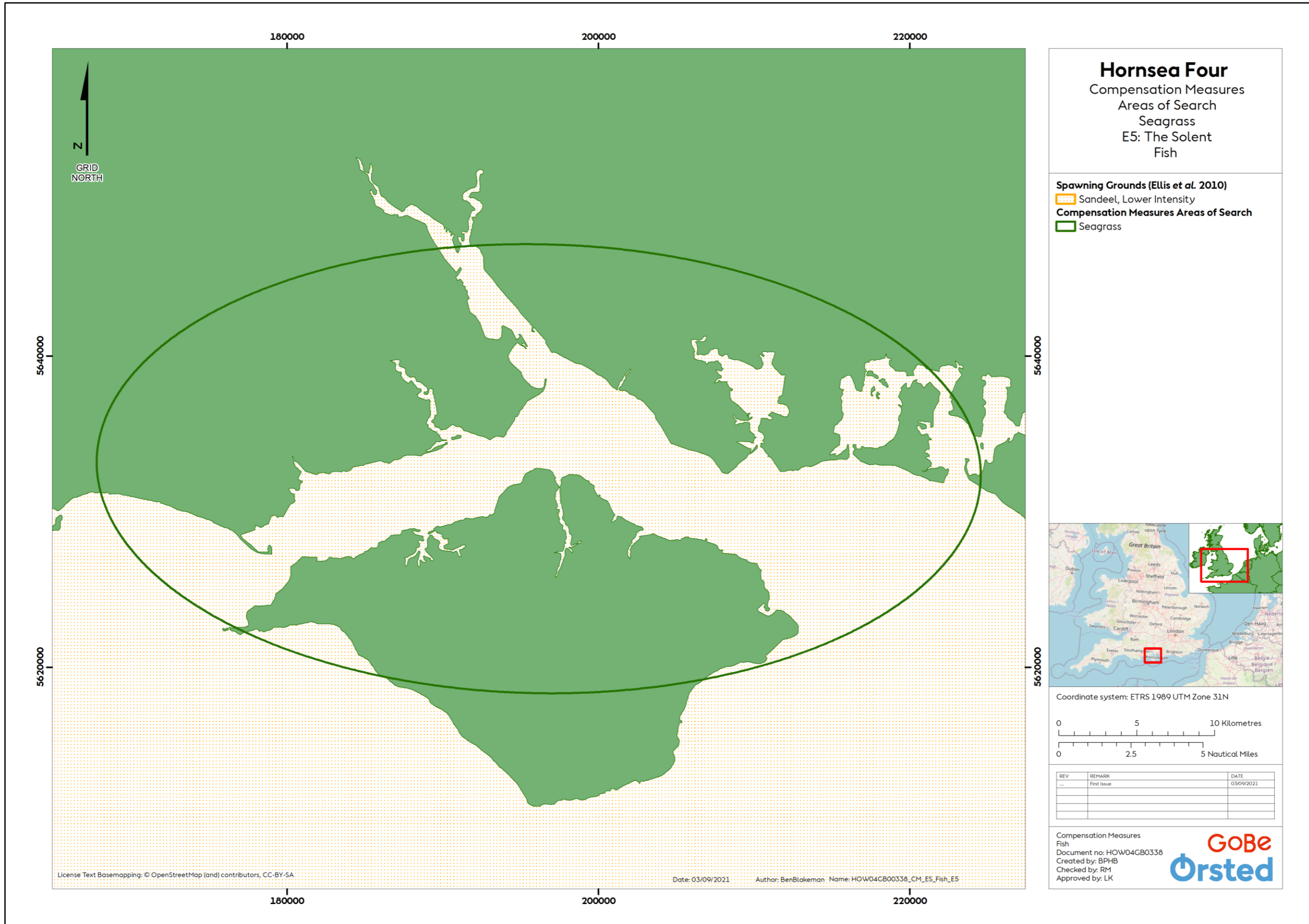
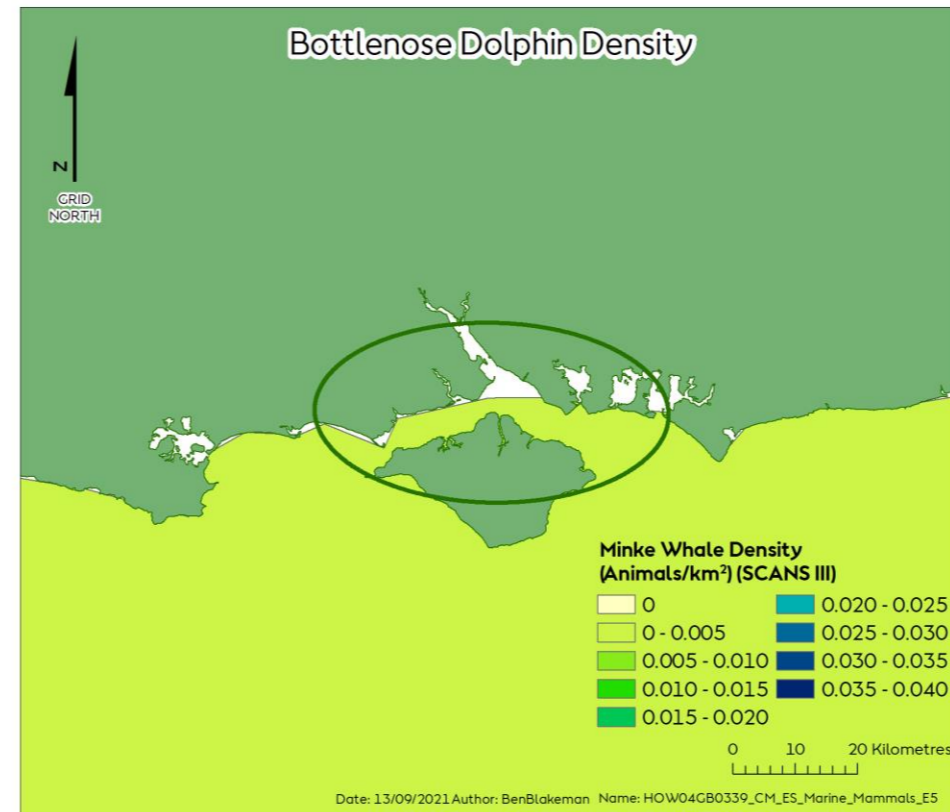
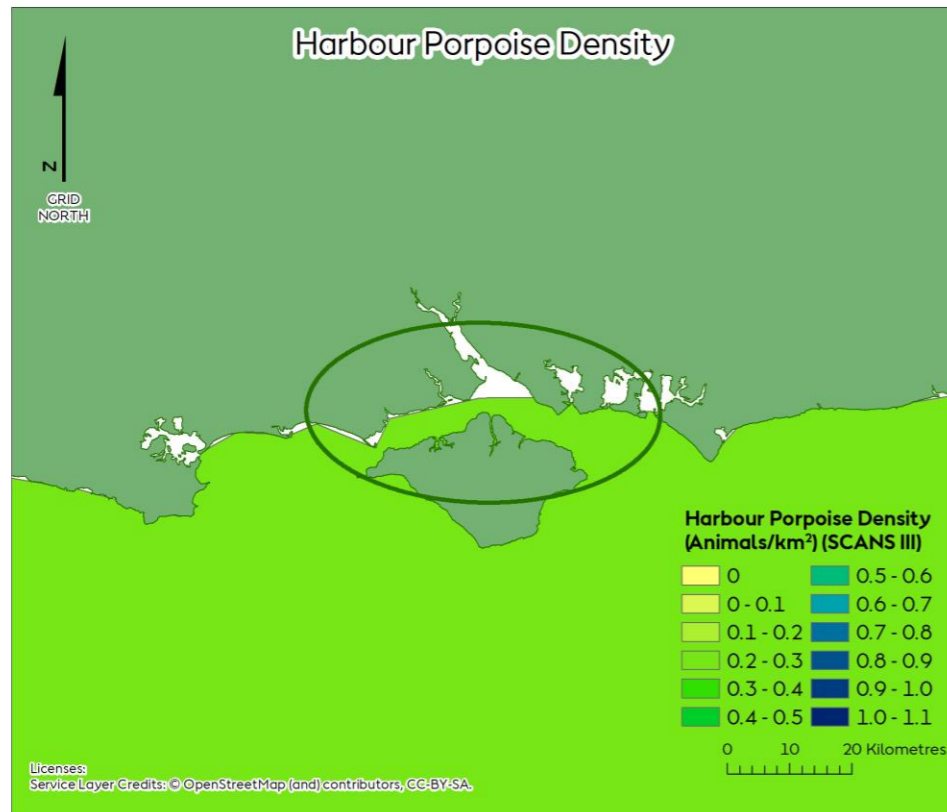
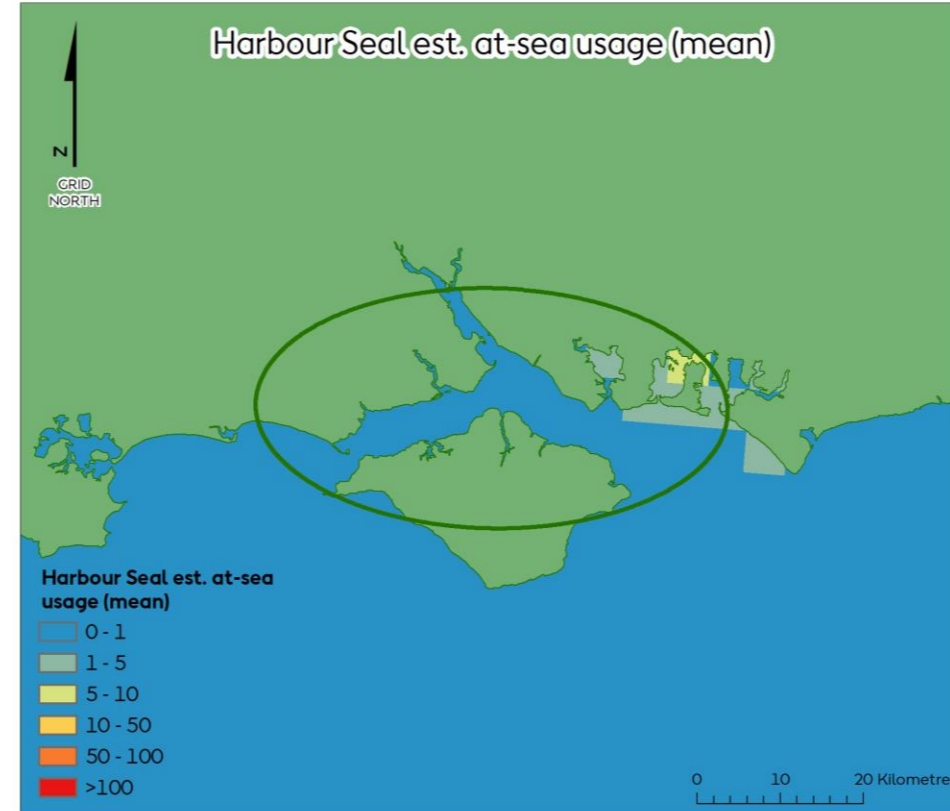
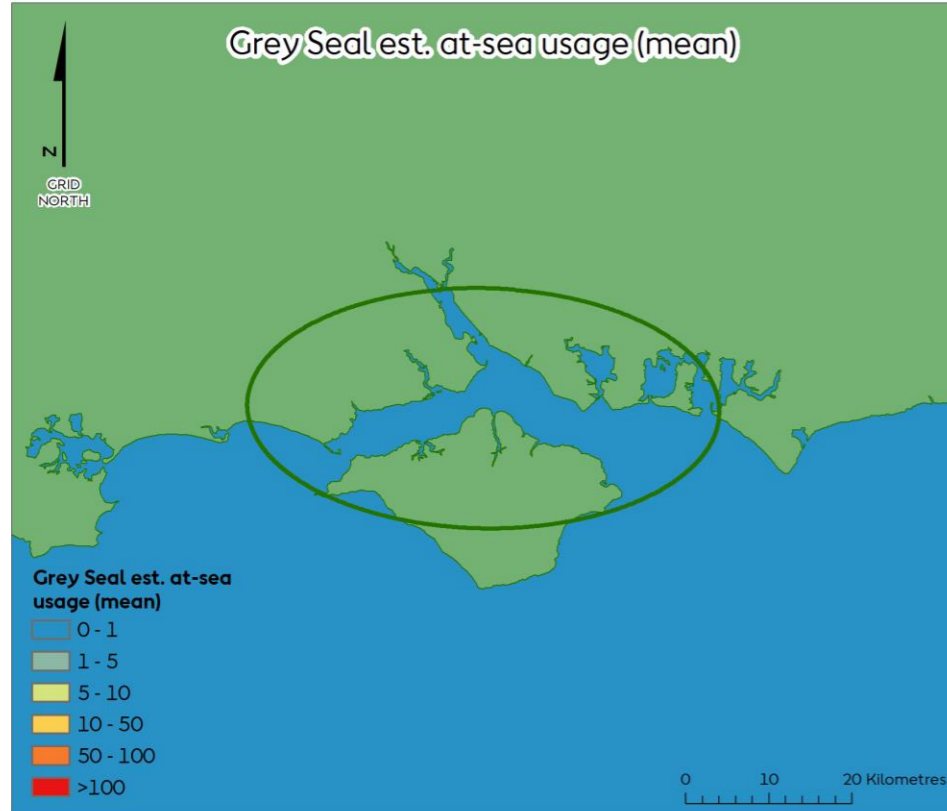


Figure 66: Resilience Measures Areas of Search Seagrass E5: The Solent Fish.



Hornsea Four

Compensation Measures
Areas of Search
Seagrass
E5: The Solent
Marine Mammals

Compensation Measures Areas of Search

- Seagrass

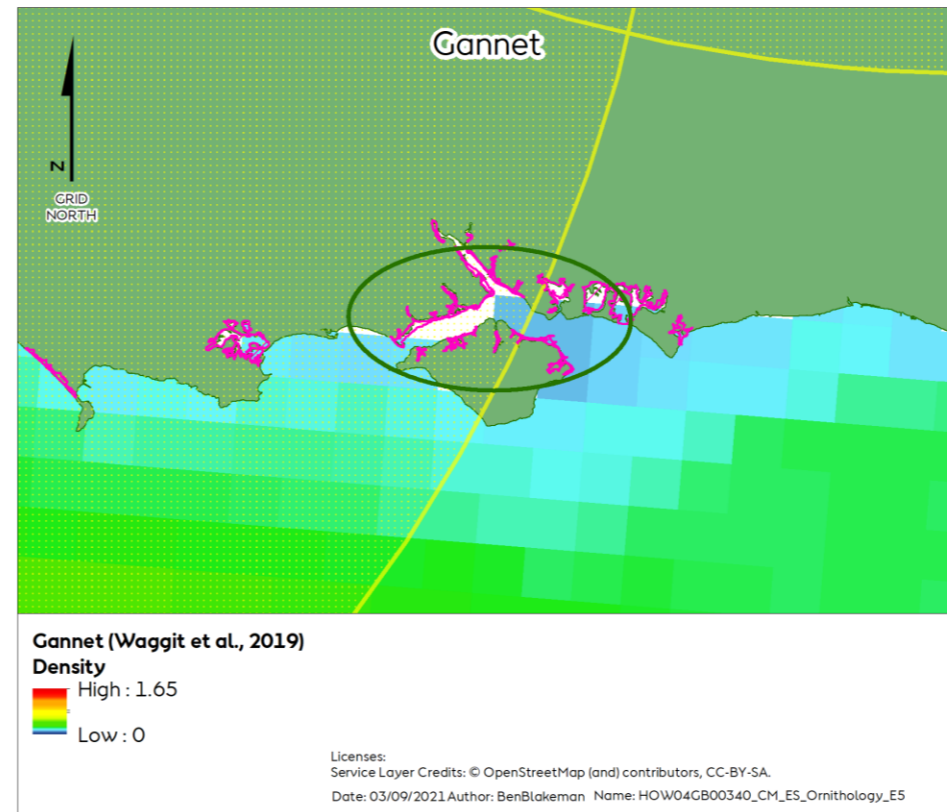
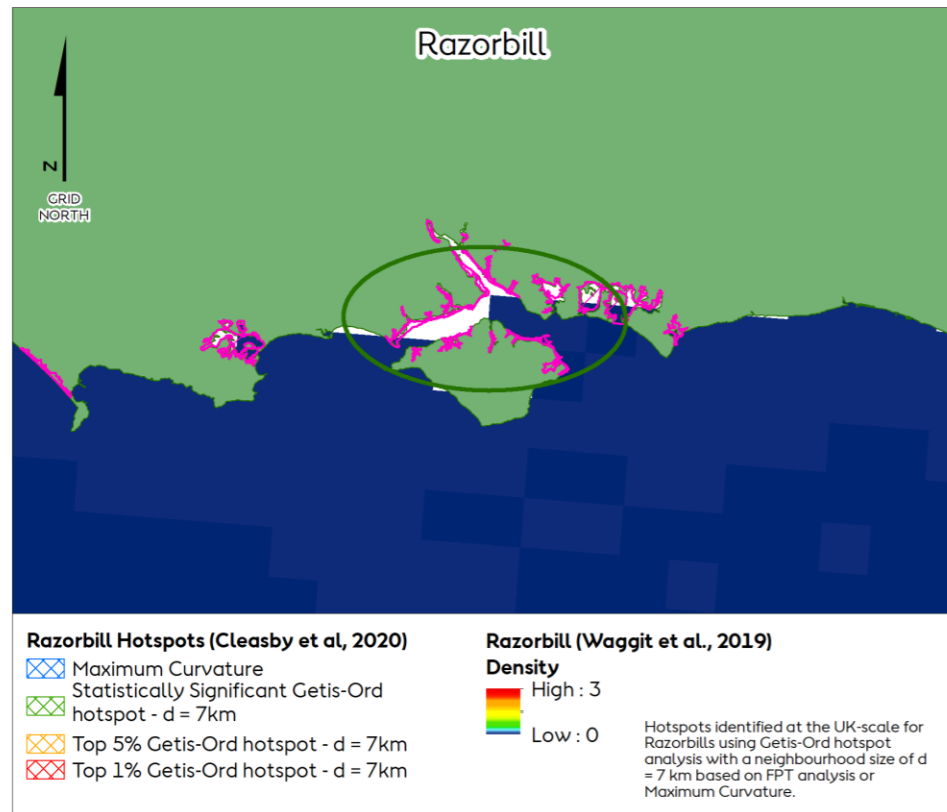
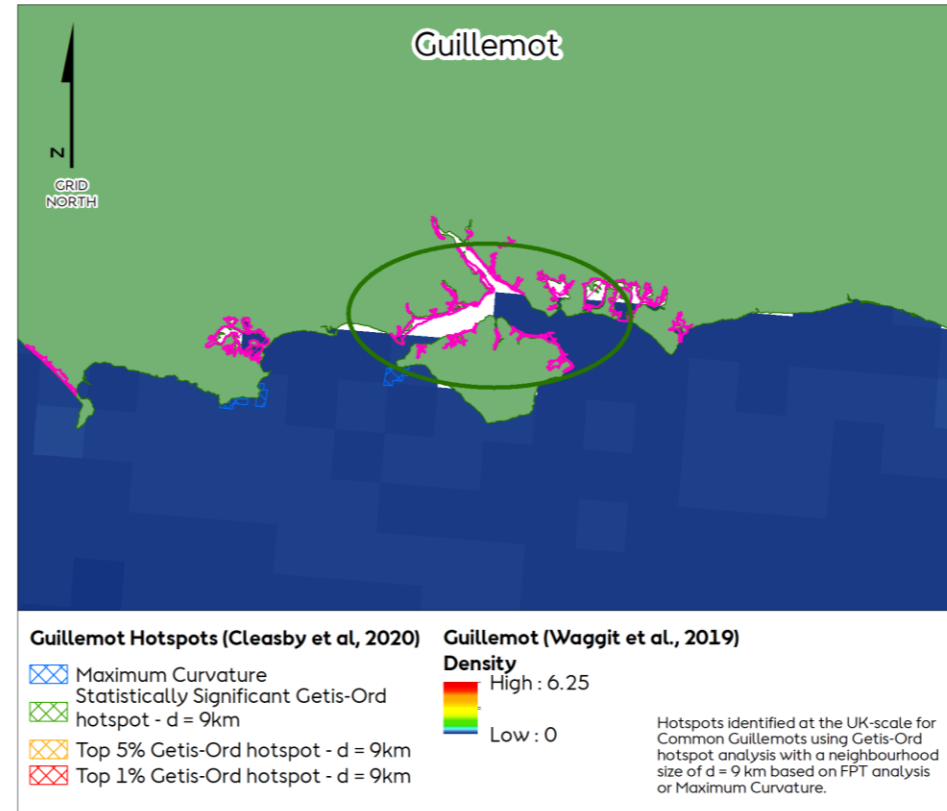
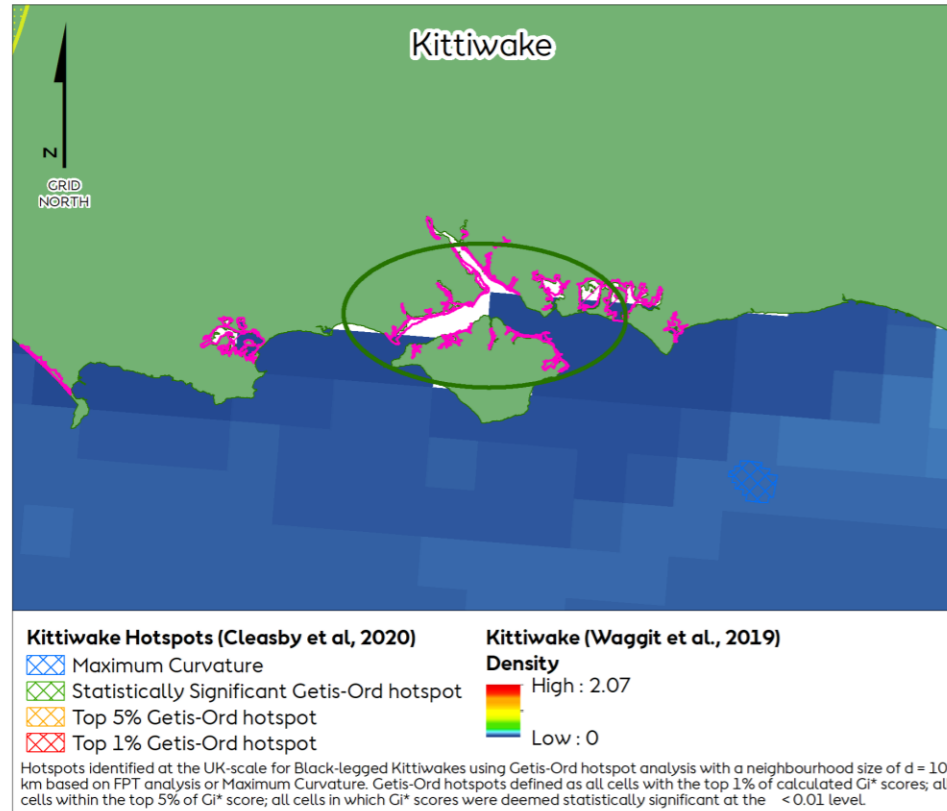
Estimated at-sea Distribution of Grey and Harbour Seals maps data from Sea Mammal Research Unit (SMRU) and Marine Scotland, 2017

Coordinate system: ETRS 1989 UTM Zone 31N

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Compensation Measures
Marine Mammals
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Figure 67: Resilience Measures Areas of Search Seagrass E5: The Solent Marine Mammals.



Hornsea Four

Compensation Measures
Areas of Search
Seagrass
E5: The Solent
Ornithology

- Special Protection Area (SPA) with Marine Components

Mean-Max Foraging Range (Woodward 2019)

- Common Guillemot - 73.2km Buffer
- Gannet - 315.2km Buffer
- Kittiwake - 156.1km Buffer
- Razorbill - 88.7km Buffer

Compensation Measures Areas of Search

- Seagrass

Waggitt et al 2019 densities data. Spatial variation in predicted densities (animals per km) of seabird species in July in the North-East Atlantic. Values are provided at 10km resolution.

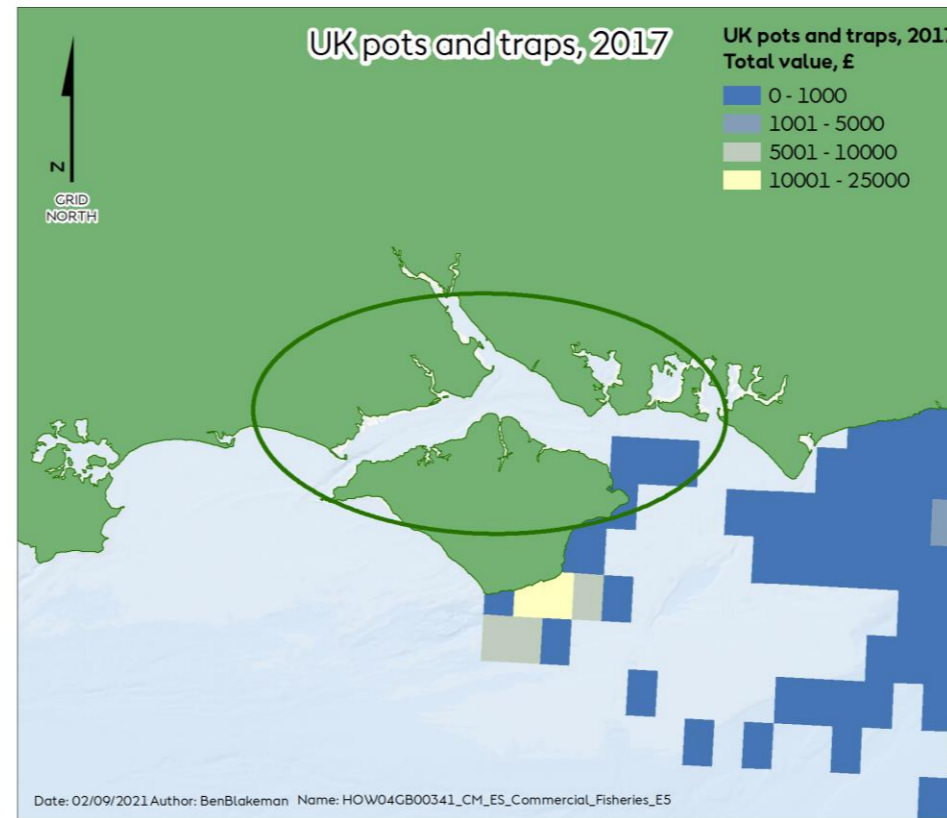
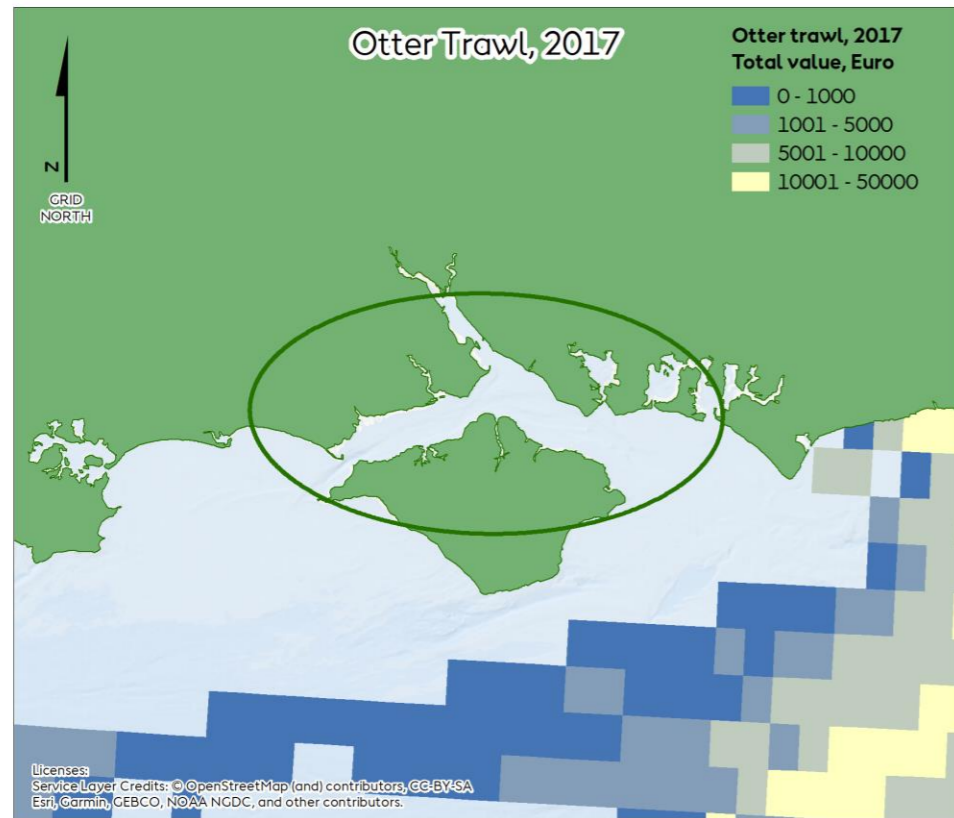
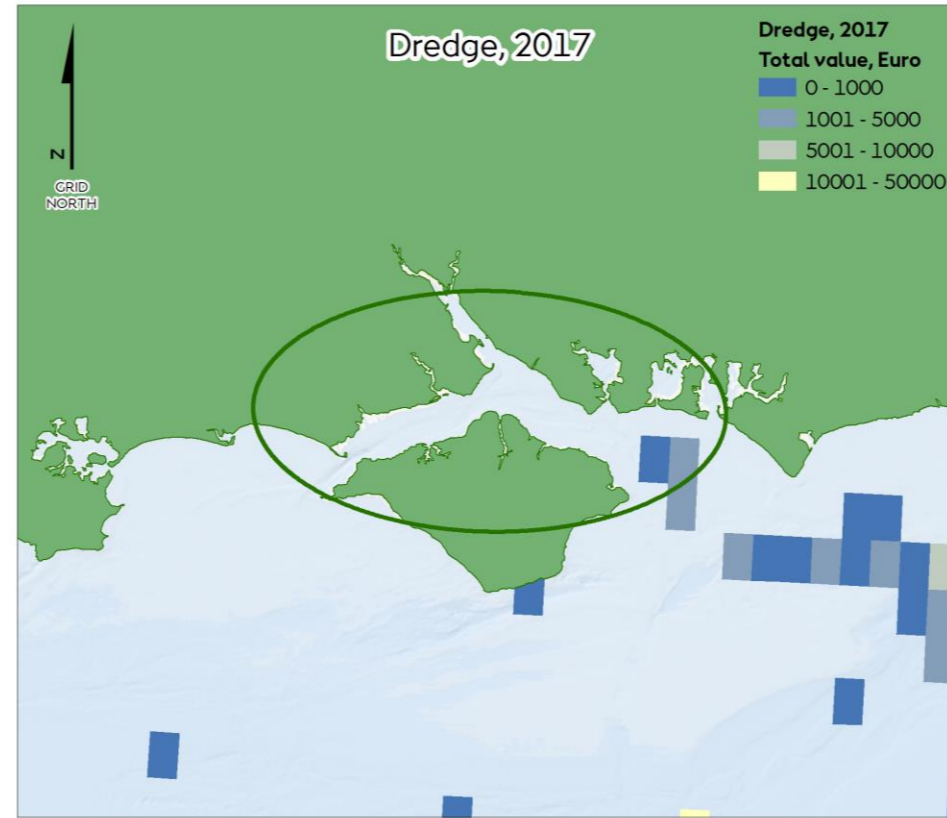
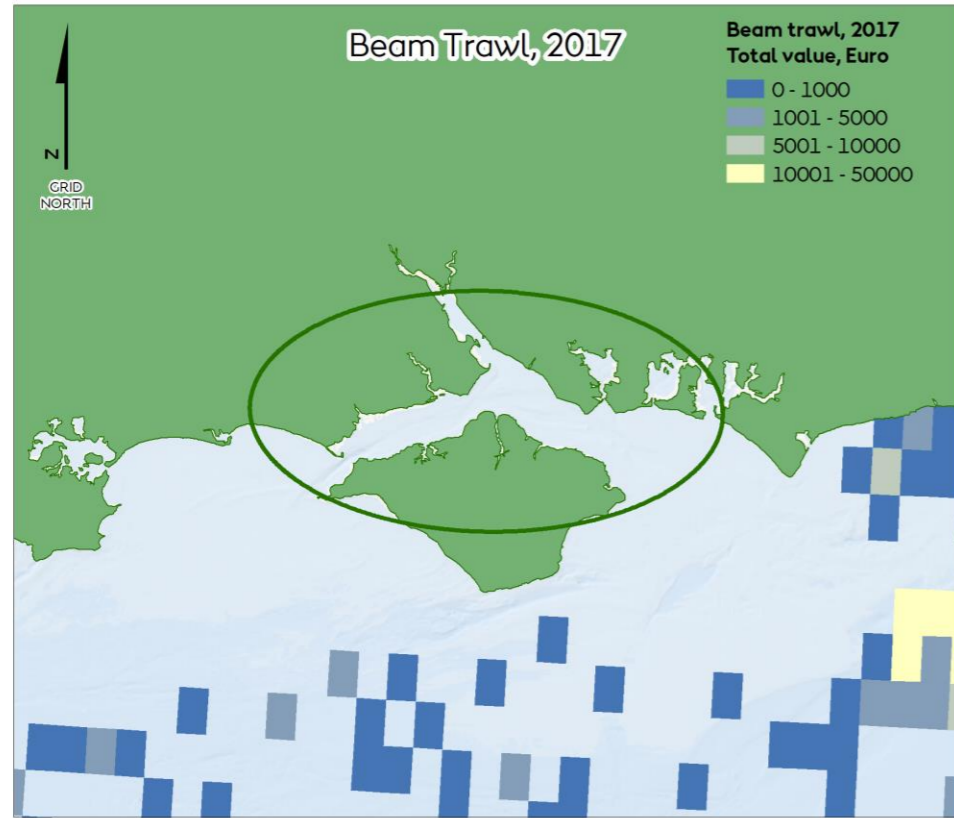
Coordinate system: ETRS 1989 UTM Zone 31N

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0 10 20 Nautical Miles

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Compensation Measures
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Figure 68: Resilience Measures Areas of Search Seagrass E5: The Solent Ornithology.



Hornsea Four

Compensation Measures
Areas of Search
Seagrass
E5: The Solent
Commercial Fisheries

Compensation Measures Areas of Search

- Seagrass

Coordinate system: ETRS 1989 UTM Zone 31N

0 20 40 Kilometres
0 10 20 Nautical Miles

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Compensation Measures
Commercial Fisheries
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Figure 69: Resilience Measures Areas of Search Seagrass E5: The Solent Commercial Fisheries.

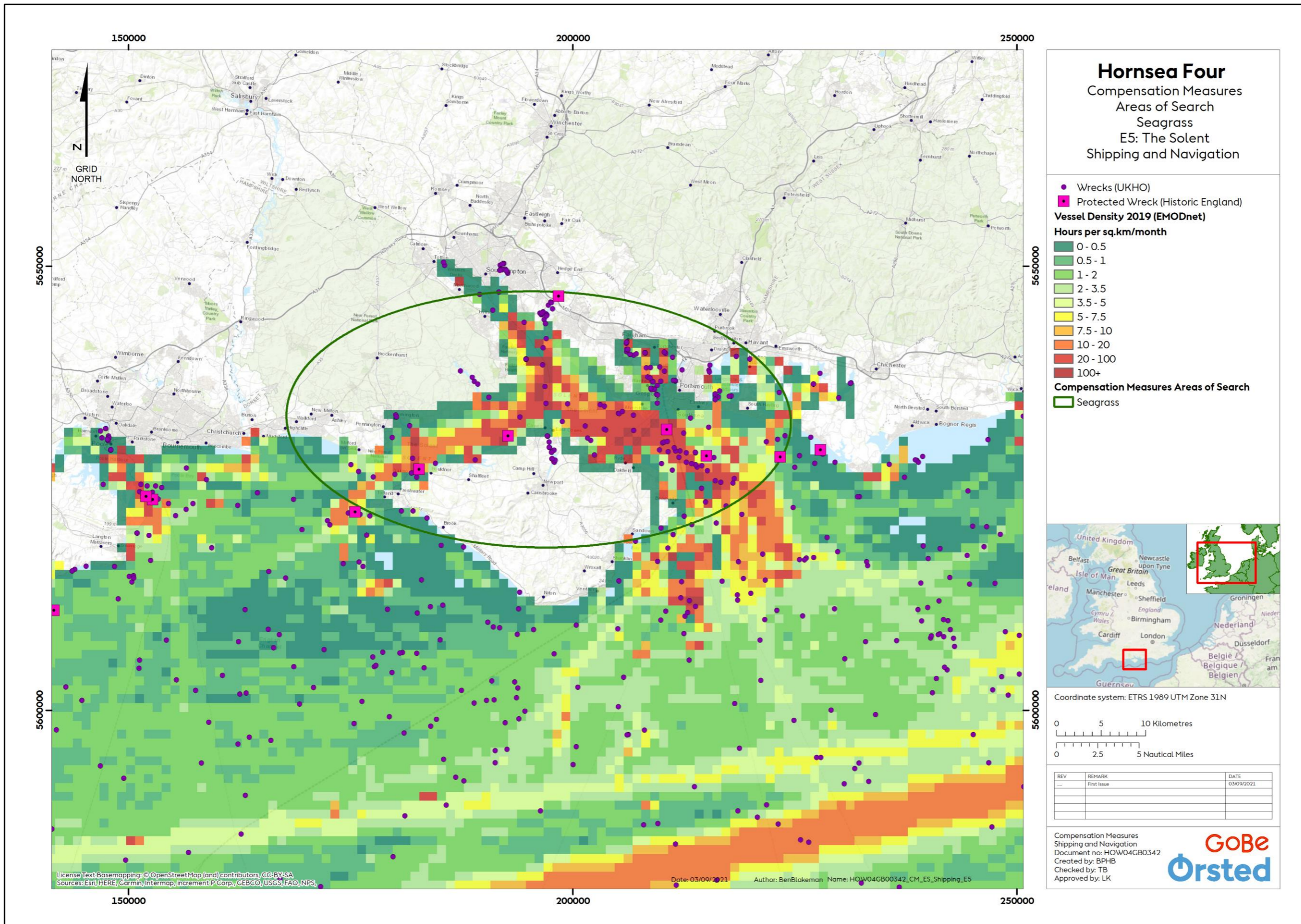


Figure 70: Resilience Measures Areas of Search Seagrass E5: The Solent Shipping and Navigation.

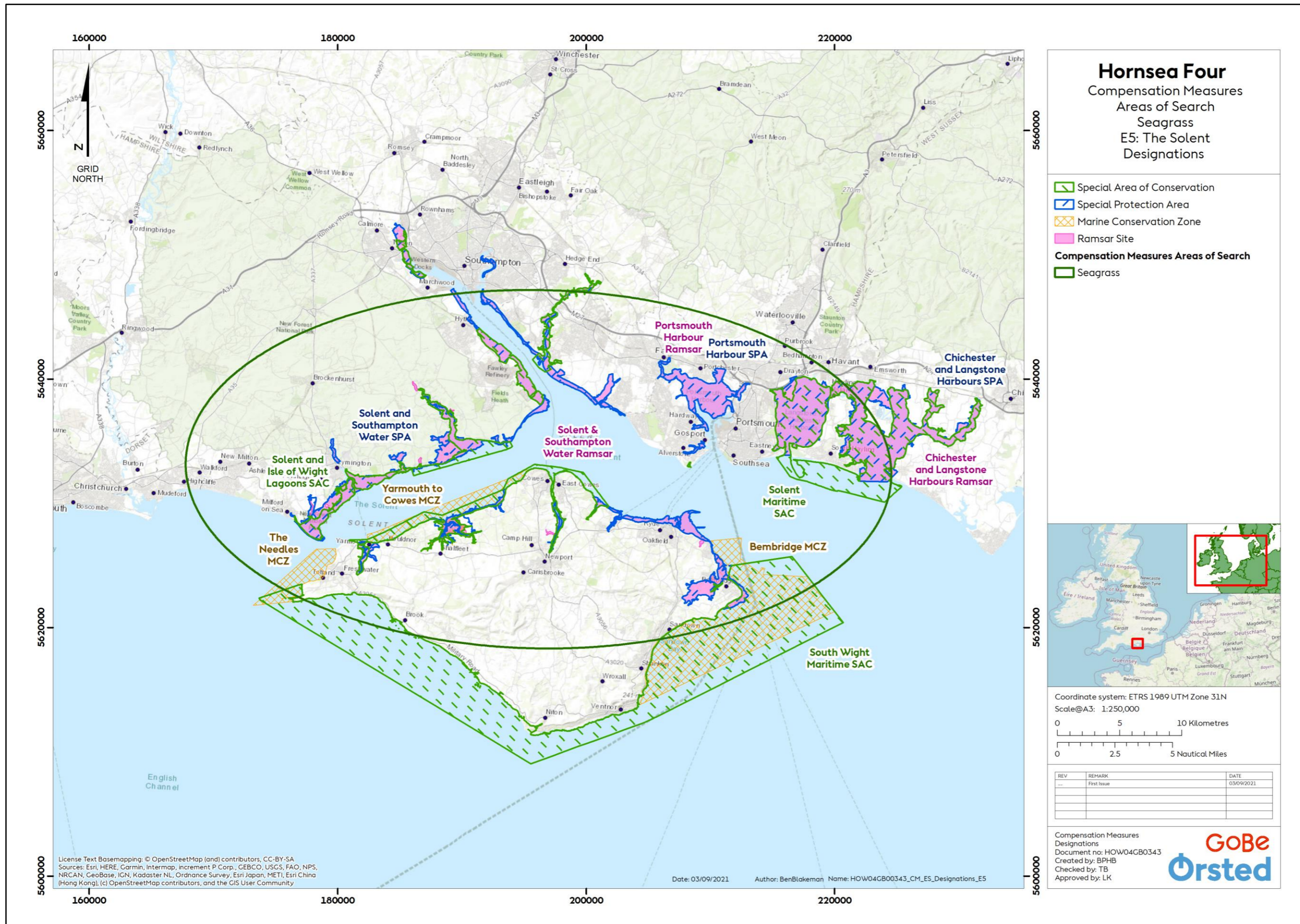
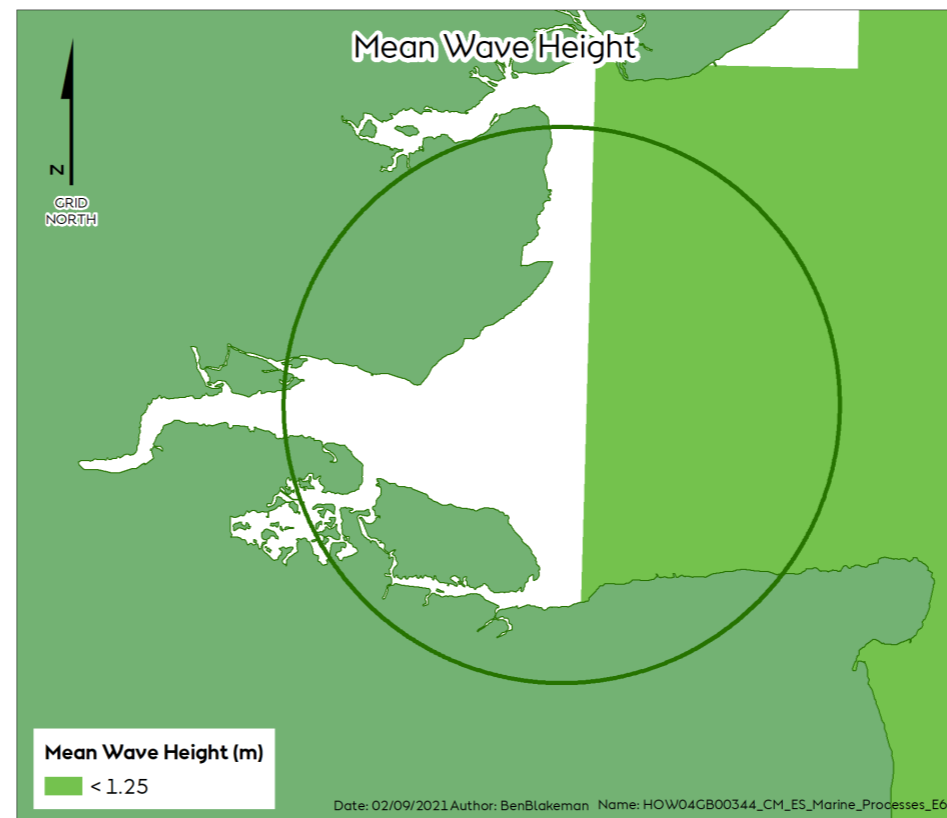
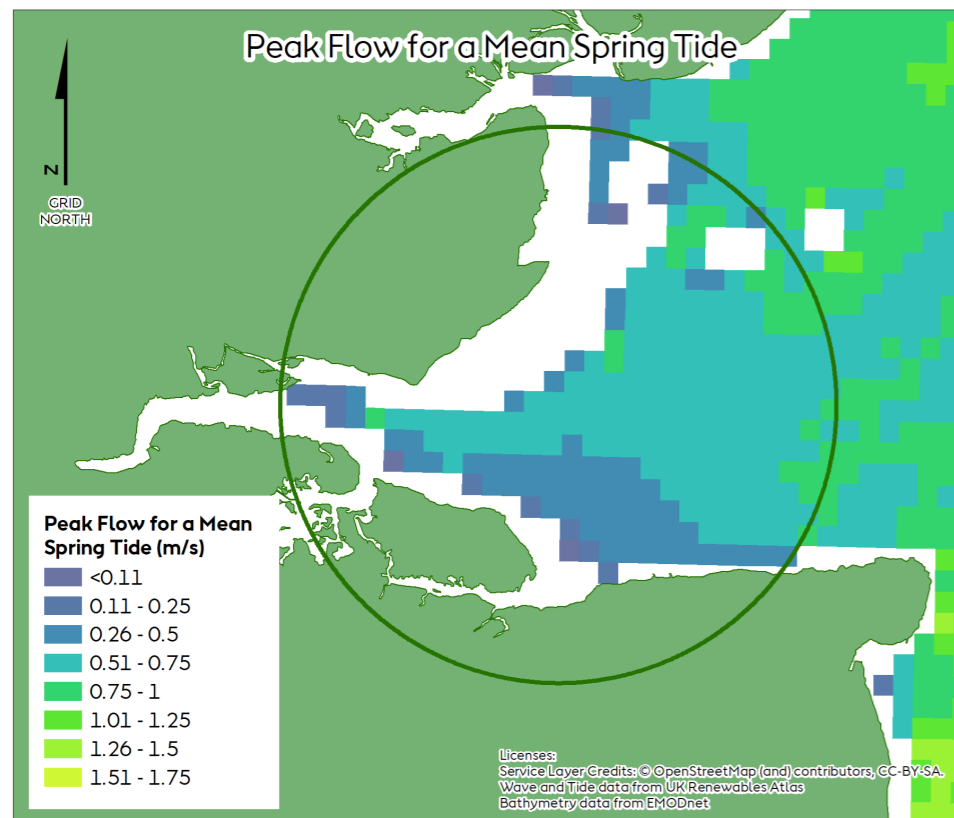
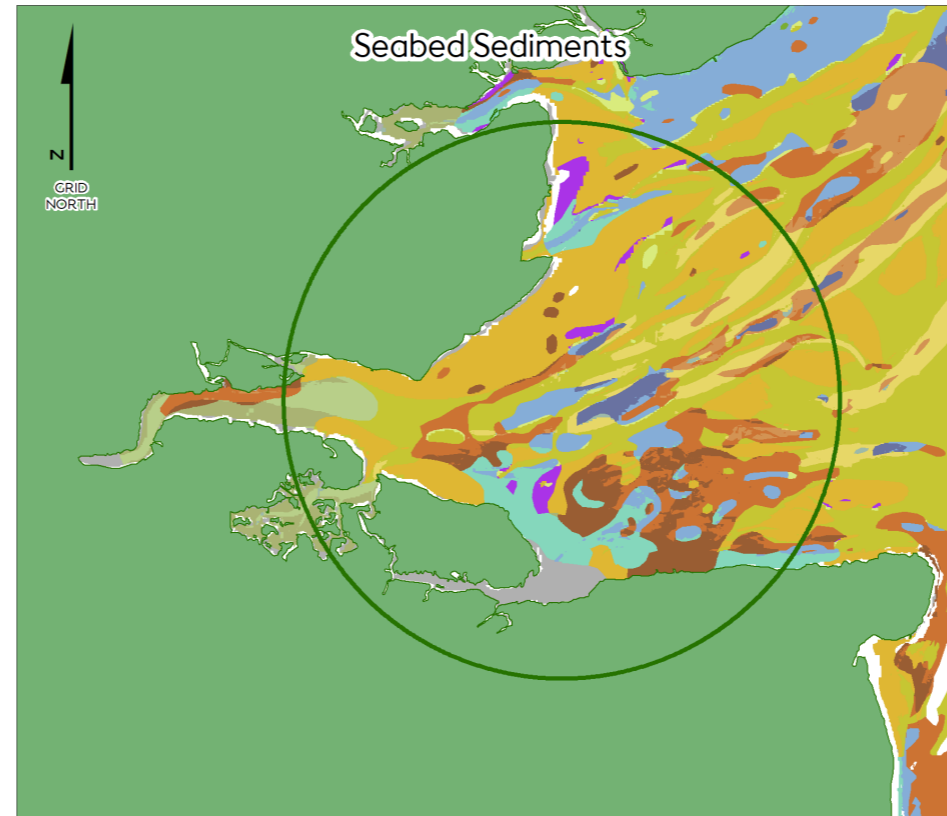
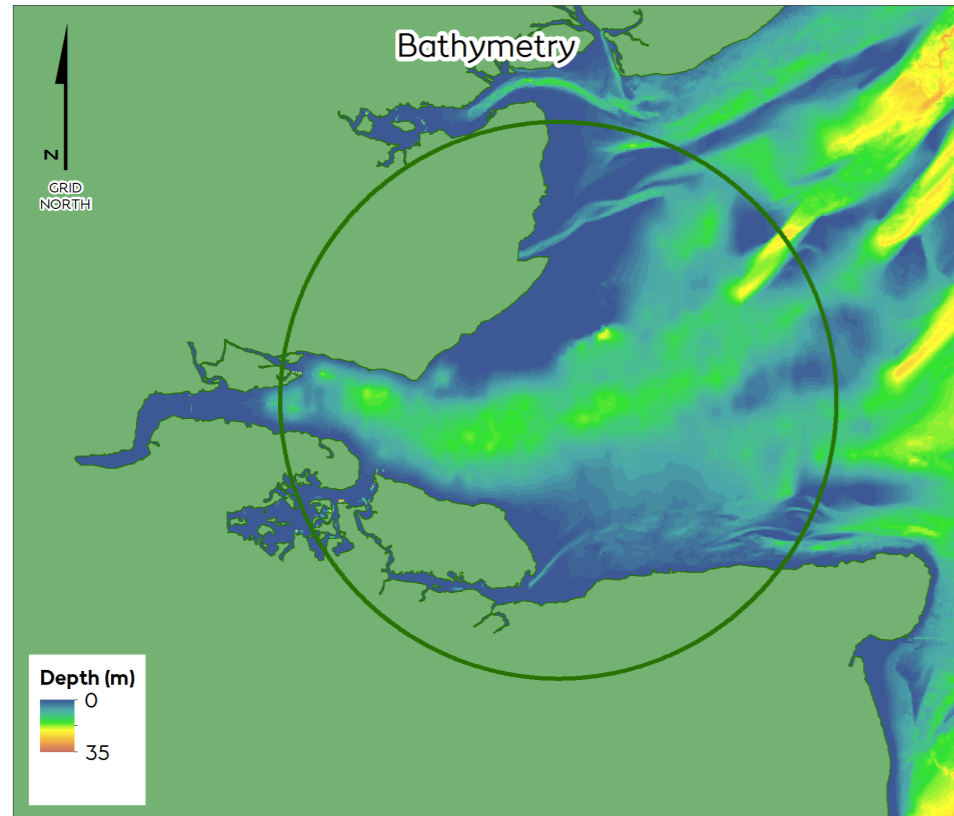


Figure 71: Resilience Measures Areas of Search Seagrass E5: The Solent Designations.

Table 17: Summary of baseline environment in relation to the Area of Search E6 (Essex Estuaries) for resilience measure - fish habitat enhancement (seagrass).

Topic	Summary of Baseline Environment
Marine Geology, Oceanography and Physical Processes	<p>The baseline environment for physical processes is illustrated in Figure 72.</p> <ul style="list-style-type: none"> The Thames can be broadly defined into the Inner and Outer Estuary, with the Inner Estuary extending upstream from the point of widening at Shoebury Ness (Southend) to the tidal limit at Teddington Weir (ABP Marine, 2014). Seabed sediments vary within the AoS between coarse, mixed and sandy sediments with patches of mud and muddy sand.
Benthic and Intertidal Ecology	<p>The baseline environment for benthic ecology is illustrated in Figure 73.</p> <ul style="list-style-type: none"> A variety of sediment types are present in this area, ranging from fine muds and sands, mixed and coarse sediments. Patches of deeper coarse sediment and rock extend further away from the coast. Species of interest include St John's jellyfish, lagoon sand shrimp, starlet sea anemone, lagoon sea slug, tentacled lagoon worm, ocean quahog and native oyster. Habitats of interest include blue mussel beds, estuarine rocky habitats, intertidal boulder communities, littoral chalk communities, ross worm reefs, seagrass beds, sheltered muddy gravel, tide swept channels, subtidal sand and gravels, subtidal chalk, and includes intertidal mudflats covering much of the Thames Estuary. Numerous SACs and MCZs designated for benthic habitats and features are present within the Thames Estuary.
Fish and Shellfish Ecology	<p>The baseline environment for fish and shellfish ecology is illustrated in Figure 74.</p> <ul style="list-style-type: none"> The AoS is an ecologically diverse and important habitat and nurseries for marine fish (McGoran, 2018). The AoS supports several spawning and nursery areas for species including herring, sole, sandeel, cod, mackerel, plaice and dab.
Marine Mammals	<p>The baseline environment for marine mammals is illustrated in Figure 75.</p> <ul style="list-style-type: none"> The most common marine mammals within the AoS include harbour porpoise (<i>Phocoena phocoena</i>), bottlenose dolphin (<i>Tursiops truncatus</i>), harbour seal (<i>Phoca vitulina</i>), and grey seal (<i>Halichoerus grypus</i>). The Harbour porpoise is the most numerous marine mammal within the area (Marine Aggregate Levy Sustainability Fund (MALSF), 2009). It is reported that the largest group of harbour seals in the study area can be found on the haul out site located on Foulness Sands and Buxey Sands at the mouth of the River Crouch (Duck, 1998). Although grey seals do not regularly breed or haul out in the region, very small numbers are occasionally seen, with the closest regular haul-out sites located at Horsey, Norfolk, Scroby Sands, Norfolk and St. Margaret's at Cliffe, Kent (Duck, 1998; SCOS, 2007).
Offshore and Intertidal Ornithology	<p>The baseline environment for offshore ornithology is illustrated in Figure 76.</p> <ul style="list-style-type: none"> Within the AoS there are several SPAs with offshore ornithology designated features including the Outer Thames Estuary SPA. Within the AoS there are ten SPAs with offshore ornithology designated features. The brent goose (<i>branta bernicla bernicla</i>) was the most widespread species, known to be at eight of the ten sites. Common ringer plover (<i>Charadrius hiaticula</i>), grey plover (<i>Pluvialis squatarola</i>), and little tern (<i>Sterna albifrons</i>) are also widespread in the AoS, being present at six of the eight sites each.

Topic	Summary of Baseline Environment
Commercial Fisheries	<p>The baseline environment for commercial fisheries is illustrated in Figure 77.</p> <ul style="list-style-type: none"> The AoS supports an important commercial fishing industry providing high quality fresh products to both local and European markets. The estuary now provides over 50% of all UK cockle landings and significant catches of sole as well as herring, sprat, thornback ray, bass, grey mullet and cod. The large populations of cockles are maintained at a sustainable level by the Kent and Essex Sea Fisheries Committee under a Regulating Order and other fisheries are controlled under EU and national legislation (Richardson and Soloviev, 2021). As shown on Figure 77, the key methods of fishing in the AoS are dredging, potting and trapping.
Shipping and Navigation	<p>The baseline environment for shipping and navigation is illustrated in Figure 78.</p> <ul style="list-style-type: none"> London has served as a major port since Roman times and currently handles over 30,000 commercial vessel movements per year. The estuary connects the London conurbation to the North Sea. The vessel density in the southern North Sea varies from 1 to >250,000 route(s)/ 0.31 km²/ year. There are several high-density shipping lanes in the region, with the primary route goes from the city of London out into the open estuary, with several routes heading Northeast along the coast and several heading east, joining the other major shipping lanes in the southern North Sea.
Marine Archaeology	<p>The baseline environment for marine archaeology is illustrated in Figure 78.</p> <ul style="list-style-type: none"> Within the AoS, there are many different types of archaeological features including both ship and aircraft wrecks.



Hornsea Four

Compensation Measures
Areas of Search
Seagrass
E6: Essex Estuaries
Marine Processes

Compensation Measures Areas of Search

- Seagrass

EUNIS Habitats (UKSeaMap 2018)

- A5.13: Infralittoral coarse sediment
- A5.14: Circalittoral coarse sediment
- A5.15: Deep circalittoral coarse sediment
- A5.23 or A5.24: Infralittoral fine sand or infralittoral muddy sand
- A5.25 or A5.26: Circalittoral fine sand or circalittoral muddy sand
- A5.27: Deep circalittoral sand
- A5.33 or A5.34: Infralittoral sandy mud or infralittoral fine mud
- A5.33: Infralittoral sandy mud
- A5.35 or A5.36: Circalittoral sandy mud or circalittoral fine mud
- A5.35: Circalittoral sandy mud
- A5.36: Circalittoral fine mud
- A5.37: Deep circalittoral mud
- A5.43: Infralittoral mixed sediments
- A5.44: Circalittoral mixed sediments
- A5.45: Deep circalittoral mixed sediments
- No EUNIS habitat assigned

Coordinate system: ETRS 1989 UTM Zone 31N

0 10 20 Kilometres
0 5 10 Nautical Miles

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Compensation Measures
Marine Processes
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Figure 72: Resilience Measures Areas of Search Seagrass E6: Essex Estuaries Marine Processes.

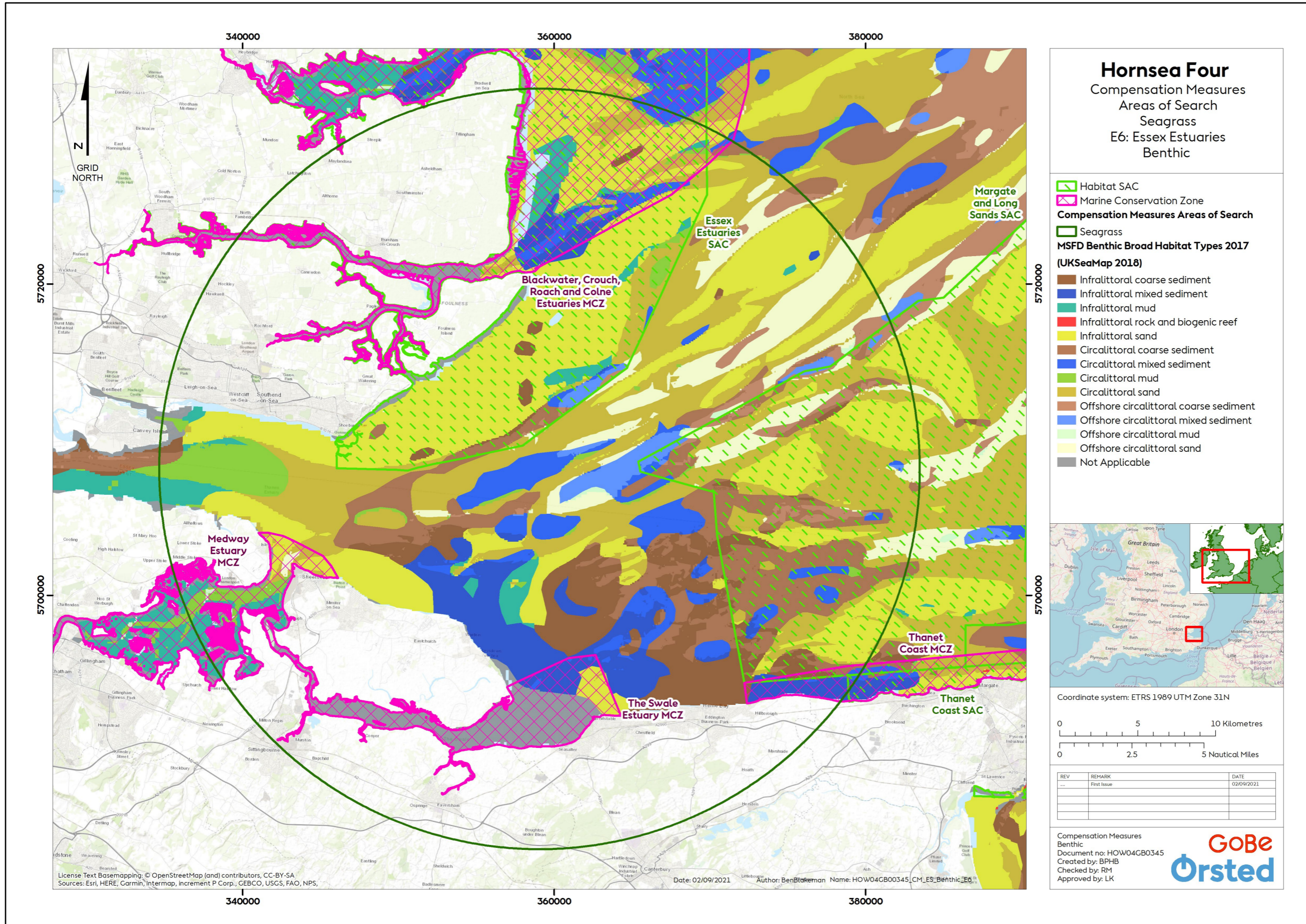


Figure 73: Resilience Measures Areas of Search Seagrass E6: Essex Estuaries Benthic.

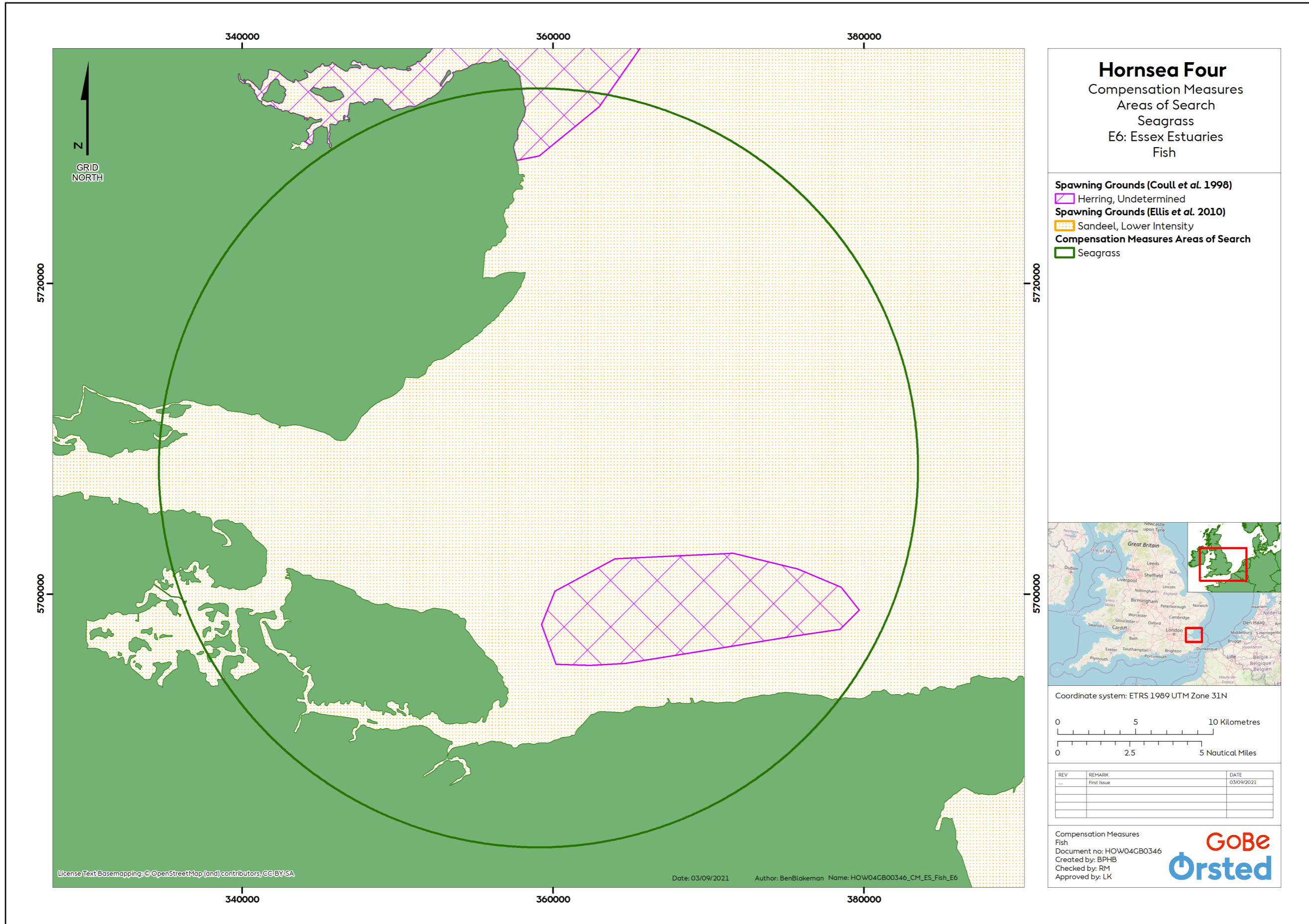
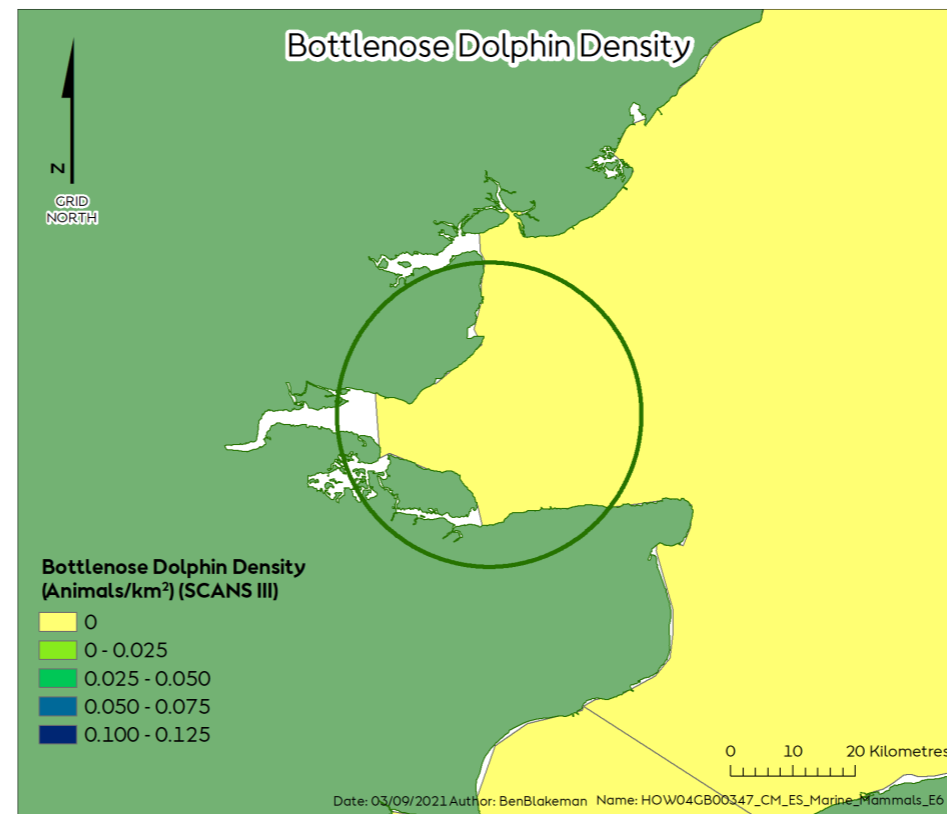
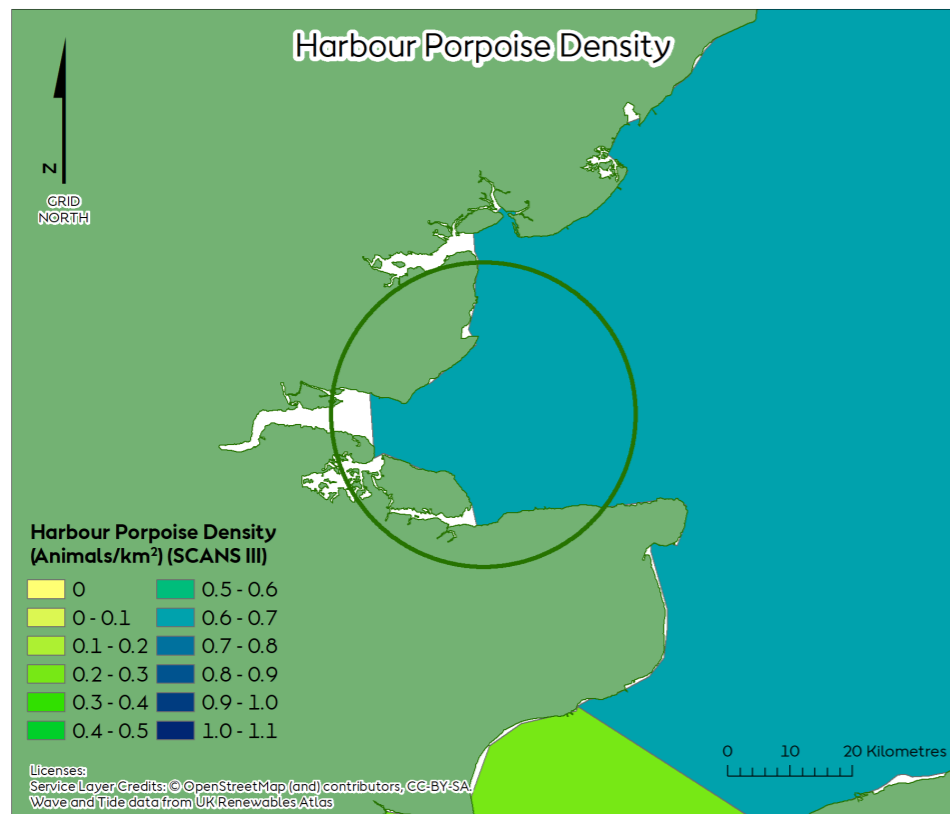
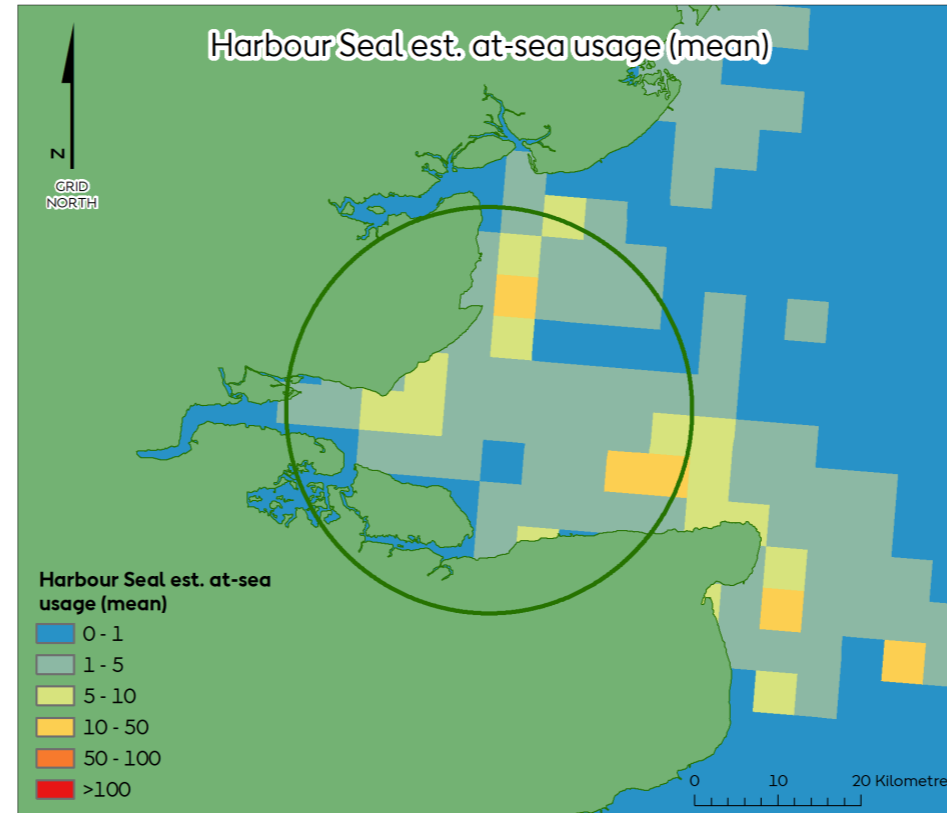
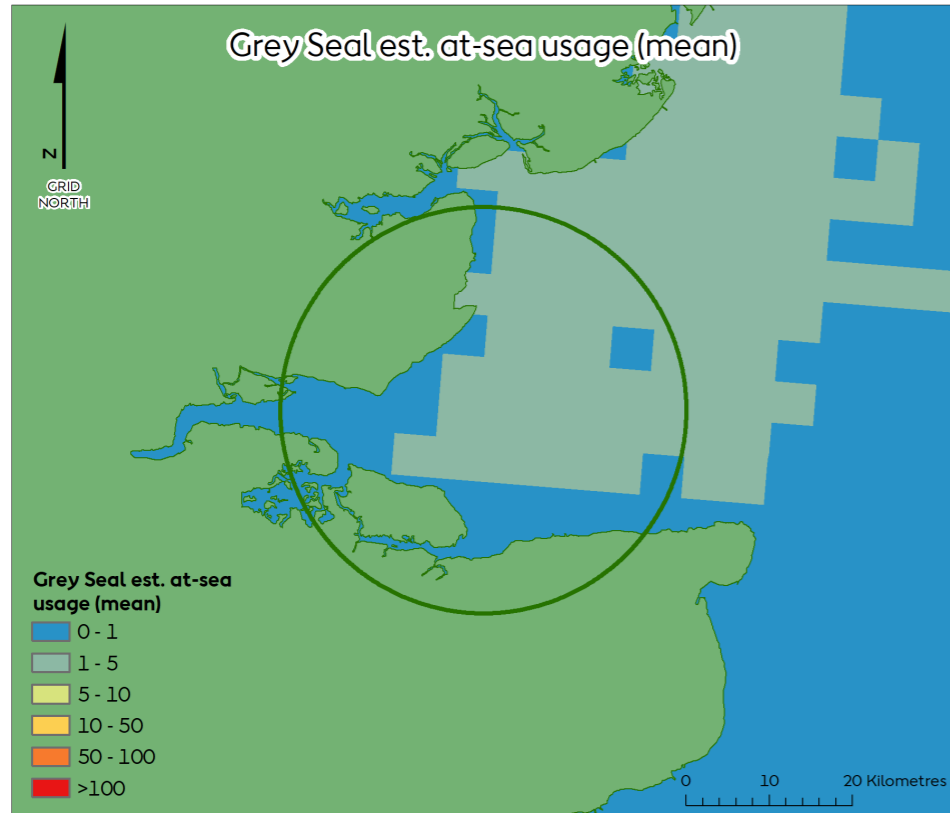


Figure 74: Resilience Measures Areas of Search Seagrass E6: Essex Estuaries Fish.



Hornsea Four

Compensation Measures
Areas of Search
Seagrass
E6: Essex Estuaries
Marine Mammals

Compensation Measures Areas of Search

Seagrass

Estimated at-sea Distribution of Grey and Harbour Seals maps data from Sea Mammal Research Unit (SMRU) and Marine Scotland, 2017



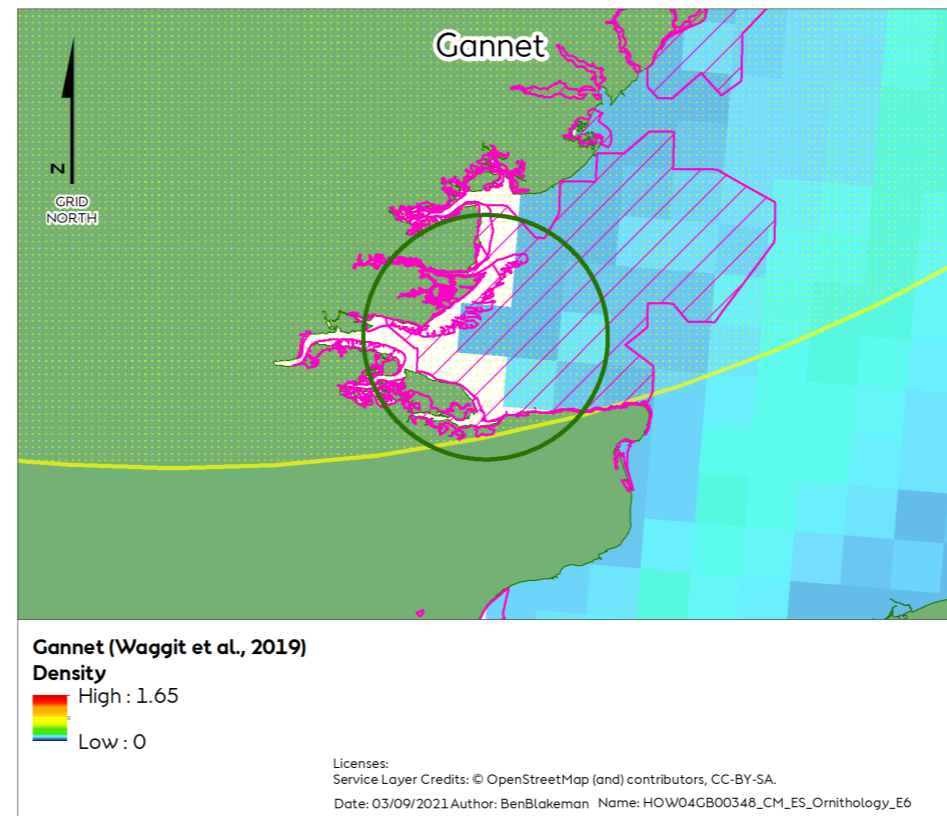
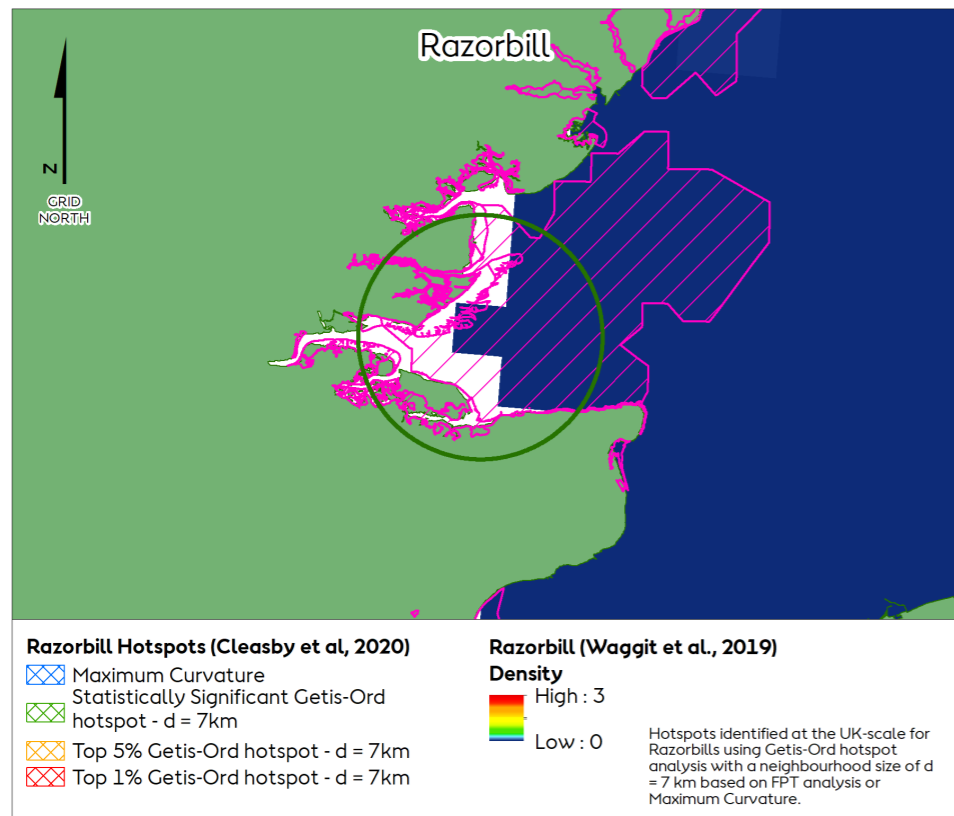
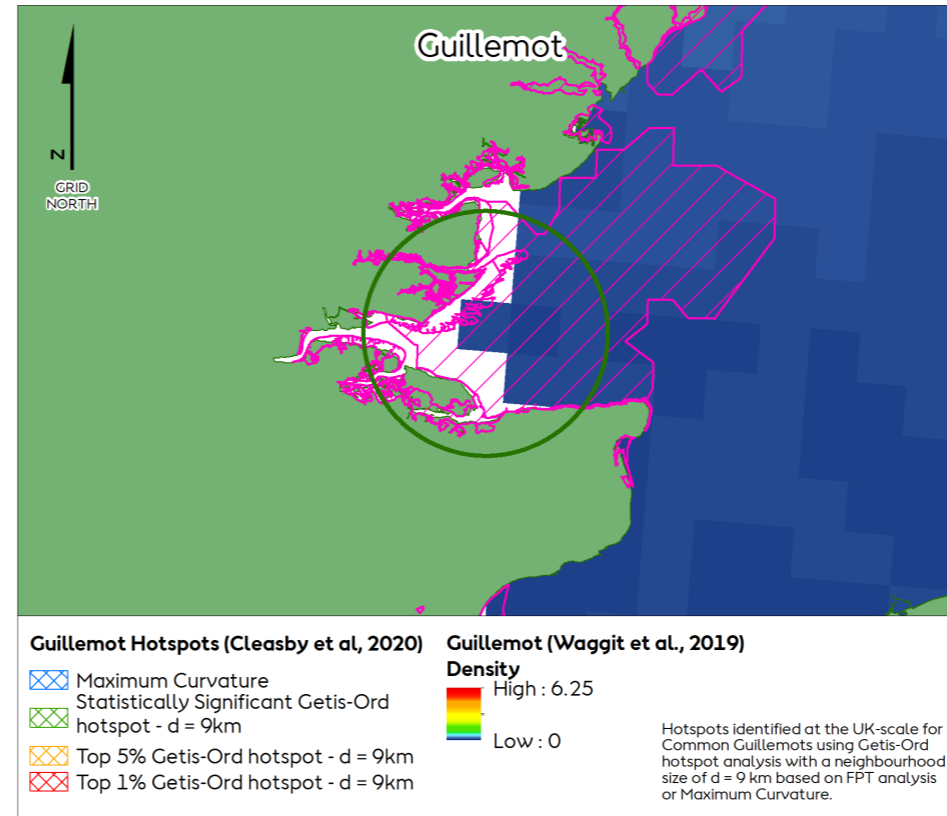
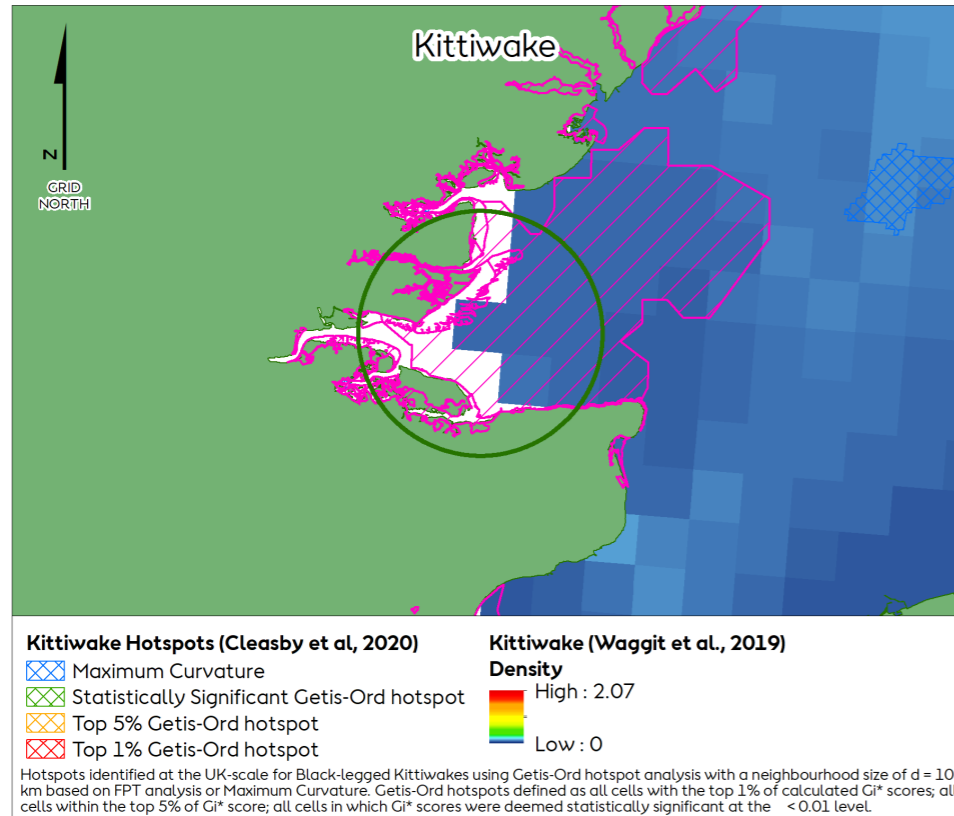
Coordinate system: ETRS 1989 UTM Zone 31N

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Compensation Measures
Marine Mammals
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Figure 75: Resilience Measures Areas of Search Seagrass E6: Essex Estuaries Marine Mammals.



Hornsea Four Compensation Measures Areas of Search Seagrass E6: Essex Estuaries Ornithology

- Special Protection Area (SPA) with Marine Components

Mean-Max Foraging Range (Woodward 2019)

- Common Guillemot - 73.2km Buffer
- Gannet - 315.2km Buffer
- Kittiwake - 156.1km Buffer
- Razorbill - 88.7km Buffer

Compensation Measures Areas of Search

- Seagrass

Waggitt et al 2019 densities data. Spatial variation in predicted densities (animals per km) of seabird species in July in the North-East Atlantic. Values are provided at 10km resolution.

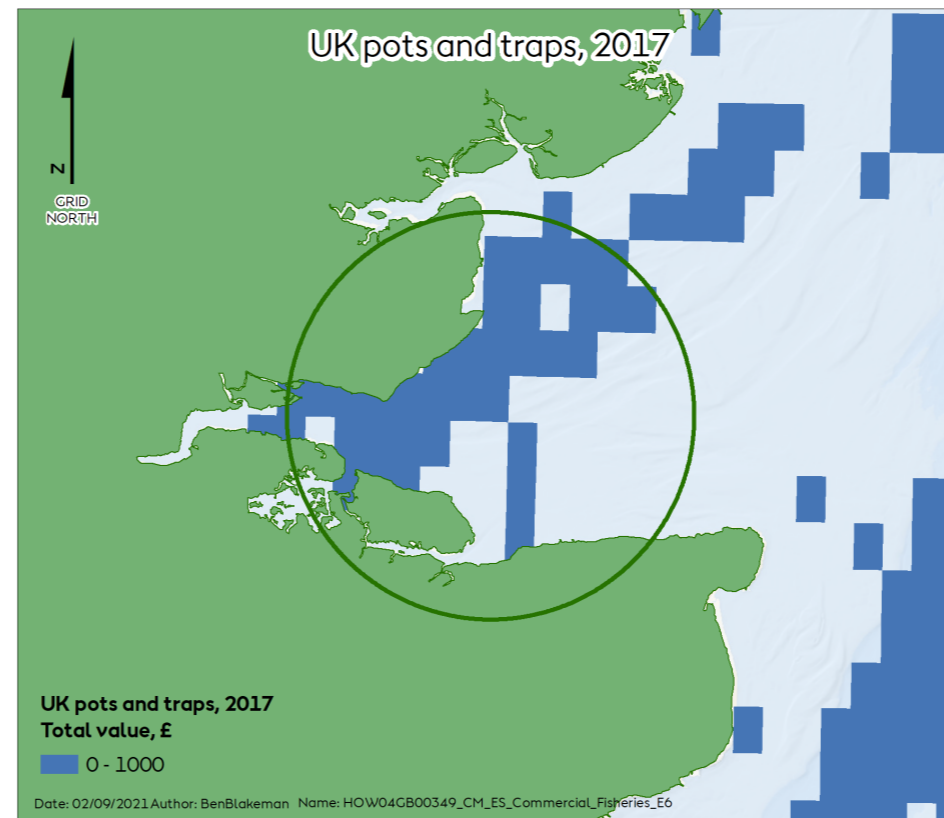
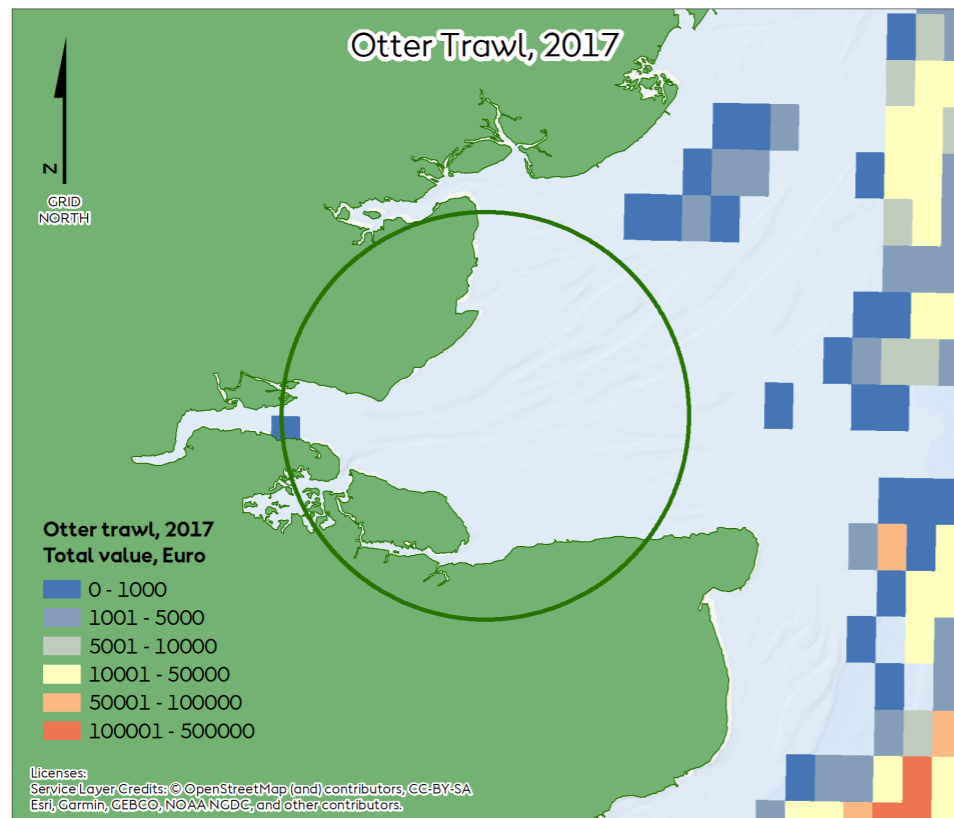
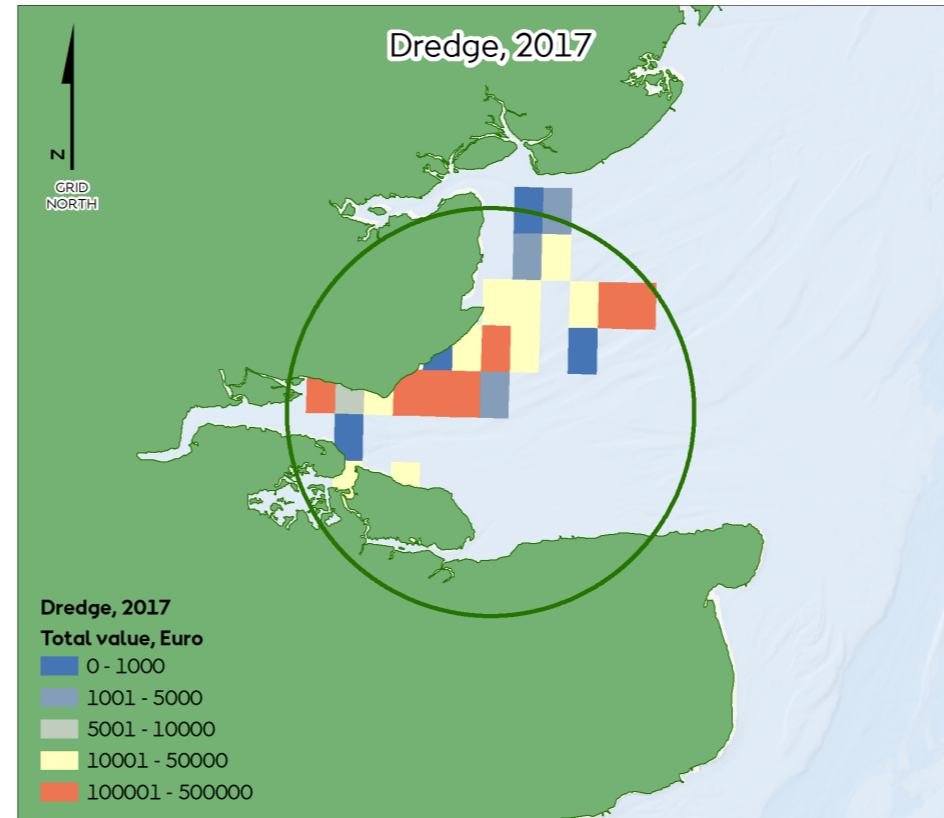
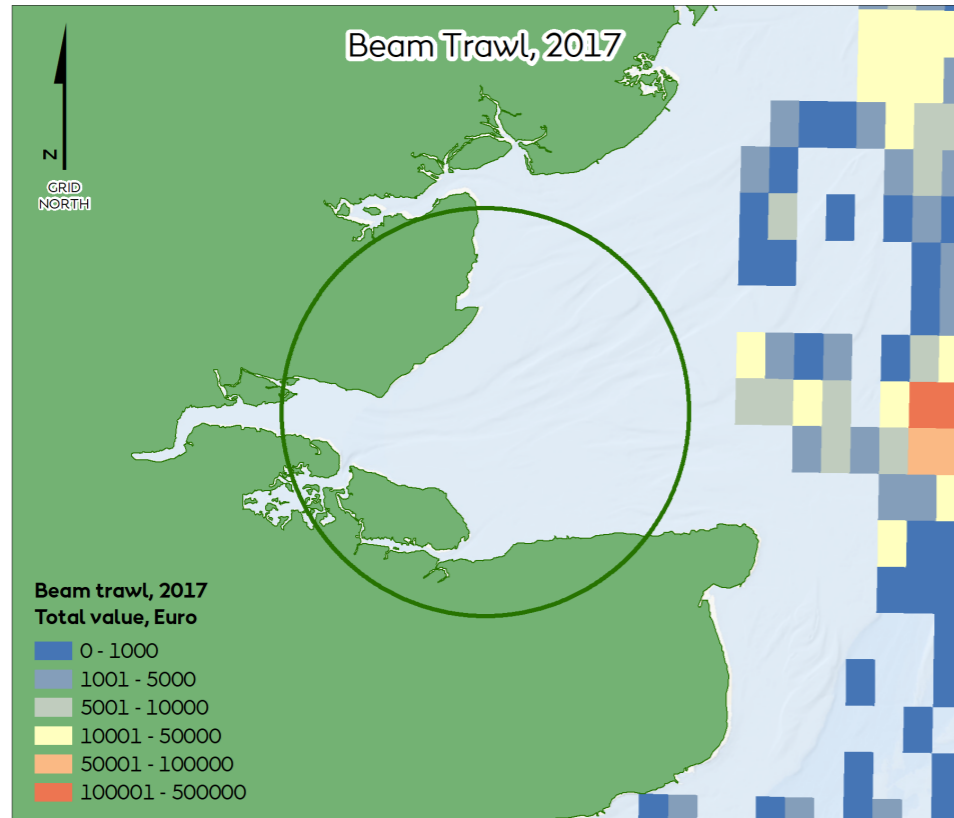
Coordinate system: ETRS 1989 UTM Zone 31N

0 25 50 Kilometres
0 10 20 Nautical Miles

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Compensation Measures Ornithology
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Figure 76: Resilience Measures Areas of Search Seagrass E6: Essex Estuaries Ornithology.



Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E6: Essex Estuaries
Commercial Fisheries

Compensation Measures Areas of Search
Seagrass

Coordinate system: ETRS 1989 UTM Zone 31N

0 20 40 Kilometres
0 10 20 Nautical Miles

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Compensation Measures
Commercial Fisheries
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Figure 77: Resilience Measures Areas of Search Seagrass E6: Essex Estuaries Commercial Fisheries.

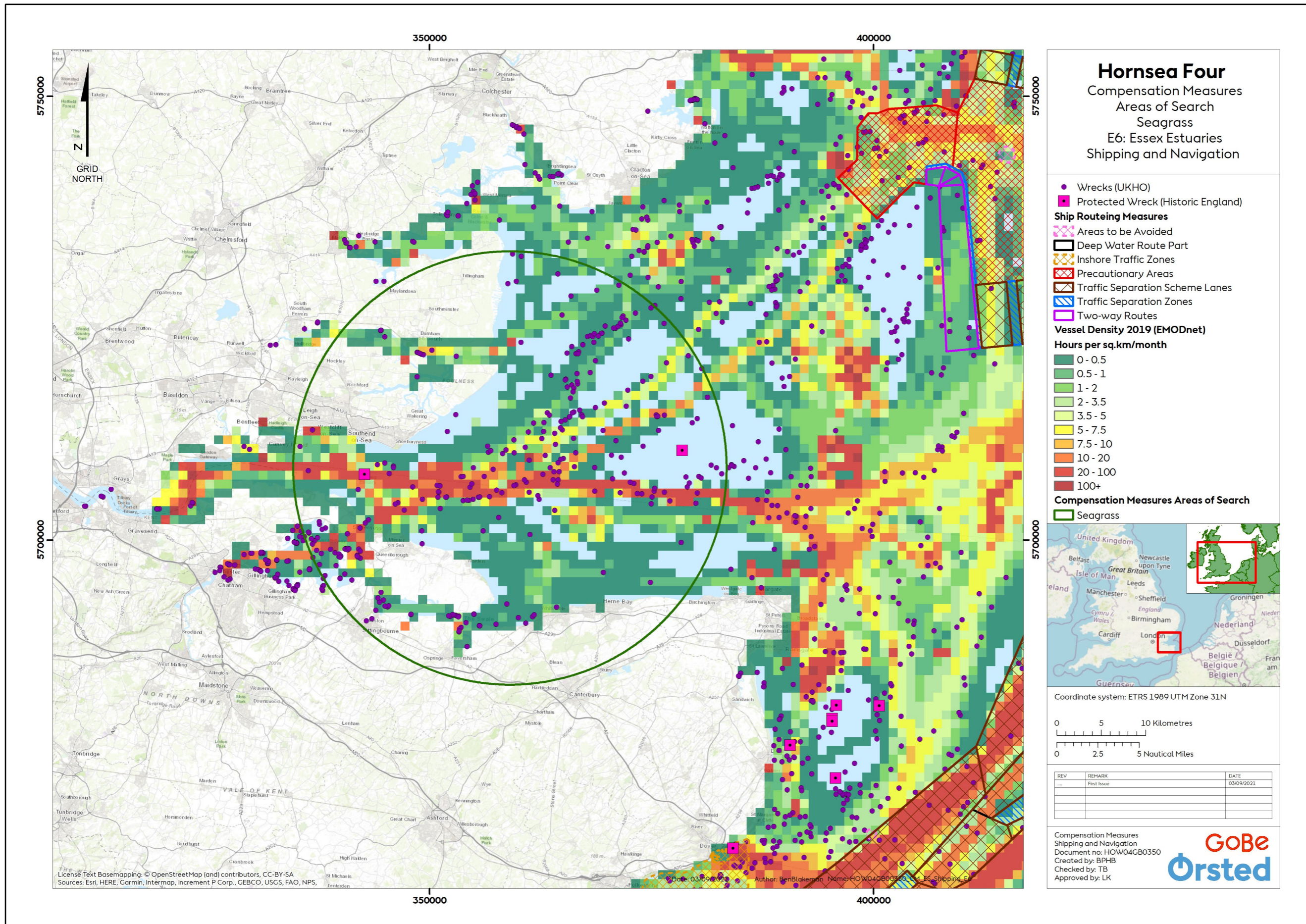


Figure 78: Resilience Measures Areas of Search Seagrass E6: Essex Estuaries Shipping and Navigation.

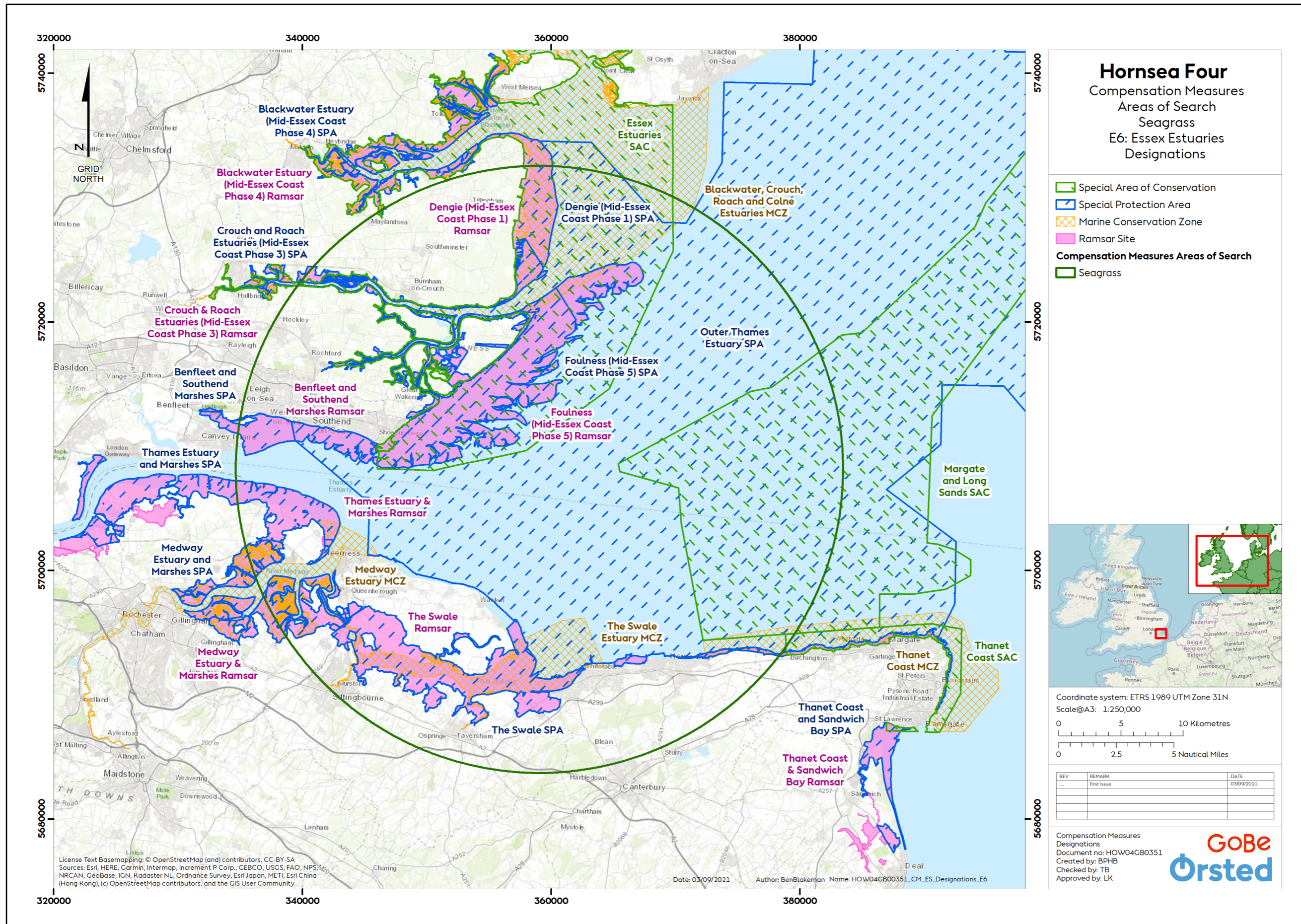
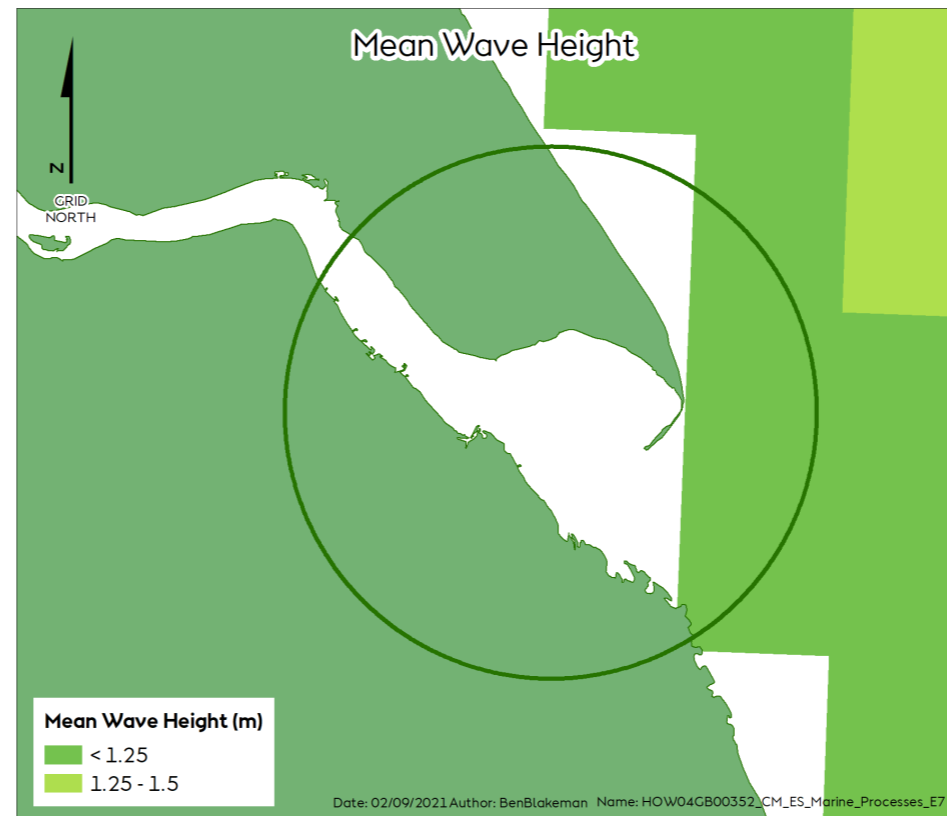
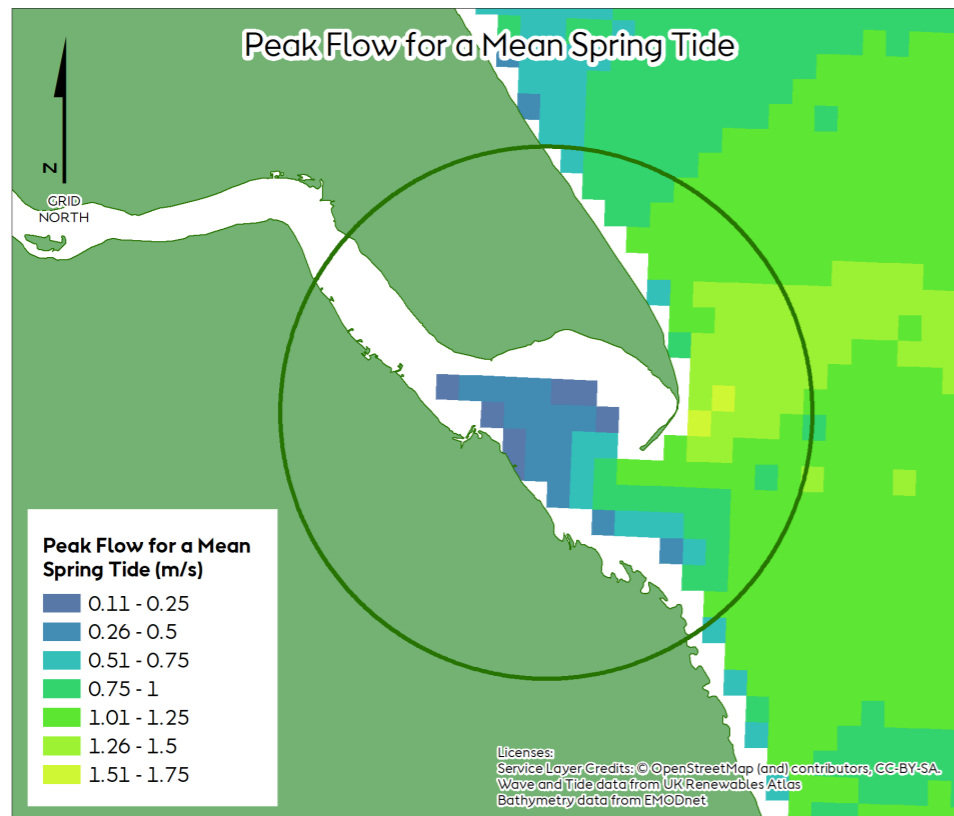
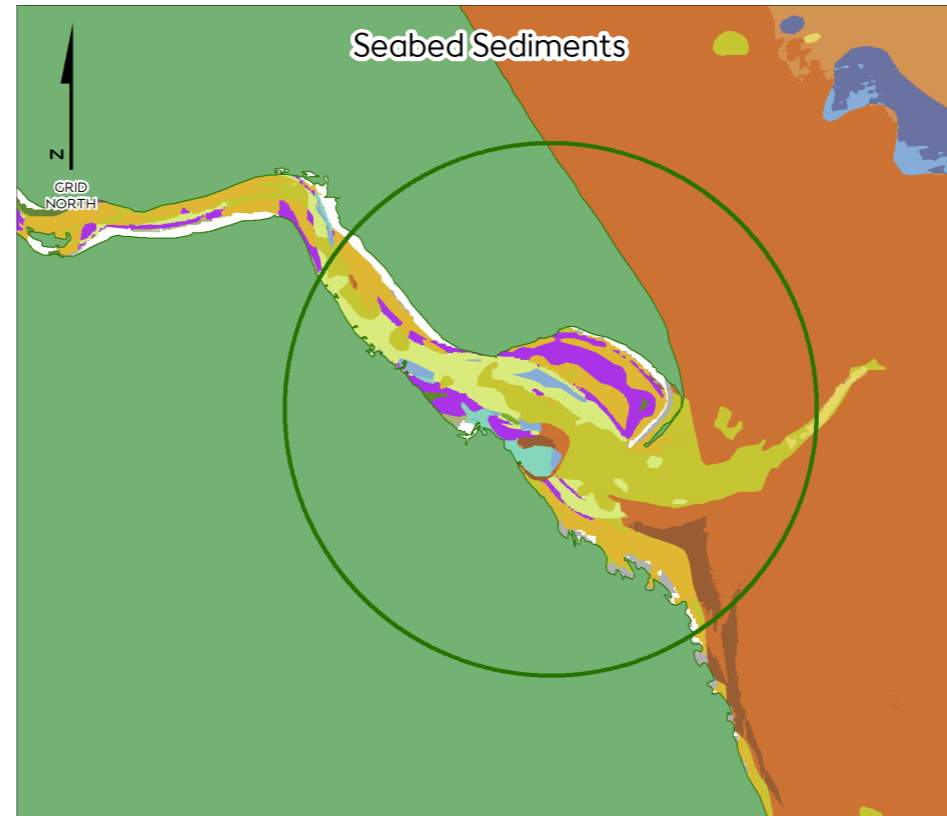
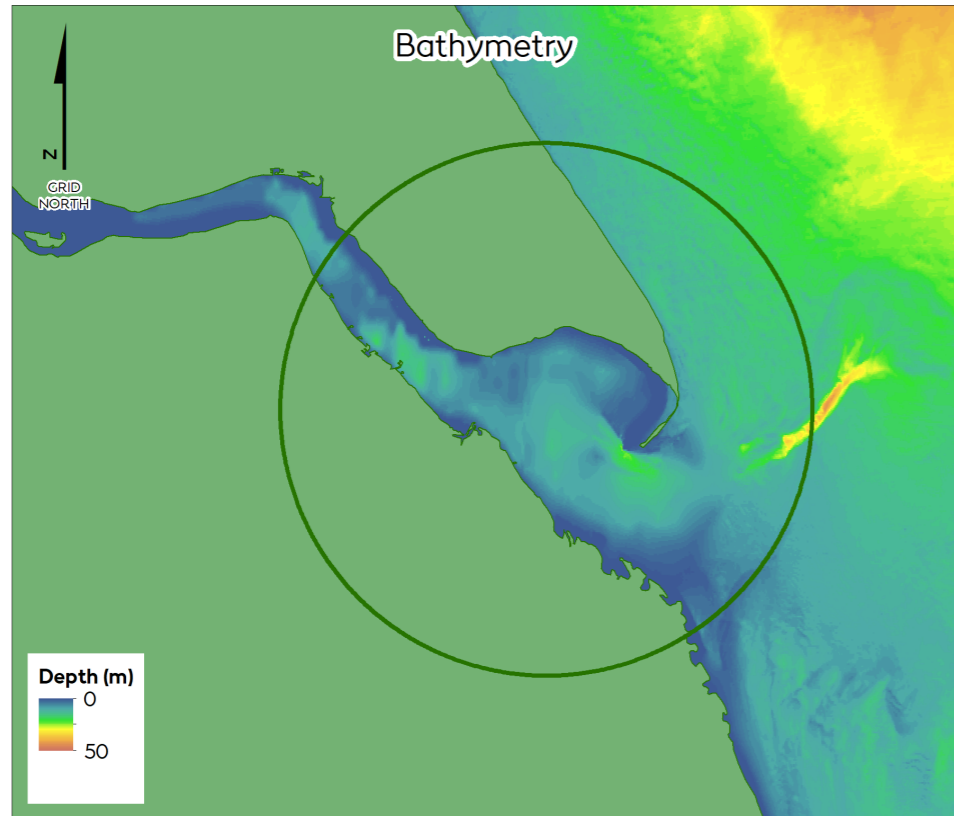


Figure 79: Resilience Measures Areas of Search Seagrass E6: Essex Estuaries Designations.

Table 18: Summary of baseline environment in relation to the Area of Search E7 (Humber Estuary) for resilience measure - fish habitat enhancement (seagrass).

Topic	Summary of Baseline Environment
Marine Geology, Oceanography and Physical Processes	<p>The baseline environment for physical processes is illustrated in Figure 80.</p> <ul style="list-style-type: none"> The AoS coastline is dominated by Spurn Head, a dynamic 5.5 km sand and gravel spit at the mouth of the Humber and the position of which is controlled by a deep water channel in the estuary mouth (HADA, 2012). Spurn Head provides protection for the extensive mudflats within the Humber Estuary. The Outer Humber Estuary is characterised by mudflats, saltmarshes and beach areas (Scott Wilson, 2010). Surficial seabed sediments are dominated by sandy gravels outwith the mouth of the Humber Estuary (DECC, 2016a), whilst within the estuary, muds and silts predominate (Scott Wilson, 2010). Generally, the direction of sediment transport is into the Humber Estuary along the coast and outwards within the channels, although localised pathways and circulatory systems occur in the estuary mouth (HADA, 2012). Suspended sediments are typically high in this region and characterised by the presence of the Humber Plume (E.On, 2009)
Benthic and Intertidal Ecology	<p>The baseline environment for benthic ecology is illustrated in Figure 81.</p> <ul style="list-style-type: none"> In the Humber Estuary they include gravels and sands, muddy sands and mud, which reflects varying degrees of exposure to waves, currents and inflowing rivers. Substantial areas of mud and sandflat have been lost due to land claim but are still a major component of the Humber Estuary and represent 4.5% of the UK's total mud and sandflat resource. There are approximately 630 Ha of saltmarsh on the Humber, accounting for only 2% of the estuarine area due to large historical losses from land claim. The subtidal environment of the Humber Estuary is highly dynamic and varies according to the composition of the bottom sediments, salinity, sediment load and turbidity, dissolved oxygen and anthropogenic factors relating to water quality and dredging. The Humber Estuary is designated as an SAC.
Fish and Shellfish Ecology	<p>The baseline environment for fish and shellfish ecology is illustrated in Figure 82.</p> <ul style="list-style-type: none"> The Humber supports a fish assemblages characteristic of the southern North Sea macro-tidal estuary. Shellfish populations are also typical of the estuary typology with commercial interest focusing on: large decapod crustaceans (brown shrimp, <i>Crangon sp.</i>; lobster, <i>Homarus gammarus</i>; and brown crab, <i>Cancer pagurus</i>), bivalve molluscs (cockles, <i>Cerastoderma edule</i>; mussels, <i>Mytilus sp.</i>) and whelk (<i>Buccinum undatum</i>) (PINS, 2011). This AoS has two Annex II fish species being the sea lamprey (<i>Petromyzon marinus</i>) and the river lamprey (<i>Lampetra fluviatilis</i>) which both breed in the River Derwent (JNCC, 2021).
Marine Mammals	<p>The baseline environment for marine mammals is illustrated in Figure 83.</p> <ul style="list-style-type: none"> The most common marine mammals within the Thames Estuary area include harbour porpoise (<i>Phocoena phocoena</i>), bottlenose dolphin (<i>Tursiops truncatus</i>), harbour seal (<i>Phoca vitulina</i>), and grey seal (<i>Halichoerus grypus</i>) (Hammond et al. 2017).
Offshore and Intertidal Ornithology	<p>The baseline environment for offshore ornithology is illustrated in Figure 84.</p>

Topic	Summary of Baseline Environment
	<ul style="list-style-type: none"> The Humber Estuary plays an international role in bird migration and is one of the most important wetland sites in the UK. The region provides a safe feeding and roosting area for species moving from breeding sites in the Arctic and sub-Arctic to wintering grounds in southern Europe and Africa, as well as for species which use the Humber as an overwintering site (Humber Nature, 2021). Within the AoS there are two SPAs with offshore ornithology designated features, the Humber Estuary SPA and the Greater Wash SPA. The litter tern (<i>Sterna albifrons</i>) is the only species present at both sites, with the Humber Estuary SPA designated for an additional 37 species, and the Greater Wash SPA designated for an additional five species.
Commercial Fisheries	<p>The baseline environment for commercial fisheries is illustrated in Figure 85.</p> <ul style="list-style-type: none"> Commercial fish species or those with recreational angling relevance that are routinely recorded in the Humber include: whiting (<i>Merlangius merlangus</i>), sprat (<i>Sprattus sprattus</i>), common (or Dover) sole (<i>Solea solea</i>) and flounder (<i>Platichthys flesus</i>). Less common but still relevant are cod (<i>Gadus morhua</i>), saithe (<i>Pollachius virens</i>), pollack (<i>Pollachius pollachius</i>), dab (<i>Limanda limanda</i>), plaice (<i>Pleuronectes platessa</i>) and eel (<i>Anguilla anguilla</i>) (PINS, 2011). As shown on Figure 85, the key methods of fishing in the AoS are beam trawling, potting and trapping.
Shipping and Navigation	<p>The baseline environment for shipping and navigation is illustrated in Figure 86.</p> <ul style="list-style-type: none"> The Humber Estuary is one of the most important estuaries in the UK for commerce, with an expanding port complex and extensive bank-side industries. The four main ports on the estuary (Grimsby, Hull, Immingham and Goole) are operated by Associated British Ports. Outside the Humer Estuary within the AoS, traffic is managed through a traffic separation scheme.
Marine Archaeology	<p>The baseline environment for marine archaeology is illustrated in Figure 86.</p> <ul style="list-style-type: none"> Within the AoS, there are many different types of archaeological features including both ship and aircraft wrecks. The Humber region has a long and busy maritime history, but the seas here can be hazardous.



Hornsea Four

Compensation Measures
Areas of Search
Seagrass
E7: Humber Estuary
Marine Processes

Compensation Measures Areas of Search

- Seagrass

EUNIS Habitats (UKSeaMap 2018)

- A5.13: Infralittoral coarse sediment
- A5.14: Circalittoral coarse sediment
- A5.15: Deep circalittoral coarse sediment
- A5.23 or A5.24: Infralittoral fine sand or infralittoral muddy sand
- A5.25 or A5.26: Circalittoral fine sand or circalittoral muddy sand
- A5.27: Deep circalittoral sand
- A5.33 or A5.34: Infralittoral sandy mud or infralittoral fine mud
- A5.33: Infralittoral sandy mud
- A5.34: Infralittoral fine mud
- A5.35 or A5.36: Circalittoral sandy mud or circalittoral fine mud
- A5.35: Circalittoral sandy mud
- A5.36: Circalittoral fine mud
- A5.37: Deep circalittoral mud
- A5.43: Infralittoral mixed sediments
- A5.44: Circalittoral mixed sediments
- A5.45: Deep circalittoral mixed sediments
- No EUNIS habitat assigned

Coordinate system: ETRS 1989 UTM Zone 31N

0 10 20 Kilometres
0 5 10 Nautical Miles

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Compensation Measures
Marine Processes
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Figure 80: Resilience Measures Areas of Search Seagrass E7: Humber Estuary Marine Processes.

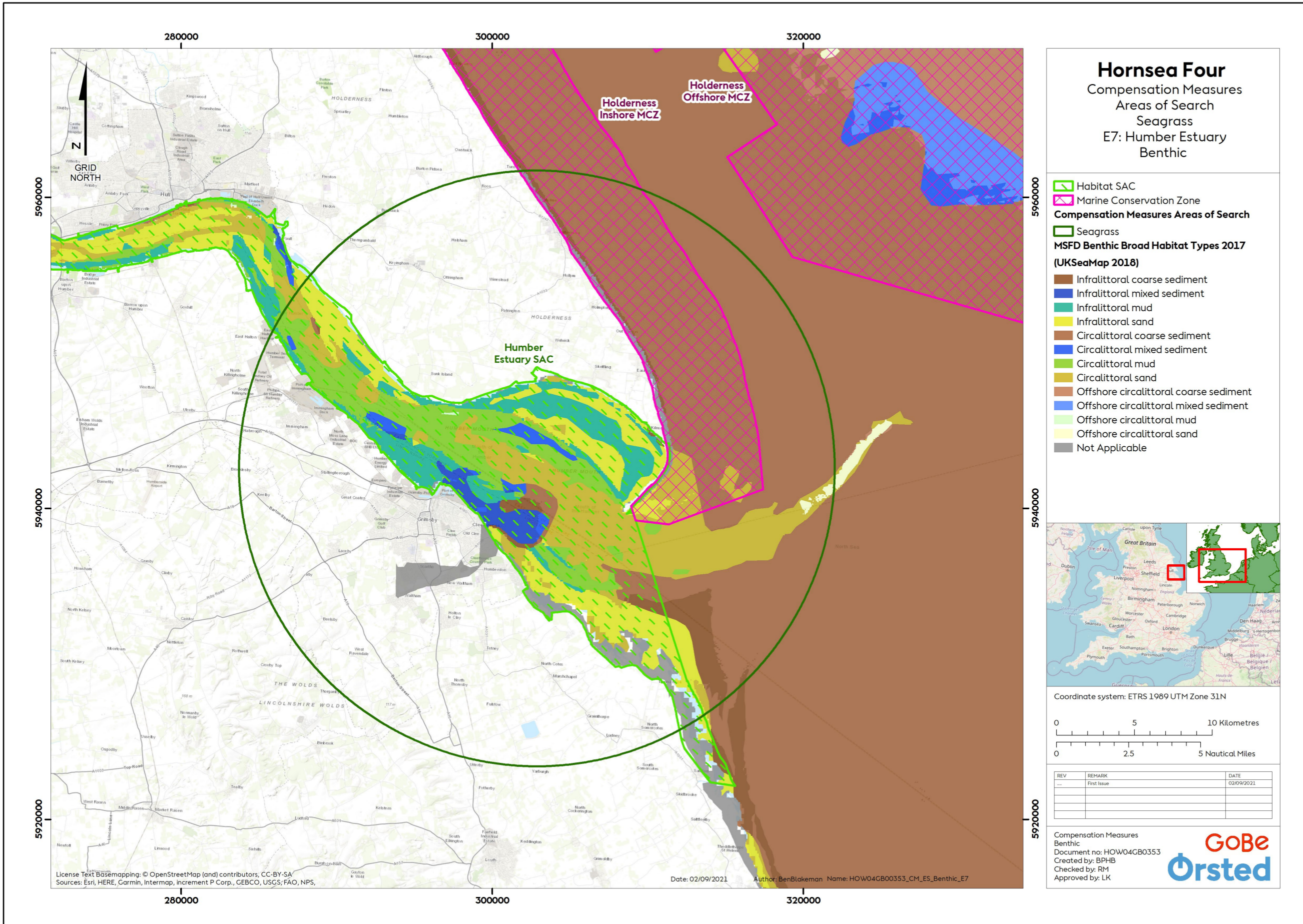


Figure 81: Resilience Measures Areas of Search Seagrass E7: Humber Estuary Benthic.

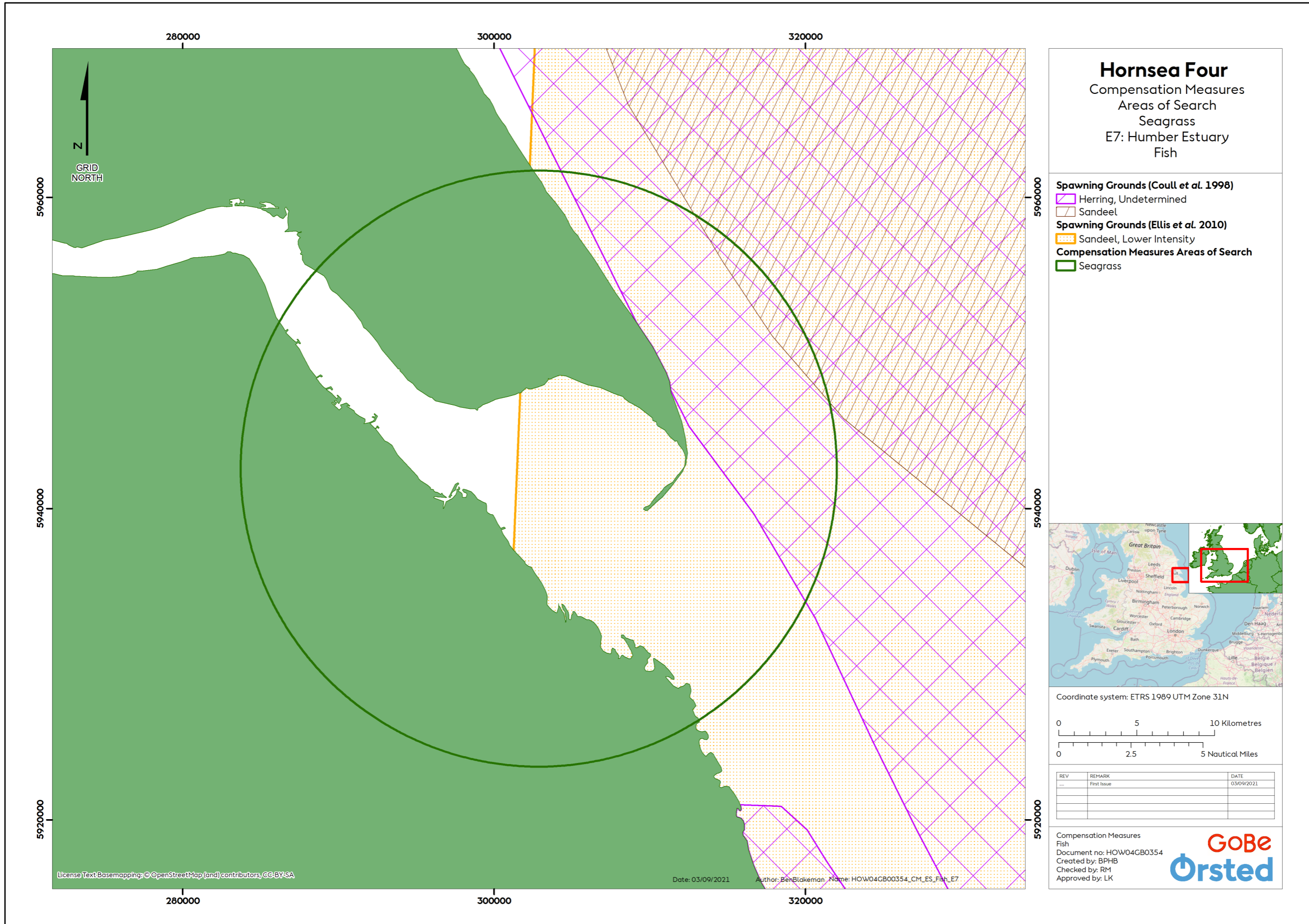
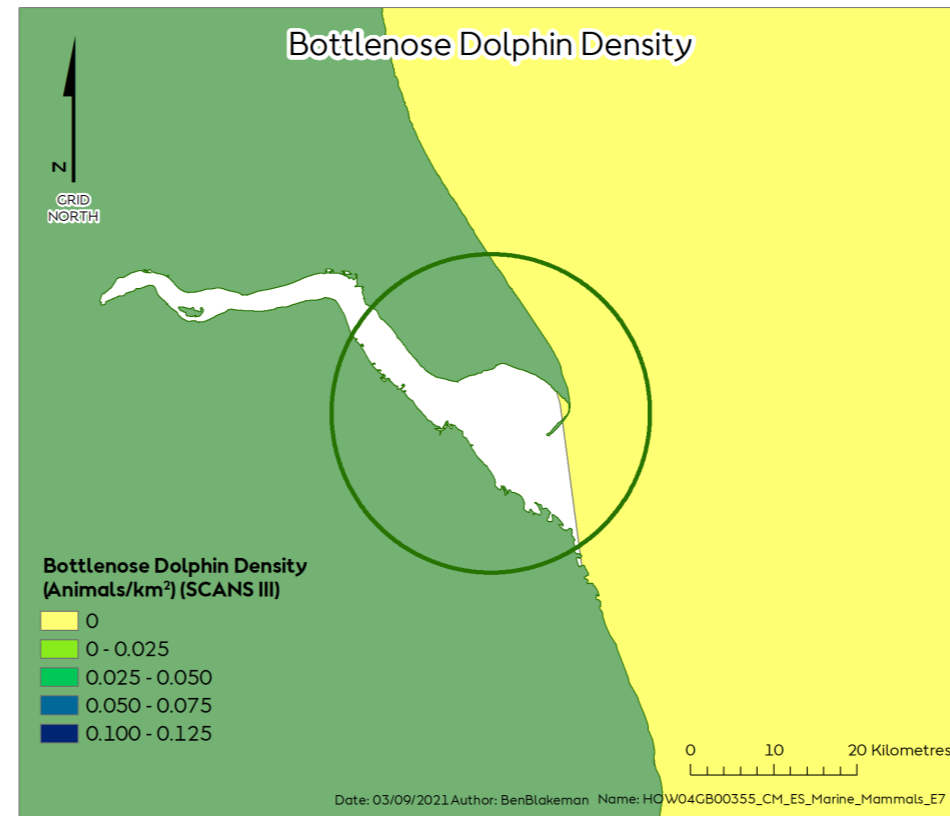
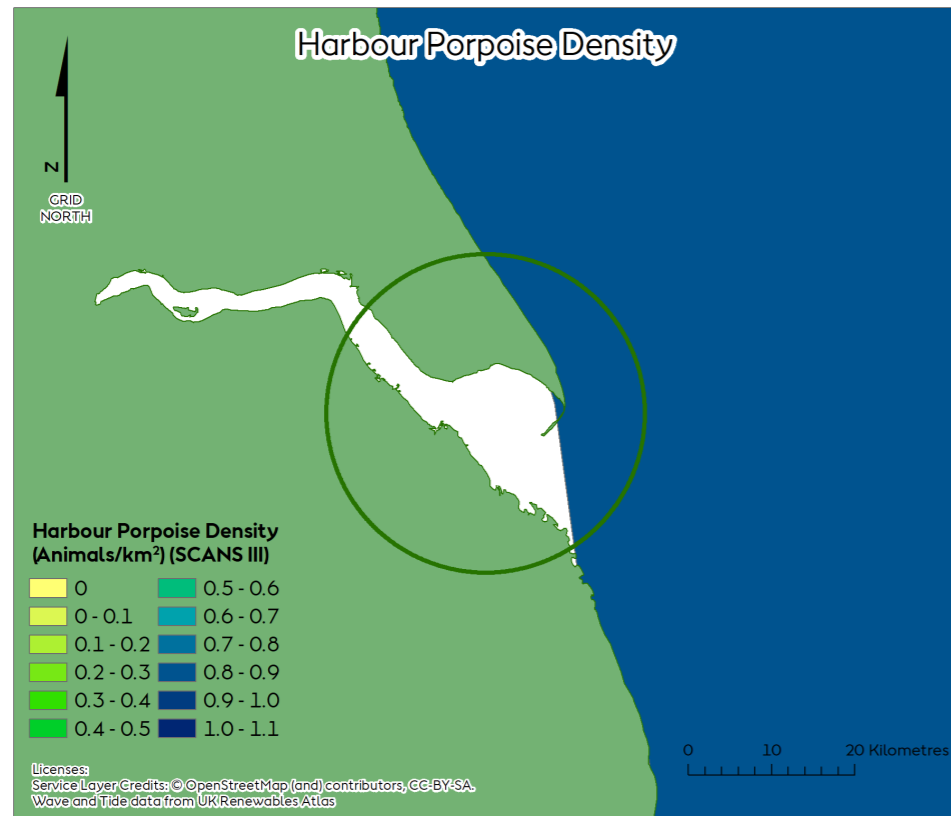
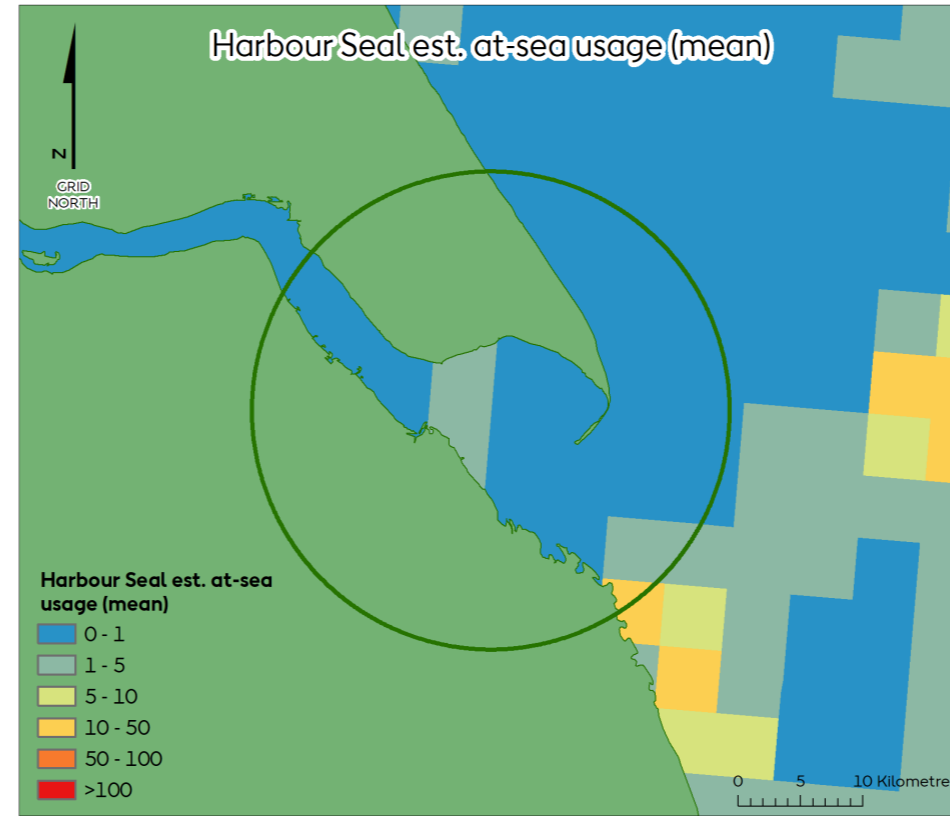
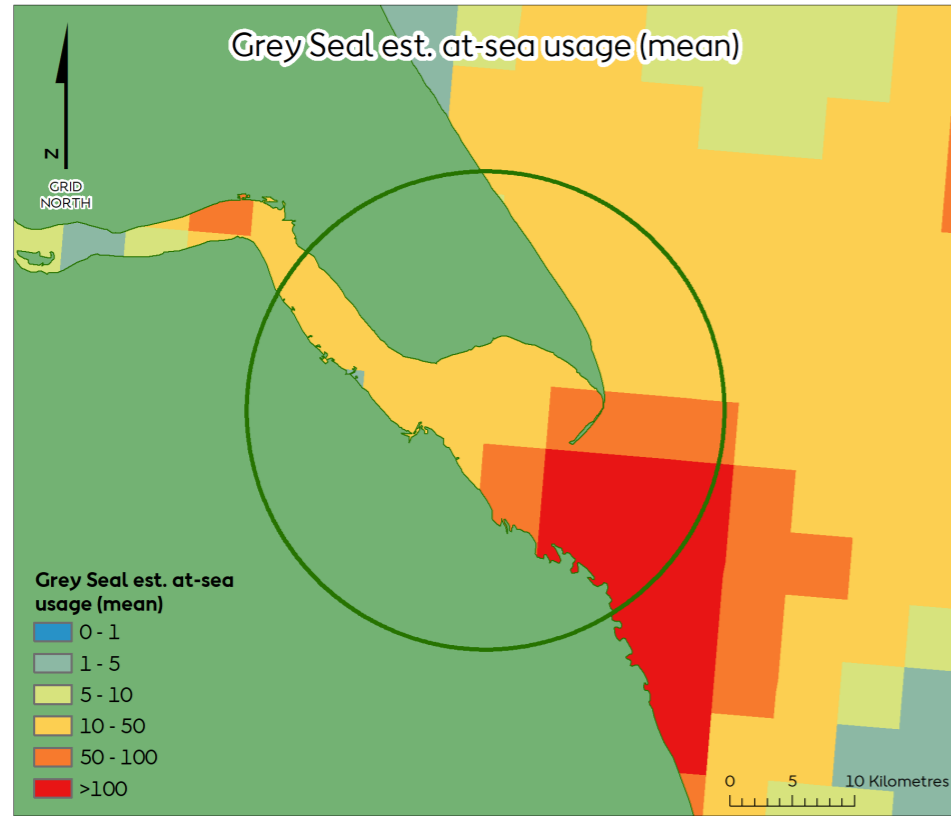


Figure 82: Resilience Measures Areas of Search Seagrass E7: Humber Estuary Fish.



Hornsea Four

Compensation Measures
Areas of Search
Seagrass
E7: Humber Estuary
Marine Mammals

Compensation Measures Areas of Search

Seagrass

Estimated at-sea Distribution of Grey and Harbour Seals maps data from Sea Mammal Research Unit (SMRU) and Marine Scotland, 2017



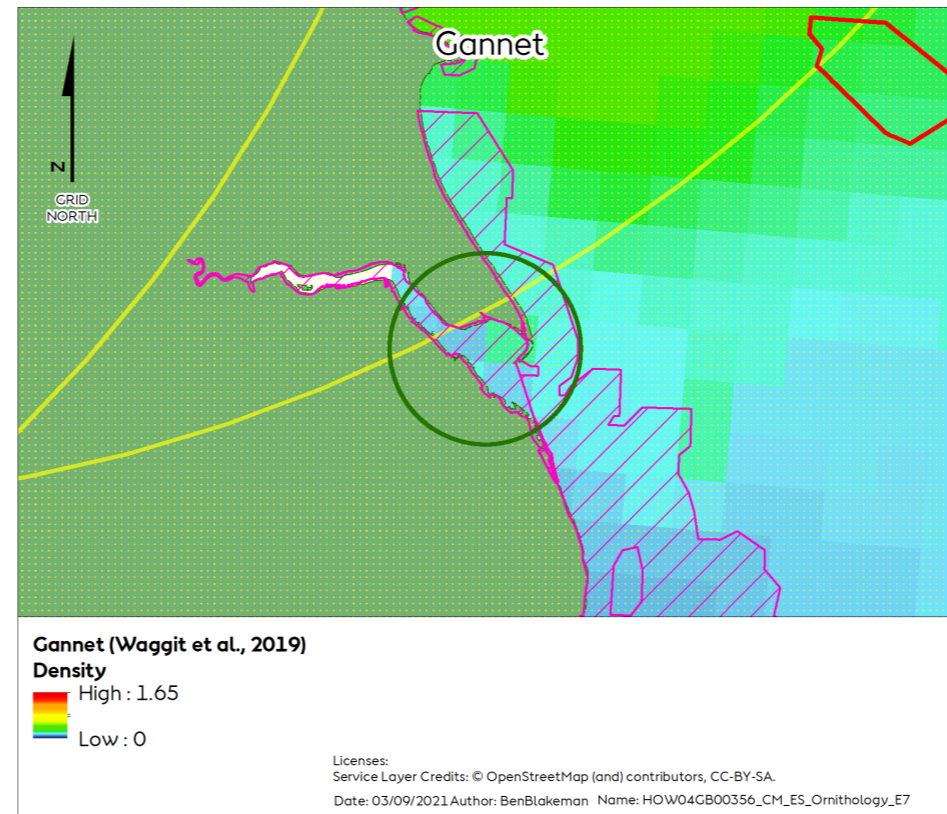
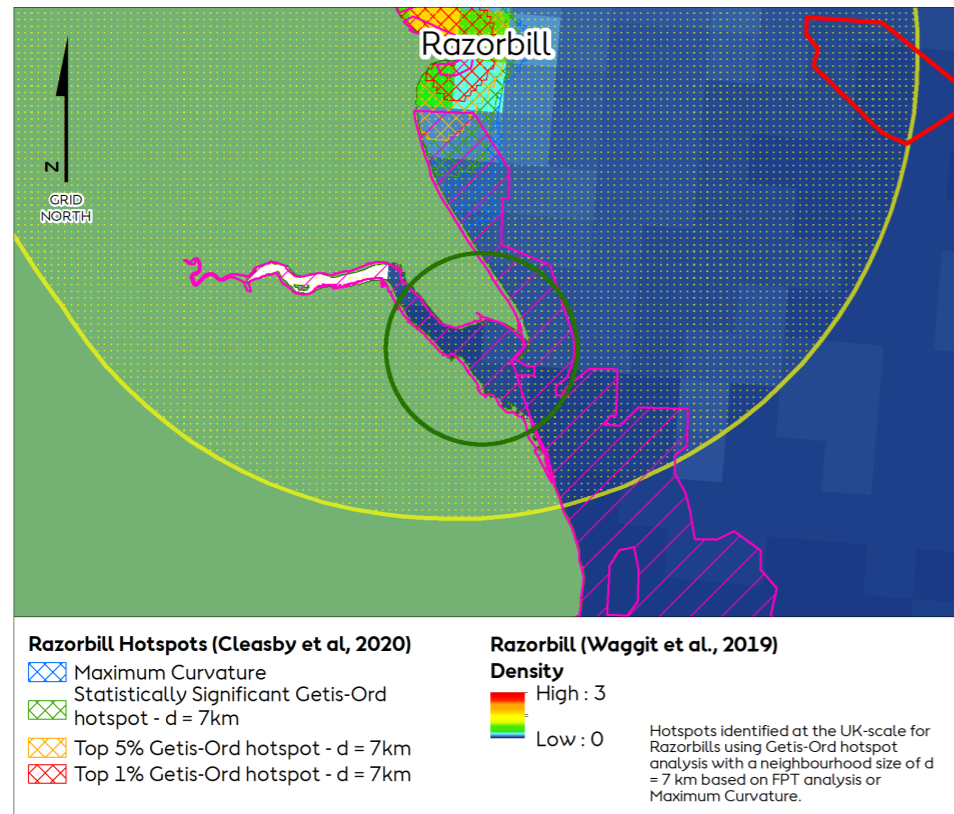
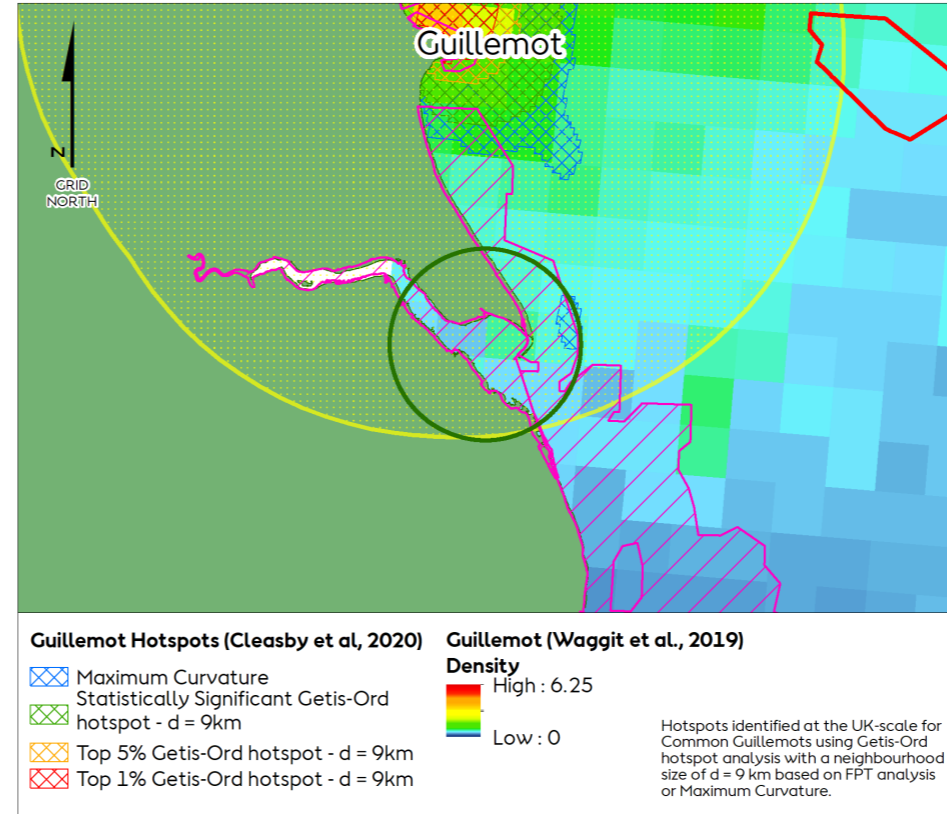
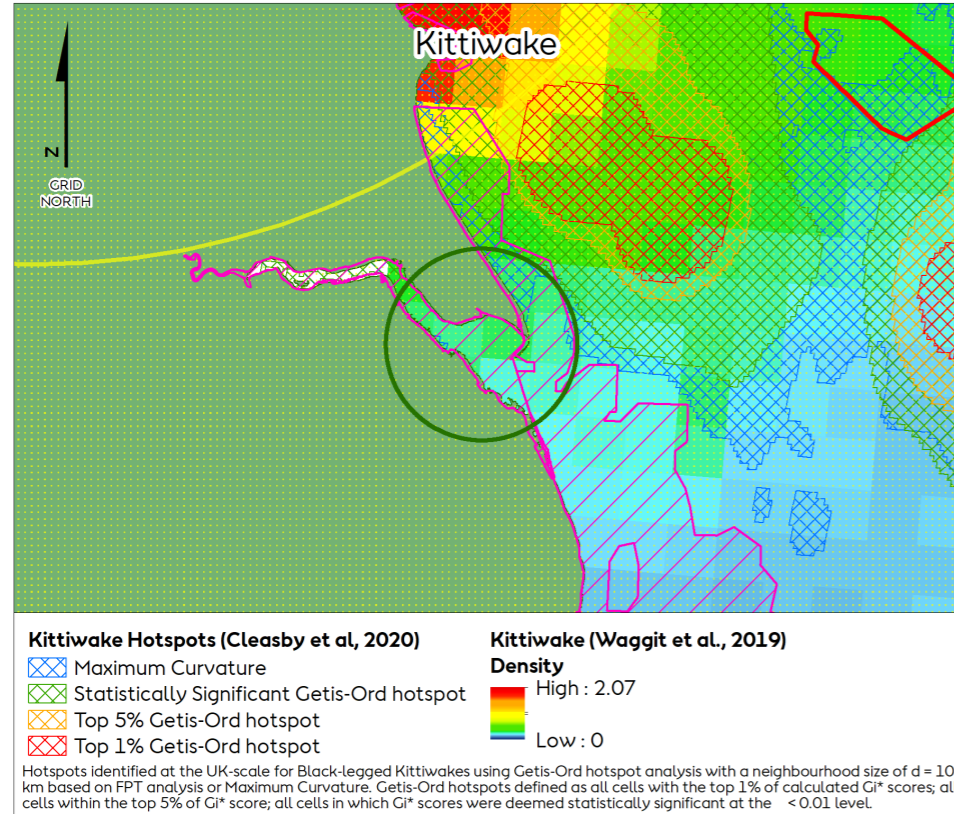
Coordinate system: ETRS 1989 UTM Zone 31N

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Compensation Measures
Marine Mammals
Document no: HOW04GB0355
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Figure 83: Resilience Measures Areas of Search Seagrass E7: Humber Estuary Marine Mammals.



Hornsea Four

Compensation Measures Areas of Search Seagrass E7: Humber Estuary Ornithology

- Array Area
- Special Protection Area (SPA) with Marine Components

Mean-Max Foraging Range (Woodward 2019)

- Common Guillemot - 73.2km Buffer
- Gannet - 315.2km Buffer
- Kittiwake - 156.1km Buffer
- Razorbill - 88.7km Buffer

Compensation Measures Areas of Search

- Seagrass

Waggit et al 2019 densities data. Spatial variation in predicted densities (animals per km) of seabird species in July in the North-East Atlantic. Values are provided at 10km resolution.

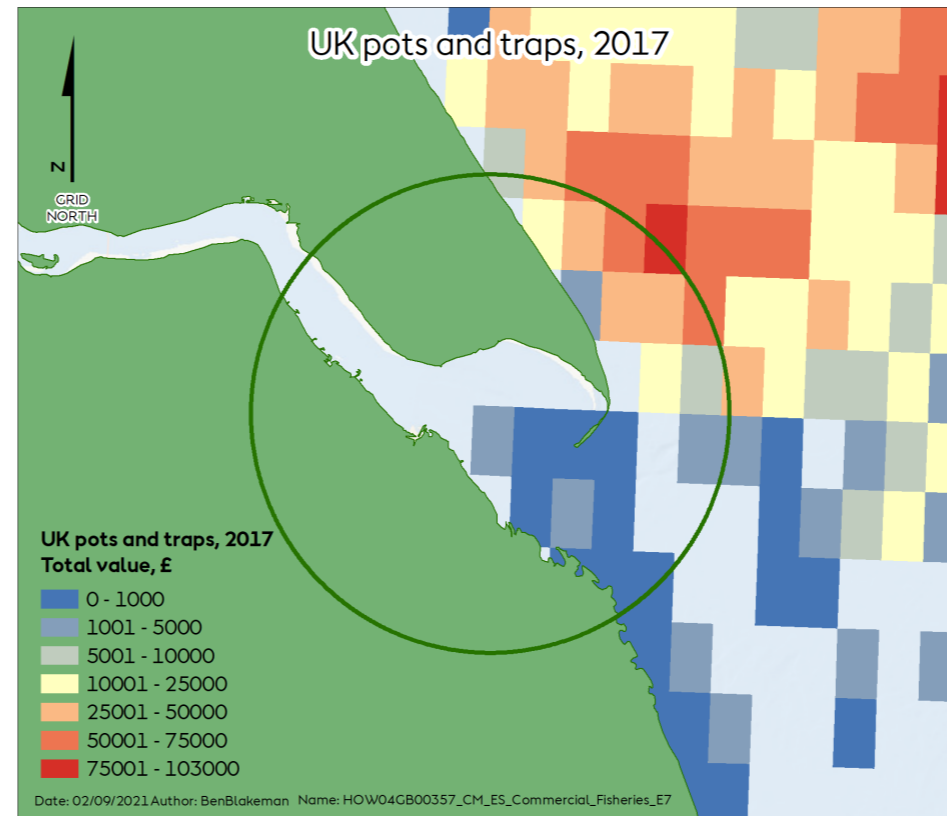
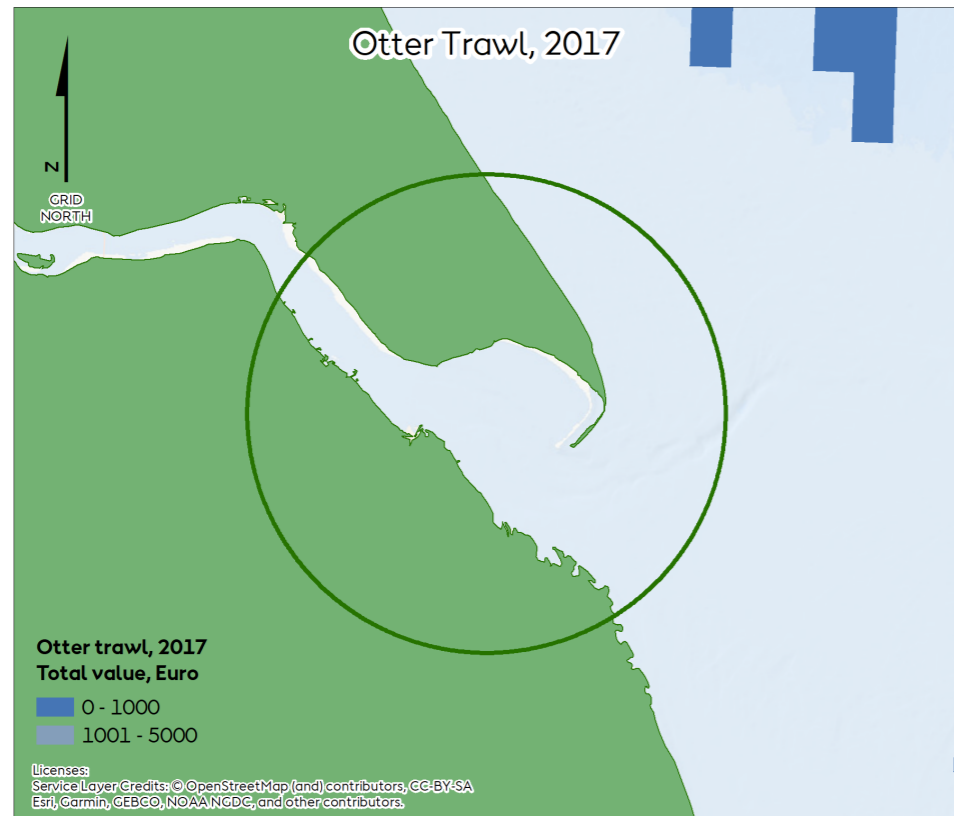
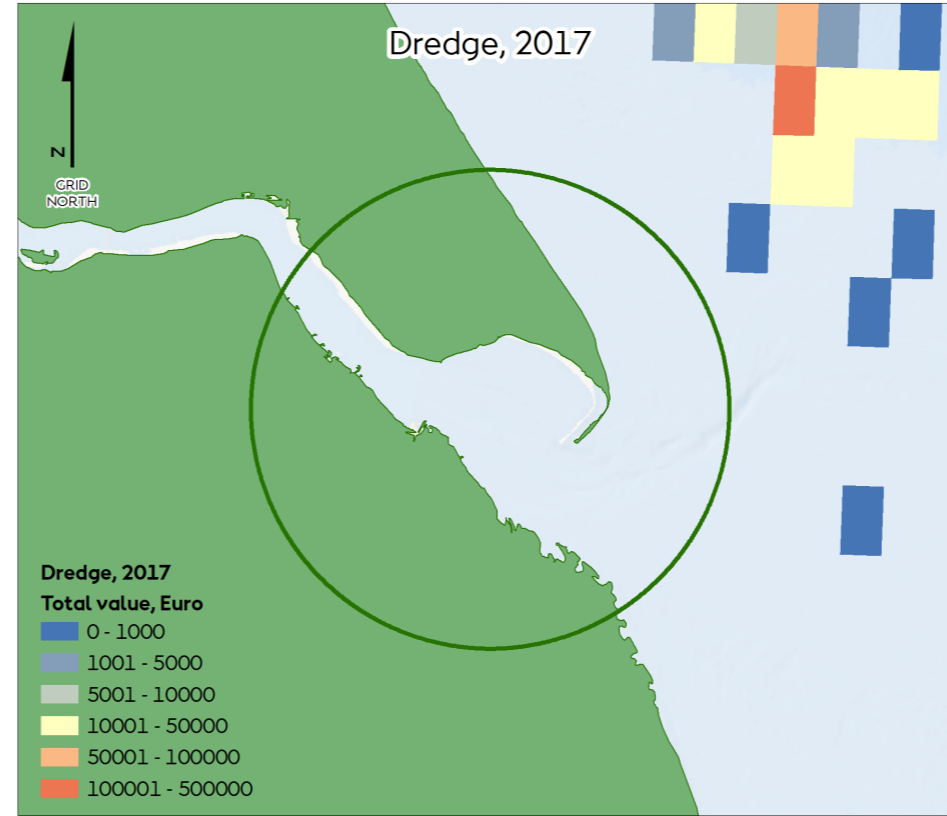
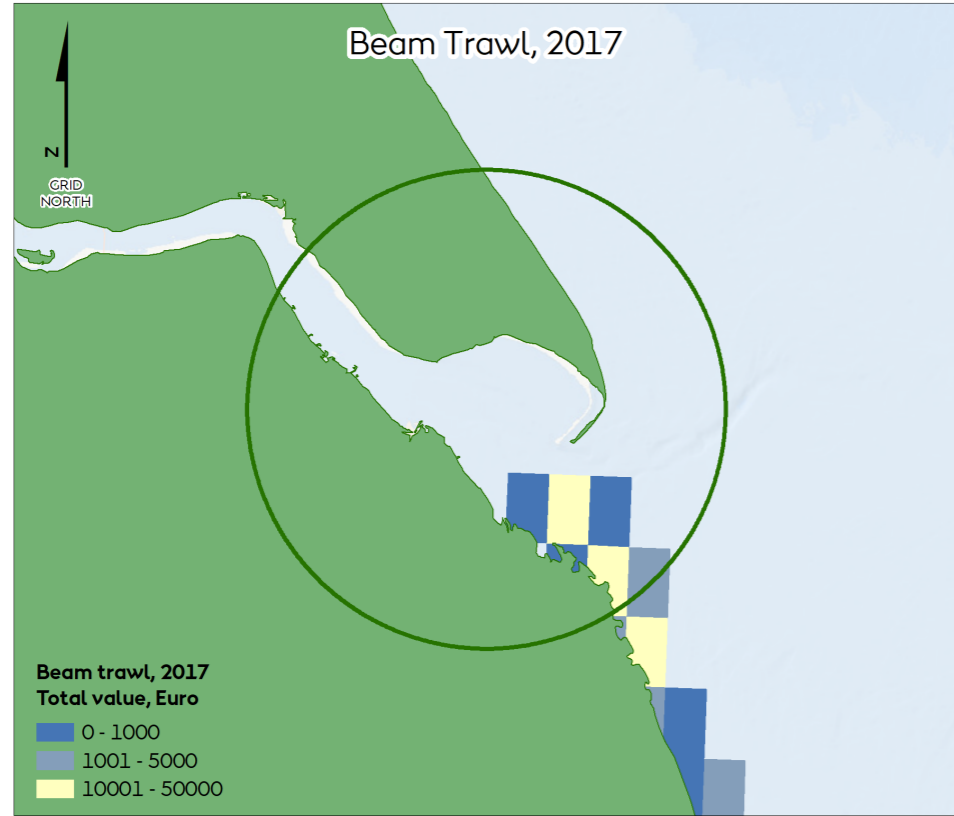
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0 25 50 Kilometres
0 10 20 Nautical Miles

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Compensation Measures Ornithology
Document no: HOW04GB0356
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Figure 84: Resilience Measures Areas of Search Seagrass E7: Humber Estuary Ornithology.



Hornsea Four

Compensation Measures
Areas of Search
Seagrass
E7: Humber Estuary
Commercial Fisheries

Compensation Measures Areas of Search

- Seagrass

Coordinate system: ETRS 1989 UTM Zone 31N

0 10 20 Kilometres
0 5 10 Nautical Miles

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Compensation Measures
Commercial Fisheries
Document no: HOW04GB0357
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Approved by: LK

Figure 85: Resilience Measures Areas of Search Seagrass E7: Humber Estuary Commercial Fisheries.

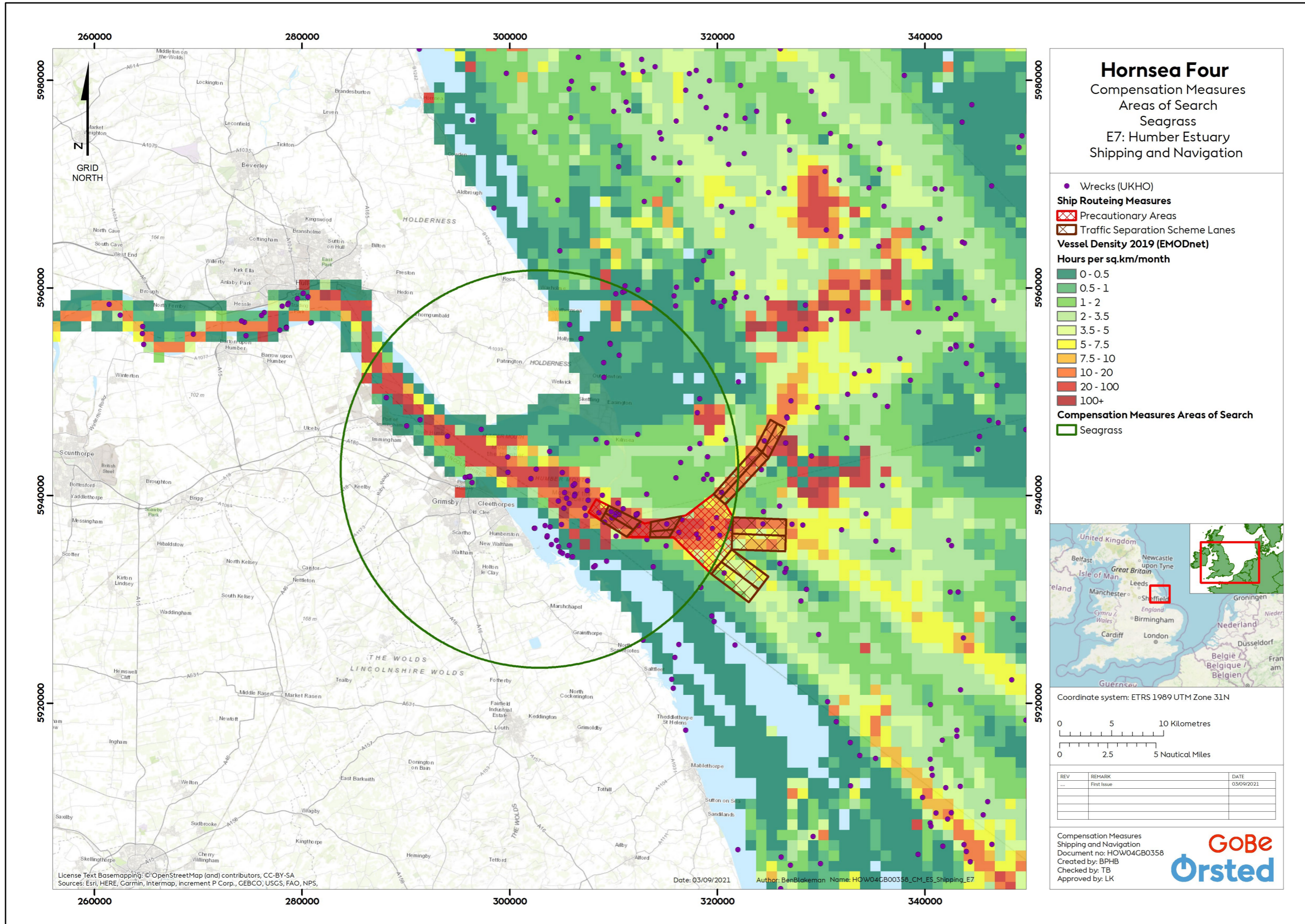


Figure 86: Resilience Measures Areas of Search Seagrass E7: Humber Estuary Shipping and Navigation.

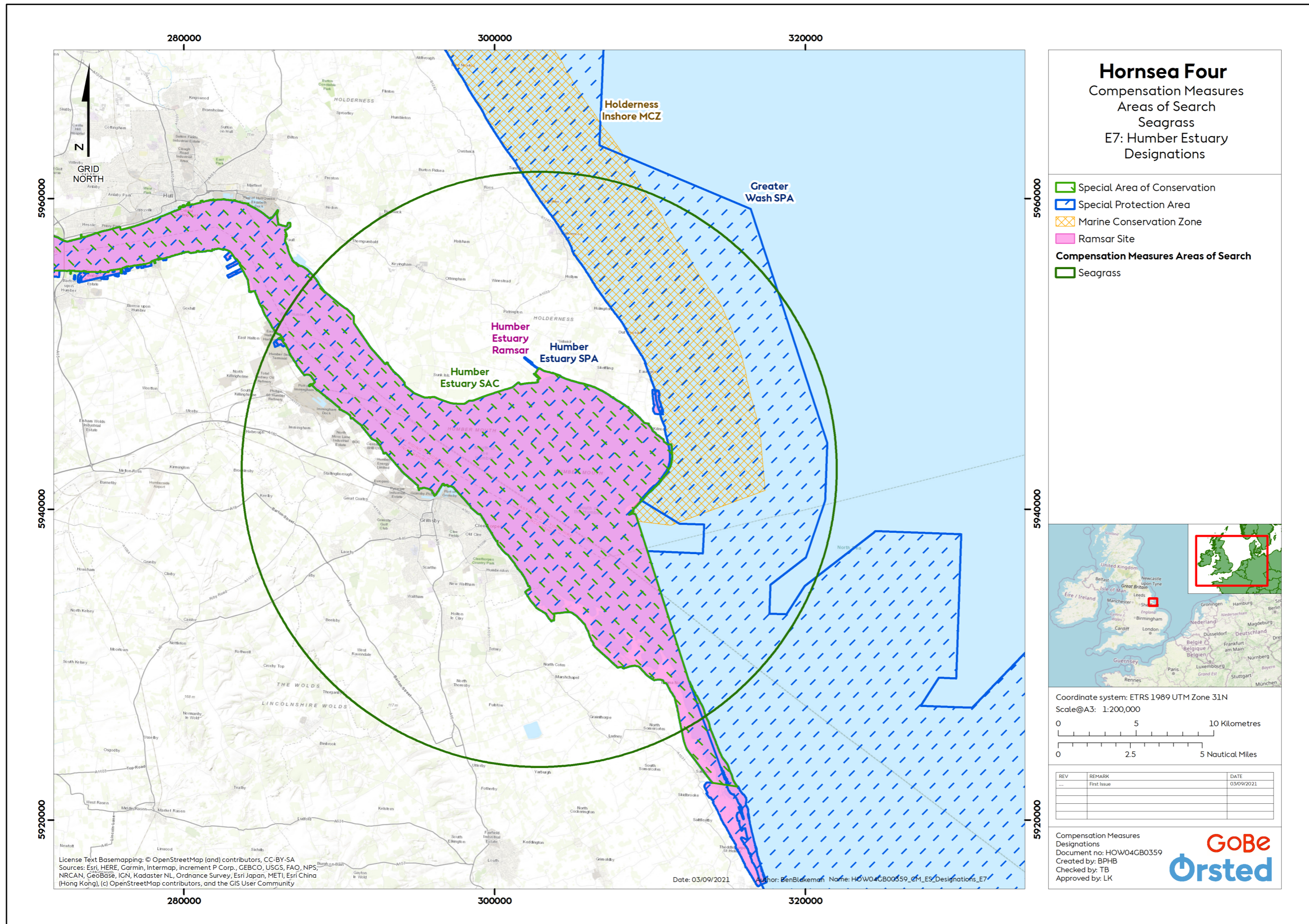


Figure 87: Resilience Measures Areas of Search Seagrass E7: Humber Estuary Designations.

12.3 Assessment

12.3.1 Identification of Impacts and Scope of Assessment

12.3.1.1 Based on the information presented in [Volume A4, Annex 6.1: Compensation Project Description](#) (and detailed in [Section 4.1.9](#)), all activities associated with the construction, implementation/O&M, and decommissioning of the resilience measure – fish habitat enhancement (seagrass) Compensation Measure were defined and potential impact pathways identified.

12.3.1.2 [Table 19](#) details the impacts that were scoped out of the assessment at this stage alongside justification as to why each impact was scoped out.

12.3.1.3 All impacts considered to be scoped into the assessment are detailed in [Volume A4, Annex 6.3: Compensation Impacts Register](#).

Table 19: Resilience Measure – Fish Habitat Enhancement (Seagrass) – Impacts Scoped Out of Assessment.

EIA Topic	Phase	Potential Impact	Justification for Scoping Out
Benthic and Intertidal Ecology	Installation/ Construction	Accidental release of pollutants (e.g. from accidental spillage/leakage) and resulting in potential effects on receptors.	The magnitude of an accidental spill incident will be limited by the size of chemical or oil inventory on construction vessels. In addition, released hydrocarbons would be subject to rapid dilution, weathering and dispersion and would be unlikely to persist in the marine environment. The likelihood of an incident will be reduced by implementation of a Project Environmental Management and Monitoring Plan (PEMMP), undertaken in accordance with CoC-OFF-7 (Volume A4, Annex 6.4: Compensation Commitments Register). This impact has therefore been scoped out of the assessment.
Fish and Shellfish Ecology	Implementation/ O&M		
Marine Mammals Offshore and Intertidal Ornithology			
Benthic and Intertidal Ecology	Installation/ Construction	Seabed disturbances leading to the release of sediment contaminants and resulting in potential effects on receptors.	Following any seabed disturbances, the majority of resuspended sediments are expected to be deposited within the immediate vicinity of the works. The release of any potential contaminants that may be present within the small proportion of fine sediments is likely to be rapidly dispersed with the tide and/or currents therefore increased bioavailability resulting in adverse eco-toxicological effects are not expected. As such and combined with the limited extent and duration of any seabed disturbances, the impact has been scoped out of the assessment.
Fish and Shellfish Ecology	Implementation/ O&M		
All EIA Topics	Decommissioning	All potential impacts.	It is currently anticipated that the implementation of the resilience measure – fish habitat enhancement (seagrass) Compensation Measure will result in new management practices which shall continue for the lifetime of Hornsea Four. The Compensation Measure sites will be left in perpetuity and as such, all decommissioning impacts have been scoped out of the assessment.
Aviation and Radar	Installation/ Construction	All potential impacts.	Due to the lack of impact pathway, all potential aviation and radar impacts are scoped out.
	Implementation/ O&M		
Seascape, Landscape and Visual Resources	Installation/ Construction	All potential impacts.	Due to the lack of impact pathway, all potential seascape, landscape and visual resources impacts are scoped out.
	Implementation/ O&M		

EIA Topic	Phase	Potential Impact	Justification for Scoping Out
Infrastructure and Other Users	All Phases	All potential impacts on aggregate dredging activities, disposal sites, Carbon Capture and Storage (CCS) sites, cables and pipelines, Oil & Gas (O&G) activities.	The resilience measure – fish habitat enhancement (seagrass) Compensation Measure will not be implemented in immediate proximity to aggregate dredging activities, disposal sites, CCS sites, cables and pipelines, and Oil & Gas (O&G) activities as per CoC-OFF-13. As such, all potential impacts on these receptors have been scoped out of the assessment.

12.3.2 Impact Assessment

- 12.3.2.1 [Volume A4, Annex 6.3: Compensation Impacts Register](#) identifies the potential scoped in impacts that could result from the installation/construction, implementation/O&M, and decommissioning of the resilience measure – fish habitat enhancement (seagrass), relating to each technical topic under consideration in the EIA process. Each of these impacts have been considered, following the process outlined in [Section 6](#), with the MDS defined, magnitude of impact and sensitivity of receptor considered and the level of significance derived by the matrix approach. The Compensation Impacts Register is presented in [Volume A4, Annex 6.3: Compensation Impacts Register](#).
- 12.3.2.2 As presented in [Volume A4, Annex 6.3: Compensation Impacts Register](#), it has been concluded that found that no LSE is predicted for any of the potential impacts arising from the installation/construction, implementation/O&M and decommissioning of the resilience measure – fish habitat enhancement (seagrass). As such, the potential effects to all receptors are therefore **not significant** in terms of the EIA Regulations ([Volume A1, Chapter 5: Environmental Impact Assessment Methodology](#)).

13 Conclusions

13.1.1.1 The Hornsea Four Compensation Measures EIA has considered the environmental impacts associated with the implementation of the following proposed Compensation Measures:

- New offshore nesting platform(s);
- Repurposed offshore nesting platform(s);
- New onshore nesting platform(s);
- Bycatch reduction technologies;
- Predator eradication; and
- Resilience Measure – Fish Habitat Enhancement (Seagrass).

13.1.1.2 Each measure is described in terms of the AoS (where the measures could be located), how the measure would be implemented, managed and (where relevant) decommissioned. For each Compensation Measure, the potential impacts has been considered, following the process outlined in [Section 6](#), with some impacts scoped out and others taken forward for assessment, with the MDS defined, magnitude of impact and sensitivity of receptor considered and the level of significance derived by the matrix approach. The Compensation Impacts Register is presented in [Volume A4, Annex 6.3: Compensation Impacts Register](#).

13.1.1.3 As presented in [Volume A4, Annex 6.3: Compensation Impacts Register](#), for all Compensation Measures, it has been concluded that found that no LSE is predicted for any of the potential impacts arising from the installation/construction, implementation/O&M and decommissioning of the Compensation Measures. As such, the potential effects to all receptors are therefore **not significant** in terms of the EIA Regulations ([Volume A1, Chapter 5: Environmental Impact Assessment Methodology](#)).

13.1.1.4 The assessment provided in this document is based on the current understanding of the location, scope and nature of the proposed Compensation Measures. It should be noted, however, that ultimately, the Compensation Measures will not be consented through the Hornsea Four DCO application process and will be subject to (where necessary) standalone EIA and HRA processes as part of their own consenting process (for example a Marine Licence application and/or Planning Application). As part of that consenting process, further assessment work will be undertaken, based on refined design and methodology details.