

Coastal Change Management Areas: Opportunities for sustainable solutions in areas subject to coastal change

Filey Bay Glacial Cliffs and Beaches; Easington Lagoons, Kilnsea Glacial Cliffs and Spurn Head Spit; Sheringham to Bacton Glacial Cliffs; Birling Gap Chalk Cliffs; Cuckmere Estuary Meanders and Grazing Marshes; Selsey to Pagham Beaches, Spit and Tidal Inlet; Milford on Sea to Highcliffe Eocene Cliffs; Slapton Sands Shingle Barrier Beach; Taw-Torridge Estuary, Coastal Dunes and Cobble Ridge; and Sefton Foreshore and Dunes.

East Wash Shingle Spit and Saline Lagoons; Trimley Saltmarshes, Grazing Marshes and Mudflats; Dawlish Warren Spit and Dunes.

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Foreword

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Background

Coastal Change Management Areas (CCMAs) are defined in the National Planning Policy Framework as **‘An area identified in plans as likely to be affected by physical change to the shoreline through erosion, coastal landslip, permanent inundation or coastal accretion.’** CCMAs provide a useful mechanism to plan for adaptation where rates of shoreline change are significant over the next 100 years, and enables the effects of climate change to be fully considered. This report highlights opportunities for CCMAs in England, where sustainable solutions can be realised in areas subject to coastal change. There was a two-study approach to this report:

Study 1: Identify a ‘top ten’ list of potential environmentally linked English CCMAs, where the options were either No Active Intervention (NAI) or Managed Realignment (MR) in the first SMP epoch.

Study 2: Expand the list of English CCMAs to include those where the current (first) SMP epoch option is Hold The Line (HTL) but where the second epoch option is either MR or NAI.

Natural England believes the use of the CCMA approach has the potential to benefit the natural environment in a number of ways:

- By using the CCMA approach to plan for predicted change, therefore avoiding potential tensions between local communities and the needs of the natural environment
- Use of the CCMA approach may help secure benefits for biodiversity, landscapes and access to the natural environment by showing that these represent positive managements options in areas subject to change

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Further information

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CONTENTS

	Page
1 INTRODUCTION	1
1.1 Coastal Change Management Areas	1
1.2 Objective	1
1.3 Methodology	2
2 STAGE 1: THE LONG LIST	3
2.1 Step 1: Adopted Policy	3
2.2 Step 2: Physical Change	3
2.3 The Long List	3
3 STAGE 2: TOP TEN	4
3.1 Environmental Criteria	4
3.2 The Top Ten	4
3.2.1 Filey Bay Glacial Cliffs and Beaches	7
3.2.2 Easington Lagoons, Kilnsea Glacial Cliffs and Spurn Head Spit	9
3.2.3 Sheringham to Bacton Glacial Cliffs	11
3.2.4 Birling Gap Chalk Cliffs	13
3.2.5 Cuckmere Estuary Meanders and Grazing Marshes	15
3.2.6 Selsey to Pagham Beaches, Spit and Tidal Inlet	17
3.2.7 Milford on Sea to Highcliffe Eocene Cliffs	19
3.2.8 Slapton Sands Shingle Barrier Beach	21
3.2.9 Taw-Torrige Estuary, Coastal Dunes and Cobble Ridge	23
3.2.10 Sefton Foreshore and Dunes	25

Appendix A: Long List of Sites

1 INTRODUCTION

1.1 Coastal Change Management Areas

Coastal Change Management Areas (CCMAs) have been identified as a key coastal planning tool. Policies and guidance to support this approach are set out in the National Planning Policy Framework (NPPF) (Department for Communities and Local Government, 2012) and its associated Planning Practice Guidance (<http://planningguidance.planningportal.gov.uk/>). They are to be defined in Local Plans as areas likely to be affected by coastal change; such as physical change to the shoreline through erosion, coastal landslip, permanent inundation or coastal accretion.

The NPPF maintains that local planning authorities should reduce risk from coastal change by avoiding inappropriate development in vulnerable areas or adding to the impacts of physical changes to the coast. They should identify as a CCMA any area likely to be affected by physical changes to the coast, and:

- be clear as to what development will be appropriate in such areas and in what circumstances; and
- make provision for development and infrastructure that needs to be relocated away from CCMAs.

CCMAs are being established in areas where interactions between coastal change and new development / infrastructure proposals (or relocation of existing development and/or infrastructure) need to be resolved. National Planning Practice Guidance also allows them to be established in areas 'for facilitating roll-back and relocation of land uses'.

A CCMA should only be defined where rates of shoreline change are significant over the next 100 years, taking account of climate change. They should not need to be defined where the accepted Shoreline Management Plan (SMP) policy is to hold or advance the line (maintain existing defences or build new defences) for the whole period covered by the plan, subject to evidence of how this may be secured.

Local planning authorities should demonstrate that they have considered SMPs, which provide a large-scale assessment of the risks associated with coastal processes, and should provide the primary source of evidence in defining the CCMA and inform land allocation within it.

1.2 Objective

Natural England commissioned this study to identify a 'top ten' list of potential environmentally linked English CCMAs. These fall into two categories:

- sites that could deliver strategic solutions in areas that might otherwise produce problematic planning casework in the future; and
- sites where there is a need for environmental adaptation at the coast (or where adaptation has the potential to create Biodiversity Action Plan opportunities).

It is currently unclear how CCMAs are being used by Local Authorities and the aim of this work is to help Natural England encourage Local Authorities to consider

environmental opportunities associated with CCMAAs so that strategic solutions can be found that avoid development or infrastructure-related conflicts in the future.

1.3 Methodology

A two-stage approach was adopted:

- Stage 1: develop a high level baseline against which stretches of coast analysed in the second round of SMPs can be assessed and from this develop a 'long-list' of potential English CCMAAs; and
- Stage 2: define a set of environmental opportunities and benefits to prioritise the long list and develop the top ten, providing a clear rationale in terms of why the sites are selected from a planning perspective.

2 STAGE 1: THE LONG LIST

A long list of potential locations for CCMA has been drawn up using the second round of SMPs. Twenty English SMPs have been reviewed starting at the Scottish border on the English east coast, around to the Scottish border on the English west coast. The review excluded the coast of Wales. The long list was developed in two steps based on 1.) adopted policy and 2.) physical change. At the long-list stage, we did not include any environmental criteria in the selection process.

2.1 Step 1: Adopted Policy

In the first step, the coast was analysed by Policy Unit and the policy adopted within each unit. The first cut was made by excluding all Policy Units where the accepted policy was to hold the line during any of the three defined epochs. All Policy Units with a managed realignment or no active intervention policy (or a mix of the two) for the life of the plan were taken to the next step. Although the NPPF guidance suggests exclusion where hold the line is affected for the whole period covered by the plan, we have decided to exclude a Policy Unit where hold the line applies to at least one of the epochs. This allows for selections to be made that take account of coastal processes throughout the whole of the next 100 years.

2.2 Step 2: Physical Change

The inclusion or exclusion of a no active intervention and/or managed realignment Policy Unit into the long list was based on the potential for 'significant' geomorphological change over the next 100 years. The definition of significant is subjective and was based on expert geomorphological assessment of a potential future for each stretch of coast. Selected individual Policy Units that are adjacent to each other were then combined to define the potential CCMA in the long list.

2.3 The Long List

The long list includes 80 potential CCMA that cover 18 of the 20 SMPs. Two SMPs did not contain any Policy Units that met the criteria to be included in the long list. The 80 potential CCMA are described in Appendix A. Their high-level description is broken down by SMP Policy Unit (and combinations), policy by epoch (managed realignment or no active intervention), main geomorphological features (very general) and coastal change.

3 STAGE 2: TOP TEN

The top ten CCMA's with the greatest scope to be environmentally led have been drawn up from the initial 80 locations in the long list.

3.1 Environmental Criteria

The top ten has been developed based on an analysis of the long list of sites from environmental risks, environmental opportunities and planning perspectives, and judgment as to which provide the 'best' environmental cases to champion with Local Authorities. A short set of environmental criteria have been used in the assessment:

- geomorphological and geological features;
- coastal biodiversity; and
- ecological adaptation of habitat.

We have also endeavoured to provide a top ten that represents a suitable balance of habitats including cliff, dune, beach and intertidal saltmarshes and flats. However, given Natural England's responsibilities a higher weighting has been given to locations that, alongside other planning considerations, allow coastal biodiversity issues and ecological adaptation of habitat to be addressed. However, geomorphological opportunities are considered as important supporting criteria; indeed there is a strong link between geomorphological change and ecological change, and this relationship is considered throughout the short-listing.

We have also given a higher weighting to stretches of coast with a predominant managed realignment policy over those that are predominantly (or fully) no active intervention. The rationale for this is to allow Natural England to identify where it can best work with other stakeholders to facilitate change and deliver improved biodiversity and ecological adaptation. In this respect, managed realignment is preferred because it allows active improvement, often requiring a decision to be made to change a management approach due to projected coastal erosion or flooding risk, whereas no active intervention is passive improvement.

3.2 The Top Ten

The top ten potential environmentally led English CCMA's are presented in Table 3.1 (from northeast England through south England to northwest England, i.e. in no particular priority order). Their locations are shown on Figure 3.1.

Table 3.1. Location of top ten potential CCMA

Shoreline Management Plan	Policy Unit	Short List CCMA	Name	Policy			Environment	Coastal Change
				Epoch 1	Epoch 2	Epoch 3		
River Tyne to Flamborough Head	31.1	Filey Bay Glacial Cliffs and Beaches	North of Filey	NAI	NAI	NAI	Till cliff & beach	Cliff erosion 0.25m/yr
	31.3		Muston Sands	NAI	NAI	NAI	Till cliff & beach	Cliff erosion 0.25m/yr
	32.1		Hunmanby Sands	NAI	NAI	NAI	Till cliff & beach	Variable erosion rates
	32.2		Hunmanby Gap	NAI	NAI	NAI	Till cliff & beach	Variable erosion rates
	32.3		Reighton	NAI	NAI	NAI	Till cliff & beach	Variable erosion rates
Flamborough Head to Gibraltar Point	J	Easington Lagoons, Kilnsea Glacial Cliffs and Spurn Head Spit	Kilnsea to Spurn Point	MR	MR/NAI	MR/NAI	Dunes, beach & intertidal flats	
Kelling Hard to Lowestoft Ness	6.03	Sheringham to Bacton Glacial Cliffs	Sheringham to Cromer	MR	NAI	NAI	Glacial cliffs & beach	Cliff erosion 0.1-0.8m/yr
	6.05		Cromer to Overstrand	MR	NAI	NAI	Glacial cliffs & beach	Cliff erosion 0.8-0.9m/yr
	6.07		Overstrand to Mundesley	MR	NAI	NAI	Glacial cliffs & beach	Cliff erosion 0.6-2.0m/yr
	6.09		Mundesley to Bacton Gas Terminal	MR	NAI	NAI	Glacial cliffs & beach	Cliff erosion 0.9m/yr
Beachy Head to Selsey Bill	4d01	Birling Gap Chalk Cliffs	Beachy Head to Cuckmere	NAI	NAI	NAI	Chalk cliffs & platform	Cliff erosion 0.3-0.5m/yr
	4d02	Cuckmere Estuary Meanders and Grazing Marshes	Cuckmere	MR	NAI	NAI	Beach / grazing marsh	Erosion 1-1.5m/yr
	4d25	Selsey to Pagham Beaches, Spit and Tidal Inlet	Pagham Harbour to Church Norton	MR	MR	MR	Shingle beach / intertidal	Erosion / Accretion
	4d26		Church Norton to Selsey East Beach	MR	MR	MR	Shingle beach / intertidal	Erosion / Accretion
Hurst Spit to Durlston Head	CBY.A.4	Milford on Sea to Highcliffe Eocene Cliffs	Cliff Road	MR	MR	MR	Eocene cliffs	Cliff erosion 0.8m/year
	CBY.B.1		Hordle Cliff to Barton	NAI	NAI	NAI	Eocene cliffs	Cliff erosion 0.8m/year
	CBY.B.2		Barton-on-Sea Marine Drive East	MR	MR	MR	Eocene cliffs	Cliff erosion 1.2m/year
	CBY.B.3		Barton-on-Sea Marine Drive West	MR	MR	MR	Eocene cliffs	Cliff erosion 1.2m/year
	CBY.B.4		Naish Cliff	MR	MR	MR	Eocene cliffs	Cliff erosion 2.8m/year
Durlston Head to Rame Head	6b75	Slapton Sands Shingle Barrier Beach	Strete to Torcross North (Slapton Sands)	MR	MR	MR	Cliffs / shingle beach	Erosion 0.3m/yr
Hartland Point to Anchor Head	7c07	Taw-Torridge Estuary, Coastal Dunes and Cobble Ridge	Northam Burrows	MR	MR	MR	Shingle ridge	Erosion 2-4m/yr
	7c29		Crow Point & Crow Neck	MR	MR	MR	Dunes	Erosion
	7c30		Braunton Burrows	NAI	NAI	NAI	Dunes	Erosion
Great Ormes Head to Scotland	11a 9.1	Sefton Foreshore and Dunes	River Alt to Southport (Formby Dunes)	MR	MR	MR	Dunes	Erosion / accretion



Figure 3.1. Location of top ten potential CCMAs

3.2.1 Filey Bay Glacial Cliffs and Beaches

The Filey Bay coastal cliffs stretching from north of Filey to Speeton are composed of glacial till (Figure 3.2). They are subject to landsliding, which exposes fresh till faces providing insights on the glacial geology and history of the area. Inland from the coast, the landscape is generally rural with a mixture of arable fields and pasture. However, the influence of coastal tourism and recreation becomes much more apparent north and south of Filey Town, where there are a series of holiday parks and villages. The cliffs are fronted by wide sandy beaches with high recreational value for holiday makers and locals alike. The SMP policy for the coast between Filey Brigg and Speeton is no active intervention over all three epochs, apart from Filey Town where a hold the line policy is advocated.

Residential properties close to the cliff top edge are located at Flat Cliffs, Hunmanby and Reighton. Homes at Flat Cliffs are at significant risk due to erosion. The cliff slope has a very low factor of safety and further erosion of the cliff toe will bring about its failure. At Hunmanby, loss of a few properties is likely in the short-term with potential further loss to the northern end of the main village over the long term. At Reighton, the most seaward properties, together with some holiday properties are likely to be lost in the short- to medium-term, with a larger number of properties and a large part of the holiday park lost over the long-term.

The most recent development along Filey Bay is the Bay Filey holiday village with 300 holiday homes already constructed. Planning applications have been submitted for new phases of the development with the intention to increase the number of homes to 450 to 500.

The Filey Bay coast is recommended as a CCMA to encourage an integrated framework for the use of the frontage and adaptive responses to potential loss of sea front properties.



Figure 3.2. General outline of Filey Bay Glacial Cliffs and Beaches potential CCMA. The red line is indicative only and is not a firm proposal for the CCMA boundary

3.2.2 Easington Lagoons, Kilnsea Glacial Cliffs and Spurn Head Spit

Easington Lagoons are situated about 2km north of Spurn Head Spit and comprise a variety of coastal habitats including saltmarsh, shingle, sand dune, swamp, and most significantly, nationally rare saline lagoons and pools (Figure 3.3). The SMP policy at the lagoons and at the Kilnsea flood defence further to the south is hold the line, providing coastal flood and erosion protection to assets in the floodplain. However, the SMP indicates that other options may be considered subject to monitoring of coastal processes and future studies and accepting that flood risk will increase over time. Along the currently undefended cliffs of the Easington to Kilnsea coast, the policy is no active intervention. This allows the continued feed of sediment to areas along the sediment transport pathway, helping to maintain Spurn Head Spit.

Spurn Head Spit is an outstanding example of a dynamic spit system extending across the mouth of the macrotidal Humber Estuary (Figure 3.3). The system contains a rich mosaic of beach, mudflats, saltmarsh, dunes, grassland, open water, saline lagoons and native scrub. Dune plants include marram grass interspersed with elder and sea buckthorn bushes and the saltmarsh located behind the spit supports sea lavender, sea aster and sea rocket, along with common glasswort and eel grass. Spurn Head Spit is also one of England's key areas for migrating birds as it is the first landfall for many migratory species on their way across the North Sea. As well as migrants there are large numbers of wintering and passage waders and wildfowl. Curlew, grey plover and knot also use the saltmarsh to roost at high tide, and shelduck and brent geese use the mudflats during the winter. It is also nationally important for many species of insects including hoverflies, ladybirds, dragonflies and butterflies.

The SMP policies for Spurn Head Spit are management realignment in Epoch 1 followed by management realignment or no active intervention in Epochs 2 and 3. The intent of these management policies is to allow Spurn Head Spit to evolve naturally with limited intervention to maintain its integrity, and to maintain access to the key facilities and assets at Spurn Point, including the RNLI station and Vessel Traffic Services (VTS) of the Humber Pilots.

There is strong justification for a CCMA for the coast between Easington and Spurn Point for a variety of reasons. The current policies of hold the line of existing defences whilst allowing no active intervention for adjacent undefended cliffs may be unsustainable in the long-term. This is because there is a possibility of the outflanking of these defences, which could lead to flooding of the Easington to Kilnsea flood cell. Properties continue to be bought in the area at risk and this heightens the need for the community to adapt locally to the changing coast. Also, the continued presence of the VTS on Spurn Point is important to river users and the RNLI station provides an essential service to mariners in the southern North Sea. The accessibility of these facilities relies on a healthy functioning spit.

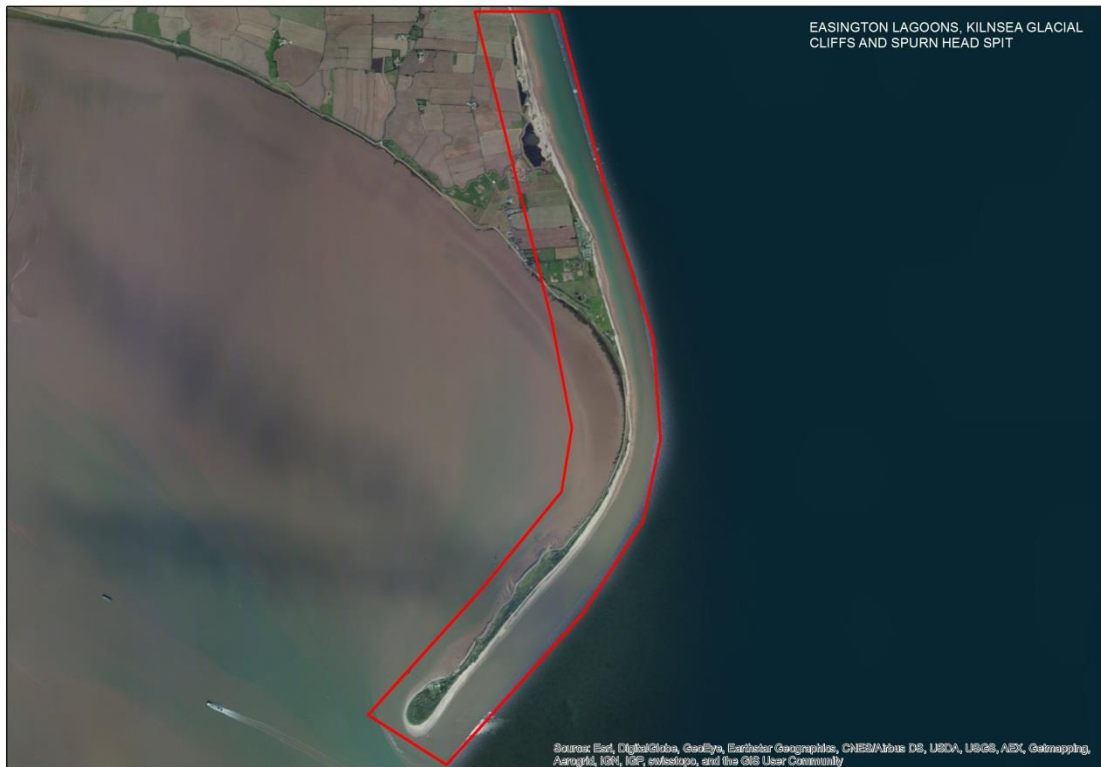


Figure 3.3. General outline of Easington Lagoons, Kilnsea Glacial Cliffs and Spurn Head Spit potential CCMA. The red line is indicative only and is not a firm proposal for the CCMA boundary

3.2.3 Sheringham to Bacton Glacial Cliffs

The stretch of cliffs between Sheringham and Bacton provide excellent opportunities for the study of glacial geology and history as the cliffs erode rapidly, continually exposing new sections. The coast is a composite site amalgamating stretches of coast with an SMP managed realignment policy in Epoch 1 followed by no active intervention policy in Epochs 2 and 3, alternating with shorter stretches of coast with a hold the line policy (generally in front of towns) (Figure 3.4).

The geological record exposed in the cliffs spans several glacial and interglacial periods over the last two million years. Pleistocene units include marine crag, glacial till, glacial sands and gravels, freshwater beds, lake and fluvial deposits, which contain numerous examples of large and small types of glacial deformation and glacio-tectonic structures, including chalk rafts, thrusting, folds, ice-wedge casts and water-escape structures. The freshwater beds are highly fossiliferous; rich in the remains of plants and trees, molluscs, fish and birds. Erosion of these units could potentially uncover larger mammal remains including elephant, rhinoceros, deer, hyena, sabre-toothed tiger, bear, beaver and hippopotamus. The marine deposits contain fossil fauna including voles, shrews, and giant beaver. In addition to glacial history, the cliffs exhibit a wide variety of contemporary slumping styles, from massive rotational slips to daily seepage through trickles of muddy slurry.

The SMP policy allows the undefended parts of the coast to retreat enabling a naturally-functioning coastal system, with minimal human interference. The policy allows for defence ruins (existing timber groynes and revetments) to be removed with no further maintenance. In most places the immediate cliff top is undeveloped and the land is predominately used for agricultural purposes. However, there are locations that are at risk of erosion including caravan parks, a few properties at East Runton, and residential and commercial properties at Trimingham, but they currently do not economically justify protection with new defences. The SMP policy for the towns of Cromer, Overstrand and Mundesley is hold the line and it will be important to ensure that their defences are not outflanked by coastal erosion.

A CCMA is justified along this coastline in order to develop adaptive measures to help minimise the coastal change impacts on local communities (particularly East Runton and Trimingham) and to encourage an integrated framework for the use of the whole frontage.

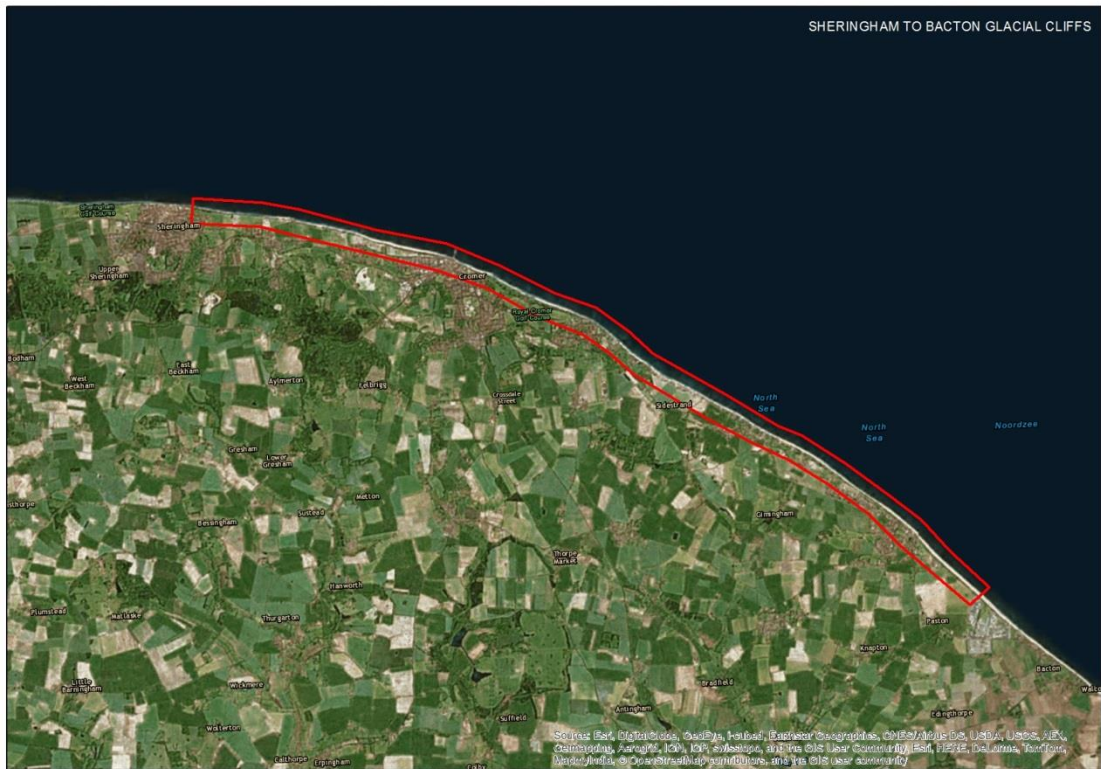


Figure 3.4. General outline of Sheringham to Bacton Glacial Cliffs potential CCMA. The red line is indicative only and is not a firm proposal for the CCMA boundary

3.2.4 Birling Gap Chalk Cliffs

Birling Gap (Figure 3.5) is a key site for earth science interests, particularly for its chalk stratigraphy, periglacial geomorphology, coastal geomorphology and the study of chalk landscape evolution. The cliffs provide an excellent example of a complete cross-section through a dry valley containing a complex series of solifluction deposits on top of deeply weathered chalk. Continued erosion of the chalk cliffs at Birling Gap exposes fresh sections of the valley. Catastrophic cliff failure does occur; during the 2013/14 winter storms an estimated seven-year's-worth of erosion took place in several months. The recommended SMP policy for the coast at Birling Gap is no active intervention to allow the unprotected cliffs to erode, maintaining the biological, geomorphological and geological assets. It is also an area of exceptional landscape interest being located in the South Downs National Park and the Sussex Heritage Coast.

A series of houses were built at Birling Gap in the early 19th century, but due to the continued erosion several of them were demolished, and the remainder are under threat from future erosion. The properties are owned by the National Trust who is implementing a policy of adaptation to coastal change. The properties that are furthest away from the cliff edge have been converted into a beach café and shop with a potential life span of around 25-30 years. A new visitor centre and learning centre have also recently been opened.

The National Trust has also installed a number of other measures to prepare Birling Gap for future erosion, including fences with 'elephant feet,' which can be moved backwards as the coast erodes. Birling Gap is one of only three places where the beach can be accessed between Eastbourne and Seaford, Stairs constructed to the beach can be extended to match coastal erosion, and be removed and re-positioned higher up the beach in the future.

Birling Gap is recommended as a CCMA to encourage further innovative planning decisions that are in keeping with the important environmental aspects of this short piece of coast.



Figure 3.5. General outline of Birling Gap Chalk Cliffs potential CCMA. The red line is indicative only and is not a firm proposal for the CCMA boundary

3.2.5 Cuckmere Estuary Meanders and Grazing Marshes

The Cuckmere Estuary is an area of floodplain grazing marsh through which a canalised channel flows fronted by a shingle beach between two chalk cliffs (Figure 3.6). The pre-canalisation river remains as a series of meanders and oxbow lakes. Managed realignment (restoration) of the estuary to a more natural state (i.e. reconnection of the stagnant river meanders to the estuary) would significantly increase its ecological value. Grazing marsh would be transformed into saltmarsh and mudflats to the benefit of many wetland birds such as shelducks, redshanks and dunlin. The SMP policies for the Cuckmere Estuary are managed realignment in Epoch 1 and no active intervention in Epochs 2 and 3.

The Cuckmere Estuary is recommended as a CCMA because of the relationship between the potential restoration (and the natural deterioration of existing defences) and future planning. These include effective management of flood risk of the A259 (renewed defences for the road) and properties upstream and adjacent to it, management of erosion risk to important landmarks, particularly the Coastguard Cottages at the mouth of the estuary, the perception of loss of aesthetic appeal, and maintenance of public access to the area (footpath diversions).

The Defra Coastal Pathfinder Project concluded that in the short-term the estuary banks should be maintained, while further consideration was given to re-activating the meanders in the longer term. The environmental aspects of the CCMA would be integral to development of a coherent plan for the short-, medium- and long-term management of the estuary.



Figure 3.6. General outline of Cuckmere Estuary Meanders and Grazing Marshes potential CCMA. The red line is indicative only and is not a firm proposal for the CCMA boundary

3.2.6 Selsey to Pagham Beaches, Spit and Tidal Inlet

The Selsey to Pagham coast is a complex coastal system comprising a tidal inlet supporting saltmarsh, intertidal mudflats, reed swamp, lagoons and open coastal water, fronted by a dynamic shingle beach and spit (Figure 3.7). Church Norton Spit is a key conservation site for coastal geomorphology and processes, significant as a classic shingle spit landform, comprising a series of sub-parallel ridges and recurves, which mark phases of extension and frontal accretion. The spit has grown significantly to the northeast over the past decade. Also, the spit is particularly important as the only place where Defolin's lagoon snail occurs, and only one of three places where this species is found in England. The SMP policy is managed realignment in all three epochs.

Within the tidal inlet (Pagham Harbour), the mudflats are particularly rich in invertebrates and algae, providing important feeding habitats for a diverse breeding community of birds including oystercatcher, shelduck and redshank. The saltmarsh comprises lower and middle marsh vegetation communities with extensive swards of common cord grass and sea purslane, supporting breeding populations of little tern in summer and wintering populations of pintail and ruff. Several percolation lagoons exist which are reed fringed and form valuable bird nesting habitats.

The recent dramatic changes in length of Church Norton Spit is affecting the evolution of the adjacent inlet channel, which is causing erosion along Pagham Beach landward of the channel, increasing the risk of tidal flooding of properties located at the back of the beach. As a response to this increased risk, an adaptive management framework has been established at Pagham Harbour, which considers the system as a series of future potential geomorphological 'states' in its sequential evolution and recommends appropriate management interventions associated with each state.

Recent storms have exacerbated the erosion of Pagham Beach. In response to this continued erosion, a rock revetment was constructed in early December 2013 to mitigate further erosion. During the storms in December 2013/14, the rock revetment held firm although some damage to it occurred. Subsequently, continued elongation of Church Norton Spit put further Pagham Beach properties at risk of erosion and an additional urgent revetment was completed in November 2014 (along with beach recycling) to provide the necessary protection.

Given the complexities and uncertainties in the evolution of Church Norton Spit and the concomitant affect it might have on Pagham Beach Estate, future management remains uncertain. Hence, a CCMA between Selsey and Pagham is recommended as part of the process to find a sustainable solution to the problem of erosion of Pagham Beach and the potential loss of properties. A recent review of the erosion at Pagham concluded that a possible solution is to create a controlled breach through the spit at a location where the tidal inlet was previously located. The sediment excavated from this breach could be used to block the existing channel that runs along the face of Pagham Beach.



Figure 3.7. General outline of Selsey to Pagham Beaches, Spits and Tidal Inlet potential CCMA. The red line is indicative only and is not a firm proposal for the CCMA boundary

3.2.7 Milford on Sea to Highcliffe Eocene Cliffs

The Milford on Sea to Highcliffe cliffs (Figure 3.8) represent classic exposures of Eocene marine to non-marine deposits, mostly soft clay and marls with some sands, ironstone nodules, thin beds of limestone and plant beds. They contain abundant thin-shelled bivalve and gastropod remains, mostly of freshwater and lagoon origin. The remains of crocodiles, snakes, birds, mammals and fragments of turtle carapace also occur, and several areas are famous for their abundance of fossil seeds and sharks teeth. In addition to its rich geological heritage, this stretch of coast provides an example of a chine; a steep sided ravine incised into a broader valley. It has been formed as a result of rapid coastal retreat so that the stream has become rejuvenated and cut down to adjust to the new cliff location. The SMP policy for most of this stretch of coast is managed realignment in all three epochs.

There is a long historical record of erosion and remedial actions at Barton on Sea located at the western end of the cliffs, with loss of properties and coastal roads. Prior to the 1960s the cliffs were undefended. In the 1960s, sheet steel piling and drainage schemes were introduced to mitigate the erosion, but part of these subsequently failed in the 1970s (during the Barton Court landslide). The landslide led to demolition of several properties close to the cliff edge. In 2001, a further large rotational landslide occurred with numerous further slides taking place during the 2000s, culminating in slides during heavy rainfall in the winter of 2012/13.

The Milford on Sea to Highcliffe Eocene cliffs are justified as a potential CCMA due to the balance between allowing the cliffs to erode to expose fresh geological units and fossils and the need to protect properties at risk on the cliff top. Over the years, policy and public attitude to management of this coast has variously swung from defence through to drainage to the eventual policy of managed realignment. The CCMA could be used to consolidate these views to develop a comprehensive action plan for this coast.



Figure 3.8. General outline of Milford on Sea to Highcliffe Eocene Cliffs potential CCMA. The red line is indicative only and is not a firm proposal for the CCMA boundary

3.2.8 Slapton Sands Shingle Barrier Beach

Slapton Sands is a shingle barrier beach enclosing a lagoon (Slapton Ley) that extends over 5km from just south of Torcross to Strete (Figure 3.9). The area is of outstanding environmental, landscape and geomorphological value and therefore a key driver of policy is conservation of this asset through allowing natural processes to occur whilst undertaking measures to ensure the sustainability of the shingle ridge. The main coast road (A379) runs along its crest, which is an important link for communities. The SMP policy for the beach is managed realignment over all three epochs.

The shingle barrier is eroding which has historically resulted in damage to the A379 due to beach cut-back. During the winter of 2000/2001 a series of storms affected beach loss to such an extent as to warrant closure of the A379 for about three months afterwards. Subsequently a replacement length of road was built approximately 20m inland from the original alignment. The road is also affected by the natural rollback of the shingle barrier, which will continue in response to sea-level rise.

Although the A379 is unsustainable in its current location, it is an important transport route and is of economic and social value for the area. Devon County Council are committed to maintaining the road whilst it is technically feasible and cost effective to do so. However, there is acceptance that it will not be possible to do this indefinitely. The long-term vision for this coastline is to allow the barrier beach to evolve naturally, with potential loss of the road.

A CCMA is recommended here so that any management decisions will be based on a wider consideration than the direct physical loss of the road. Not only is the unique ecology of the area linked to the fate of the shingle ridge, any attendant changes in landscape and the relationship to the beach and the Ley would have an impact on tourism and the dependent communities in the area. In addition, sea-level rise and increased storminess will impact upon the sustainability of continuing to defend the seaward part of Torcross. The roll-back of Slapton Sands to the north could potentially lead to outflanking of defences here. The beaches at Torcross may narrow and steepen as they respond to sea-level rise and changes in storm patterns, exposing the defences to greater wave action making it increasingly difficult to sustain them in their current position.



Figure 3.9. General outline of Slapton Sands Shingle Barrier Beach potential CCMA. The red line is indicative only and is not a firm proposal for the CCMA boundary

3.2.9 Taw-Torridge Estuary, Coastal Dunes and Cobble Ridge

The area at the mouth of the Taw-Torridge Estuary comprises a large dynamic system comprising a large sand dune field to the north, a cobble ridge with a smaller dune field to the south, sandwiching an area with extensive intertidal flats, banks, beaches and shore platforms (Figure 3.10). All together they are important for their active coastal geomorphological processes, with all elements forming part of the estuary sediment budget.

Braunton Burrows is one of the largest dune systems in England, important for its diversity of form with lime-rich dunes and an extensive system of variably-flooded slacks, grassland and scrub, inland of a wide sandy foreshore. A legacy of major blowouts is also apparent. Invertebrates are numerous over the whole dune system, particularly terrestrial or freshwater molluscs, including the sand-bowl amber snail. The dunes also contain a variety of habitats for many flowering and lower plants including marram (‘in the ‘yellow’ dunes) and dune fescue (in the ‘grey’ dunes). The dunes also support the rare sea stock and the nationally scarce bird’s-foot clover and rock sea-lavender. Northam Burrows contains one of few spits in England that are formed of large cobbles at the back of an extensive sandy intertidal zone. The pebbles are composed of hard, fine-grained sandstone, which outcrops in the cliffs west of Westward Ho!

The whole system is a focal point of bird migration routes down the west coast of the United Kingdom. The estuary regularly supports nationally important numbers of curlew, golden plover and lapwing. Other species of waders such as redshank, dunlin and oystercatcher are also abundant.

A CCMA for the Taw-Torridge Estuary, Coastal Dunes and Cobble Ridge is recommended for multiple management and planning reasons. There is potential for future stress on the estuarine flood defences (particularly the Taw) in response to sea-level rise and migration of channel meanders. It is likely that the Braunton Burrows dunes will erode and potentially become more mobile.

Sand accretion has occurred on the intertidal areas fronting Instow, which has caused problems of wind-blown sand encroaching on to the coast road, which has to be removed. In order to maintain the sediment budget, the sand blown on to the road is placed back into the estuary system. It is possible that the accelerated rates of sea-level rise will revert the Instow intertidal area to erosion upsetting the sediment balance in the estuary, with knock-on effects elsewhere.

The cobble ridge of Northam Burrows is currently retreating with potential future impacts on the multiple uses of the land behind it, including risk of exposure of a landfill site and the developed area of Westward Ho!.



Figure 3.10. General outline of Taw-Torrige Estuary, Coastal Dunes and Cobble Ridge potential CCMA. The red line is indicative only and is not a firm proposal for the CCMA boundary

3.2.10 Sefton Foreshore and Dunes

The Sefton coast is of special interest for coastal geomorphology, in particular for the large mobile dune system, intertidal mudflats and sandflats, and the relatively stable sand bars (with many different types of bedform) that occur on the foreshore (Figure 3.11). The dunes are important for their range of stages, from embryonic shifting dunes, mobile dunes, dunes with creeping willow and humid dune slacks through to fixed dunes and dune grasslands. Varied assemblages of vascular and non-vascular plants occur in the various dune stages, in particular the nationally rare grey hair grass, nationally scarce liverwort and nationally rare moss. Populations of sand lizard, natterjack toad and great-crested newt are also of interest, along with populations of sandhill rustic moth.

The extensive intertidal mudflats and sandflats are part of an internationally important site for birds and provide feeding grounds and roosts for many species of waders and wildfowl. In winter the site supports internationally important populations of grey plover, knot, sanderling and bar-tailed godwit. Oystercatcher and dunlin also occur in nationally important numbers. This coast is also an important staging post for migrating birds during both spring and autumn.

The SMP policy for the Sefton Foreshore and Dunes is managed realignment for all three epochs. This allows for the natural evolution of the area, with minimal intervention if local problems occur, which may include dune management or relocation of assets at risk. By managing any natural roll back of the dune system into the future the impacts on the human assets can be minimised whilst maintaining the natural character of the frontage.

This area is recommended as a CCMA because of local planning and amenity issues related to the natural evolution of the dunes. Intervention may include adaptation in eroding areas, such as relocating footpaths and car parks. There is also erosion risk to a small number of isolated properties and holiday parks, in the medium- to long-term. Also, maintaining accretion and increased beach levels along the Southport frontage will provide natural defence to the southern part of this town.



Figure 3.11. General outline of Sefton Foreshore and Dunes potential CCMA. The red line is indicative only and is not a firm proposal for the CCMA boundary

Appendix A: Long List of Sites

Shoreline Management Plan	Policy Unit	Long List	Name	Policy			Environment	Coastal Change
				Epoch 1	Epoch 2	Epoch 3		
Northumberland & North Tyneside	4.1	1.1	North Low and South Low	MR	MR	MR	Flood defences	Erosion 0.1m/yr Develop natural boundary
	4.2		Beal Point	NAI	NAI	NAI	Cliff?	
	4.3		Fenham Flats	NAI	NAI	NAI	Intertidal flats & saltmarsh	
	4.6		Shell Road (Holy Island)	MR	MR	MR	MR - raise road level	
	4.7		Holy Island Clay Cliff	NAI	NAI	NAI	Clay cliff?	
	5.1		North Coast	NAI	NAI	NAI	Dunes	
	5.2		East Coast	NAI	NAI	NAI	Cliff?	
	6.1	1.2	Bamburgh and St Aiden's Dunes	NAI	NAI	NAI	Dunes & Beach	Dune erosion 0.3-0.4m/yr
	8.4	1.3	Beadnell Bay North	MR	MR	MR	Dunes & Beach	Dune erosion 0.2-0.3m/yr
	8.5		Beadnell Bay South	NAI	NAI	NAI	Dunes & Beach	Dune erosion 0.2-0.3m/yr
	13.9	1.4	Buston Links	NAI	NAI	NAI	Dunes	Dune erosion 0.1m/yr
	14.1		Birling Links	NAI	NAI	NAI	Dunes	Dune erosion 0.1-0.3m/yr
	14.2		Breakwater Dunes	MR	MR	NAI	Dunes	Dune erosion 0.1-0.3m/yr
	17.3	1.5	Druridge Bay North	MR	MR	MR	Dunes	Dune erosion 0.1m/yr
17.4	Druridge Bay South		MR	MR	MR	Dunes	Dune erosion 0.1m/yr	
River Tyne to Flamborough Head	21.2	2.1	Runswick Bay	NAI	NAI	NAI	Till cliffs	Cliff erosion 0.2m/yr
	21.3		Kettleiness	NAI	NAI	NAI	Hard rock cliff & platform	Cliff erosion 0.1m/yr
	22.1		Sandsend Cliffs	NAI	NAI	NAI	Hard rock cliff & platform	Cliff erosion 0.1m/yr
	29.1	2.2	Cornelian Bay	NAI	NAI	NAI	Till cliff & beach	Cliff erosion 0.2m/yr
	29.2		Cayton Bay	NAI	NAI	NAI	Till cliff & beach	Cliff erosion 0.25m/yr
	29.3		Cayton Bay Access	MR	MR	MR		
	30.1		Gristhorpe Cliff	NAI	NAI	NAI	Till cliff & rock platform	Cliff erosion 0.25m/yr
	30.2		North Cliff	NAI	NAI	NAI	Hard rock cliff? (W) till cliff (E)	Cliff erosion 0.25-0.5m/yr
	31.1		North of Filey	NAI	NAI	NAI	Till cliff & beach	Cliff erosion 0.25m/yr
	31.3	2.3	Muston Sands	NAI	NAI	NAI	Till cliff & beach	Cliff erosion 0.25m/yr
	32.1		Hunmanby Sands	NAI	NAI	NAI	Till cliff & beach	Variable erosion rates
	32.2		Hunmanby Gap	NAI	NAI	NAI	Till cliff & beach	Variable erosion rates
	32.3		Reighton	NAI	NAI	NAI	Till cliff & beach	Variable erosion rates
33.1	Speeton		NAI	NAI	NAI	Till cliff & beach	Cliff erosion 1.5m/yr	
Flamborough Head to Gibraltar Point	C	3.1	Wilsthorpe to Atwick	NAI	NAI	NAI	Till cliffs & beach / platform	Cliff erosion 1-2m/yr
	G	3.2	Hollym to Dimlington Cliffs	NAI	NAI	NAI	Till cliffs & beach / platform	Cliff erosion 1-2m/yr
	J	3.3	Kilnsea to Spurn Point	MR	MR/NAI	MR/NAI	Dunes, beach & intertidal flats	
Hunstanton to Kelling Hard	1D	5.1	Thornham	NAI	NAI	NAI	Saltmarsh & intertidal flats	Accretion / erosion
	2A		Thornham to Titchwell	NAI	NAI	NAI	Saltmarsh & intertidal flats	Accretion / erosion
	2I	5.2	Holkham Dunes	MR1	MR1	MR1	Beach, dunes & saltmarsh	Erosion (roll back)
	2M	5.3	Stiffkey Bay	NAI	NAI	NAI	Saltmarsh & intertidal flats	?
	3B	5.4	Stiffkey to Morston	NAI	NAI	NAI	Saltmarsh / Blakeney spit	?
	3D		Cley to Salhouse	MR1	MR1	MR1	Saltmarsh & shingle ridge	Erosion (roll back)

Shoreline Management Plan	Policy Unit	Long List	Name	Policy			Environment	Coastal Change
				Epoch 1	Epoch 2	Epoch 3		
Kelling Hard to Lowestoft Ness	6.01	6.1	Kelling to Sheringham	NAI	NAI	NAI	Glacial cliffs & beach	Cliff erosion 0.1-0.7m/yr
	6.03	6.2	Sheringham to Cromer	MR	NAI	NAI	Glacial cliffs & beach	Cliff erosion 0.1-0.8m/yr
	6.05	6.3	Cromer to Overstrand	MR	NAI	NAI	Glacial cliffs & beach	Cliff erosion 0.8-0.9m/yr
	6.07	6.4	Overstrand to Mundesley	MR	NAI	NAI	Glacial cliffs & beach	Cliff erosion 0.6-2.0m/yr
	6.09	6.5	Mundesley to Bacton Gas Terminal	MR	NAI	NAI	Glacial cliffs & beach	Cliff erosion 0.9m/yr
	6.12	6.6	Ostend to Eccles	MR	MR	MR	Glacial cliffs & beach	Cliff erosion 0.4-1.2m/yr
	6.19	6.7	Gorleston to Hopton	MR	NAI	NAI	Soft cliffs & beach	Cliff erosion 0.4m/yr
	6.21	6.8	Hopton to Corton	MR	MR	NAI	Soft cliffs & beach	Cliff erosion 0.9m/yr
	6.23	6.9	Corton to Lowestoft	MR	NAI	NAI	Soft cliffs & beach	Cliff erosion 1.6m/yr
Lowestoft Ness to Languard Point	5.1	7.1	Benacre Ness	NAI	NAI	NAI	Shingle ness	Accretion north
	5.2		Kessingland Cliff	NAI	NAI	NAI	Soft cliffs & beach	Cliff erosion 0.3m/yr
	7.1	7.2	Benacre Broad to Easton	NAI	NAI	NAI	Soft cliffs, beach with Broads	Erosion 4.5m/yr
	7.2		Easton Broad	MR	NAI	NAI	Beach with Broad	Erosion 3.4m/yr
	8.1		Southwold and Southwold North	MR	MR	MR	Soft cliffs & beach	Erosion 0.5m/yr
	11.2	7.3	Walberswick Marshes	MR	MR	MR	Beach and marshes	Beach erosion 0.5-1.2m/yr
	11.4	7.4	Dunwich Cliff	MR	MR	MR	Soft cliffs & beach	Cliff erosion 0.6m/yr
	12.1		Dunwich and Minsmere Cliffs	NAI	NAI	NAI	Soft cliffs & beach	Cliff erosion 0.4-0.6m/yr
	12.2		Minsmere North	MR	MR	NAI	Beach & marshes	Erosion (rollover) 0.1m/yr
	12.3		Minsmere Central	MR	MR	MR	Beach & marshes	Erosion (rollover) 0.1m/yr
	12.4		Minsmere South	MR	MR	MR	Beach & marshes	Erosion (rollover) 0.1m/yr
	15.2	7.5	Orford Ness	NAI	NAI	NAI	Shingle ness	Erosion 0.3-0.7m/yr
	16.1		Orford Beach	NAI	NAI	NAI	Shingle ness	Erosion 1m/yr
16.2	North Weir Point		MR	MR	NAI	Shingle ness	Erosion 0.3m/yr	
Languard Point to Two Tree Island	B6a	8.1	Naze Cliffs North	NAI	NAI	NAI	London Clay cliffs	Cliff erosion 1.8m/yr
	B6b		Naze Cliffs South	MR1	MR1	MR1	London Clay cliffs	Cliff erosion 1.8m/yr
Medway Estuary and Swale	E4 02	9.1	Colemouth Creek to Bee Ness Jetty	MR	MR	MR	Saltmarsh	Coastal squeeze
	E4 04	9.2	Kingsnorth Power Station to Cockham Wood	MR	MR	MR	Grazing marsh	Coastal squeeze
	E4 15	9.3	Motney Hill to Ham Green	MR	MR	MR	Marshes	Coastal squeeze
	E4 16		Ham Green to East of Upchurch	NAI	NAI	NAI	Intertidal mudflat & saltmarsh	Coastal squeeze
	E4 17		East of Upchurch to East Lower Halstow	MR	MR	MR	Intertidal mudflat & saltmarsh	Coastal squeeze
	E4 18		Barksore Marshes	MR	NAI	NAI	Marshes	Coastal squeeze
	E4 19		Funton to Raspberry Hill	NAI	NAI	NAI	Intertidal mudflat & saltmarsh	Coastal squeeze
	E4 20		Chetney Marshes	MR	MR	MR	Marshes	Coastal squeeze
	E4 30		Medway Islands	NAI	NAI	NAI	Marshes	Coastal squeeze
	E4 25	9.4 / 10.1	Shell Ness to Sayes Court	MR	MR	MR	Beach & marshes	Coastal squeeze
E4 26	Sayes Court to North Elmley Island		MR	MR	MR	Marshes	Coastal squeeze	
Isle of Grain to South Foreland	4a 06	10.2	Leysdown-on-Sea to Shell Ness	MR	MR	MR	Beach & marshes	Coastal squeeze
	4a 04		Minster Slopes to Warden Bay	NAI	NAI	NAI	London Clay cliffs	Cliff erosion 0.5-1m/yr
	4a 13		Reculver Country Park	NAI	NAI	NAI	Tertiary cliffs	Cliff erosion 0.1-0.5m/yr
	4b 21		10.4	South of the River Stour to Sandwich Bay Estate (north)	NAI	NAI	NAI	Dunes & beach

Shoreline Management Plan	Policy Unit	Long List	Name	Policy			Environment	Coastal Change
				Epoch 1	Epoch 2	Epoch 3		
South Foreland to Beachy Head	4c07	11.1	Copt Point	NAI	NAI	NAI	Sand cliffs	Cliff erosion 0.5-1m/yr
	4c19	11.2	Cliff End to Fairlight Cove	NAI	NAI	NAI	Clay / sand cliffs	Cliff erosion 0.7-2.0m/yr
	4c20		Fairlight Cove East (Sea Road)	MR	MR	MR	Clay / sand cliffs	Cliff erosion 0.7-2.0m/yr
	4c22	11.3	Fairlight Cove West	NAI	NAI	NAI	Clay / sand cliffs	Cliff erosion 0.7-2.0m/yr
	4c23		Fairlight Cove West to Hastings	NAI	NAI	NAI	Clay / sand cliffs	Cliff erosion 0.7-2.0m/yr
Beachy Head to Selsey Bill	4d01	12.1	Beachy Head to Cuckmere	NAI	NAI	NAI	Chalk cliffs & platform	Cliff erosion 0.3-0.5m/yr
	4d02	12.2	Cuckmere	MR	NAI	NAI	Beach / marshes	Erosion 1-1.5m/yr
	4d20	12.3	Littlehampton to Poole Place	MR	MR	MR	Shingle beach / lowland	Erosion (roll back)
	4d25	12.4	Pagham Harbour to Church Norton	MR	MR	MR	Shingle beach / lowland	Erosion / Accretion
	4d26		Church Norton to Selsey East Beach	MR	MR	MR	Shingle beach / lowland	Erosion / Accretion
Selsey Bill to Hurst Spit	5C02	13.1	Warsash North to Swanwick Shore Road	NAI	NAI	NAI	Tidal floodplain	Coastal squeeze
	5C05		Satchell Marshes to Hamble Common Point	NAI	NAI	NAI	Tidal floodplain	Coastal squeeze
	5C06		Hamble Common Point to Hamble Oil Terminal	NAI	NAI	NAI	Tidal floodplain	Coastal squeeze
	5C17	13.2	Inchmery to Salternshill	NAI	NAI	NAI	Tidal floodplain	Coastal squeeze
Isle of Wight	2A.1	14.1	Osborne Bay	NAI	NAI	NAI	Cliffs	Cliff erosion 0.1-0.3m/year
	2A.2		Woodside	NAI	NAI	NAI	Cliffs	Cliff erosion 0.1-0.3m/year
	2B.8		Quarr and Binstead	NAI	NAI	NAI	Cliffs	Cliff erosion 0.4m/year
	3B.5	14.2	Whitecliff Bay	NAI	NAI	NAI	Cliffs	Cliff erosion 0.2-0.7m/year
	3C.1		Culver Cliff & Red Cliff	NAI	NAI	NAI	Cliffs	Cliff erosion 0.2m/year
	3C.4	14.3	Luccombe	NAI	NAI	NAI	Cliffs	Cliff erosion 0.4m/year
	4A.1		Dunnose	NAI	NAI	NAI	Cliffs	Cliff erosion 0.4m/year
	4B.1	14.4	St. Lawrence Undercliff	NAI	NAI	NAI	Cliffs	Cliff erosion 0.3m/year
	4B.3	14.5	St. Catherine's and Blackgang	NAI	NAI	NAI	Cliffs	Cliff erosion 0.6m/year
	5.1		Central Chale Bay to Afton Down	NAI	NAI	NAI	Cliffs	Cliff erosion 0.3-0.75m/year
	6A.2	14.6	Tennyson Down, Alum Bay and Headon Warren	NAI	NAI	NAI	Cliffs variable	Cliff erosion 0.25-0.3m/year
	6C.2	14.7	Western Yar Estuary - West	NAI	NAI	NAI	Intertidal Marsh / estuary	Coastal squeeze
	6C.4		Western Yar Estuary - East	NAI	NAI	NAI	Intertidal Marsh / estuary	Coastal squeeze
	7.1	14.8	Bouldnor Copse and Hamstead	NAI	NAI	NAI	Cliffs	Cliff erosion 0.3m/year
	7.2		Newtown Estuary	NAI	NAI	NAI	Spits, beaches, intertidal	Erosion 0.2-0.6m/year
7.3	Thorness Bay and Southern Gurnard Bay		NAI	NAI	NAI	Cliffs variable	Cliff erosion 0.4m/year	
Hurst Spit to Durlston Head	CBY.A.4	15.1	Cliff Road	MR	MR	MR	Cliffs	Cliff erosion 0.8m/year
	CBY.B.1		Hordle Cliff to Barton	NAI	NAI	NAI	Cliffs	Cliff erosion 0.8m/year
	CBY.B.2		Barton-on-Sea Marine Drive East	MR	MR	MR		Cliff erosion 1.2m/year
	CBY.B.3		Barton-on-Sea Marine Drive and Marine Drive West	MR	MR	MR		Cliff erosion 1.2m/year
	CBY.B.4		Naish Cliff	MR	MR	MR	Cliffs	Cliff erosion 2.8m/year
	CBY.E.2	15.2	East of Hengistbury Head	MR	MR	MR	Dunes	Erosion 1.6m/year
	PBY.E.4	15.3	Solent Beach	MR	MR	MR	Dunes	Erosion 1.8m/year
	PBY/STU.H.5	15.4	Studland Dunes	NAI	NAI	NAI	Dunes	Erosion 0.6m/year
DUR.O.1	15.5	Durlston Bay	MR	MR	NAI	Cliffs	Cliff erosion 0.65m/year	
Durlston Head to Rame Head	5g01-5g09	16.1	Durlston Head to Ringstead Bay (defended length east)	NAI	NAI	NAI	Cliffs	

Shoreline Management Plan	Policy Unit	Long List	Name	Policy			Environment	Coastal Change
				Epoch 1	Epoch 2	Epoch 3		
	5g11-5g12	16.2	Ringstead Bay (defended length west) to Bowleaze Cove (gabions)	NAI	NAI	NAI	Cliffs	
	5g14	16.3	Furzy Cliff	NAI	NAI	NAI	Cliffs	Cliff erosion 0.75m/yr
	6a13-6a14	16.4	West Cliff (East) to Seatown (East)	NAI	NAI	NAI	Cliffs	Cliff erosion 0.4m/yr
	6a16-6a17	16.5	Seatown (West) to Charnmouth (East)	NAI	NAI	NAI	Cliffs	Cliff erosion 0.1-1.0m/yr
	6a19	16.6	Charmouth (West) to East Cliff (Lyme Regis)	NAI	NAI	NAI	Cliffs	Cliff erosion 0.2-3.3m/yr
	6a33-6a34	16.7	Beer to Salcombe Hill	NAI	NAI	NAI	Cliffs	Cliff erosion 1.5m/yr
	6a35		River Sid and East Sidmouth	MR	MR	MR	Cliffs	Cliff erosion 1.5m/yr
	6b75	16.8	Strete to Torcross North (Slapton Sands)	MR	MR	MR	Cliffs / shingle beach	Erosion 0.3m/yr
Rame Head to Hartland Point	17.1	17.1	undefended cliffs	NAI	NAI	NAI	Hard cliffs & beach	Low cliff erosion
	17.2		Gunwalloe Fishing Cove	NAI	NAI	NAI	Hard cliffs & beach	Low cliff erosion
	17.3		Loe Bar & Pool	MR	MR	MR	Shingle Bar	Roll back / erosion 1m/yr
	18.2	17.2	Praa Sands east	MR	MR	NAI	Dunes	Dune erosion 0.5m/yr
	18.3		Praa Sands west	MR	MR	MR	Dunes	Dune erosion 0.5m/yr
	28.2	17.3	Mexico Towans to Gwithian Towans	MR	MR	MR	Dunes	Erosion
	28.3		Gwithian beach & Red River	MR	MR	MR	Dunes	Erosion
	28.4		Godrevy Cliffs	NAI	NAI	NAI	Cliffs	Cliff erosion 1m/yr
	Hartland Point to Anchor Head	7c07	18.1	Northam Burrows	MR	MR	MR	Shingle ridge
7c29		18.2	Crow Point & Crow Neck	MR	MR	MR	Dunes	Erosion
7c30			Braunton Burrows	NAI	NAI	NAI	Dunes	Erosion
7d15-7d17		18.3	Gore Point to Hurlstone Point (Porlock)	NAI	NAI	NAI	Shingle beach / lowland	High rate of change
Great Ormes Head to Scotland	11a 9.1	22.1	River Alt (west bank) to Weld Road, Southport (Formby Dunes)	MR	MR	MR	Dunes	Erosion / accretion
	11c 14.1	22.2	South End Hawes to Biggar (east side)	NAI	NAI	NAI	Low cliffs?	Cliff erosion 0.3-1m/yr
	11c 14.3		South End Hawes to Hare Hill (open coast)	NAI	NAI	NAI	Low cliffs?	Cliff erosion 0.3-1m/yr
	11c 14.5	22.3	Hillock Whins to Nanny Point Scar	NAI	MR	MR	Low cliffs?	Cliff erosion 0.3-1m/yr
	11c 14.6		Nanny Point Scar to Mill Scar	NAI	NAI	NAI	Low cliffs?	Cliff erosion 0.3-1m/yr
	11c 14.7		Mill Scar to north of West Shore Park	MR	MR	MR	Low cliffs?	Cliff erosion 0.3-1m/yr
	11c 14.8		North Walney from north of West Shore Park to Lenny Hill	NAI	NAI	NAI	Low cliffs?	Cliff erosion 0.3-1m/yr
	11d 1.3	22.4	Haverigg to Hartrees Hill	NAI	NAI	NAI	Dunes	Accretion
	11d 2.2	22.5	Stubb Place and Eskmeals Dunes	MR	MR	MR	Dunes	
	11d 3.1		Eskmeals Dunes to Ravenglass	NAI	NAI	NAI	Estuary / Saltmarsh	
	11d 3.3	22.6	Ravenglass to Drigg Point	NAI	NAI	NAI	Estuary / Saltmarsh	
11d 4.1	Drigg Point to Seascale		NAI	NAI	NAI	Dunes		
	11e 7.3-7.5	22.7	Wath Farm to Anthorn	MR	MR	MR	Saltmarsh	Coastal squeeze

REPORT

Coastal Change Management Areas

Phase 2

Client: Natural England

Reference: PB6579

Revision: 0.1/Final

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Table of Contents

1	Introduction	1
1.1	Coastal Change Management Areas	1
1.2	Objective	1
1.3	Methodology	2
2	Results	3
2.1	Stage 1: the long-list	3
2.2	Stage 2: the stand-outs	3
2.2.1	East Wash Shingle Spit and Saline Lagoons	5
2.2.2	Trimley Saltmarshes, Grazing Marshes and Mudflats	7
2.2.3	Dawlish Warren Spit and Dunes	9

Table of Tables

Table 2.1. Location of stand-out potential CCMA's	4
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Table of Figures

Figure 2.1. Location of stand-out potential CCMA's	3
Figure 2.2. General outline of East Wash Shingle Spit and Saline Lagoons potential CCMA. The red line is indicative only and is not a firm proposal for the CCMA boundary	6
Figure 2.3. General outline of Trimley Saltmarshes, Grazing Marshes and Mudflats potential CCMA. The red line is indicative only and is not a firm proposal for the CCMA boundary	8
Figure 2.4. General outline of Dawlish Warren Spit and Dunes potential CCMA. The red line is indicative only and is not a firm proposal for the CCMA boundary	10

Appendices

Appendix A: Long List of Sites	
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1 Introduction

1.1 Coastal Change Management Areas

Coastal Change Management Areas (CCMAs) have been identified as a key coastal planning tool. Policies and guidance to support this approach are set out in the National Planning Policy Framework (NPPF) (Department for Communities and Local Government, 2012) and its associated Planning Practice Guidance (<http://planningguidance.planningportal.gov.uk/>). They are to be defined in Local Plans as areas likely to be affected by coastal change; such as physical change to the shoreline through erosion, coastal landslip, permanent inundation or coastal accretion.

The NPPF maintains that local planning authorities should reduce risk from coastal change by avoiding inappropriate development in vulnerable areas or adding to the impacts of physical changes to the coast. They should identify as a CCMA any area likely to be affected by physical changes to the coast, and:

- be clear as to what development will be appropriate in such areas and in what circumstances; and
- make provision for development and infrastructure that needs to be relocated away from CCMAs.

CCMAs are being established in areas where interactions between coastal change and new development/infrastructure proposals (or relocation of existing development and/or infrastructure) need to be resolved. National Planning Practice Guidance also allows them to be established in areas 'for facilitating roll-back and relocation of land uses'.

A CCMA should only be defined where rates of shoreline change are significant over the next 100 years, taking account of climate change. They should not need to be defined where the accepted Shoreline Management Plan (SMP) policy is to hold or advance the line (maintain existing defences or build new defences) for the whole period covered by the plan, subject to evidence of how this may be secured.

Local planning authorities should demonstrate that they have considered SMPs, which provide a large-scale assessment of the risks associated with coastal processes, and should provide the primary source of evidence in defining the CCMA and inform land allocation within it.

1.2 Objective

In 2015, Natural England retained Royal HaskoningDHV to identify a 'top ten' list of potential environmentally linked English CCMAs, where the options were either No Active Intervention (NAI) or Managed Realignment (MR) in the first epoch. The initial study identified the following areas and associated environments:

- Filey Bay Glacial Cliffs and Beaches;
- Easington Lagoons, Kilnsea Glacial Cliffs and Spurn Head Spit;
- Sheringham to Bacton Glacial Cliffs;
- Birling Gap Chalk Cliffs;
- Cuckmere Estuary Meanders and Grazing Marshes;
- Selsey to Pagham Beaches, Spit and Tidal Inlet;
- Milford on Sea to Highcliffe Eocene Cliffs;
- Slapton Sands Shingle Barrier Beach;

- Taw-Torridge Estuary, Coastal Dunes and Cobble Ridge; and
- Sefton Foreshore and Dunes.

This study has been commissioned to expand the list of English CCMA's to include those where the current (first epoch) SMP option is Hold The Line (HTL) but where the second epoch is either MR or NAI.

While CCMA's are already being used by some Local Authorities the aim of this work is to help Natural England engage with and encourage Local Authorities to consider environmental opportunities associated with CCMA's and to identify where CCMA's can help secure strategic solutions that avoid development or infrastructure-related conflicts in the future.

1.3 Methodology

A two-stage approach was adopted:

- Stage 1: compile a 'long-list' of SMP Policy Units where the first epoch option is HTL and where the second epoch option is either MR or NAI.
- Stage 2: prioritise the list to develop a set of 'stand-out' potential CCMA's providing a clear rationale in terms of why the sites are selected from a planning perspective and the potential environmental benefits associated with each of them.

Prioritisation was assessed using two criteria:

- the risk of conflict (e.g. from planning or coastal defence proposals) associated with the natural environment if the HTL approach was extended beyond the first epoch; or
- where adaptation during the second epoch has the potential to provide biodiversity opportunities or other benefits for the natural environment.

2 Results

2.1 Stage 1: the long-list

A long-list of potential locations for CCMA with HTL-MR or HTL-NAI combinations has been drawn up using the second round of SMPs. Twenty English SMPs have been reviewed starting at the Scottish border on the English east coast, around to the Scottish border on the English west coast. The review excluded the coast of Wales. The long list includes 80 potential CCMA that cover 15 of the 20 SMPs. Five SMPs did not contain any Policy Units that met the criteria to be included in the long list. The 80 potential CCMA are described in Appendix A. Their high-level description is broken down by SMP Policy Unit (and combinations), policy by epoch (Hold the Line followed by Managed Realignment or No Active Intervention), and main geomorphological features (very general).

2.2 Stage 2: the stand-outs

The stand-out CCMA with the greatest scope to help address environmental issues have been drawn up from the initial 80 locations in the long list. They have been based principally on the proximity of designated sites to the Policy Unit, either behind or adjacent or in combination, with expert judgment as to which provide the 'best' environmental cases to champion with Local Authorities.

Three stand-out potential CCMA have been identified and they are presented in Table 2.1 (from northeast England through south England to northwest England, i.e. in no particular priority order). Their locations are shown on Figure 2.1.



Figure 2.1. Location of stand-out potential CCMA

Table 2.1. Location of stand-out potential CCMA

Shoreline Management Plan	Policy Unit	Short List CCMA	Name	Policy			Environment	Notes
				Epoch 1	Epoch 2	Epoch 3		
Gibraltar Point to Hunstanton	2	East Wash Shingle Spit and Saline Lagoons	Wolferton Creek to South Hunstanton	HTL	HTL or MR or NAI	HTL or MR or NAI	Spit & Lagoons	Area in front of the defence has high conservational value Lagoons designated as SPA and SAC Ramsar site The Wash SSSI
Languard Point to Two Tree Island	A2	Trimley Saltmarshes, Grazing Marshes and Mudflats	Trimley Marsh	HTL	MR2	HTL	Lowland	Within Stour and Orwell Estuaries Ramsar and SPA Suffolk Coast and Heaths AONB
	A3a		Loom Pit Lake	HTL	MR2	NAI		
Durlston Head to Rame Head	6b20	Dawlish Warren Spit and Dunes	Dawlish Warren (East - Distal End)	HTL	HTL or MR	HTL or MR	Spit & Dunes	SPA and SSSI
	6b21		Dawlish Warren (Central - gabion defences)	HTL	HTL or MR	HTL or MR		
	6b22		Dawlish Warren (West - hard defences)	HTL	HTL or MR	HTL or MR		

MR2= Breach of the frontline defence after building any necessary new landward defence line and counter walls to limit flooding to adjacent areas

2.2.1 East Wash Shingle Spit and Saline Lagoons

The coast between south Hunstanton and Wolferton Creek on the eastern shore of The Wash is a continuous strip of storm beach shingle, up to 6m high, in the form of a spit stretching for 11km from Hunstanton to Dersingham (Figure 2.2). Contemporary growth of the spit is very limited, but at its southernmost end it still provides shelter for growth of saltmarshes on its landward side. The shingle ridge also provides protection to saline lagoons, which are an internationally designated habitat and one of the most important roosting areas for wading birds in The Wash. Landward of the spit-ridge is an earth embankment which provides a secondary line of defence, before tapering to a single hard defence at south Hunstanton.

The ridge and embankment provide flood protection to 642 residential properties and around 3,500 caravans and holiday homes at south Hunstanton, Heacham and Shepherd's Port, and a Country Park south of Heacham. The ridge is subject to erosional pressures and can be significantly lowered by storm events, increasing the flood risk. If the defences were to breach it could result in widespread flooding of the inland facilities between the ridge and the secondary flood bank.

In the short term (up to 2025) the intent is to hold the defences in their current position (policies of both the SMP and the Wash East Coastal Management Strategy). In the medium and long term (2025 to 2105), it is possible that parts of the current alignment can be held, but it is also possible that MR or NAI may be required for part of the frontage.

Currently, the Environment Agency maintains the shingle ridge through annual beach recycling. However, from this year, the funding that supports the Environment Agency to complete the beach recycling is no longer available. Continued investment in annual beach recycling for flood defence is being supported by funding contributions from local sources through a local Community Interest Company (CIC). Supported by the Borough Council of Kings Lynn & West Norfolk and the Environment Agency, the CIC is aiming to raise 75% of the funding with the remainder coming from government funding. The community directly benefit from the defences and want to influence flood risk management works in their area.

Future decisions to continue with flood defence will need to recognise that it may become unsustainable and unaffordable in the future. Future policies will need to be developed through a collaborative process, with the partners, in order to achieve the best balance between socio-economic and environmental constraints and opportunities. Hence, a CCMA is recommended here because of the uniqueness of the saline lagoon habitats linked to the fate of the shingle ridge, but also because any attendant changes in the shingle ridge would have an impact on tourism and the dependent communities in the area. In addition, sea-level rise and increased storminess will impact upon the sustainability of continuing to defend the low lying areas behind the ridge. However, it is doubtful whether retreating the shingle ridge to the existing flood embankment is a realistic option because this would require large scale adaptation of the area between the lines, and the embankment was not designed as a frontline defence.



Figure 2.2. General outline of East Wash Shingle Spit and Saline Lagoons potential CCMA. The red line is indicative only and is not a firm proposal for the CCMA boundary

2.2.2 Trimley Saltmarshes, Grazing Marshes and Mudflats

Trimley Marshes and Loom Pit Lake are a complex of saltmarshes, grazing marshes and mudflats within the Trimley Estate, owned by Trinity College, Cambridge (Figure 2.3). Some of the area is also farmed under a tenancy agreement. They are also designated as part of the Suffolk Coast and Heaths AONB and fall within the Stour and Orwell Estuaries SPA, Ramsar site and Orwell Estuary SSSI. They are also adjacent to the Port of Felixstowe, the UK's leading container port. Trimley Estate and the Port of Felixstowe work closely together, to ensure appropriate planning for the area goes forward. Significant landscape enhancements have already been carried out by Trimley Estate in this area together with mitigation measures for Port expansion. These areas require maintenance and enhancement to continue to be an asset for the growing community and its visitors in the long term.

The growth of the port over recent years has been considerable, and has been matched by the steady growth of support facilities and the development of the local infrastructure. In 2007, Trinity College published its latest long-term vision for the Trimley Estate in order to provide a considered framework for future change and sustainability. This was produced independently from the policies of the SMP; no specific policies were described with respect to the natural environment, but general long-term aspirations include:

- Areas of Outstanding Natural Beauty require maintenance and enhancement to continue to be an asset for the growing community and its visitors in the long term;
- natural habitats of European importance for wildlife require continued protection and management and could become a fundamental aspect of education, public awareness and sustainable development objectives around Felixstowe; and
- Felixstowe Peninsula South, which comprises Felixstowe and the adjoining communities of Trimley St Martin and Trimley St Mary, should be an integrated area that (as a priority) is well defended from risk of flooding and coastal erosion.

The SMP policies for Trimley Marshes and Loom Pit Lake are HTL in Epoch 1 followed by MR in Epoch 2 by breach of the existing defence while continuing to provide flood defence to the Port of Felixstowe.

With ongoing and continuing plans for expansion and modification of the Port of Felixstowe, a CCMA is justified along this coastline in order to develop future planning measures to encourage an integrated framework for the use of the whole frontage that reflects the needs of Trimley Estate and the Port of Felixstowe, but ensures that environmental considerations remain at the forefront of discussion. In addition, the flood defences in front of Trimley Marshes and Loom Pit Lake are under pressure from erosion and the stress will be increased in response to sea-level rise. The defences at Loom Pit Lake are privately owned and the ongoing maintenance is the responsibility of the landowner.

A landward realignment within the timescale of the SMP will create a more sustainable situation by reducing the pressure on the flood defences and will support the estuary to move towards a more natural system. The realignment would come at the expense of good quality agricultural land, and partly designated freshwater habitat within the AONB, but it would create new intertidal habitats and the opportunity to replace and expand the area of current freshwater interest.

2.2.3 Dawlish Warren Spit and Dunes

Dawlish Warren is a significant area of sand dunes located on a spit at the mouth of the Exe Estuary. The area falls within the Dawlish Warren SAC, SSSI, NNR and LNR. The short-term Hold the Line policy is in place to maintain its flood defence function which has been continued through use of gabion baskets and groynes. However, the medium- to long-term policies for management are currently uncertain (HTL or MR) and require examination to determine a technically appropriate, economically sustainable and environmentally acceptable way of managing this area to continue to provide its flood protection function whilst also meeting the requirements of environmental legislation.

The seaward-facing sand dunes and beach were eroding significantly along most of the spit length (Exe Estuary Flood and Coastal Erosion Risk Management Strategy). Erosional pressure is particularly acute at the neck of the spit and is at risk of being over-washed or breached as a result of sea-level rise and storms. The gabion baskets were failing in numerous places and preventing the dune from behaving naturally. A breach would increase the risk of flooding to the railway line and the estuary community of Starcross. Significant damage to the groynes during the storms of winter 2015/16 led to a package of emergency works completed in spring 2016. Over the summer of 2016, a further programme of refurbishment and maintenance works was completed, focusing on groynes 5 to 9.

In order to mitigate this erosion the Dawlish Warren beach management (nourishment) scheme (Environment Agency and Teignbridge District Council) is currently underway with the aim of allowing the sand spit to continue to act as a barrier to storm waves, whilst improving the quality of the beach and allow the sand dunes to recover. The works began in January 2017 with removal of the old gabion baskets, which was completed in March 2017. Between April and June 2017, the old timber groynes 10 to 14 were replaced with new groynes to help hold sand on the beach. Beach nourishment using sand from Pole Sands began in June 2017 and has been completed at the neck of the spit. Beach nourishment will continue through the summer, with further sand being placed along the eastern half of the beach, due for completion by the end of August.

The future uncertainty with respect medium- and long-term policies justifies a CCMA to encourage an integrated framework for the management of the spit. Adaptive responses to potential future erosion and flood risk of estuary properties may be needed after the current scheme runs its course. Different strategies can be assessed within the framework of a CCMA.

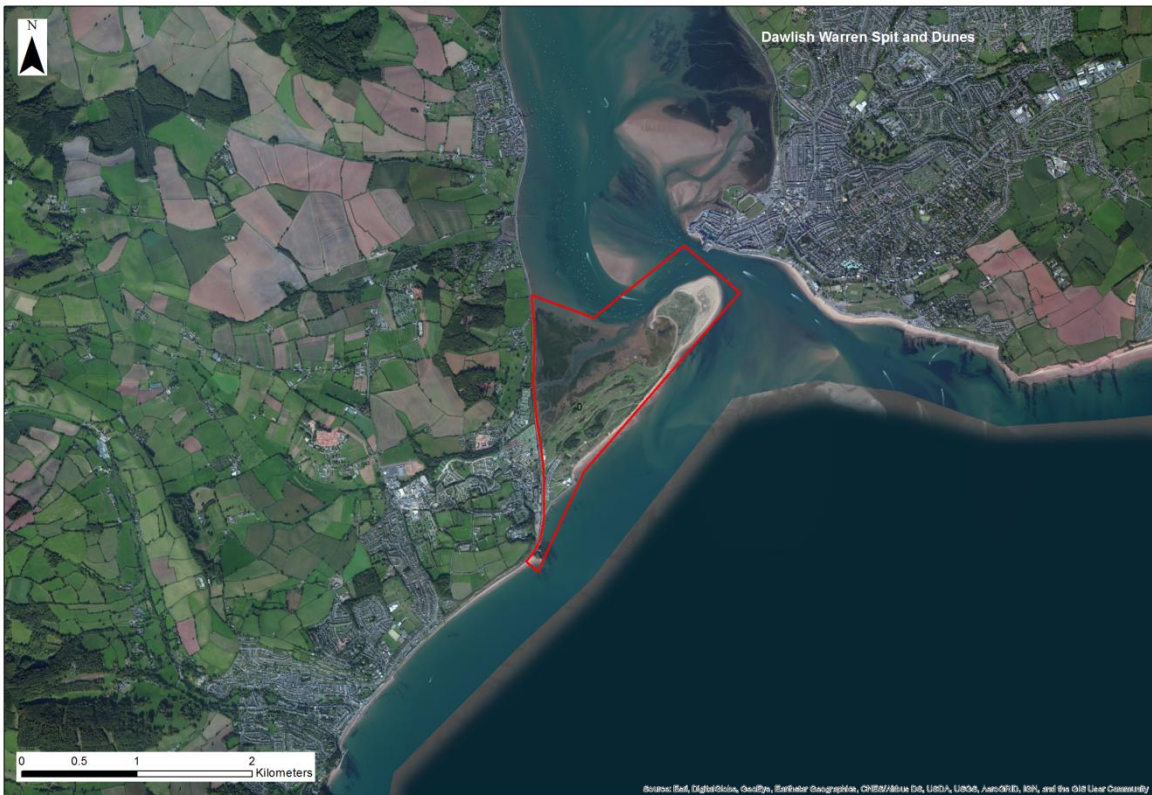


Figure 2.4. General outline of Dawlish Warren Spit and Dunes potential CCMA. The red line is indicative only and is not a firm proposal for the CCMA boundary

Appendix A: Long List of Sites

Shoreline Management Plan	Policy Unit	Name	Policy			Environment
			Epoch 1	Epoch 2	Epoch 3	
River Tyne to Flamborough Head	2.2	Herd Sands South	HTL	MR	HR	Dunes
	3.2	Trow Quarry	HTL	MR	MR	Cliff
	5.1	Harbour Quarry	HTL	R	R	Cliff
	22.3	Coast Road	HTL	R	R	Till Cliff
Gibraltar Point to Hunstanton	2	Wolferton Creek to South Hunstanton	HTL	HTL or MR or NAI	HTL or MR or NAI	Spit & Lagoons
Hunstanton to Kelling Hard	1A	Old Hunstanton Dunes	HTL	MR1	MR1	Dunes
	2D	Reclaimed Grazing Marsh at Brancaster	HTL	HTL or MR3	HTL or MR3	Lowland
	3A.3	Blakeney Freshes Marshes	HTL	MR2	HTL	Lowland
Kelling Hard to Lowestoft Ness	6.06	Overstrand	HTL	MR	MR	Glacial Cliffs
	6.11	Bacton, Walcott & Ostend	HTL	MR	MR	Glacial Cliffs
	6.15	California to Caister-on-Sea	HTL	HTL or MR	MR	Glacial Cliffs
	6.20	Hopton	HTL	MR	MR	Glacial Cliffs
	6.22	Corton	HTL	MR	MR	Glacial Cliffs
Lowestoft Ness to Languard Point	BEN 6.1	Kessingland South	HTL	MR	MR	Lowland
	BEN 6.2	Kessingland Levels	HTL	MR	MR	Lowland
	SWD 8.2	Easton Marsh	HTL	MR	HTL	Lowland
	BLY 9.4	Harbour Reach & Mouth, South Wide	HTL	MR	MR	Lowland
	ORF 15.1	Sudbourne Beach	HTL	NAI	NAI	Lowland
Languard Point to Two Tree Island	A2	Trimley Marsh	HTL	MR2	HTL	Lowland
	A3a	Loom Pit Lake	HTL	MR2	NAI	Lowland
	A8b	Shotley Marshes East	HTL	MR2	HTL	Lowland
	B2	Little Oakley	HTL	MR2	HTL	Lowland
Medway Estuary and Swale	E4 14	The Strand to West Motney Hill	HTL	MR	MR	Estuary
	E4 23	Murston Pits to Faversham	HTL	MR	MR	Estuary
	E4 27	North Elmley Island to Kingsferry Bridge	HTL	MR	MR	Estuary
Isle of Grain to South Foreland	4a 01	Allhallows-on-Sea to Grain (South)	HTL	MR	MR	Floodplain
	4a 05	Warden Bay to Leysdown-on-Sea	HTL & MR	HTL & MR	HTL & MR	Cliff & Lowland
	4a 14	Reculver Towers to Minnis Bay	HTL	MR	MR	Lowland



Isle of Wight	1A.1	Gurnard Luck	HTL	NAI	NAI	Cliff
	1A.6	East Cowes Outer Esplanade	HTL	NAI	NAI	Cliff
	6C.5	Thorley Brook and Barnfields Stream	HTL	MR	NAI	Lowland
Hurst Spit to Durlston Head	CBY.A.2	Milford	HTL	MR	MR	Spit & Lowland
	CBY.E.1	Mudeford Spit	HTL	MR	MR	Spit & Lowland
	CHB.F.1	Mudeford	HTL	MR	HTL	Estuary
	CHB.F.2	Stanpit Marshes	HTL	MR	MR	Estuary
Durlston Head to Rame Head	6a15	Seatown	HTL	NAI	NAI	Cliff
	6a18	Charmouth	HTL	NAI & MR	NAI & MR	Cliff & Lowland
	6b20	Dawlish Warren (East - Distal End)	HTL	HTL or MR	HTL or MR	Spit & Dunes
	6b21	Dawlish Warren (Central - gabion defences)	HTL	HTL or MR	HTL or MR	Spit & Dunes
	6b22	Dawlish Warren (West - hard defences)	HTL	HTL or MR	HTL or MR	Spit & Dunes
	6b32	Teign Estuary - Passage House Hotel to Kingsteignton Road Bridge	HTL	MR	MR	Lowland
Rame Head to Hartland Point	13.3	Swanpool	HTL	MR	MR	Lake
	13.4	Maenporth	HTL	MR	MR	Lake
	35.9	Amble Marshes	HTL	MR	MR	Estuary
Hartland Point to Anchor Head	7c17	Instow to Yelland	HTL	MR & HTL	HTL	Lowland
	7c18	Home Farm Marsh (Yelland to Fremington)	HTL	MR	HTL	Lowland
	7c21	Penhill Point to Bickington	HTL	MR	HTL	Lowland
	7c25	West Ashford to Braunton (East Bank of River Caen)	HTL	MR & HTL	HTL	Lowland
	7c26	Braunton to Horsey Island (West Bank of River Caen)	HTL	MR	HTL	Lowland
	7c27	Horsey Island	HTL	MR	HTL	Lowland
	7c28	Horsey Island to Crow Point	HTL	MR	HTL	Lowland
	7d29	Lilstock	HTL	NAI	NAI	Cliff
	7d32	Hinkley Point to Stolford	HTL	MR	MR	Lowland
	7d33	Stolford	HTL	MR	HTL	Lowland
	7d42	Dunball to River Brue	HTL	MR or HTL	MR or HTL	Lowland
	7d44	Berrow to Brean (North)	HTL	MR	MR	Dunes
	7e02	Axe Estuary Left (West) Bank (Mouth to Near Diamond Farm)	HTL	HTL or MR	HTL or MR	Estuary
	7e03	Axe Estuary Right (East) Bank (near Diamond Farm to Mouth)	HTL	MR or HTL	HTL	Estuary
7e04	Axe Estuary Mouth to Uphill	HTL	MR or HTL	HTL	Estuary	
Anchor Head to Lavernock Point	SHAR4	Overton Lane to Hock Cliff (East Bank of the River Severn)	HTL	MR	MR	Estuary
	SHAR2	Wick's Green to Longley Green (East Bank of the River Severn)	HTL	MR	HTL	Estuary
	SHAR1	Severn Farm to Wick's Green (East Bank of the River Severn)	HTL	MR	MR	Estuary
Great Ormes Head to Scotland	11a 7.4	Runcorn Bridge to Arpley Landfill Site (Upper Mersey Estuary South Bank)	HTL	MR	MR	Estuary

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11a 7.6	Sewage Works to Terrace Road Widnes (Upper Mersey Estuary North Bank)	HTL	MR	MR	Estuary
11c 1.5	Stanah to Cartford Bridge (South Bank) and Cartford Bridge to Shard Bridge (North Bank)	HTL	MR	MR	Estuary
11c 2.3	Fluke Hall to Cocker Bridge	HTL	HTL or MR	HTL	Lowland
11c 2.4	Cocker Bridge to Glasson Dock	HTL	HTL or MR	HTL or MR	Lowland
11c 7.1	Hest Bank to North of West Cain House	HTL	MR	HTL	Lowland
11c 7.3	Red Bank Farm to Bolton-le-Sands Caravan Park	HTL	MR	HTL	Lowland
11c 9.1	Kent Viaduct to Dick Fell Road (Sandside)	HTL	MR	MR	Lowland
11c 9.3	Hollins Well Road North to Levens Bridge (East Bank) & Levens Bridge to kent Viaduct (West Bank)	HTL	MR	MR	Lowland
11c 10.2	Humphrey Head to Cowpren Point	HTL	MR & HTL	MR	Lowland
11c 12.1	Leven Viaduct to Haverthwaite (Left Bank) and Haverthwaite to Greenodd (Right Bank)	HTL	MR	NAI	Lowland
11c 12.3	Barrow End Rocks (A590) to Leven Viaduct	HTL	MR	NAI	Lowland
11c 16.8	Duddon Estuary (Both Banks Upstream of Viaduct and Right Bank South to Green Road Station)	HTL	MR	MR	Lowland
11c 16.9	Millom Marshes	HTL	MR	MR	Lowland
11d 1.1	Hodbarrow Point to Haverigg	HTL	MR	HTL	Lowland
11e 3.1	Workington Harbour to Siddick	HTL	MR	MR	Cliff
11e 4.6	Seacroft Farm to Dubmill Point	HTL	NAI	NAI	Cliff
11e 7.2	Skinburness to Wath Farm	HTL	MR	HTL	Lowland

MR1= Maintain natural defence with minimum intervention

MR2= Breach of the frontline defence after building any necessary new landward defence line and counterwalls to limit flooding to adjacent areas

MR3= Breach of frontline defence, no building of inland defence

HTL+= Maintain or upgrade the standard of protection, including taking into account impacts of climate change