Appendix E
Policy Appraisal

Draft for public consultation
11 March 2010

APPENDIX E - CONTENTS

E1 INTRODUCTION

This appendix describes the policy appraisal for the Essex & South Suffolk Shoreline Management Plan (SMP). The appraisal has been carried out through a number of steps, with strong involvement from the Client Steering Group and Elected Members Forum, and with significant input of local knowledge from the Key Stakeholders Group.

Two processes were essential for carrying out an appraisal appropriate to the SMP: objectives setting and identification of options for appraisal. The approach and methodology for development of both processes is outlined on sections E2 and E3 respectively.

Section E4 outlines the outcome of the application of the objectives setting and options appraisal process at a management unit and policy development zone level.

E2 SETTING PRINCIPLES AND OBJECTIVES

This chapter sets out the approach for establishing the policy appraisal objectives. This approach was presented to and confirmed by the Client Steering Group (CSG) on 15 October 2008.

E2.1 Objective setting in the SMP guidance

The Shoreline Management Plan (SMP) guidance indicates the following process for setting objectives:

- Develop objectives for each feature in the theme review (task 2.4)
- Prioritise objectives within themes - specific approach at the discretion of the CSG (task 2.6)
- Identify key policy drivers - features with associated objectives likely to have overriding influence (task 3.1a).

The theme review for the Essex and South Suffolk SMP has led to the development of a set of objectives for all identified features. This information is used to feed into the development of the objectives for policy appraisal, using a method that is appropriate for this particular SMP. The SMP guidance does not present a fixed methodology for developing objectives, but allows the CSG to agree an appropriate approach.

E2.2 Agreed approach

Based on (ongoing) experience with the Wash SMP2, a different approach was devised for developing policy appraisal objectives, at a level (which is) appropriate to SMPs. The suggested approach is therefore to follow a logical process in four steps:

- Use the outcome of earlier tasks (theme review, baseline scenarios) to develop a *characterisation* of the shoreline
- Determine a set of *key values* based on the characterisation
- Identify the *principles* (on an appropriate geographic scale) that should govern shoreline management, based on the key values and on local and national ambitions
- Combine the key values and the principles to identify the *policy appraisal criteria*.

In general, the nature of the values, principles and criteria determines their geographic scale, so there is no pre-defined unit size. However, for practical purposes, we will use units at an appropriate geographic scale.

E2.3 Typical elaboration of suggested approach

The approach of identifying key values and the associated criteria and objectives is carried out on a local level along the entire shoreline. This section sets out the typical outcomes for all four steps: characterisation, key values, principles and criteria for policy appraisal.

E2.3.1 Characterisation

The characterisation is based on earlier tasks in stage 2 of the SMP: the theme review (Appendix D), the baseline scenarios task (Appendix F) and the identification of flood and erosion risks (Appendix F). This characterisation covers the whole area that could be affected by shoreline management, so this concerns the whole area at risk of flooding and erosion (up to the high ridge).

E2.3.2 Key values

Key values offer a clear definition of the key or core values which underpin the entire range of values that both communities and society attach to the Essex and South Suffolk coastal area (both coastline and hinterland). The key values provide a concise account of the key assets that support the range of activities in or around the shoreline of Essex and South Suffolk that are enjoyed or used by society. Ecological values (specific habitat for example) have an inherent value, but also contribute towards tourism, commercial activity and the overall experience of visiting specific coastal areas. These key values have been developed for each unit, based on the characterisation. Typical key values will be:

- Communities of people and associated range of economic activities (agriculture, tourism, etc.)
- Landscape
- Freshwater, brackish and saline habitats
- Recreation
- Roads.

The key values have been visualised in cross-sections as the *Theme Review Graphics* and have been presented in **Appendix D**. Each cross-section is representative of a management unit of the SMP shoreline and covers the whole zone relevant to the SMP. The cross-sections provide a summary of the key values of each area of coast and provide clarity about how values 'sit together' and interact.

E2.3.3 Principles

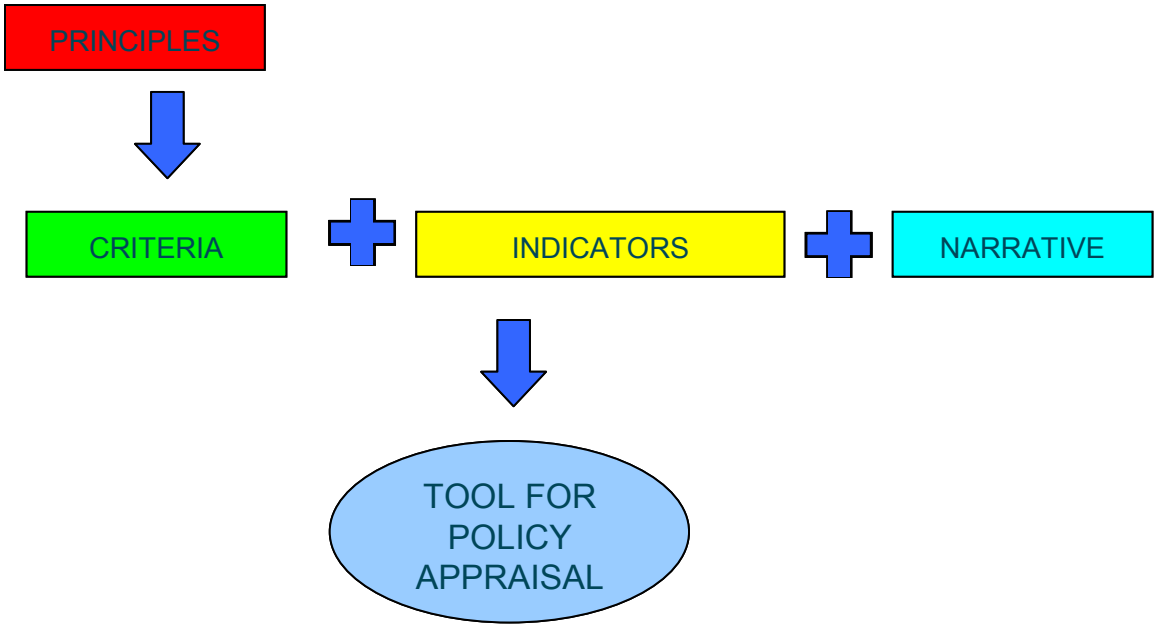
In the context of the SMP, principles define the statements which provide a clear expression of position which will inform and guide the decision making process within the SMP.

These statements offer a concise account of the specific guidance which will focus the formulation of policy. Principles therefore provide an expression of the 'rules' within which appraisal criteria will be developed and policy formulated. Note that principles can be in competition. It is important to realise that the SMP will probably not be able to fulfil all principles, but will need to find the right balance between the principles ('balanced sustainability', as the SMP guidance calls it).

E2.3.4 Policy appraisal criteria and indicators

The principles set the framework, but the appraisal also requires a set of more specific criteria to measure how well each policy option performs against each principle. These criteria bring together the overall principles and the more locally defined key values. Therefore they will be location specific, even though in practice particular criteria can be valid for more than one area. The criteria need to be accompanied by indicators, which if possible are quantifiable. However, the assessment of how well a policy option performs against the principles will be always based on judgement, supported by indicators and a narrative.

The actual performance of the policy against the principle ('Extent and quality of biodiversity') requires judgement, but this is supported by a calculated value for the indicator, in combination with a narrative that puts the outcome in perspective. Figure 1 illustrates the approach.


PRINCIPLES
CRITERIA
INDICATORS
NARRATIVE
TOOL FOR POLICY APPRAISAL

E2.4 Principles

This set of principles for the Essex and South Suffolk SMP was developed with (active involvement from) the Client Steering Group and the Elected Members Forum.

The set of principles as a whole represents the balance of values to which the SMP aspires. In other words, the SMP aims to develop the policies that achieve the best achievable balance between the principles ('balanced sustainability') in the short, medium and long term.

1. To develop policies appropriate to the diverse character of the Essex and South Suffolk coast and its dynamic interaction of land and sea

2. To balance flood and erosion management with the assets and benefits that it protects

3. To seek opportunities for managing the shoreline through natural coastal processes and take full account of longshore and cross-shore impacts

4. To develop policies that are resilient against future changes and associated uncertainty.

5. To provide time and information for communities, individuals and partner organisations to adapt to any anticipated coastal change.

6. To support communities and sustainable development for the people living around the Essex and South Suffolk shoreline by managing the risk to community activities and infrastructure.

7. To support and promote the social and economic values of the Essex and South Suffolk coast to wider society

8. To support conservation and enhancement of biodiversity and geodiversity

9. To contribute to maintaining and enhancing the evolving character of the coastal landscape.

10. To support protection and promotion of the historic environment and its value for the heritage, culture and economy of the area.

11. To support and enhance people's enjoyment of the coast by maintaining and enhancing access.

E2.5 Objectives and Criteria

This section describes the characterisation and key values along the frontage of the Essex and South Suffolk coastline and how they combine with the principles from Section E2.4 to set policy appraisal criteria.

E2.5.1 Criteria

As described in Section E2.3.4 the policy appraisal criteria are typically linked to one or more of the principles and to one or more of the key values. Each principle may have more than one criterion, or one criterion may serve a suite of principles. Most of the criteria are supported by quantifiable measurements but for all criteria, a level of judgement is needed to test to what extent each SMP policy fulfils the associated principles.

To make this transparent, each criterion is accompanied by indicators. Their assessment is illustrated by a narrative which will further explain the decision-making process and will inform judgement on overall policy scoring. Through this approach, the principles and criteria will be used explicitly for policy appraisal. Appendix G provides appraisal tables which demonstrate the application of this approach.

As many of the key values and characteristics of the Essex and South Suffolk coast are present throughout the SMP area, the general structure and content of the criteria are similar for all frontages. The first column of Table E 1 gives an overview. However, the indicators will be largely frontage-specific and relate to particular features. The second column of Table E 1 gives a generic description. This table is repeated for each frontage in this chapter but with the indicators made specific. There are cases where particular criteria are not relevant for a frontage; this is also mentioned.

Table E 1 Principles, criteria and indicators

Principle / Criterion	Indicator
To develop policies appropriate to the diverse character of the Essex and South Suffolk coast and its dynamic interaction of land and sea	
Impact of policy package on the diverse character of the Essex coast	Qualitative judgement
Impact of policy package on dynamic interaction of land and sea	Qualitative judgement

Principle / Criterion	Indicator
To balance flood and erosion management with the assets and benefits that it protects	
Level of flood and erosion risk to people and property.	Number of properties within the tidal flood zone compared to the current number.
Impact on future opportunities	Judgement based on input about future opportunities
To seek opportunities for managing the shoreline through natural coastal processes and take full account of longshore and cross-shore impacts	
Use of natural processes (saltmarsh, longshore interaction)	Qualitative judgement
Longshore impact on neighbouring frontages	Qualitative judgement
Cross-shore impact on near shore activities	Qualitative judgement
To develop policies that are resilient against future changes and associated uncertainty	
This principle will be tested by the sensitivity check (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To provide time and information for communities, individuals and partner organisations to adapt to any anticipated coastal change	
Adequacy of time available for communities, individuals and partner organisations to adapt.	Time (in epochs) available for each required process of adaptation, depending on the policy option
To support communities and sustainable development for the people living around the Essex and South Suffolk shoreline by managing the risk to community activities and infrastructure	
Impact on infrastructure	Type of roads and railways affected
Impact on socio-economic activities	• Impact on tourism and recreation features • Impact on fisheries • Impact on area and grade of agricultural land
Impact on public services	Type and number of services affected
Impact on communities	Number and size of communities (individual dwellings, hamlets, settlements)

Principle / Criterion	Indicator
To support and promote the social and economic values of the Essex and South Suffolk coast to wider society	
Impact on socio-economic features of regional, national or international significance	Impact as a in percentage of regional / national / international availability
To support conservation and enhancement of biodiversity and geodiversity	
Impact on the achievement of management objectives for designated habitats and species, keeping them in favourable condition (including no significant loss of extent or populations)	• Area of designated land lost/gained for each epoch and scenario. • Changes in condition of designated land for each epoch and scenario.
Impact on the achievement of national and local Biodiversity Action Plan (BAP) targets, both within designated sites and within the wider coastal countryside	• Area of BAP habitats • Impact on BAP species
Impact on the achievement of management objectives for designated geological sites, keeping them in favourable condition	• Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario.
To contribute to maintaining and enhancing the evolving character of the coastal landscape	
Impact on the character of the coastal landscape, including considering of geological, geomorphological, historical environment and cultural features, and the role of settlements in the landscape	Qualitative judgement

Principle / Criterion	Indicator
To support protection and promotion of the historic environment and its value for the heritage, culture and economy of the area	
Impact on historic environment and its wider value	• Type and number of designated heritage assets (Scheduled Monuments, Listed Buildings, Conservation Areas, Registered Battlefields, Protected Wreck Sites, Registered Parks and Gardens) • Significant undesignated heritage assets are assessed separately, due to the lack of a Rapid Coastal Zone Assessment Survey for the study area. See the policy appraisal results agreed with English Heritage in Appendix G.
To support and enhance people's enjoyment of the coast by maintaining and enhancing access	
Impact on access to the coast	Type and number of roads and paths affected

E3 SETTING OPTIONS FOR APPRAISAL

This appendix section outlines the approach and methodology for setting the options for appraisal.

The appraisal of options in this SMP is carried out for 10 Management Units (MUs). These have been defined based on the physical processes and they typically cover an estuary, a combined estuary or a coastal frontage. Within each Management Unit we have defined Policy Development Zones. These are smaller units for which the issues are uniform and which are therefore likely to have one set of policies. Once the policies have been confirmed, the Policy Development Zones will be translated to Policy Units. The SMP's appraisal has to take into account issues at a range of different geographical scales: local (PDZ), estuary / coastal frontage (MU), the SMP as a whole, and even larger than that.

The appraisal of options process of the Essex and South Suffolk SMP has consisted of a number of cycles. This appendix aims to capture the essence of this process and thereby provide a framework for justifying the proposed draft policies. We can distinguish the following steps:

1. Defining the coastal policy context. This step, early on in the SMP process, identified which policies were sufficiently relevant to require appraisal. This is described in Section E3.1.
2. Refinement of the coastal policy context based on more local information, identifying frontages where a change of management approach may be needed. For currently-defended frontages, this step is about identifying frontages that are, or are expected to come, under pressure from defence deterioration and coastal processes. For currently undefended frontages, this step concerns identifying of sites where features are at risk of erosion. The outcome is a refined list of sites for which there is more than one option and that therefore need full appraisal.
3. Appraisal of realistic options against the principles. For PDZs with more than one realistic option, this step assesses and illustrates how each option in performs against the principles. This needs to form the basis of the SMP's decision making.
4. For this SMP, steps 1 to 3 only concern the overall decision about whether a change from the current policy is needed. For the PDZs where a change of policy is proposed, this step concerns the decision about which epoch (1, 2 or 3) this change would happen in.
5. Analysis of economic viability. In line with the SMP guidance, this is carried out for the proposed (draft) policies only. This is reported in a separate note, which will constitute the Economics appendix of the SMP document. (appendix H)

Each step is covered in a separate section, discussing first the approach and then summarising the results.

E3.1 Coastal Policy Context

E3.1.1 Approach

This section reports on Task 3.1a and 3.1b from the SMP Guidance: the identification of policy options that are sufficiently realistic and relevant to justify the effort of full appraisal. This streamlining process is required because otherwise there would be an infinite number of policy options in both time (epochs) and space (frontages). This task therefore improves the efficiency of the SMP process. Key elements of this section were included earlier in the note 'Playing field for policies' of 5 January 2009, which was discussed with the Client Steering Group on 12 January 2009.

The essence of this task is to identify:

- *Obvious* policy choices for certain frontages and epochs – this will streamline the process by avoiding having to go through detailed appraisal for that frontage and epoch.
- *Unrealistic* policy choices for certain frontages and epochs – this will streamline the process by limiting the number of options that need appraising.

All policies have drivers (reasons for) and constraints (reasons against). They are listed here (Table E 2) for the policies, as applied to Essex and South Suffolk SMP.

Table E 2: Drivers and constraints for SMP policies

Policy	Drivers	Constraints
Hold the line	Existing land use: communities, infrastructure, agriculture, heritage assets, freshwater habitats, tourism / amenity	Flood risk management budget Intertidal habitats (coastal squeeze) Coastal / estuary processes
Managed realignment	Intertidal habitats Flood risk management budget (in case of realignment to more cost effective location) Wider benefits (tourism, amenity, fisheries, etc)	Existing land use: communities, infrastructure, agriculture, heritage assets, freshwater habitats, tourism / amenity Flood risk management budget (in case of realignment to less cost effective location)
Advance the line	Reclamation to create agricultural land, freshwater habitats. To be determined whether these are realistic drivers.	Intertidal habitats Existing use of foreshore Flood risk management budget
No active intervention	Flood risk management budget Technical feasibility Enhancement of intertidal habitats Coastal / estuary processes (increase of tidal prism, longshore effects)	Existing land use: communities, infrastructure, agriculture, designated heritage assets, freshwater habitats

E3.1.2 Outcome

At this first stage of the appraisal, we need to look for drivers or constraints of such an absolute nature that they can rule out a policy or even determine policy selection without full appraisal. This means that a policy is only part of the coastal policy context if there is at least a driver and if there are no absolute constraints.

The decision whether a constraint is absolute or not is, of course, a matter of judgement. At this stage of the process, this requires a cautious approach. If it is uncertain whether a policy can be eliminated, it is preferable to keep it within the coastal policy context and take it through appraisal. The results are as follows.

- *Hold the Line* always has a driver for currently-defended frontages. This is to sustain current land use. There can be strong constraints (such as pressures from coastal processes or habitat loss due to coastal squeeze), but these are not sufficiently absolute to eliminate hold the line for appraisal. This means that hold the line is part of the coastal policy context for all currently defended frontages.
  The only exception is Wallasea Island and Deveraux Farm (Hamford Water), where the decision has already been made outside the SMP to carry out managed realignment in epoch 1.

- *Managed realignment* can be an option for frontages that currently have flood defences. The key drivers would be the reduction of pressure on the defences (from channel movement or waves) by moving them landward and creating intertidal habitat. Both drivers are particularly relevant where there is a loss of foreshore (either current or predicted). There can of course also be strong constraints for managed realignment, because of its impact on existing land use. Section E3.2.1 looks in more detail at these drivers and constraints, aiming to refine the coastal policy context by identifying frontages for which managed realignment is or isn't a realistic option.
  There can also be cases where managed realignment is a realistic option because the value of the protected features is limited and outweighed by the benefits of realignment. Section E3.2.3 identifies frontages where this is the case.

  Note that in any case, managed realignment is only realistic within certain constraints. The landward extent is limited where there are features (such as established settlements) that need continued protection. Furthermore, the timing of the realignment has to take into account the time needed for affected people, businesses and organisations to adapt. These constraints are taken into account in developing the alignments for managed realignment options (see section E4) and in the epochs (see section E5).

  For undefended frontages on higher ground, it can sometimes be a realistic management approach to limit or slow down erosion. This is neither hold the line or no active intervention, so it has to be labelled as managed realignment. For currently undefended frontages, this is only part of the coastal policy context if ongoing erosion is likely to threaten significant features. Section E3.2.2 looks in more detail at these frontages, aiming to refine the coastal policy context by identifying frontages for which managed realignment is or isn't a realistic option.

  Beyond the scope of the Essex and South Suffolk SMP, managed realignment may also be an option in places that are not under pressure and we have not taken these forward as managed realignment policies. Through the Environment Agency Habitat Creation Programme managed

realignment may take place in areas with willing landowners. Within the scope of the SMP, managed realignment is still needed at vulnerable locations to reduce flood risk pressures.

- *No active intervention* is a realistic option for all currently undefended frontages. It is not an option for any flood defences that protect dwellings (in eachmanent or temporary) as it could lead to failure of the defences in an uncontrolled manner. As mentioned under managed realignment, there can be frontages where the value of the protected features is limited. For some of these, the available information suggests that continued maintenance will be difficult to justify. NAI could be a realistic option, although only after time for adaptation. Section E3.2.2 identifies frontages where this is the case.

- *Advance the line* will always have significant impacts, so it is only realistic if there is a strong driver. Based on the understanding that we have developed thus far, there are only two PDZs where this may be the case: Felixstowe Port (PDZ A1), where an extension is underway and Bathside Bay (PDZ A11a) where an extension is being considered. For all other PDZs there are no strong drivers for advance the line, so apart from PDZs A1 and A11a, advance the line can be eliminated at this stage for the whole SMP area.

These considerations lead to the following coastal policy context:

- Hold the line is part of the coastal policy context for all frontages that are currently defended, apart from Wallasea Island (H10) and Deveraux Farm (B4a).
- Advance the line is not part of the coastal policy context for any of the frontages apart from Felixstowe Port and Bathside Bay.
- Managed realignment could in principle be considered for all frontages with flood defences and for all currently undefended higher ground frontages, but this will be refined further in section E3.2.
- No active intervention is an option for all currently undefended frontages. It is not an option for most of the currently defended ones, but it could be an option (after time for adaptation) for flood defences that protect very limited features (see section E3.2.2).

E3.2 Refinement of coastal policy context

E3.2.1 Managed realignment for frontages with flood defences

As described in section E3.1 the 'coastal policy context' analysis results in the conclusion that for most frontages with flood defences, hold the line and managed realignment are in principle both realistic options. However, it is possible to further refine the coastal policy context by selecting those frontages for which there are practical and local drivers for managed realignment. These are the frontages where the existing defences are under pressure from coastal or estuary processes. For the frontages where this is not the case, the constraints for managed realignment (that is, sustaining existing land use) can be seen to outweigh the drivers.

At a high level, there are two key drivers for choosing a managed realignment policy for frontages within this SMP: defence sustainability and compensation for loss of habitats. Both drivers are related to the estuary and coastal processes, which are leading to loss of saltmarsh in various locations throughout the area. In such frontages, continuing to hold the current alignment is unlikely to be sustainable. In addition, there are frontages where continued defence could be unsustainable because the defences themselves or their foundations are of poor quality. Realigning these defences to a more landward position creates a buffer. For coastal frontages, the newly created foreshore can dissipate wave energy, while for estuary frontages there would be more room for natural channel development before it undermines the defence. The frontages where the defences are under pressure largely coincide with the areas where intertidal habitats are being lost. Note that there can also be other benefits of managed realignment, such as for recreation purposes and landscape. These have been taken into account in the appraisal, see section E4.

The identification of defences under pressure has been carried out based on existing scientific and technical information combined with local knowledge from all those involved in the Essex and South Suffolk SMP. This has involved the Environment Agency's defence asset managers, the officers and elected members from all the SMP's partner organisations and also the local representatives from the Key Stakeholder Group.

Our understanding of overall estuary behaviour has played an important role in this selection process, complementing local knowledge. This tells us that the estuaries are currently most constrained in their middle and outer reaches, which is typically where the shoreline is eroding and the defences are under pressure. Realigning the defences in those areas reduces this pressure and provides room for the natural processes. It is likely to reduce pressure on the defences across the estuary. In contrast, carrying out managed realignments in the upper estuaries is likely to aggravate the problem. Doing this would increase the tidal prism of the estuaries, causing more water to flow in and out of the estuary with each tidal cycle. This water

has to pass through the already constrained profile of the middle and outer estuary, which would further increase the pressure on the shoreline there. Based on this, it will generally be more sustainable to carry out realignments in the middle and outer estuaries, than in the upper estuaries.

For some of the frontages under pressure as identified on the maps, there are constraints for managed realignment which has been judged to be overriding. This is the case for PDZs where the land behind the defence is in use as military ranges: D8b (Fingringhoe and Langenhoe), I1a (Foulness) and H16 (Great Wakering). This is also the case for PDZs with refuse-filled defences or contaminated land behind the defences. PDZs with refuse-filled defences are: G3 (Dengie, Holliwell Point), H8a (South Fambridge), I1b (Potton Island). PDZ H14 (Barling Marsh) has contaminated land behind the defences.

The remaining list of frontages for which managed realignment and HtL need to be appraised is included in Table E 1.

Table E 3: Frontages under pressure for which managed realignment needs to be appraised

Management Unit (MU)	Policy Development Zone (PDZ)
A. Stour & Orwell	A2 (Trimley Marshes) A3 (Levington Creek) A8a (Shotley Marshes) A8b (Shotley Marshes)
B. Hamford Water	B2 (Little Oakley) B3a (Horsey Island) B4a (Deveraux farm) B5 (Walton Channel)
C. Tendring	C2 (Holland-Haven) C4 (Seawick, Jaywick and Osyth Marsh)*
D. Colne Estuary	D1b (Point Clear to St Osyth Creek) D2 (Along the southern bank of Flag Creek) D3 (Flag Creek to northern bank to Brightlingsea) D5 (Westmarsh Point to where the frontage meets the B1029)
E. Mersea Island	E1 (Landward frontage) E2 (seaward frontage between North Barn and West Mersea) E4a (Mersea Island along The Strood Channel)
F. Blackwater	F3 (South bank of the Salcott Channel to Tollesbury Fleet)

Management Unit (MU)	Policy Development Zone (PDZ)
	F5 (Tollesbury Wick Marshes to Goldhanger) F12 (Steeple) F14 (St. Lawrence Creek)
H. Crouch & Roach	H2a (From Burnham on Crouch to Bridgemarsh) H2b (Bridgemarsh to North Fambridge) H8b (Canewdon) H10 (Wallasea) H11a (Paglesham Reach North Bank) H12b (Paglesham Eastend)
I. Foulness	I1c (Rushley Island)

*Appraisal outside SMP through LDF process, see policy statement in Section 4.4 of main SMP document

E3.2.2 Managed realignment for currently undefended higher ground frontages

As described in section E3.1 continuation of no active intervention is always a realistic option for currently undefended higher ground frontages. However, for frontages where ongoing erosion could affect features, it could be a realistic option to start defending against erosion. Within the context of the Essex and South Suffolk SMP, holding the shoreline in the same location (hold the line) is unlikely to be a realistic option for these PDZs. This would have an unacceptable impact on the natural processes and the costs are unlikely to be justified by the features to be protected. However, it may be realistic to allow the implementation of local small scale measures to slow down or limit erosion (in order) to protect particular features. This last option can't be described as either hold the line or as no active intervention and therefore it has to be labelled as managed realignment. If there are no drivers (that is features at risk of erosion), no active intervention is the obvious policy and there is no need for appraising other options. This section identifies the frontages for which other options do need to be appraised.

The technical background is described in the Note Task 2.5b Identification of erosion risk (first draft of 22 September 2009, only distributed to EA, CSG members from Suffolk local authorities, Natural England and English Heritage for verification; to be distributed more widely). The availability of monitored erosion rates to predict future erosion is limited and needs to be complemented by judgement and local knowledge. Part of this local knowledge is provided in the 'Coastal processes and defence assessment overview' maps, which highlight frontages where erosion is taking place. The identification of key features at risk has been informed by the SMP graphics. For frontages with features at risk of erosion but lack of erosion rate information, the SMP's action plan will highlight the need for monitoring.

The analysis in this section is summarised in Table E 4. The conclusion is based on the following logical steps:

1. If there is no erosion, there is no reason to change from NAI
2. If there is erosion but there are no features at risk, there is no reason to change from NAI. This assessment is done conservatively at this stage (using high estimates of erosion rates and including all features). A more detailed assessment can be carried out in appraisal.

Table E 4: Currently undefended frontages – refining coastal policy context

PDZ	Location of undefended shoreline	Erosion	Features at risk	Policies
A3 Levington Creek	Thorpe Common – Marina (*A3a*)	No	--	A3a: NAI
A4 Orwell Northern Bank	All	Orwell Park eastward (*A4a*)	Parks and footpaths	A4a: appraise A4b: NAI
A6 Wherstead	All	Locally	B1456 (also flood risk)	Appraise
A7 Orwell Southern Bank	All	Pin Mill	Marina and park	A7a: NAI A7b: appraise
A8b Shotley	Shotley Gate (A8c)	Yes	Seafront, dwellings	A8c: appraise
A9 Northern Stour	Seven sections throughout	A9c and A9e	Footpaths	A9c/e: appraise Other sections: NAI
A10 Southern Stour	Four sections throughout	A10d and A10f	Roads, footpaths, beach huts, dwellings, railway	A10d/f: appraise Other sections: NAI
B3 Oakley Creek to Kirby-le-Soken	Small sections	No	--	NAI
B3a Horsey Island	Small section north shore	No	--	NAI

PDZ	Location of undefended shoreline	Erosion	Features at risk	Policies
B6 Naze Cliffs	All (geological designation)	Yes	Mainly southern tip (Naze Tower, car park, facilities) footpath throughout	NAI for northern section (B6a); appraise for southern section (B6b)
D1a Stone Point	Point Clear	No	--	NAI
D8b Fingringhoe & Langenhoe	Small sections	No	--	NAI
F1 Strood to Salcott-cum Virley	Abbot's Hall	No	--	NAI
F8 Maldon Inner estuary	Marina	No	--	NAI
F9b Northey Island		No	--	NAI
Osea Island		No	--	NAI
F11b Mayland Creek		No	--	NAI
F14 St. Lawrence Creek	Orplands	No	--	NAI
H2a From Burnham on Crouch to Bridgemarsh	The Cliff (geological designation)	Yes	No	NAI
H5 Eastwards of Brandy Hole	Sections	No	--	NAI
H9 Paglesham Creek	All	No	--	NAI
H13 Rochford	Purdeys	No	--	NAI

Table E 4 shows that appraisal is needed for nine frontages. These will be defined as separate PDZs (refining the list used so far and using the numbers identified in italics in the table). This will ensure that each PDZ has only one set of policies.

E3.2.3 Managed realignment or no active intervention for potentially ‘uneconomical’ flood defences

There are a few areas where the flood defences are not necessarily under pressure, but for which there is still a need to appraise alternative options. This is because the economic assessment of the SMP (in this case based on available estuary strategies) indicates that continued hold the line is not likely to be viable (see appendix H). The two PDZs are: PDZ D6b (B1029 to Wivenhoe) and PDZ D8a (Inner Colne west bank).

E4 APPRAISAL AGAINST THE PRINCIPLES

E4.1 Introduction

In the preceding sections we have identified which policy options need to be appraised for which of the PDZs. For those PDZs that have more than one realistic option, the appraisal against the principles and related criteria is described in this section.

Note that this step in the appraisal does not include the decision about the epoch in which the policy would change. This is covered in section E5.

Section E4.2 summarises the approach. Section E4.3 describes in general terms the appraisal results for the two most common policy decisions in the Essex and South Suffolk SMP. The appraisal is then described by Management Unit, starting with MU A Stour and Orwell in section E4.4..

E4.2 Approach

E4.2.1 Appraisal against the principles and criteria

For this part of the task, each option is assessed against all the principles via the agreed set of criteria. The results are indicated by a combination of a number/colour. Table E 5 shows the scoring system.

Table E 5 Assessment in each criterion

Decreasing fulfilment of criteria ↓	Score	Description	Associated colour
	9	**Good** in eachformance of the policy against the criterion	
	8		
	7		
	6	**Average** in eachformance of the policy against the criterion	
	5		
	4		
	3	**Poor** in eachformance of the policy against the criterion	
	2		
	1		

A narrative is included for each criterion for further explanation of the impact of the policy on the specific criterion. This narrative describes the judgement behind the score, based on the indicators (quantifiable as far as possible). The results for each criterion are then aggregated to assess the performance of each policy against each principle. The score for each criterion (within a PDZ) is averaged, giving an overall score and associated colour for each principle. All policy appraisal tables will be posted on the extranet.

The aggregate assessment is the tabulated end product of the appraisal and is visualised schematically. These figures provide an overview for each PDZ for each policy option and use a symbol to represent each principle. The symbol is then shaded in green, amber, or red to visualise how the policy option scores against each principle. The graphics are intended to provide decision makers with a transparent overview of the advantages and disadvantages of each of the policy options to support them in their decision to choose the policy that will deliver the best balance of values.

E4.2.2 Defence alignments for managed realignment options

For the appraisal of managed realignment options against the principles, we need to have some indication of the new alignment. This determines which features do and don't remain protected, how much intertidal habitat is created and how long the new defence length will be. We have developed indicative alignments, based on the following principles:

- Continued protection of all dwellings, key infrastructure and specific local features
- Within that constraint, minimise the length of the new defences and aim to follow existing defence lines

Note that these alignments are by no means final and have only been developed for the purpose of the appraisal. If managed realignment is chosen as the final policy, there will be a full process of project appraisal and scheme development, including local consultation.

E4.3 General description of appraisal

E4.3.1 PDZs with flood defences hold the line versus managed realignment

This section describes the general appraisal of the PDZs with flood defences that have been identified to be under pressure (see section E3.1). For these PDZs, there is a need to appraise two policies: hold the line and managed realignment.

Overall, the key difference between these two options concerns the following four principles:

- managing the shoreline through natural coastal processes
- support communities and sustainable development
- enhancement of biodiversity
- historic environment
- access.

Whilst sustaining the defences allows for protection of agricultural land and historical features landwards of the defence, it can be detrimental for the natural development of coastal processes. The defences remain under pressure and work against coastal processes. In estuaries and creeks,

holding the line aggravates the undermining and pressure on defences of frontages on the opposite side of the channel, as tidal volumes increase. In addition, holding the line does not provide compensation for the loss of designated intertidal habitats due to continued erosion.

Conversely, managed realignment allows for the development of natural processes, creation of intertidal habitats and relocation of defence line to a more sustainable position, but this can come at the expense of agricultural land and historical assets and areas. In particular cases, realignment also comes at the expense of designated or undesignated freshwater habitats and would convert these into intertidal habitats.

Under both hold the line and managed realignment the shoreline will remain accessible along the existing defences, path or tracks or through the creation of new routes. However, for managed realignment there will be temporary disturbance and additional costs.

E4.3.2 Currently undefended PDZs no active intervention versus managed realignment / hold the line

This section describes the general appraisal of the currently undefended PDZs where features could be at risk of erosion (see section E3.2). For these PDZs, there is a need to appraise two policies: no active intervention and an option that provides erosion protection.

Overall, the key difference between these two options concerns the following five principles:

- managing the shoreline through natural coastal processes
- support communities and sustainable development
- enhancement of biodiversity
- historic environment
- access.

While starting to defend the shoreline against erosion allows for protection of features on the shoreline (especially footpaths but also agricultural land, parks and historic assets), it can be detrimental for the natural development of coastal processes. The new defences are likely to come under pressure and work against coastal processes. Conversely, continuing the current no active intervention approach allows for the development of natural processes, but this can come at the expense of features.

Under managed realignment the shoreline will remain accessible along the existing defences, path or tracks or through the creation of new routes. Within areas under no active intervention erosion and/or flood risk is not likely to affect paths and tracks.

A more detailed description of the appraisal of the impacts on the historic environment is provided for each Management Unit or PDZ in the following sections.

E4.4 Management Unit A: Stour and Orwell

E4.4.1 Characterisation and summary of options

Characterisation

The Stour and Orwell estuary system is confined by geology and/or flood defences which limit the landward development of intertidal areas and the waves and tidal flows promote erosion of the seaward edge of the intertidal areas. The hydrodynamic pressures and erosion are particularly prominent at the mouth of the estuary which is highly exposed to the north-easterly waves and waves generated by shipping activity.

Most of the land surrounding the estuaries falls outside the 1 in 1000 year flood risk zone. Notable exceptions are the ports of Harwich and Felixstowe with their ferry services and cargo shipping. In addition there are properties along the estuaries that also fall within the flood risk zone. Other communities include those of Shotley Gate, Brantham, Lawford, Manningtree and Mistley on the Stour. While on the Orwell there is Levington, Nacton, Freston, Woolverstone and Chelmondiston. The railway line on the southern side of the Stour is at risk at several locations. Most of the flood zone however is characterised by agricultural land. There are sewage treatment works on both the Stour and Orwell that discharge waste water into the rivers. The industry at Ipswich and Cattawade also falls within the flood risk zone. There are numerous marinas along the Orwell, golf courses and camping and caravan sites that are also at risk. In addition there is the Royal Hospital School near Holbrook and the HMS Ganges museum at Shotley Marina

The Stour and Orwell estuaries are of international importance. They provide habitats for an important assemblage of wetland birds and internationally important numbers of wintering and passage wildfowl and waders. The site also holds several nationally scarce plants and British Red Data Book invertebrates. In the Stour Estuary horizontal erosion of saltmarsh is occurring at a rate of four hectares a year while the Orwell Estuary has vertical erosion of mudflats in the lower reaches and saltmarsh erosion at a rate of one hectare a year.

The Cattawade Marshes SSSI lies at the head of the Stour Estuary and is situated between the freshwater and tidal channels of the River Stour. These grazing marshes with their associated open water and fen habitats are of major importance for the diversity of their breeding bird community. This includes species that have become uncommon throughout lowland Britain as a result of habitat loss.

The Harwich Foreshore SSSI yields the only fossil flora attributable to the lowest division of the Eocene London Clay. Its composition is typical of the formation and specimens are abundant. Association of the plants with ash bands within the Clay may aid correlations elsewhere in the basin since they form useful marker horizons. This is a recently discovered site with great research potential.

Criteria and indicators to appraise against options

Principle / Criterion	Indicator
To develop policies appropriate to the diverse character of the Essex and South Suffolk coast and its dynamic interaction of land and sea	
Impact of policy package on the diverse character of the Essex coast	Qualitative judgement
Impact of policy package on dynamic interaction of land and sea	Qualitative judgement
To balance flood and erosion management with the assets and benefits that it protects	
Level of flood and erosion risk to people and property.	Number of properties within the tidal flood zone in each epoch compared to the current number (about 13,600 in epoch 1, 13,780 in epoch 2 and 14,630 in epoch 3)
Impact on future opportunities	Judgement based on input regarding future opportunities
This principle is also tested by the check of economic viability (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To seek opportunities for managing the shoreline through natural coastal processes and take full account of longshore and cross-shore impacts	
Use of natural processes (saltmarsh, longshore interaction)	Qualitative judgement
Longshore impact on neighbouring frontages	Qualitative judgement: • Impact on Hamford Water and The Naze • Impact on the Felixstowe frontage (Suffolk SMP2)
Cross-shore impact on near shore activities	Qualitative judgement: • Dredging of the channel at Harwich
The impact of cross-shore processes on the shoreline is will also assessed through sensitivity testing (task 3.4) as part of appraisal.	

Principle / Criterion	Indicator
To develop policies that are resilient against future changes and associated uncertainty	
This principle is tested by the sensitivity check (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To provide time and information for communities, individuals and partner organisations to adapt to any anticipated coastal change	
Adequacy of time available for adaptation for communities, individuals and partner organisations	Time (in epochs) available for each required process of adaptation, depending on the policy option
To support communities and sustainable development for the people living around the Essex and South Suffolk shoreline by managing the risk to community activities and infrastructure	
Impact on infrastructure	Type and length of roads, railways and services affected: • Railway line between Harwich and Manningtree and mainline railway link to Ipswich. • A136 at Parkeston, A120 from Harwich, A137 between Manningtree station and Cattawade, A154 in Felixstowe and A1455 in Felixstowe. Type and number of utilities affected: • Sewage treatment works at Dovercourt and Harwich, Chantry (Ipswich) and Cliff Quay (Ipswich).
Impact on socio-economic activities	• Impact on Grade 1, 2, 3 and 4 agricultural land. Impact on tourism and recreation assets including: • Marinas within the estuaries • Campsites and caravan parks • Harwich and Dovercourt golf club • Orwell country park • Historical features at Harwich.
Impact on public services	Type and number of services affected: • Rail services to Harwich and Ipswich • Passenger ferry services from Harwich and Felixstowe • RNLI oin eachation from Harwich.

Principle / Criterion	Indicator
Impact on communities	Number and size of communities (individual dwellings, hamlets, settlements): • Ports of Harwich and Felixstowe • Smaller communities of Shotley Gate, Brantham, Lawford, Manningtree, Mistley, Nacton, Freston, Woolverstone and Chelmondiston.
To harness the social and economic values of the Essex and South Suffolk coast to wider society	
Impact on socio-economic features of regional, national or international significance	Impact as a in eachcentage of regional / national / international availability: • Railway links • Orwell country park • Harwich ferry terminal and International port • Felixstowe port • Ipswich port
To support conservation and enhancement of biodiversity and geodiversity	
Impact on the achievement of management objectives for designated habitats and species, keeping them in favourable condition (including no significant loss of extent or populations)	For each of the designations (Stour and Orwell Estuaries Ramsar and SPA, Stour Estuary SSSI and Cattawade Marshes SSSI): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario.
Impact on the achievement of national and local Biodiversity Action Plan (BAP) targets, both within designated sites and within the wider coastal countryside	• Area of BAP habitats in each epoch and scenario (BAP habitats present are maritime cliffs and slopes, mudflats, coastal and floodplain grazing marsh, reed beds, lowland mixed deciduous forest, lowland meadow, wet woodland and fens)

Principle / Criterion	Indicator
Impact on the achievement of management objectives for designated geological sites, keeping them in favourable condition	For each of the geological designations (Harwich Foreshore SSSI and Little Oakley Channel Deposits SSSI): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario.
To contribute to maintaining and enhancing the evolving character of the coastal landscape	
Impact on the character of the coastal landscape, including consideration of geological, geomorphological, historical environment and cultural features, and the role of settlements in the landscape	Qualitative judgement: • Suffolk Coast and Heaths Area of Outstanding Natural Beauty.
To support protection and promotion of the historic environment and its value for the heritage, culture and economy of the area	
Impact on historic environment and its wider value	Impact on designated heritage assets • 11 Scheduled Monuments • 27 Grade I and II* Listed Buildings • 207 Grade II Listed Buildings • Five Conservation Areas • No Protected Wreck Sites, Registered Battlefields, Registered Parks and Gardens

Principle / Criterion	Indicator
To support and enhance people's enjoyment of the coast by maintaining and enhancing access	
Impact on access to the coast	Type and number of roads and paths affected • footpaths along part of the shoreline (including Suffolk coast and heaths path) • numerous footpaths, tracks and roads leading to the shoreline • Eight car parks in flood zone.

Summary of PDZs and options

The analysis of the coastal policy context has led to the following list of PDZs and options for this Management Unit.

PDZ	Options	Appraisal needed?
A1 (Felixstowe)	AtL in epoch 1, HtL in epoch 2 and 3	No
A2 (Trimley Marshes)	HtL or managed realignment 2	Yes
A3a (Levington Creek east)	HtL or managed realignment 2	Yes
A3b (Levington Creek west)	HtL	No
A4a (Northern Orwell east)	NAI or managed realignment 1	Yes
A4b (Northern Orwell west)	NAI	No
A5 (Ipswich)	HtL	No
A6 (Wherstead)	NAI or managed realignment 1	Yes
A7a (Southern Orwell west)	NAI	No
A7b (Southern Orwell east)	NAI or managed realignment 1	Yes
A8a (Shotley Marshes west)	HtL or managed realignment 2	Yes
A8b (Shotley Marshes east)	HtL or managed realignment 2	Yes

PDZ	Options	Appraisal needed?
A8c (Shotley Gate)	NAI or managed realignment 1	Yes
A9a,d,f (Northern Stour – flood defence)	HtL	No
A9b (Northern Stour – undefended, not erosional)	NAI	No
A9c,e (Northern Stour – undefended, erosional)	NAI or managed realignment 1	Yes
A10a,c,e (Southern Stour – flood defence)	HtL	No
A10b,g (Southern Stour – undefended, not erosional)	NAI	No
A10a,f (Southern Stour – undefended, erosional)	NAI or managed realignment 1	Yes
A11a (Harwich Harbour)	AtL	No (outside SMP scope)
A11b (Harwich coastal town)	HtL	No

managed realignment 1	Allow local and limited intervention to limit the risks, as long as negative impacts are minimised
managed realignment 2	Breach of the frontline defence after building a new landward defence line

E4.4.2 PDZ A2: Trimley Marshes

Description of the options

With managed realignment the current line of natural defence will be realigned. However the Port of Felixstowe, south of the realignment areas will remain protected by the bund currently positioned between PDZ A1 and A2. Reinforcement of the bund may be required. Apart from Felixstowe Port no further features will require protection. In the HtL option the current line of defence will be sustained.

Comparison

Unlike HtL, managed realignment will lead to loss of about 65 hectares of designated freshwater habitats. However there will be a significant net gain in habitats, with a total intertidal area of about 200 hectares. Managed realignment will require the re-routing of the Stour and Orwell Walk path which may also create opportunities for improvement. The majority of agricultural land lost through realignment is of grade 3. Managed realignment would have limited adverse impact on the historic environment as the historic marshes have been severely damaged by agriculture and there is moderate archaeological potential. Managed realignment would relieve pressure on the

currently constrained sections of the estuary, which is likely to reduce pressure across the river at Shotley Marshes. New wetland areas, currently managed by Suffolk Wildlife Trust may be of benefit to local communities in terms of recreation and education.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.4.3 PDZ A3a: Loom Pit

Description of the options
With managed realignment the current line of natural defence will be breached in the relevant epoch. Breaching of the defences is not likely to affect any features so no new defences lines are required. In the HtL option the current line of defence will be sustained.

Comparison
Unlike hold the line, managed realignment will lead to conversion of around 15 hectares of designated freshwater habitats into intertidal habitats. Managed realignment will require the re-routing of the Stour and Orwell Walk path which may also create opportunities for improvement. Managed realignment would have limited adverse impact on the historic environment as there is low archaeological potential due to the quarry pits. Managed realignment would relieve pressure on the currently constrained sections of the estuary, which is likely to reduce pressure across the river at Shotley Marshes.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.4.4 PDZ A4a: Northern Orwell east

Description of the options
As an alternative to continuing the current no active intervention policy, there is a need to appraise a managed realignment option that limits the erosion in order to protect the Stour and Orwell Walk footpath and Orwell Park from erosion. This managed realignment option would consist of limited small-scale local flexible measures such as gabions and geo-textiles.

Comparison
Continuing of the no active intervention policy supports the natural state of the estuary, including the role of bank erosion as a source of sediment elsewhere in the estuary. The managed realignment policy as described would have an impact (although limited) on these aspects, but it would sustain the full area of the parks and could prevent the need to realign the footpaths along the estuary bank.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.4.5 PDZ A6: Wherstead

Description of the options
As an alternative to continuing of the current no active intervention policy, there is a need to appraise an option that protects the B1456 road on the shoreline from flooding and potentially from erosion. This option could consist of the construction of a low embankment. An alternative solution could be to realign the B1456 to higher ground, but this is outside the remit of the SMP.

Comparison
Continuing of the current no active intervention approach is likely to lead to the road flooding more often, which impacts the accessibility of Shotley peninsula. That there is a second access route (via the B1080) for emergency situations. Continuing of no active intervention would not have significant negative impacts on other features or values. Building a defence or raising the level of the road would solve this problem. The costs of a new defence are unlikely to be justified, but this would be assessed separately after the appraisal. Further discussion will be required with partners regarding other alternatives such as raising the road.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.4.6 PDZ A7b: Southern Orwell east

Description of the options
As an alternative to continuing of the current no active intervention policy, there is a need to appraise a managed realignment option that limits the erosion in order to protect the Pin Mill marina, including a Grade II Listed public house and the Stour and Orwell Walk footpath from erosion. This managed realignment option would consist of limited local flexible measures such as gabions or geo-textiles.

Comparison
Continuing of the no active intervention policy supports the natural state of the estuary, including the role of bank erosion as a source of sediment elsewhere in the estuary. The managed realignment policy as described would have an impact (although limited) on these aspects, but it would reduce erosion risk to the marina and could prevent the need to realign the footpaths along the estuary bank.

Recommended option

The draft policy for this frontage is for managed realignment as described above.

E4.4.7 PDZ A8a: Shotley Marshes west

Description of the options

With managed realignment the current line of defence will be realigned with continued flood protection to dwellings at the Clamp. This will require a new line of defence around 100 metres long. With hold the line the current line of defence will be sustained.

Comparison

Managed realignment leads to loss of around 50 hectares of designated freshwater habitats in the Shotley Marshes. The intertidal habitat created is about 75 hectares so there will be a small net gain. Most of agricultural land lost through realignment is of grade 3. Managed realignment will require the re-routing of the Stour and Orwell Walk path which may also create opportunities for improvement. Furthermore, managed realignment will have a moderate adverse impact on the historic environment due to the anticipated high archaeological potential of the area. Managed realignment would relieve pressure on the currently constrained sections of the estuary, which is likely to reduce pressure across the river at Trimley Marshes.

Recommended option

The draft policy for this frontage is for managed realignment as described above.

E4.4.8 PDZ A8b: Shotley Marshes east

Description of the options

Under managed realignment the current defence will be realigned while continuing to provide protection to the Shotley Marina, dwellings and roads. This will require new defences around Shotley Marina, Church End and Old Hall Cottage (near the Oldhall Road), with a total length of about 430 metres. With hold the line the current line of defence will be sustained.

Comparison

Managed realignment leads to loss of about 65 hectares of designated freshwater habitats in the Shotley Marshes. The area of intertidal habitats created is around 100 hectares, so there would be some net gain in habitats. Most of agricultural land lost through realignment is of grade 3. Managed realignment will require the re-routing of the Stour and Orwell Walk path; this may also create opportunities for improvement. Furthermore, managed realignment will have a high adverse impact on the historic environment, due to archaeological potential and tracts of historic landscape which will entail extensive mitigation. Managed realignment would relieve pressure on the currently constrained sections of the estuary, which is likely to reduce pressure across the river at Trimley Marshes.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.4.9 PDZ A8c: Shotley Gate

Description of the options
As an alternative to continuing the current no active intervention policy, there is a need to appraise a managed realignment option that limits the erosion in order to protect the seafront, dwellings and heritage assets (notably HMS Ganges) at Shotley Gate and the footpaths (which have already been realigned recently). The stability of the cliffs in this section is also under threat from local drainage issues.

There is a lack of information on the erosion rates. This is particularly relevant for this PDZ given how close dwellings and the seafront are to the shoreline. The SMP's action plan will flag up the need for monitoring to inform firmer policy decisions in the next review of the SMP.

Comparison
Continuing of the no active intervention policy supports the natural state of the estuary, including the role of bank erosion as a source of sediment elsewhere in the estuary. The managed realignment policy as described would have an impact (although limited) on these aspects, but it could reduce erosion risk to the dwellings and to the seafront (although (it needs to be noted) that coastal erosion is not the only cause of cliff instability). It could also prevent the need to carry out further realignment of the footpaths along the estuary bank.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.4.10 PDZ A9c,e Northern Stour – undefended, erosional

Description of the options
As an alternative to continuing of the current no active intervention policy, there is a need to appraise a Managed Realignment option that limits the erosion in order to protect the footpaths (part of the Stour and Orwell Walk) from erosion. This managed realignment option would consist of limited local flexible measures such as gabions.

Comparison
Continuing of the no active intervention policy supports the natural state of the estuary, including the role of bank erosion as a source of sediment elsewhere in the estuary. The managed realignment policy as described

would have an impact (although limited) on these aspects, but it could prevent the need to realign the footpaths along the estuary bank.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.4.11 PDZ A10d,f Southern Stour – undefended, erosional

Description of the options
As an alternative to continuing of the current no active intervention policy, there is a need to appraise a managed realignment option that limits the erosion in order to protect the features at Wrabness Beach (beach with facilities) and at Strandlands (dwellings, footpaths) from erosion. In the long term, there may also be an erosion risk to the railway at this location. This managed realignment option would consist of limited local flexible measures such as gabions.

Comparison
Continuing of the no active intervention policy supports the natural state of the estuary, including the role of bank erosion as a source of sediment elsewhere in the estuary. The managed realignment policy as described would have an impact (although limited) on these aspects, but it would reduce erosion risk to the beach and its facilities at Wrabness and to the other properties along this frontage. It could also prevent the need to realign the footpaths along the estuary bank. Finally, in the long term it would protect the railway line if the erosion extends that far.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.5 Management Unit B Hamford Water

E4.5.1 Characterisation and summary of options

Characterisation
Hamford Water coastal processes are largely driven by north-easterly waves and winds leading to erosion along the frontages at the entrance of the estuary. Little Oakley is particularly exposed, leading to the undermining of the defences. In the Walton channel undercutting of defences takes place due to hydrodynamic pressures (tidal flow and waves). The Naze constitutes an intermittent and decreasing sediment source. Erosion of intertidal areas takes place at the mouth of the estuary with accretion at inner creeks.

In Hamford water, there are no significant settlements within the flood zone. However, some properties do lie within the zone around the edge of Hamford

Water. Most of the area is agricultural land. The B1414 crosses the flood zone at Beaumont Key and the B1043 is at risk near Kirby-le-Soken. Titchmarsh Marina is also in the flood risk zone.

Hamford Water has been designated a Ramsar site, National Nature Reserve, and SSSI. It is a large, shallow estuarine basin comprising tidal creeks and islands, intertidal mud and sand flats and saltmarsh supporting rare plants and internationally important species/populations of migratory waterfowl. The site is of international importance for breeding little terns and wintering dark-bellied Brent geese, wildfowl and waders and of national importance for many other bird species. It also supports communities of coastal plants which are rare or extremely local in Britain, including Hog's Fennel, *Peucedanum officinale,* which is found elsewhere only in Kent.

Criteria and indicators to appraise against options

Principle / Criterion	**Indicator**
To develop policies appropriate to the diverse character of the Essex and South Suffolk coast and its dynamic interaction of land and sea	
Impact of policy package on the diverse character of the Essex and South Suffolk coast	Qualitative judgement
Impact of policy package on dynamic interaction of land and sea	Qualitative judgement
To balance flood and erosion management with the assets and benefits that it protects	
Level of flood and erosion risk to people and property.	Number of properties within the tidal flood zone compared to the current number (about 890 in epoch 1, 1,000 in epoch 2 and 1,570 in epoch 1).
Impact on future opportunities	Judgement based on input regarding future opportunities
This principle is tested by the check of economic viability (task 3.4) as part of appraisal, so there is no need for explicit criteria.	

Principle / Criterion	Indicator
To seek opportunities for managing the shoreline through natural coastal processes and take full account of longshore and cross-shore impacts	
Use of natural processes (saltmarsh, longshore interaction)	Qualitative judgement
Longshore impact on neighbouring frontages	Qualitative judgement: • Impact on the Stour and Orwell Estuaries • Impact on the Tendring peninsula.
Cross-shore impact on near shore activities	Qualitative judgement
To develop policies that are resilient against future changes and associated uncertainty	
This principle is tested by the sensitivity check (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To provide time and information for communities, individuals and partner organisations to adapt to any anticipated coastal change	
Adequacy of time available for adaptation for communities, individuals and partner organisations	Time (in epochs) available for each required process of adaptation, depending on the policy option.

Principle / Criterion	Indicator
To support communities and sustainable development for the people living around the Essex and South Suffolk shoreline by managing the risk to community activities and infrastructure	
Impact on infrastructure	• Type and length of roads, railways and services affected. • Impact on the sewage treatment works at The Naze.
Impact on socio-economic activities	• Impact on grade 2, 3 and 4 agricultural land. Impact on tourism and recreation assets including: • Titchmarsh marina • Campsite and caravan park at Walton-on-the-Naze.
Impact on public services	No services affected
Impact on communities	Number and size of communities (individual dwellings, hamlets, settlements): • Individual dwellings only.
To harness the social and economic values of the Essex and South Suffolk coast to wider society	
Impact on socio-economic features of regional, national or international significance	No specific features
To support conservation and enhancement of biodiversity and geodiversity	
Impact on the achievement of management objectives for designated habitats and species, keeping them in favourable condition (including no significant loss of extent or populations)	For each of the designations (Hamford Water SPA, SSSI and NNR): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario. Area of designated land lost/gained.
Impact on the achievement of national and local Biodiversity Action Plan (BAP) targets, both within designated sites and within the wider coastal countryside	• Area of BAP habitats in each epoch and scenario (BAP habitats present are mudflats, coastal and floodplain grazing marsh and reed beds)

Principle / Criterion	Indicator
Impact on the achievement of management objectives for designated geological sites, keeping them in favourable condition	For each of the geological designations (The Naze SSSI): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario. Area of designated land lost/gained.
To contribute to maintaining and enhancing the evolving character of the coastal landscape	
Impact on the character of the coastal landscape, including consideration of geological, geomorphological, historical environment and cultural features, and the role of settlements in the landscape	Qualitative judgement
To support protection and promotion of the historic environment and its value for the heritage, culture and economy of the area	
Impact on historic environment and its wider value	Impact on designated heritage assets: • Two Scheduled Monuments. • One Grade II* Listed Building. • 18 Grade II Listed Buildings. • One Conservation Area. • No Protected Wreck Sites, Registered Battlefields, Registered Parks and Gardens.
To support and enhance people's enjoyment of the coast by maintaining and enhancing access	
Impact on access to the coast	Type and number of roads and paths affected • Footpaths and tracks to and along shoreline of Hamford Water and the Naze. • No car parks affected.

Summary of PDZs and options

The analysis of the coastal policy context has led to the following list of PDZs and options for this Management Unit.

PDZ	Options	Appraisal needed?
B1 (South Dovercourt)	HtL	No
B2 (Little Oakley)	HtL or managed realignment 2	Yes
B3 (Oakley Creek to Kirby-le-Soken)	HtL	No
B3a (Horsey Island)	HtL or managed realignment 2	Yes
B4a (Kirby-le-Soken to the Martello Tower west)	managed realignment 2	No
B4b (Kirby-le-Soken to the Martello Tower east)	HtL	No
B5 (Walton Channel)	HtL or managed realignment 2	Yes
B6a (Naze Cliffs – north)	NAI	No
B6b (Naze Cliffs – south)	NAI or managed realignment 1	Yes

managed realignment 1	Allow local and limited intervention to limit the risks, as long as negative impacts are minimised
managed realignment 2	Breach of the frontline defence after building a new landward defence line

E4.5.2 PDZ B2: Little Oakley

Description of the options

With managed realignment the current line of defence will be realigned while continuing to protect the dwellings, communities, roads and infrastructure south of Dovercourt (with a 640 metre defence line), and the sewage works at Bramble Island (with a 170 metre defence line). Little Oakley is currently proposed as a realignment site for habitat compensation under the Harbour Empowerment Order should the Bathside Bay Port development go ahead. The realignment that the SMP proposes for PDZ B2 includes the Bathside Bay compensation plus additional area. With hold the line the current line of defence will be sustained.

Comparison

With managed realignment there will be a considerable increase in intertidal habitats (about 370 hectares) with no loss of designated freshwater habitats. Most of agricultural land lost through realignment is of grade 4 and some

grade 2. Managed realignment will require the re-routing of the Essex Way and Long Bank paths which may also create opportunities for improvement. Managed realignment is likely to have a high impact on the historic environment due to the expected quality of preservation and high archaeological potential of the area, including tracts of historic landscape.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.5.3 PDZ B3a: Horsey Island

Description of the options
Managed realignment would consist of realignment of the defences which would turn the eastern end of the Island into intertidal area. A new defence line of about 400 metres would be required to protect the dwellings at the western end of the Island. With hold the line the current line of defence will be sustained.

Comparison
The key difference between the two options is that hold the line would keep protecting all the designated freshwater grazing marsh, while managed erealignment would turn about 45 hectares into intertidal habitats. Managed realignment requires the construction of a new defence, but this would be much shorter and under much less pressure than the existing alignment. In addition, managed realignment could have high adverse impact on the historic environment due to large tracts of historic landscape and associated archaeological potential. Mitigation by design should be explored at an early stage.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.5.4 PDZ B5: Walton Channel

Description of the options
With managed realignment the defence will be realigned over the Walton Hall marshes. New defence lines of about 1.5 kilometres in total would be required to protect the sewage works to the north and the Willows caravan park, dwellings and communities to the south. With hold the line the current line of defence will be sustained.

Comparison
While HtL sustains the Walton marshes, the Nature Reserve (30 hectares of designated grazing marsh) and grade 4 agricultural land, managed realignment would convert these areas into intertidal habitat and create an

additional 90 hectares. Paths and tracks along the defences would have to be realigned which may also create opportunities for improvement. In addition, managed realignment would have a high adverse impact on the historic environment due to tracts of historic landscape with associated archaeological potential. In addition, managed realignment may have a positive impact on tourism and access to the backwaters under future regeneration plans for Walton.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.5.5 PDZ B6b Naze Cliffs south

Description of the options
As an alternative to continuing of the current no active intervention policy, there is a need to appraise a Managed Realignment option that limits the erosion in order to protect the Naze Tower and possibly also the features around it (car park other and facilities) from erosion.

This managed realignment option has been developed as a scheme that is currently being proposed by Tendring District Council under the Coast Protection Act (CPA) 1949. The preferred option set out by the Naze Coastal Protection Scheme-Crag Walk Project Appraisal Report (Royal Haskoning 2009) is for a rock revetment at the base of the cliffs including an access road for maintenance and providing access to the cliff face for geological interpretation. The cliffs will slump, vegetate and stabilise as the erosion of the toe is prevented, although small-scale vegetation clearance will be required to maintain the geological exposure.

Comparison
Continuing of the no active intervention policy supports the natural state of the estuary, including the role of bank erosion as a source of sediment elsewhere on the frontage. The managed realignment policy as described would have an impact (although limited) on these aspects, but it would significantly extend the life of the characteristic Naze Tower, a Grade II* Listed Building, while maintaining the geological interest and improving the amenity value.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.6 Management Unit C Tendring Peninsula

E4.6.1 Characterisation and summary of options

Characterisation

Tendring is a beach frontage with a mixture of shingle, and/or sand and muddy shores. Here the predominant process is loss of beach material due to its vulnerability to wave pressures (seawards) and landward constraints imposed by coastal and flood defences, set mainly at the low water mark (including Clacton-on-Sea and Holland-on-Sea) as well as the general orientation of the coast. Effectively, the defences are being undermined. The sediment drifts in a north-south direction, but there is lack of sediment supply from the north. There is some accretion at Seawick and Leewick due to change in alignment of the coast.

There is less low-lying land within this frontage than most of the other frontages, with exceptions being St Osyth Marsh, Seawick, Holland Haven Marshes and part of Walton-on-the-Naze. St Osyth Marsh comprises drained agricultural land with the settlements of Seawick and Jaywick to the east including a substantial caravan park and Jaywick golf club.

The seafront at Clacton-on-Sea has important recreational and tourism value with attractions including the beach and pier. Walton-on-the-Naze is another important tourist destination with its frontage and pier. Although most of these settlements are outside the flood risk zone they are at risk from coastal erosion that is an issue throughout the frontage.

The foreshore and cliff exposures, and excavations in the Clacton district (Clacton Cliffs and Foreshore SSSI) have provided opportunities for the study of one of the most important Pleistocene interglacial deposits in Britain. The Holland-on-Sea Cliffs SSSI represents a stratigraphic site of considerable importance. These sites can be precisely attributed to the Anglian glaciation, providing a fixed dating point within the terrace sequence of the eastern London Basin and a means of correlation with sequences where the Anglian is represented elsewhere in southern Britain and on the continent.

Holland Haven Marshes SSSI represents an outstanding example of a freshwater to brackish water transition and includes a number of nationally and locally scarce species. Holland Haven Country Park, situated on the floodplain of Holland Brook, is important both for conservation and recreational value. Part of Walton-on-the-Naze is also within the flood zone, with several buildings and a caravan site at risk. There are several Martello Towers along this part of the coast. These are small defensive forts built in the 19th century, which are of historical significance. The Clacton and Holland-on-Sea Strategy, which is likely to start by the end of 2009, will provide further details about the interaction between the frontages of Clacton and Holland-on-Sea.

<u>Criteria and indicators to appraise against options</u>

Principle / Criterion	Indicator
To develop policies appropriate to the diverse character of the Essex and South Suffolk coast and its dynamic interaction of land and sea	
Impact of policy package on the diverse character of the Essex and South Suffolk coast	Qualitative judgement
Impact of policy package on dynamic interaction of land and sea	Qualitative judgement
To balance flood and erosion management with the assets and benefits that it protects	
Level of flood and erosion risk to people and property.	Number of properties within the tidal flood zone compared to the current number (about 7,100 in epoch 1, 7510 in epoch 2 and 8,390 in epoch 3).
Impact on future opportunities	Judgement based on input regarding future opportunities
This principle will is tested by the check of economic viability (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To seek opportunities for managing the shoreline through natural coastal processes and take full account of longshore and cross-shore impacts	
Use of natural processes (saltmarsh, longshore interaction)	Qualitative judgement
Longshore impact on neighbouring frontages	Qualitative judgement: • Impact on Hamford Water and The Naze • Impacts on the Colne Estuary, Blackwater Estuary and Mersea Island.
Cross-shore impact on near shore activities	Qualitative judgement
To develop policies that are resilient against future changes and associated uncertainty	
This principleis tested by the sensitivity check (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To provide time and information for communities, individuals and partner organisations to adapt to any anticipated coastal change	
Adequacy of time available for communities, individuals and partner organisations to adapt	Time (in epochs) available for each required process of adaptation, depending on the policy option

Principle / Criterion	Indicator
To support communities and sustainable development for the people living around the Essex and South Suffolk shoreline by managing the risk to community activities and infrastructure	
Impact on infrastructure	Type and length of roads, railways and services affected: • A133 Type and number of utilities affected: • Sewage treatment works at Jaywick, Clacton-on-Sea and St Osyth • Electricity transmission lines at Holland-on-Sea
Impact on socio-economic activities	• Impact on grade 2, 3 and 4 agricultural land. Impact on tourism and recreation assets including: • Caravan park at Seawick, • Clacton-on-Sea and Frinton-on-Sea golf clubs • St Osyth beach, • Holland Haven country park • Piers at Clacton-on-Sea and Walton-on-the-Naze.
Impact on public services	Public services affected: • Coastguard lookout station at Clacton-on-Sea and Walton-on-the-Naze. • RNLI stations at Clacton-on-Sea and Walton-on-the-Naze.
Impact on communities	Number and size of communities (individual dwellings, hamlets, settlements): • Towns of Walton-on-the-Naze, Frinton-on-Sea and Clacton-on-Sea. • Smaller communities of Seawick and Jaywick
To harness the social and economic values of the Essex and South Suffolk coast to wider society	
Impact on socio-economic features of regional, national or international significance	Impact as a in eachcentage of regional / national / international availability: • St Osyth beach

Principle / Criterion	Indicator
To support conservation and enhancement of biodiversity and geodiversity	
Impact on the achievement of management objectives for designated habitats and species, keeping them in favourable condition (including no significant loss of extent or populations)	For each of the designations (Colne Estuary Ramsar site, SPA and SSSI): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario.
Impact on the achievement of national and local Biodiversity Action Plan (BAP) targets, both within designated sites and within the wider coastal countryside	• Area of BAP habitats in each epoch and scenario (BAP habitats present are maritime cliffs and slopes, mudflats, coastal and floodplain grazing marsh, reed beds, lowland heathland and lowland acid dry grassland)
Impact on the achievement of management objectives for designated geological sites, keeping them in favourable condition	For each of the geological designations (Clacton Cliffs and foreshore SSSI, and Holland-on-Sea Cliffs SSSI): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario.
To contribute to maintaining and enhancing the evolving character of the coastal landscape	
Impact on the character of the coastal landscape, including consideration of geological, geomorphological, historical environment and cultural features, and the role of settlements in the landscape	Qualitative judgement

Principle / Criterion	Indicator
To support protection and promotion of the historic environment and its value for the heritage, culture and economy of the area	
Impact on historic environment and its wider value	Impact on designated heritage assets: • Five Scheduled Monuments. • No Grade I and II* Listed Buildings. • Four Grade II Listed Buildings. • Two Conservation Areas. • No Protected Wreck Sites, Registered Battlefields, Registered Parks and Gardens.
To support and enhance people's enjoyment of the coast by maintaining and enhancing access	
Impact on access to the coast	Type and number of roads and paths affected: • Footpaths to and along shoreline. • Tracks across St Osyth Marsh. • Three car parks in flood zone.

Summary of PDZs and options

The analysis of the coastal policy context has led to the following list of PDZs and options for this Management Unit.

PDZ	Options	Appraisal needed?
C1 (Walton-on-the-Naze and Frinton-on-Sea)	HtL	No
C2 (Holland Haven)	HtL or managed realignment 2	Yes
C3 (Clacton)	HtL	No
C4 (Seawick, Jaywick and Osyth Marsh)	HtL - MR	No (see policy statement in Section 4.4 of main SMP)

managed realignment 1	Allow local and limited intervention to limit the risks, as long as negative impacts are minimised
managed realignment 2	Breach of the frontline defence after building a new landward defence line

E4.6.2 PDZ C2: Holland-on-Sea

Description of the options

With managed realignment the current line would be realigned over the Holland Haven country park and the golf course. Approximately 640 metres of new defences would be required to protect properties in Frinton and 1.6 kilometres to protect the B1032 road, the Pumping Station and properties in Holland-on-Sea. With hold the line the current line of defence will be held.

Comparison

Managed realignment would lead to creation of 190 hectares of intertidal habitats at the expense of coastal vegetated shingle, about 55 hectares of designated coastal grazing marsh and grade 4 agricultural land. The managed realignment option would also allow the release of some sediment down drift, which may improve the beach level of the (beaches) in Clacton-on-Sea. The new defence lines constructed would be under less pressure than the existing alignment as the intertidal area would act as a buffer for the north-easterly wave action. Realignment of tracks and footpaths would be required which may also create opportunities for improvement. In addition, managed realignment would have a moderate to high adverse impact on the historic environment, impacting upon the historic landscape in an area with very high archaeological potential. hold the line would sustain the recreational activities in Holland country park and the golf course. This could be counter-balanced by new opportunities for water-based recreational activities within the new wetland area. The sluice has been recently upgraded and managed realignment will therefore be a likely option for Epoch 3.

Recommended option

The draft policy for this frontage is for managed realignment as described above.

E4.7 Management Unit D: Colne Estuary

E4.7.1 Characterisation and summary of options

Characterisation

The Colne estuary system is confined by geology and/or flood defences which limit the landward development of intertidal areas. The hydrodynamic pressures (tidal flows and waves) and erosion are particularly prominent at the mid section of the estuary where the channel is widening. Hence the defences are under pressure. There is erosion throughout the main sections of the River Colne, Brightlingsea creek and Pyefleet Channel and accretion at the inner sections, including Geedon creek.

Most of the land within the 1 in 1000 year flood zone lies within the river flood plain and agricultural areas. There are the communities of Point Clear, Brightlingsea, Thorrington, Wivenhoe and Rowhedge. The Wick Marsh - Langenhoe Marsh - Fingringhoe Marsh area has military importance as a

Ministry of Defence firing range and is also within the flood risk zone. At Point Clear, a large caravan site lies within the 1 in 1000 year flood zone in addition to another Martello Tower, an associated battery and a museum. The camping and caravan site at Brightlingsea also provides amenity and tourist value.

The Colne Estuary Ramsar site, SAC, SPA, SSSI and NNR is of international importance for wintering Brent geese and black-tailed godwit and of national importance for breeding little terns and five other species of wintering waders and wildfowl. The variety of habitats, which include mudflat, saltmarsh, grazing marsh, sand and shingle spits, disused gravel pits and reed beds, support outstanding assemblages of invertebrates and plants. Recently saltmarsh erosion has accelerated reflecting the ebb tidal dominance within the estuary. The Colne Barrier is of importance for regulating tidal exchange and upstream issues.

Criteria and indicators to appraise against options

Principle / Criterion	Indicator
To develop policies appropriate to the diverse character of the Essex and South Suffolk coast and its dynamic interaction of land and sea	
Impact of policy package on the diverse character of the Essex and South Suffolk coast	Qualitative judgement
Impact of policy package on dynamic interaction of land and sea	Qualitative judgement
To balance flood and erosion management with the assets and benefits that it protects	
Level of flood and erosion risk to people and property.	Number of properties within the tidal flood zone compared to the current number (about 4,520 in epoch 1, 5,100 in epoch 2 and 5,860 in epoch 3).
Impact on future opportunities	Judgement based on input regarding future opportunities
This principle is tested by the check of economic viability (task 3.4) as part of appraisal, so there is no need for explicit criteria.	

Principle / Criterion	Indicator
To seek opportunities for managing the shoreline through natural coastal processes and take full account of longshore and cross-shore impacts	
Use of natural processes (saltmarsh, longshore interaction)	Qualitative judgement
Longshore impact on neighbouring frontages	Qualitative judgement: • Impact on the Tendring peninsula • Impact on Mersea Island • Impact on the Blackwater Estuary
Cross-shore impact on near shore activities	Qualitative judgement
To develop policies that are resilient against future changes and associated uncertainty	
This principle is tested by the sensitivity check (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To provide time and information for communities, individuals and partner organisations to adapt to any anticipated coastal change	
Adequacy of time available for communities, individuals and partner organisations to adapt	Time (in epochs) available for each required process of adaptation, depending on the policy option

Principle / Criterion	Indicator
To support communities and sustainable development for the people living around the Essex and South Suffolk shoreline by managing the risk to community activities and infrastructure	
Impact on infrastructure	• Type and length of roads, railways and services affected • Type and number of utilities affected • Railway line at Wivenhoe
Impact on socio-economic activities	• Impact on grade 2, 3, 4 and 5 agricultural land. Impact on tourism and recreation assets including: • Wivenhoe quay, Brightlingsea moorings, Rowhedge quay • Campsites and caravan parks at Point Clear and Brightlingsea • Museum at Stone Point
Impact on public services	Public services affected • Rail services to Clacton-on-Sea and Walton-on-the-Naze
Impact on communities	Number and size of communities (individual dwellings, hamlets, settlements): • Point Clear, Brightlingsea, Thorrington, Wivenhoe and Rowhedge.
To harness the social and economic values of the Essex and South Suffolk coast to wider society	
Impact on socio-economic features of regional, national or international significance	No specific features

Principle / Criterion	Indicator
To support conservation and enhancement of biodiversity and geodiversity	
Impact on the achievement of management objectives for designated habitats and species, keeping them in favourable condition (including no significant loss of extent or populations)	For each of the designations (Colne Estuary Ramsar site, SPA and SSSI): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario.
Impact on the achievement of national and local Biodiversity Action Plan (BAP) targets, both within designated sites and within the wider coastal countryside	• Area of BAP habitats in each epoch and scenario (BAP habitats present are mudflats, coastal and floodplain grazing marsh, reed beds, lowland mixed deciduous forest, lowland heathland and lowland acid dry grassland)
Impact on the achievement of management objectives for designated geological sites, keeping them in favourable condition	For each of the geological designations (Colne Estuary SSSI): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario.
To contribute to maintaining and enhancing the evolving character of the coastal landscape	
Impact on the character of the coastal landscape, including consideration of geological, geomorphological, historical environment and cultural features, and the role of settlements in the landscape	Qualitative judgement

Principle / Criterion	Indicator
To support protection and promotion of the historic environment and its value for the heritage, culture and economy of the area	
Impact on historic environment and its wider value	Impact on designated heritage assets: • One Scheduled Monument • Two Grade I and II* Listed Buildings • 77 Grade II Listed Buildings • Four Conservation Areas • One Registered Park or Garden • No Protected Wreck Sites, Registered Battlefields
To support and enhance people's enjoyment of the coast by maintaining and enhancing access	
Impact on access to the coast	Type and number of roads and paths affected • Footpaths to and along estuary shoreline. • Tracks to estuary shoreline • Two car parks in flood zone.

Summary of PDZs and options

The analysis of the coastal policy context has led to the following list of PDZs and options for this Management Unit.

PDZ	Options	Appraisal needed?
D1(Point Clear to St Osyth Creek)	HtL or managed realignment 2	Yes
D2 (Along the southern bank of Flag Creek)	HtL or managed realignment 2	Yes
D3 (Flag Creek to northern bank to Brightlingsea)	HtL or managed realignment 2	Yes
D4 (Brightlingsea)	HtL	No
D5 (Westmarsh Point to where the frontage meets the B1029)	HtL or managed realignment 2	No
D6a (South of Wivenhoe)	HtL	No
D6b (B1029 to Wivenhoe)	HtL & managed realignment 2	Yes
D7 (Colne Barrier)	HtL	No

PDZ	Options	Appraisal needed?
D8a (Inner Colne west bank)	HtL & managed realignment 2	Yes
D8b (Fingringhoe & Langenhoe)	HtL	No
D8c (Langenhoehall Marsh)	HtL	No

managed realignment 1	Allow local and limited intervention to limit the risks, as long as negative impacts are minimised
managed realignment 2	Breach of the frontline defence after building a new landward defence line

E4.7.2 PDZ D1b: Point Clear to Osyth Creek

Description of the options
Managed realignment will require building 1 kilometre of new defences to the west and east of the realignment area for flood protection of the caravan park, dwellings at Point Clear and roads.

Comparison
Managed realignment allows the creation of 34 hectares of intertidal habitats at the expense of the golf course and grade 3 agricultural land. Managed realignment would relieve the pressure on defences along Brightlingsea Creek and the new defence alignment would be under less pressure than the existing alignment. Realignment of footpaths would be required. This would have a limited adverse impact on the historic environment.

Recommended option
The draft policy for this frontage is for managed realignment in a phased approach as described above.

E4.7.3 PDZ D2: Along the southern bank of Flag Creek

Description of the options
Managed realignment will require the building of about 900 metres of new defences to the south and north of the realignment area for protection of dwellings and roads including the B1027. Under hold the line the defences will be remain at the current alignment.

Comparison
Managed realignment allows the creation of about 75 hectares of intertidal habitats at the expense of 60 hectares of designated freshwater habitats and grade 4 agricultural lands. Managed realignment would relieve the pressure on defences along Brightlingsea Creek and the new defence alignment would be under less pressure than the existing alignment. Realignment of footpaths would be required which may also create opportunities for improvement. In addition, managed realignment would have high adverse impact on many

aspects of the historic environment, due to the rich historic landscape in this area. Mitigation by design would be desirable from an early stage. The impact of managed realignment on oyster fisheries is difficult to quantify as realignments can affect local shell-fisheries in terms of increased flows but can also provide new oyster-laying areas and food sources for existing shellfisheries as in the case at Abbotts Hall in the Blackwater. Further modelling at scheme level would be undertaken to manage impacts and maximise opportunities.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.7.4 PDZ D3: Flag Creek to Brightlingsea

Description of the options
Under managed realignment the new realignment would require about 200 metres of defence line for flood protection of dwellings and roads including the B1029. With hold the line the defences will remain at the current alignment.

Comparison
Managed realignment would lead to the creation of 70 hectares of intertidal habitat with no loss of designated freshwater habitats. However, there would be loss of grade 3 and grade 4 agricultural lands. Managed realignment would relieve the pressure on defences along Brightlingsea Creek and Flag Creek and the new defence alignment would be under less pressure than the existing alignment. In addition, managed realignment would have a high adverse impact on the historic environment of the area. There are tracts of historic landscape with associated high archaeological potential. Under HtL all agricultural land would remain protected. The impact of managed realignment on oyster fisheries is difficult to quantify as realignments can affect local shell-fisheries in terms of increased flows but can also provide new oyster-laying areas and food sources for existing shellfisheries as in the case at Abbott Hall in the Blackwater. Further modelling at scheme level would be undertaken to manage impacts and maximise opportunities.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.7.5 PDZ D5: Westmarsh Point to where the frontage meets the B1029

Description of the options
Under hold the line the current line of defence will remain. With managed realignment new defences will be needed at Thicks Wood (180 metres) and the current Brightlingsea counter wall. The new defences would be required to keep protecting Brightlingsea, isolated dwellings and roads including the

B1029. With hold the line the defences will be remain at the current alignment.

Comparison
Managed realignment would create about 125 hectares of intertidal habitats at expense of grade 3 agricultural land and 20 hectares of designated freshwater grazing marsh landwards of the defences at Alresford Creek. In addition realignment would relieve the pressure on defences and allow the widening of the River Colne at the mid-section. Realignment of footpaths would be required which may also create opportunities for improvement. In addition, managed realignment would have a high adverse impact on the historic environment, due to archaeological potential and the expected scale of mitigation. Under hold the line all agricultural land and present day footpaths would remain protected.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.7.6 PDZ D6b: B1029 to Wivenhoe

Description of the options
Under HTL the current line of defence will remain. With managed realignment 700 metres of new defences will be needed to protect the railway, the properties near the Colne Barrier, properties near the Alresford creek bank and associated roads and the B1027. With hold the line the defences will be remain at the current alignment. Under NAI the defences along are likely to fail in epoch 2. Although the railway is not expected to flood its embankment will suffer increased pressure as it becomes more exposed. In later epochs with sea level rise, properties near the Alresford creek bank and the B1027 road may be affected.

Comparison
With managed realignment and NAI there would be creation of about 40 hectares of intertidal habitats at the expense of grade 2 agricultural land. In addition, managed realignment and NAI are likely to reduce the ongoing erosion southwards of the Colne Barrier. Realignment of footpaths would be required which may also create opportunities for improvement. In addition, managed realignment and NAI would have an adverse impact on the historic environment as there is well preserved grazing marsh and high archaeological potential. Under hold the line all agricultural land and present day footpaths would remain protected.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.7.7 PDZ D8a: Inner Colne west bank

Description of the options
Under hold the line the current line of defence will remain. With managed realignment 30 metres of new defences will be needed to protect Fingringhoe quay. Under NAI the defences are likely to fail in epoch 2 and allow flooding of the areas behind the defences (no properties are expected to flood).

Comparison
Managed realignment and NAI would create about 30 hectares of intertidal habitats at the expense of grade 3 agricultural land. Managed realignment and NAI are likely to reduce the ongoing erosion southwards of the Colne Barrier. Realignment of footpaths would be required which may also create opportunities for improvement. In addition, managed realignment and NAI would have a moderate adverse impact on the historic environment, due largely to the archaeological potential of the area. Under hold the line all agricultural land and present day footpaths would remain protected.

Recommended option
The draft policy for this frontage is for managed realignment (breach of defences) followed by NAI, as described above.

E4.8 Management Unit E: Mersea Island

E4.8.1 Characterisation and summary of options

Characterisation
The Colne estuary system is confined by geology and/or flood defences which limit the landward development of intertidal areas. The hydrodynamic pressures (tidal flows and waves) and erosion are particularly prominent mid section of the estuary where the channel is widening. The defences are therefore under pressure. There is erosion throughout the main sections of the River Colne, Brightlingsea creek and Pyefleet Channel and accretion at the inner sections, including Geedon creek.

This frontage covers Mersea Island. Most of the properties are outside the flood risk zone but there are several camping and caravan sites that are at risk. The landward side of the Island is made up of drained agricultural land behind the flood defences with a small area of saltmarsh.

Two areas of foreshore at East Mersea are of geological importance and Cudmore Grove Country Park and Mersea Stone Local Nature Reserve have local conservation and recreational value.

Criteria and indicators to appraise against options

Principle / Criterion	Indicator
To develop policies appropriate to the diverse character of the Essex and South Suffolk coast and its dynamic interaction of land and sea	
Impact of policy package on the diverse character of the Essex and South Suffolk coast	Qualitative judgement
Impact of policy package on dynamic interaction of land and sea	Qualitative judgement
To balance flood and erosion management with the assets and benefits that it protects	
Level of flood and erosion risk to people and property.	Number of properties within the tidal flood zone compared to the current number (about 90 in epoch 1, 120 in epoch 2 and 300 in epoch 3).
Impact on future opportunities	Judgement based on input regarding future opportunities
This principle is tested by the check of economic viability (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To seek opportunities for managing the shoreline through natural coastal processes and take full account of longshore and cross-shore impacts	
Use of natural processes (saltmarsh, longshore interaction)	Qualitative judgement
Longshore impact on neighbouring frontages	Qualitative judgement
Cross-shore impact on near shore activities	Qualitative judgement
To develop policies that are resilient against future changes and associated uncertainty	
This principle is tested by the sensitivity check (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To provide time and information for communities, individuals and partner organisations to adapt to any anticipated coastal change	
Adequacy of time available for communities, individuals and partner organisations to adapt	Time (in epochs) available for each required process of adaptation, depending on the policy option

Principle / Criterion	Indicator
To support communities and sustainable development for the people living around the Essex and South Suffolk shoreline by managing the risk to community activities and infrastructure	
Impact on infrastructure	• Type and length of roads and services affected. • No utilities affected.
Impact on socio-economic activities	• Impact on grade 2, 3, 4 and 5 agricultural land. Impact on tourism and recreation assets including: • Caravan parks and campsites • Cudmore Grove Country Park • Mersea Stone Nature Reserve.
Impact on public services	Public services affected: • RNLI station at West Mersea
Impact on communities	Number and size of communities (individual dwellings, hamlets, settlements): • West Mersea and East Mersea
To harness the social and economic values of the Essex and South Suffolk coast to wider society	
Impact on socio-economic features of regional, national or international significance	No specific features

Principle / Criterion	Indicator
To support conservation and enhancement of biodiversity and geodiversity	
Impact on the achievement of management objectives for designated habitats and species, keeping them in favourable condition (including no significant loss of extent or populations)	For each of the designations (Colne Estuary Ramsar site, SPA and SSSI and Blackwater Estuary Ramsar site, SPA, SSSI and NNR): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario. Area of designated land lost/gained.
Impact on the achievement of national and local Biodiversity Action Plan (BAP) targets, both within designated sites and within the wider coastal countryside	• Area of BAP habitats in each epoch and scenario (BAP habitats present are mudflats, coastal and floodplain grazing marsh and reed beds)
Impact on the achievement of management objectives for designated geological sites, keeping them in favourable condition	For each of the designations (Colne Estuary SSSI and Blackwater Estuary SSSI): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario. Area of designated land lost/gained.
To contribute to maintaining and enhancing the evolving character of the coastal landscape	
Impact on the character of the coastal landscape, including consideration of geological, geomorphological, historical environment and cultural features, and the role of settlements in the landscape	Qualitative judgement

Principle / Criterion	Indicator
To support protection and promotion of the historic environment and its value for the heritage, culture and economy of the area	
Impact on historic environment and its wider value	Impact on designated heritage assets: • Four Scheduled Monuments • No Grade I and II* Listed Buildings • 68 Grade II Listed Buildings • One Conservation Area • No Protected Wreck Sites, Registered Battlefields, Registered Parks and Gardens
To support and enhance people's enjoyment of the coast by maintaining and enhancing access	
Impact on access to the coast	Type and number of roads and paths affected • Footpaths to and along shoreline of Mersea Island. • Tracks to shoreline of Mersea Island • Five car parks in flood zone.

Summary of PDZs and options

The analysis of the coastal policy context has led to the following list of PDZs and options for this Management Unit.

PDZ	Options	Appraisal needed?
E1 (Landward Frontage)	HtL	No
E2 (seaward frontage between North Barn and West Mersea)	HtL or managed realignment 2	Yes
E3 (West Mersea)	HtL	No
E4a (Mersea Island along the Strood Channel)	HtL or managed realignment 2	Yes
E4b (Pyefleet Inner Channel)	HtL	No

managed realignment 1	Allow local and limited intervention to limit the risks, as long as negative impacts are minimised
managed realignment 2	Breach of the frontline defence after building a new landward defence line

E4.8.2 PDZ E2: Seaward frontage between North Barn and West Mersea

Description of the options

Under hold the line the current line of defence will remain. With managed realignment there would be of about 800 metres of new defences to the east and west of the realignment area protecting roads, sewage works, dwellings and properties in West Mersea.

Comparison

Managed realignment would convert 30 hectares of undesignated freshwater grazing marsh into intertidal habitat with a net gain of 10 hectares of habitat. Grade 3 agricultural land would also be lost. Realignment would relieve the pressure on defences caused by the north-easterly waves and the new defence alignment would be under less pressure than the existing alignment. Realignment of footpaths would be required which may also create opportunities for improvement. In addition, managed realignment would have moderate adverse impact on the historic environment. Under hold the line the current defence alignment would be maintained and protect agricultural land, present day footpaths and historic environment.

Recommended option

The draft policy for this frontage is for managed realignment as described above.

E4.8.3 PDZ E4a: Mersea Island along the Strood Channel

Description of the options

Under managed realignment the new realignment would require about 230 metres of defences for flood protection of the B1025 and properties in West Mersea. With hold the line the defences will remain at the current alignment.

Comparison

Managed realignment would lead to the creation of 45 hectares of intertidal habitat at the expense of 10 hectares of undesignated freshwater grazing marsh and grade 4 agricultural land. Managed realignment would relieve the pressure on defences along the Strood Channel and the new defence alignment would be under less pressure than the existing alignment. Realignment of footpaths would be required which may also create opportunities for improvement. In addition, managed realignment would have moderate adverse impact on the historic environment of the area. The impact of managed realignment on oyster fisheries is difficult to quantify as realignments can impact on local shell-fisheries in terms of increased flows but can also provide new oyster-laying areas and food sources for existing shellfisheries as in the case at Abbotts Hall in the Blackwater. Further modelling at scheme level would be undertaken to manage negative impacts and maximise positive impacts. Under hold the line the current defence alignment would be maintained and protect agricultural land, present day footpaths and historic environment.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.9 Management Unit F: Blackwater Estuary

E4.9.1 Characterisation and summary of options

Characterisation
The mouth of estuary is under significant pressure from north-easterly waves and estuary processes. Effectively, the estuary at this section is trying to widen. The widening of the estuary is constrained by the flood defences. The north bank is the section of the estuary most affected by waves whilst at the mid estuary the south bank is pressurised by estuary processes. Overall there is erosion of saltmarsh at outer and mid sections of the estuary and siltation at inner creeks and inner estuary. Jet skis and boat wash may encourage further erosion. At some locations overtopping is an issue. Foreshore recharge to prevent overtopping has taken place in the past at the seaward face of the Old Marshes. At Mundon Creek and Mayland Creek there is hydrodynamic pressure on the defences due to widening of meanders.

This unit covers the low-lying land surrounding the Blackwater Estuary extending inland to Maldon. The area within the 1 in 1000 year flood zone is for the most part agricultural land with sporadic farm buildings. There are, however, several settlements incorporated within this zone St Lawrence, Mayland, Maylandsea, parts of Maldon and Goldhanger. Sections of several B-roads along with numerous minor roads are also included throughout the flood zone. The campsites at St Lawrence, Mayland Creek and Vaulty Manor provide amenity value. There are several marinas in the estuary that have recreational, amenity and economic value. The site of the Battle of Maldon and National Trust property is a valuable tourist attraction.

Blackwater Estuary NNR and SSSI is the largest estuary in Essex north of the Thames and is one of the largest estuarine complexes in East Anglia. The mudflats are fringed by saltmarsh on the upper shores and support internationally and nationally important numbers of over-wintering waterfowl. Shingle and shell banks and offshore islands are also a feature of the tidal flats. The surrounding terrestrial habitats the sea wall, ancient grazing marsh and its associated fleet and ditch systems, plus semi-improved grassland are also of high conservation interest. This rich mosaic of habitats supports an outstanding assemblage of nationally scarce plants and a nationally important assemblage of rare invertebrates.

Northey Island Nature Reserve (National Trust), Ray Island Nature Reserve (National Trust) and several other local nature reserves further highlight the conservation value of much of the flood risk zone.

Criteria and indicators to appraise against options

Principle / Criterion	Indicator
To develop policies appropriate to the diverse character of the Essex and South Suffolk coast and its dynamic interaction of land and sea	
Impact of policy package on the diverse character of the Essex and South Suffolk coast	Qualitative judgement
Impact of policy package on dynamic interaction of land and sea	Qualitative judgement
To balance flood and erosion management with the assets and benefits that it protects	
Level of flood and erosion risk to people and properties eighty.	Number of properties within the tidal flood zone compared to the current number (about 3110 in epoch 1, 3,500 in epoch 2 and 4,430 in epoch 3).
Impact on future opportunities	Judgement based on input regarding future opportunities
This principle is tested by the check of economic viability (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To seek opportunities for managing the shoreline through natural coastal processes and take full account of longshore and cross-shore impacts	
Use of natural processes (saltmarsh, longshore interaction)	Qualitative judgement
Longshore impact on neighbouring frontages	Qualitative judgement
Cross-shore impact on near shore activities	Qualitative judgement
To develop policies that are resilient against future changes and associated uncertainty	
This principle is tested by the sensitivity check (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To provide time and information for communities, individuals and partner organisations to adapt to any anticipated coastal change	
Adequacy of time available for communities, individuals and partner organisations to adapt	Time (in epochs) available for each required process of adaptation, depending on the policy option
To support communities and sustainable development for the people living around the Essex and South Suffolk shoreline by managing the risk to community activities and infrastructure	

Principle / Criterion	Indicator
Impact on infrastructure	Type and length of roads, railways and services affected Impact on utilities including: • Electricity transmission lines at Bradwell Marshes. • Maldon sewage treatment works. • Bradwell nuclear power station.
Impact on socio-economic activities	• Impact on grade 2, 3, 4 and 5 agricultural land. Impact on tourism and recreation assets including: • Campsites and caravan parks at St Lawrence, Mayland Creek and Vaulty Manor. • Marinas at Bradwell Waterside, Maylandsea and Tollesbury. • Museum at Maldon
Impact on public services	• Provision of electricity
Impact on communities	Number and size of communities (individual dwellings, hamlets, settlements): • St Lawrence, Mayland, Maylandsea, Tollesbury, Ramsey Island, Maldon and Goldhanger
To harness the social and economic values of the Essex and South Suffolk coast to wider society	
Impact on socio-economic features of regional, national or international significance	No specific features

Principle / Criterion	Indicator
To support conservation and enhancement of biodiversity and geodiversity	
Impact on the achievement of management objectives for designated habitats and species, keeping them in favourable condition (including no significant loss of extent or populations)	For each of the designations (Blackwater Estuary Ramsar site, SPA, SSSI and NNR, and Dengie Ramsar site, SPA, SSSI and NNR): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario. Area of designated land lost/gained.
Impact on the achievement of national and local Biodiversity Action Plan (BAP) targets, both within designated sites and within the wider coastal countryside	• Area of BAP habitats in each epoch and scenario (BAP habitats present are mudflats, coastal and floodplain grazing marsh, reed beds, and purple moorgrass and rush pasture)
Impact on the achievement of management objectives for designated geological sites, keeping them in favourable condition	For each of the designations (Blackwater Estuary SSSI and Dengie SSSI): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario. Area of designated land lost/gained.
To contribute to maintaining and enhancing the evolving character of the coastal landscape	
Impact on the character of the coastal landscape, including consideration of geological, geomorphological, historical environment and cultural features, and the role of settlements in the landscape	Qualitative judgement

Principle / Criterion	Indicator
To support protection and promotion of the historic environment and its value for the heritage, culture and economy of the area	
Impact on historic environment and its wider value	Impact on designated heritage assets: • Six Scheduled Monuments • Four Grade I and II* Listed Buildings • 99 Grade II Listed Buildings • Three Conservation Areas • One Registered Battlefield • No Protected Wreck Sites, Registered Parks and Gardens
To support and enhance people's enjoyment of the coast by maintaining and enhancing access	
Impact on access to the coast	Type and number of roads and paths affected • Footpaths to and along estuary shoreline. • Tracks to estuary shoreline. • Three car parks in flood zone.

Summary of PDZs and options

The analysis of the coastal policy context has led to the following list of PDZs and options for this Management Unit.

PDZ	Options	Appraisal needed?
F1 (Strood to Salcott-cum-Virley)	HtL	No
F2 (Salcott-cum-Virley to Old Marsh)	HtL	No
F3 (South bank of the Salcott Channel to Tollesbury Fleet)	HtL or managed realignment 2	Yes
F4 (Tollesbury)	HtL	No
F5 (Tollesbury Wick Marshes to Goldhanger)	HtL or managed realignment 2	Yes
F6 (Goldhanger to Heybridge)	HtL	No
F7 (Heybridge Basin)	HtL	No
F8 (Maldon Inner estuary)	HtL	No
F9a (Mundon Point)	HtL	No
F9b (Northey Island)	HtL	No
F10 (Maylandsea)	HtL	No
F11a (Mayland Creek - West)	NAI	No
F11b (Mayland Creek - North)	NAI	No
F11 (Mayland Creek - East)	HtL	No
F12 (Steeple)	HtL or managed realignment 2	Yes
F13 (St. Lawrence)	HtL	No
F14 (St. Lawrence Creek)	HtL or managed realignment 2	Yes
F15 (Bradwell Creek)	HtL	No

managed realignment 1	Allow local and limited intervention to limit the risks, as long as negative impacts are minimised
managed realignment 2	Breach of the frontline defence after building a new landward defence line

E4.9.2 PDZ F3: South bank of the Salcott Channel to Tollesbury Fleet

Description of the options
Under hold the line the current line of defence will remain. With managed realignment about 950 metres of new defences would be built to protect the properties at Salcott, the B1026 and other roads, sewage works and isolated dwellings.

Comparison
Managed realignment would convert 390 hectares of designated freshwater habitat in Old Hall Marshes into intertidal habitat. The majority of agricultural land lost would be of grade 4 and realignment of footpaths would be required which may also create opportunities for improvement. Realignment would relieve the pressure on defences caused by the north-easterly waves and tidal flows along the Salcott Channel and the Tollesbury network of creeks. The new defence alignment would be under less pressure than the existing alignment. The impact of managed realignment on oyster fisheries is difficult to quantify, as realignments can impact on local shell-fisheries in terms of increased flows but can also provide new oyster-laying areas and food sources for existing shellfisheries as in the case at Abbotts Hall in the Blackwater. Further modelling at scheme level would be undertaken to manage negative impacts and maximise positive impacts. In addition, managed realignment would have a particularly high adverse impact on the historic environment, which includes two decoy ponds (both Scheduled Monuments), a rich historic landscape and high archaeological potential. Mitigation by design would be desirable from an early stage. Under hold the line the current defence alignment would be maintained and protect the designated freshwater habitats, agricultural land and present day alignment of footpaths.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.9.3 PDZ F5: Tollesbury Wick Marshes to Goldhanger

Description of the options
Managed realignment of the Tollesbury Wick Marshes area (at the eastern end of this PDZ) would require about 860 metres of new defences for flood protection of the properties at Salcott, the B1026 and other roads, sewage works and isolated dwellings. With hold the line the defences will remain at the current alignment.

Comparison
Managed realignment would convert 200 hectares of designated freshwater habitat in Tollesbury Wick Marshes into intertidal habitat. There would also be loss of grade 3 and grade 4 agricultural land and various footpaths would need to be realigned. This may also create opportunities for improvement.

The new defence alignment would be under less pressure from the north-easterly waves than the existing alignment. In addition, managed realignment would have a particularly high adverse impact on the historic environment, which comprises a rich historic landscape with associated high archaeological potential. Mitigation by design would be desirable from an early stage. Under hold the line the current defence alignment would be maintained and continue to protect the designated freshwater habitats, agricultural land and present day alignment of footpaths.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.9.4 PDZ F12: Steeple

Description of the options
Managed realignment would require 220 metres of new defences for flood protection of the properties at Steeple and Ramsey Island, sewage works, roads and isolated dwellings. With hold the line the defences will remain at the current alignment.

Comparison
Managed realignment would creation of 160 hectares of intertidal habitat at the expense of 40 hectares of undesignated freshwater grazing marsh and grade 3 agricultural land. Managed realignment would relieve the pressure on defences and the new defence alignment would be under less pressure than the existing alignment. Realignment of footpaths would be required which may also create opportunities for improvement. In addition, managed realignment would have a moderate adverse impact on the historic environment, due largely to the archaeological potential of the area. HtL would keep protecting the agricultural land and present day alignment of footpaths.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.9.5 PDZ F14: St. Lawrence Creek

Description of the options
Managed realignment would require about 400 metres of new defences for flood protection of the properties at Ramsey Island, Beacon Hill Leisure Park, roads and dwellings. With hold the line the defences would remain at the current alignment.

Comparison

Managed realignment would create around 50 hectares of intertidal habitat at the expense of grade 3 agricultural land and realignment of footpaths. This may also create opportunities for improvement. Realignment would relieve the pressure on defences and the new defence alignment would be under less pressure than the existing alignment. In addition, managed realignment would have a moderate adverse impact on the historic environment, due largely to the archaeological potential of the area. With hold the line the defences would be kept at the existing position allowing for protection of agricultural land and present day alignment of footpaths. This site is adjacent to a successful managed realignment at Orplands which was completed in 1999 and is currently managed by the local wildfowling group. Further realignment of this frontage would complement existing intertidal habitat and create opportunities for similar local recreational activities.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.10 Management Unit G: Dengie peninsula

E4.10.1 Characterisation and summary of options

Characterisation
The Dengie peninsula comprises extensive low lying areas of intertidal flats. The Dengie Flats and Ray Sands are currently undergoing accretion of the foreshore with vulnerable parts at Sales Point and Holliwell Point. Most of the defences are under pressure from coastal processes, apart from the pressure point mentioned where the extent of foreshore is also limited.

Within this frontage the flood zone is almost exclusively drained agricultural land with scattered buildings and some minor roads. The area is one of the largest coastal hinterlands in the Anglian region with good freshwater supply. It consequently supports very productive grade 1 and 2 agricultural land.

Othona Roman Fort, a Saxon Shorefort and St Peters Chapel have important value historically and as tourist attractions. Bradwell nuclear power station is currently being decommissioned but there are plans for a new development on the site. Flooding or undermining of this site would cause numerous issues.

The Dengie Ramsar site, SPA and SSSI NNR and saltmarsh is the largest continuous example of its type in Essex. The foreshore, saltmarsh and beaches support an outstanding assemblage of rare coastal flora and internationally and nationally important wintering populations of wildfowl and waders, as well as supporting a range of breeding coastal birds in summer. Bradwell Cockel Spit Nature Reserve consists of saltmarsh and shell bank habitats which support numerous species of breeding bird species.

Criteria and indicators to appraise against options

Principle / Criterion	Indicator
To develop policies appropriate to the diverse character of the Essex and South Suffolk coast and its dynamic interaction of land and sea	
Impact of policy package on the diverse character of the Essex and South Suffolk coast	Qualitative judgement
Impact of policy package on dynamic interaction of land and sea	Qualitative judgement
To balance flood and erosion management with the assets and benefits that it protects	
Level of flood and erosion risk to people and property.	Number of properties within the tidal flood zone compared to the current number (13 in epoch 1, 16 in epoch 2 and 19 in epoch 3).
Impact on future opportunities	Judgement based on input regarding future opportunities
This principle is tested by the check of economic viability (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To seek opportunities for managing the shoreline through natural coastal processes and take full account of longshore and cross-shore impacts	
Use of natural processes (saltmarsh, longshore interaction)	Qualitative judgement
Longshore impact on neighbouring frontages	Qualitative judgement
Cross-shore impact on near shore activities	Qualitative judgement
To develop policies that are resilient against future changes and associated uncertainty	
This principle is tested by the sensitivity check (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To provide time and information for communities, individuals and partner organisations to adapt to any anticipated coastal change	
Adequacy of time available for communities, individuals and partner organisations to adapt	Time (in epochs) available for each required process of adaptation, depending on the policy option
To support communities and sustainable development for the people living around the Essex and South Suffolk shoreline by managing the risk to community activities and infrastructure	
Impact on infrastructure	Type and length of roads, railways and services affected:

Principle / Criterion	Indicator
	• Electricity transmission lines at Bradwell Marshes.
Impact on socio-economic activities	• Impact on grade 1, 2, 3 and 5 agricultural land. Impact on tourism and recreation assets including: • Bradwell Cockel Spit Nature Reserve. • St Peter's Way Path. • St Peter's Chapel and Othona Roman Fort.
Impact on public services	• Provision of electricity.
Impact on communities	Number and size of communities (individual dwellings, hamlets, settlements): • Tillingham and individual dwellings on the Dengie peninsula.
To harness the social and economic values of the Essex and South Suffolk coast to wider society	
Impact on socio-economic features of regional, national or international significance	No specific features
To support conservation and enhancement of biodiversity and geodiversity	
Impact on the achievement of management objectives for designated habitats and species, keeping them in favourable condition (including no significant loss of extent or populations)	For each of the designations (Dengie Ramsar, SPA, SSSI and NNR, and the Sand beach Meadows SSSI): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario. Area of designated land lost/gained.
Impact on the achievement of national and local Biodiversity Action Plan (BAP) targets, both within designated sites and within the wider coastal countryside	• Area of BAP habitats in each epoch and scenario (BAP habitats present are maritime cliffs and slopes, mudflats, coastal and floodplain grazing marsh and reed beds)

Principle / Criterion	Indicator
Impact on the achievement of management objectives for designated geological sites, keeping them in favourable condition	For each of the geological designations (Dengie SSSI): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario. Area of designated land lost/gained.
To contribute to maintaining and enhancing the evolving character of the coastal landscape	
Impact on the character of the coastal landscape, including consideration of geological, geomorphological, historical environment and cultural features, and the role of settlements in the landscape	Qualitative judgement
To support protection and promotion of the historic environment and its value for the heritage, culture and economy of the area	
Impact on historic environment and its wider value	Impact on designated heritage assets: • Four Scheduled Monuments • One Grade I and II* Listed Buildings • 33 Grade II Listed Buildings • No Conservation Areas, Registered Parks and Gardens, Protected Wreck Sites, Registered Battlefields
To support and enhance people's enjoyment of the coast by maintaining and enhancing access	
Impact on access to the coast	Type and number of roads and paths affected • Footpaths to and along shoreline of the Dengie peninsula. • Tracks to shoreline of the Dengie peninsula. • No car parks affected

Summary of PDZs and options

The analysis of the coastal policy context has led to the following list of PDZs and options for this Management Unit.

PDZ	Options	Appraisal needed?
G1 (Bradwell-on-Sea)	HtL	No
G2 (Bradwell Marshes)	HtL	No
G3 (Dengie Marshes)	HtL	Yes

E4.10.2 PDZ G3: Dengie Marshes

Description of the options
Managed realignment would require around three kilometres of new defences, largely by upgrading an existing relic defence line. This would continue to provide flood protection of isolated dwellings at Burnham-on-Crouch, Southminster and Dengie. The new defences would also provide protection to roads and agricultural land. With hold the line the defences would remain at the current alignment.

Comparison
Managed realignment would create about 130 hectares of intertidal habitat at the expense of grade 2 agricultural land and realignment of footpaths. This may also create opportunities for improvement. Realignment would relieve the pressure on defences along the mouth of the Crouch and the new defence alignment would be under less pressure than the existing alignment. However, managed realignment has the potential to release contaminants into the water bodies as the defences are filled. Further work to establish the extent of waste issues within defences will be required. Managed realignment would also have a very limited adverse impact on the historic environment. With HtL the defences would be kept at the existing position, providing continued protection of agricultural land and present day alignment of footpaths.

Recommended option
The draft policy for this frontage is for HtL as described above.

E4.11 Management Unit H: Crouch & Roach

E4.11.1 Characterisation and summary of options

Characterisation
The Crouch and Roach is a very canalised and constrained system, in eachhaps the most constrained system in Essex. Due to the confined character of the estuary there is very little room for developing intertidal areas in the estuary and the defences are being strongly undermined as the tidal volumes increase. The mid section of the Crouch estuary (Bridgemarsh and Cliff Reach) is particularly under hydrodynamic pressure. There will be increased strain if there are no changes to the mid section of the Crouch. At both the Crouch and Roach there is an overall loss of saltmarsh, with some

accretion at inner estuaries and creeks. At the Roach, boat wash may encourage further erosion to H2, H5 and H8.

The settlements within the flood zone include parts of Rochford, South Woodham Ferrers and Burnham-on-Crouch. Infrastructure located within the flood zone includes several minor roads and the railway line between Woodham Ferrers and Burnham-on-Crouch, along with the station at Althorne.

The marinas at Burnham-on-Crouch, Althorne and North Fambridge provide recreational and economical value, along with the campsites around Burnham-on-Crouch. Foulness and Potton Islands have significant military importance as firing ranges for the Ministry of Defence

The Crouch and Roach Estuaries Ramsar site, SPA and SSSI is of international importance for bird species, with additional interest being provided by the aquatic and terrestrial invertebrates and an outstanding assemblage of nationally scarce plants.

Criteria and indicators to appraise against options

Principle / Criterion	**Indicator**
To develop policies appropriate to the diverse character of the Essex and South Suffolk coast and its dynamic interaction of land and sea	
Impact of policy package on the diverse character of the Essex and South Suffolk coast	Qualitative judgement
Impact of policy package on dynamic interaction of land and sea	Qualitative judgement
To balance flood and erosion management with the assets and benefits that it protects	
Level of flood and erosion risk to people and property.	Number of properties within the tidal flood zone compared to the current number (about 6,190 in epoch 1,6,660 in epoch 2 and 10,120 in epoch 3).
Impact on future opportunities	Judgement based on input re. future opportunities
This principle will also be tested by the check of economic viability (task 3.4) as part of appraisal, so there is no need for explicit criteria.	

Principle / Criterion	Indicator
To seek opportunities for managing the shoreline through natural coastal processes and take full account of longshore and cross-shore impacts	
Use of natural processes (saltmarsh, longshore interaction)	Qualitative judgement
Longshore impact on neighbouring frontages	Qualitative judgement
Cross-shore impact on near shore activities	Qualitative judgement
To develop policies that are resilient against future changes and associated uncertainty	
This principle will be tested by the sensitivity check (task 3.4) as part of appraisal, so there is no need for explicit criteria.	

Principle / Criterion	Indicator
To provide time and information for communities, individuals and partner organisations to adapt to any anticipated coastal change	
Adequacy of time available for communities, individuals and partner organisations to adapt	Time (in epochs) available for each required process of adaptation, depending on the policy option
To support communities and sustainable development for the people living around the Essex and South Suffolk shoreline by managing the risk to community activities and infrastructure	
Impact on infrastructure	Type and length of roads, railways and services affected: • A130, A1245 and A129 • Railway line to Southend-on-Sea and Southminster Type and number of utilities affected: • Electricity transmission lines • Rochford sewage treatment works
Impact on socio-economic activities	• Impact on grade 1, 2, 3, 4 and 5 agricultural land. Impact on tourism and recreation assets including: • Caravan parks and campsites at Wallasea Island and Burnham-on-Crouch. • Marinas at Wallasea Island, North Fambridge and Burnham-on-Crouch.
Impact on public services	Type and number of services affected: • Rail services • RNLI station at Burnham-on-Crouch • Electricity provision • Police station at South Woodham Ferrers
Impact on communities	Number and size of communities (individual dwellings, hamlets, settlements): • South Woodham Ferrers, Burnham-on-Crouch, Rochford, Hullbridge, Battlesbridge, Paglesham East and Churchend
To harness the social and economic values of the Essex and South	

Principle / Criterion	Indicator
Suffolk coast to wider society	
Impact on socio-economic features of regional, national or international significance	No specific features
To support conservation and enhancement of biodiversity and geodiversity	
Impact on the achievement of management objectives for designated habitats and species, keeping them in favourable condition (including no significant loss of extent or populations)	For each of the designations (Crouch and Roach Estuaries Ramsar site, SPA and SSSI, Foulness Ramsar site, SPA and SSSI, and Dengie Ramsar site, SPA, SSSI and NNR): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario.
Impact on the achievement of national and local Biodiversity Action Plan (BAP) targets, both within designated sites and within the wider coastal countryside	• Area of BAP habitats in each epoch and scenario (BAP habitats present are maritime cliffs and slopes, mudflats, coastal and floodplain grazing marsh, reed beds, lowland meadows and purple moorgrass and rush pasture)
Impact on the achievement of management objectives for designated geological sites, keeping them in favourable condition	For each of the geological designations (The Cliff, Burnham-on-Crouch SSSI and Dengie SSSI): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario.
To contribute to maintaining and enhancing the evolving character of the coastal landscape	
Impact on the character of the coastal landscape, including consideration of geological, geomorphological, historical environment and cultural features, and the role of settlements in the landscape	Qualitative judgement

Principle / Criterion	Indicator
To support protection and promotion of the historic environment and its value for the heritage, culture and economy of the area	
Impact on historic environment and its wider value	Impact on designated heritage assets: • One Scheduled Monument • Three Grade I and II* Listed Buildings • 70 Grade II Listed Buildings • Six Conservation Areas • No Registered Parks and Gardens, Protected Wreck Sites, Registered Battlefields
To support and enhance people's enjoyment of the coast by maintaining and enhancing access	
Impact on access to the coast	Type and number of roads and paths affected: • Footpaths to and along shoreline of the estuaries. • Tracks to the shoreline of the estuaries. • Two car parks in flood zone.

Summary of PDZs and Options

The analysis of the coastal policy context has led to the following list of PDZs and options for this Management Unit.

PDZ	Options	Appraisal needed?
H1 (Burnham-on-Crouch)	HtL	No
H2a (From Burnham-on-Crouch to Bridgemarsh)	HtL or managed realignment 2	Yes
H2b (Bridge Marsh to North Fambridge)	HtL or managed realignment 2	Yes
H3 (North Fambridge and South Woodham)	HtL	No
H4 (South Woodham, Battlesbridge and Hullbridge)	HtL	No
H5 (Eastwards of Brandy Hole)	HtL	No
H6 (Landward of Brandy Hole Reach)	HtL	No
H7 (South Fambridge)	HtL	No

PDZ	Options	Appraisal needed?
H8a (South bank of Longpole, Shortpole and Raypitts Reaches)	HtL or managed realignment 2	Yes
H8b (Canewdon)	HtL or managed realignment 2	Yes
H9 (Paglesham Creek)	NAI	No
H10 (Wallasea)	managed realignment 2	No
H11a (Paglesham Churchend)	HtL or managed realignment 2	Yes
H11b (Paglesham Eastend)	HtL or managed realignment 2	Yes
H12 (Stambridge)	HtL	No
H13 (Rochford)	HtL	No
H14 (Barling Marsh)	HtL or managed realignment 2	Yes
H15 (Little Wakering)	HtL	No
H16 (Great Wakering)	HtL	No

managed realignment 1	Allow local and limited intervention to limit the risks, as long as negative impacts are minimised
managed realignment 2	Breach of the frontline defence after building a new landward defence line

E4.11.2 PDZ H2a: From Burnham on Crouch to Bridgemarsh

Description of the options

Managed realignment will require the construction of 220 metres of new defences to the west and east of the realignment area for flood protection of properties at Creeksea, Althorne and North Fambridge. In addition, there may have to be some reinforcement of 800 metres of railway embankment that would be exposed to the tides. With HtL the defences will remain at the current alignment.

Comparison

Managed realignment allows the creation of 40 hectares of intertidal habitats at the expense of grade 3 agricultural land. Managed realignment would relieve the pressure on defences along Cliff Reach and Easter Reach and the new defence alignment would be under less pressure than the existing alignment. Realignment of footpaths would be required which may also create opportunities for improvement. In addition, managed realignment would have a high adverse impact on the historic environment, due largely to the archaeological potential of the area. HtL would sustain the agricultural land and present day alignment of footpaths.

Recommended option

The draft policy for this frontage is for managed realignment as described above. Note that realignment at PDZ H2 and H8 needs to be considered in conjunction with this.

E4.11.3 PDZ H2b: Bridge Marsh to North Fambridge

Description of the options

Managed realignment would require 3.2 kilometres of new defences, including reinforcement of the railway embankment to provide flood protection to the railway, properties at Althorne and North Fambridge. Under HtL the defences will be remain at the current alignment.

Comparison

Managed realignment allows the creation of about 310 hectares of intertidal habitats at the expense of 200 h of hectares designated freshwater habitats and grade 3 and grade 4 agricultural land. Managed realignment would relieve the pressure on defences along the mid section of the Crouch and the new defence alignment would be under less pressure than the existing alignment. Realignment of footpaths would be required which may also create opportunities for improvement. In addition, managed realignment would have a very high adverse impact on the historic environment, as there are tracts of historic landscape with associated high archaeological potential. Mitigation by design would be desirable from an early stage. Note that the current alignment area is under discussion. HtL would sustain the agricultural land and present day alignment of footpaths.

Recommended option

The draft policy for this frontage is for managed realignment as described above. Note that realignment at PDZ H2 and H8 needs to be considered in conjunction with this.

E4.11.4 PDZ H8a: South bank of Longpole, Shortpole and Raypitts Reaches

Description of the options

Under managed realignment the new realignment would require about 200 metres of defences for flood protection of dwellings and roads including the B1029. With HtL the defences will remain at the current alignment.

Comparison

Managed realignment would lead to the creation of 360 hectares of intertidal habitat with no loss of designated freshwater habitats. However, there would be loss of grade 3 and grade 4 agricultural land. Managed realignment would relieve the pressure on defences along the mid section of Crouch and the new defence alignment would be under less pressure than the existing alignment. Realignment of footpaths would be required which may also create opportunities for improvement. Managed realignment has the potential to release contaminants into the water bodies as the defences around here are filled. Further work to establish the extent of waste issues within defences

will be required. In addition, managed realignment would have a high adverse impact on the historic environment, due to the archaeological potential of the area. HtL would sustain the agricultural land and present day alignment of footpaths.

Recommended option
The draft policy for this frontage is for hold the line as described above.

E4.11.5 PDZ H8b: Canewdon

Description of the options
Under HTL the current line of defence will remain. With managed realignment new defences will be constructed to east (300 metres) and west (one kilometre) of the realignment area for protection of properties at Ashingdon, roads and isolated dwellings.

Comparison
Managed realignment would create 300 hectares of intertidal habitat at the expense of 50 hectares of designated freshwater habitats. Most of the agricultural land lost would be grade 3. Managed realignment would relieve the pressure on defences along the mid section of Crouch and the new defence alignment would be under less pressure than the existing alignment. Realignment of footpaths would be required which may also create opportunities for improvement. In addition, managed realignment would have a very high adverse impact on the historic environment, as there are tracts of historic landscape with associated high archaeological potential. Mitigation by design would be desirable from an early stage. HtL would sustain the agricultural land and present day alignment of footpaths.

Recommended option
The draft policy for this frontage is for managed realignment as described above. Note that realignment at PDZ H2 and H8 needs to be considered in conjunction with this.

E4.11.6 PDZ H11a: Paglesham

Description of the options
Managed realignment will require the construction of 4 kilometres of new defences for flood protection of roads and properties at Paglesham, Great Stambridge and Rochford. Under HtL the defences will remain at the current alignment.

Comparison
Managed realignment allows the creation of 270 hectares of intertidal habitats at the expense of grade 1, grade 2 and grade 3 agricultural land. Managed realignment would relieve the pressure on defences along a limited section of the Paglesham Pool, the Paglesham Reach and the Roach estuary. The new defence alignment would be under less pressure than the

existing alignment. Realignment of footpaths would be required which may also create opportunities for improvement. In addition, managed realignment would have a high adverse impact on the historic environment, due to tracts of historic landscape and associated high archaeological potential. HtL would sustain the agricultural land and present day alignment of footpaths.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.11.7 PDZ H11b: Paglesham Reach North Bank

Description of the options
Managed realignment will require two kilometres of new defence line, including reinforcement of to provide flood protection to the power lines, roads and properties at Paglesham, as well as roads and properties at Great Stambridge and Rochford. Under HtL the defences remain at the current alignment.

Comparison
Managed realignment allows the creation of about 70 hectares of intertidal habitat at the expense of grade 3 agricultural land. Managed realignment would relieve the pressure on defences along the Paglesham Reach and the Roach estuary. The new defence alignment would be under less pressure than the existing alignment. Realignment of footpaths would be required which may also create opportunities for improvement. In addition, managed realignment would have a high adverse impact on the historic environment, due to tracts of historic landscape and associated high archaeological potential. HtL would sustain the agricultural land and present day alignment of footpaths.

Recommended option
The draft policy for this frontage is for managed realignment as described above.

E4.11.8 PDZ H14: Barling Marsh

Description of the options
With HtL the defences will remain at the current alignment. However, under managed realignment the 1.3 kilometres of new defences would be required for protecting properties, roads and infrastructure at Barling, Little Wakering and Great Wakering as well as isolated dwellings and a pumping station.

Comparison
Managed realignment would lead to the creation of 130ha of intertidal habitat at the expense of 12 hectares of undesignated designated freshwater habitats and grade 3 agricultural land. Managed realignment would relieve the pressure on defences along the River Roach and the new defence

alignment would be under less pressure than the existing alignment. Realignment of footpaths would be required which may also create opportunities for improvement. Managed realignment has the potential to release contaminants into the water bodies as the defences around here are filled with refuse. Further work to establish the extent of waste issues within defences will be required. In addition, managed realignment would have a moderate adverse impact on the historic environment, due largely to the archaeological potential of the area. HtL would sustain the agricultural land and present day alignment of footpaths.

Recommended option
The draft policy for this frontage is HtL as described above.

E4.12 Management Unit I: Foulness, Potton and Rushley Islands

E4.12.1 Characterisation and summary of options

Characterisation
The Foulness eastern frontages are made up of tidal flats, with extensive areas of mudflat. This frontage is very exposed and under pressure due to waves and processes. The northern and the western frontages of Foulness are governed by the Crouch and Roach estuarine processes detailed above. A considerable length of the Foulness defence line within those estuaries is being strongly undermined due to an increase in tidal volumes. Potton and Rushley Island, considered as PDZs of this management unit, are also within the Crouch and Roach system and the defences there are also being undermined.

This land in this unit is low-lying and overlaps with the 1 in 1000 year flood zone of Frontage H. Most of the flood zone includes the Ministry of Defence controlled firing ranges on Havengore and Foulness Islands that extend offshore onto Maplin Sands. The area has numerous associated buildings including the hamlets of Churchend and Courtsend which are below the 1 in 1000 year flood level. The Broomway pubic right of way across Maplin Sands has amenity value

Foulness Ramsar site, SPA and SSSI is part of an open coast estuarine system comprising grazing marsh, saltmarsh, intertidal mudflats and sand flats which support nationally rare and nationally scarce plants and nationally and internationally important populations of breeding, migratory and wintering waterfowl

Criteria and indicators to appraise against options

Principle / Criterion	Indicator
To develop policies appropriate to the diverse character of the Essex and South Suffolk coast and its dynamic interaction of land and sea	
Impact of policy package on the diverse character of the Essex and South Suffolk coast	Qualitative judgement
Impact of policy package on dynamic interaction of land and sea	Qualitative judgement
To balance flood and erosion management with the assets and benefits that it protects	
Level of flood and erosion risk to people and properties.	Number of properties within the tidal flood zone compared to the current number (about 2,160 in epoch 1,2,340 in epoch 2 and 4,200 in epoch 3).
Impact on future opportunities	Judgement based on input regarding future opportunities
This principle will also be tested by the check of economic viability (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To seek opportunities for managing the shoreline through natural coastal processes and take full account of longshore and cross-shore impacts	
Use of natural processes (saltmarsh, longshore interaction)	Qualitative judgement
Longshore impact on neighbouring frontages	Qualitative judgement
Cross-shore impact on near shore activities	Qualitative judgement
To develop policies that are resilient against future changes and associated uncertainty	
This principle will be tested by the sensitivity check (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To provide time and information for communities, individuals and partner organisations to adapt to any anticipated coastal change	
Adequacy of time available for communities, individuals and partner organisations to adapt	Time (in epochs) available for each required process of adaptation, depending on the policy option
To support communities and sustainable development for the people living around the Essex and South Suffolk shoreline by managing the risk to community activities and infrastructure	
Impact on infrastructure	• Type and length of roads, railways and services affected • No specific utilities affected

Principle / Criterion	Indicator
Impact on socio-economic activities	• Impact on grade 1, 2, 3, 4 and 5 agricultural land. Impact on tourism and recreation assets including: • Campsite and caravan park at Shoeburyness. • The Broomway byeway.
Impact on public services	• Type and number of services affected
Impact on communities	Number and size of communities (individual dwellings, hamlets, settlements): • Great Wakering.
To harness the social and economic values of the Essex and South Suffolk coast to wider society	
Impact on socio-economic features of regional, national or international significance	No specific features
To support conservation and enhancement of biodiversity and geodiversity	
Impact on the achievement of management objectives for designated habitats and species, keeping them in favourable condition (including no significant loss of extent or populations)	For each of the designations (Foulness Ramsar site, SPA and SSSI, Benfleet, and Southend Marshes Ramsar site, SPA and SSSI): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario. Area of designated land lost/gained.
Impact on the achievement of national and local Biodiversity Action Plan (BAP) targets, both within designated sites and within the wider coastal countryside	• Area of BAP habitats in each epoch and scenario (BAP habitats present are maritime cliffs and slopes, mudflats, coastal and floodplain grazing marsh, lowland meadows and purple moorgrass and rush pasture)
Impact on the achievement of management objectives for designated geological sites, keeping them in favourable condition	No geological designations

Principle / Criterion	Indicator
To contribute to maintaining and enhancing the evolving character of the coastal landscape	
Impact on the character of the coastal landscape, including consideration of geological, geomorphological, historical environment and cultural features, and the role of settlements in the landscape	Qualitative judgement
To support protection and promotion of the historic environment and its value for the heritage, culture and economy of the area	
Impact on historic environment and its wider value	Impact on designated heritage assets: • One Scheduled Monument • No Grade I and II* Listed Buildings • 17 Grade II Listed Buildings • One Conservation Area • No Registered Parks and Gardens, Protected Wreck Sites, Registered Battlefields
To support and enhance people's enjoyment of the coast by maintaining and enhancing access	
Impact on access to the coast	Type and number of roads and paths affected • Footpaths on the Foulness peninsula and along shoreline by Great Wakering. • Tracks across the Foulness Peninsula and along shoreline by Great Wakering. • one car park in flood zone

Summary of PDZs and Options

The analysis of the coastal policy context has led to the following list of PDZs and options for this Management Unit.

PDZ	Options	Appraisal needed?
I1a (Foulness Island)	HtL	No
I1b (Potton Island)	HtL	No
I1c (Rushley Island)	HtL or managed realignment 2	Yes

managed realignment 1	Allow local and limited intervention to limit the risks, as long as negative impacts are minimised
managed realignment 2	Breach of the frontline defence after building a new landward defence line

E4.12.2 PDZ I1b: Potton Island

Description of the options

Managed realignment would lead to flooding of the entire Island. It would require no new defences. Under HtL the defences will remain at the current alignment.

Comparison

Managed realignment would lead to the creation of 360 hectares of intertidal habitat at the expense of 44 hectares of designated freshwater grazing marsh grade 3 agricultural land, MOD facilities and properties. Managed realignment would relieve the pressure on defences along the Roach and it would have a high adverse impact on historic environment, due to tracts of historic landscape and associated high archaeological potential. In addition, managed realignment has the potential to release contaminants into the water bodies as the defences around here are filled with refuse. Further work to establish the extent of waste issues within defences will be required. Under HtL the current alignment of the defences would remain unchanged. The MOD facilities, properties, agricultural land and the freshwater habitats would therefore remain protected.

Recommended option

The draft policy for this frontage is HtL as described above.

E4.12.3 PDZ I1c: Rushley Island

Description of the options

Managed realignment would lead to flooding of the entire Island. It would require no new defences. Under HtL the defences will remain at the current alignment.

Comparison

Managed realignment would create approximately 55 hectares of intertidal habitat at the expense of grade 4 agricultural land. Realignment would relieve the pressure on defences along the Roach. With HtL the defences would be kept at the existing position allowing for protection of the agricultural land. Managed realignment would have a high adverse impact on historic environment, due largely to high archaeological potential.

Recommended option

The draft policy for this frontage is managed realignment as described above.

E4.13 Management Unit J: Southend-on-Sea

E4.13.1 Characterisation and summary of options

Characterisation

Southend is a narrow beach frontage with a mixture of shingle, sand and muddy shores. Here the main process is loss of beach material due to tidal pressures and lack of sediment availability, partly due to cliff protection. Regular beach recharge is required.

The land in the 1 in 1000 year flood zone in this area is fairly limited comprising small sections of the seafront at Southend-on-Sea. Some properties lie within the 1 in 1000 year flood zone at Shoeburyness, South church and small areas of the seafront at Southend. Sections of the B1016 and the railway line at Leigh-on-Sea are within the flood zone. The golf course at Southchurch provides recreational value. The seafront at Southend-on-Sea has important recreational and tourism value with its attractions including the beach, pier, aquarium and museum, while Shoeburyness has military importance as a Ministry of Defence firing range.

Benfleet and Southend Marshes Ramsar site, SPA and SSSI comprise an extensive series of salt marshes, mudflats, scrub and grassland which support a diverse flora and fauna. The south-facing slopes of the downs, composed of London Clay capped by sand, represent the line of former river cliffs with several re-entrant valleys.

Criteria and indicators to appraise against options

Principle / Criterion	Indicator
To develop policies appropriate to the diverse character of the Essex and South Suffolk coast and its dynamic interaction of land and sea	
Impact of policy package on the diverse character of the Essex and South Suffolk coast	Qualitative judgement
Impact of policy package on dynamic interaction of land and sea	Qualitative judgement

Principle / Criterion	Indicator
To balance flood and erosion management with the assets and benefits that it protects	
Level of flood and erosion risk to people and property.	Number of properties within the tidal flood zone compared to the current number (about 6,370 in epoch 1, 6,990 in epoch 2 and 8,620 in epoch 3).
Impact on future opportunities	Judgement based on input regarding future opportunities
This principle will also be tested by the check of economic viability (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To seek opportunities for managing the shoreline through natural coastal processes and take full account of longshore and cross-shore impacts	
Use of natural processes (saltmarsh, longshore interaction)	Qualitative judgement
Longshore impact on neighbouring frontages	Qualitative judgement
Cross-shore impact on near shore activities	Qualitative judgement
To develop policies that are resilient against future changes and associated uncertainty	
This principle will be tested by the sensitivity check (task 3.4) as part of appraisal, so there is no need for explicit criteria.	
To provide time and information for communities, individuals and partner organisations to adapt to any anticipated coastal change	
Adequacy of time available for communities, individuals and partner organisations to adapt	Time (in epochs) available for each required process of adaptation, depending on the policy option

Principle / Criterion	Indicator
To support communities and sustainable development for the people living around the Essex and South Suffolk shoreline by managing the risk to community activities and infrastructure	
Impact on infrastructure	Type and length of roads, railways and services affected: • A13 at Bournes Green • Railway line east of Southchurch and along Southend-on-Sea seafront • No specific utilities affected
Impact on socio-economic activities	• Impact on grade 1 and 4 agricultural land. Impact on tourism and recreation assets including: • Aquarium, museum and pier at Southend-on-Sea • Thorpe Hall golf club • Waterside Farm Sports Centre.
Impact on public services	Type and number of services affected: • RNLI station at Southend-on-Sea • Rail services

Principle / Criterion	Indicator
To harness the social and economic values of the Essex and South Suffolk coast to wider society	
Impact on socio-economic features of regional, national or international significance	No specific features
Impact on communities	Number and size of communities (individual dwellings, hamlets, settlements): • Southend-on-Sea and associated communities.
To support conservation and enhancement of biodiversity and geodiversity	
Impact on the achievement of management objectives for designated habitats and species, keeping them in favourable condition (including no significant loss of extent or populations)	For each of the designations (Benfleet and Southend Marshes SPA and SSSI, Pitsea Marsh SSSI, Vange and Fobbing Marshes SSSI, Holehaven Creek SSSI and Canvey Wick SSSI): • Area of designated land lost/gained in each epoch and scenario. • Changes in condition of designated land in each epoch and scenario. Area of designated land lost/gained.
Impact on the achievement of national and local Biodiversity Action Plan (BAP) targets, both within designated sites and within the wider coastal countryside	• Area of BAP habitats in each epoch and scenario (BAP habitats present are mudflats and coastal and floodplain grazing marsh)
Impact on the achievement of management objectives for designated geological sites, keeping them in favourable condition	No geological designations.
To contribute to maintaining and enhancing the evolving character of the coastal landscape	
Impact on the character of the coastal landscape, including consideration of geological, geomorphological, historical environment and cultural features, and the role of settlements in the landscape	Qualitative judgement

Principle / Criterion	Indicator
To support protection and promotion of the historic environment and its value for the heritage, culture and economy of the area	
Impact on historic environment and its wider value	Impact on designated heritage assets: • One Scheduled Monument • No Grade I and II* Listed Buildings • 13 Grade II Listed Buildings • Four Conservation Areas • No Registered Parks and Gardens, Protected Wreck Sites, Registered Battlefields
To support and enhance people's enjoyment of the coast by maintaining and enhancing access	
Impact on access to the coast	Type and number of roads and paths affected • Footpaths along shoreline behind Two Tree Island and at Leigh-on-Sea. • Two car parks in flood zone.

Summary of PDZs and Options

The analysis of the coastal policy context has led to the following list of PDZs and options for this Management Unit.

PDZ	Options	Appraisal needed?
J1 (Southend-on-Sea))	HtL	No

E5 EPOCHS

E5.1 Approach

In order to prioritise the Policy Development Zones and subsequently assign the policy option to epochs a prioritisation exercise has been carried out with Natural England, English Heritage, Environment Agency and Royal Haskoning. This exercise took place on August, 13, 2009. Three criteria were established, which were used for the prioritisation exercise. The three criteria are:

1) The impact of the policy option on assets and issues landward of the defences
2) The impact of the policy option on assets and issues seaward of the defences, including the impact on adjacent defences
3) The impact of the policy option on designated sites landward of the defences.

Each PDZ has been evaluated and was given a score of 1 if impacts were marginal, a score of 2 if impacts are expected to be considerate and a score of 3 if impacts are considered to be significant. Assigning the policy option of the PDZ to an epoch is done as follows: if the total score is 1 to 3 the policy option is assigned to epoch 1. If the total score is 4 to 6 the policy option is assigned to epoch 2, and if the total score is 7 to 9 the policy option is assigned to epoch 3.

Table 5.1 summarises the assignment of the policy option to the epochs of each Policy Development Zone. Background information about the prioritisation exercise for each PDZ will be posted on the extranet.

Table 5.1: Results of the prioritisation exercise.

PDZ	Score	Epoch
A2	6/9	2
A3a	6/9	2
A8a	5/9	1/2
A8b	4/9	2
B2	4/9	2
B3a	7/9	3
B5	9/9	3
C2	9/9	3
D1b	5/9	2
D2	6/9	2
D4	4/9	2
D5	4/9	2

E1	7/9	3
E2	5/9	2
E4a	5/9	2
F3	7/9	3
F5	7/9	3
F12	7/9	3
F14	4/9	1/2
H2a	4/9	2
H2b	7/9	3
H8b	5/9	2
H11a	4/9	2
H11b	3/9	3
D6	n/a	2
D8a	n/a	2
I1c - Rushley	n/a	3
B4a - Devereux Farm	n/a	1
H10 - Wallasea	n/a	1
B2 - Bathside Bay	n/a	1

E6 CONFIRMATION OF DRAFT POLICIES

E6.1 Economic viability

The economic assessment is discussed in detail in **Appendix H**.

E6.2 Sensitivity analysis

This section discusses some of the main uncertainties that are likely to have an impact on policy selection. What is the uncertainty? What is the potential impact on the in eachformance of policy options against the principles? How could this uncertainty be managed in the SMP process?

Climate change

Sea level will certainly continue to rise, but the rates are uncertain, especially for epoch 3. The rate of sea level rise could strongly influence the speed of morphological developments. In the case of saltmarsh development, it could even determine locally whether there is accretion or erosion. The morphological developments, and particularly the development of saltmarsh, are an important factor in policy development because they determine whether defences are under pressure and they have an impact on the habitats.

Both factors have played an important role in the selection of PDZs where managed realignment of flood defences is the draft policy. For the short term (epoch 1), this source of uncertainty is limited, but in the medium and long term it is possible that different rates of sea level rise will cause more, less or other PDZs to come under pressure. They may also cause different developments of designated habitats. This will need to be taken into account in future reviews of the SMP.

Behaviour of coastal processes

Coastal geomorphology is a complex science that typically deals with large uncertainties. The main ones for the Essex and South Suffolk SMP are:

- Our general understanding of the estuaries' behaviour has played an important role in policy development, primarily by focusing on the middle and outer estuaries for managed realignment of flood defences. At the level of individual channels, particularly in the more complex estuaries, further work as part of scheme development is needed to confirm the estuaries' response to realignment.
- Development of intertidal areas in response to sea level rise. It is likely that the various current trends will continue into epoch 1. The predicted developments in the later epochs, in response to the speeding up of sea level rise and other changes, are much less certain. SMP policy development is not very sensitive to the speed of these developments, but it is very sensitive to the direction of change.
- Influence of managed realignment on foreshore, neighbouring frontages and wider area. This has played a part in identifying of managed

realignment PDZs, but further study and confirmation is needed in developing managed realignment projects after the SMP. Monitoring from existing realignments will lead to increased understanding in the coming years.

Saltmarsh development following realignment. Habitat creation is one of the drivers for realignment, in addition to wave dissipation. Both drivers will benefit from accretion in the newly created intertidal areas and subsequent saltmarsh development. The SMP policies are not very sensitive to the rate of saltmarsh development, but they can be sensitive to whether saltmarsh will develop at all. To some extent, this is also a locally specific issue, which can be influenced by design of realignment strategies and schemes (which places it beyond the scope of the SMP).

Future land use / future habitat needs

The future wider need for (high grade) agricultural land and habitat needs are important uncertainties which can change the balance between these values and will therefore have significant impacts on policy appraisal. The SMP guidance suggests that it is not appropriate to speculate regarding changes in social attitudes or policy. Still, this uncertainty is a fact that the SMP has to deal with. Some further insights will be provided through ongoing developments such as Foresight projects and other policy studies. In the meantime, it has to be acknowledged that the policies for the medium and long term are relatively uncertain.