Environment Agency in partnership with

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Chichester District Council

Arun District Council

planning for the future

Pagham to East Head Coastal defence strategy 2007

Initial consultation – a guide for local communities

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Chichester and Arun District Councils

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introduction

The Environment Agency and Chichester and Arun District Councils are looking at options for managing coastal flooding and erosion between Pagham Beach and East Head on the Manhood Peninsula. This will result in the **Pagham to East Head coastal defence strategy 2007**.

With climate changing, sea levels rising and increased storminess, our existing coastal defences are under greater threat. This strategy will set out the preferred options for managing the area's coastal defences over the next 100 years. The previous strategy completed in 2001 did not gain approval from the Government. Since then government guidance has changed the way we consider management options for the coast. We used the revised guidance to reassess the options and completed a *Technical Review* document in 2005. The results of the review are given as an indicative preferred option for each of the frontages later in this document. For some frontages, the option has changed from the 2001 strategy.

The Environment Agency and the District Councils only have permissive powers to construct coastal defences to protect people and property where these are economically justified and government funds are available. The amount of funding available from central government to provide defences is limited and there is strong competition for these funds from areas around the country.

The Environment Agency also has a legal obligation to protect habitats including inter-tidal salt marsh and mudflats that form part of a network of internationally designated sites (known as the Natura 2000 network). These too are at risk from rising sea levels. Where sections are lost, new areas further inland will have to be provided.

This document, *A guide for local communities*, sets out some of the key issues we need to address in the final strategy. Included with this document there is a short questionnaire. We would appreciate you taking the time to complete this and sending it to the address shown. Alternatively you can access it online at www.environment-agency.gov.uk/yourenv/consultations/current_consultations/ Your answers will help us determine the final strategy and further explore the funding issues.

the coastline between Pagham and East Head

The Manhood Peninsula together with Pagham is constantly at risk from the sea. The name 'Selsey' is thought to have originated from 'Seal Island'. Until the end of the eighteenth century, Selsey was actually an island with its own ferry to the mainland. The causeway was completed in 1809, introducing the only access road, now the B2145. Although much of the town of Selsey lies on slightly higher ground, its access still relies on the protection of low lying land from the sea.

Since the 1950s, timber, concrete and shingle defences have given protection against the most serious impacts of flooding and erosion. Before then, some areas of the peninsula were eroding at a rate of 8 metres per year.

The area is home to approximately 20,000 people in the main towns and villages of Selsey, East Wittering, West Wittering, Bracklesham and Pagham. Commercial activity centres around leisure and agriculture. West Sands, behind the defences at Medmerry, is one of the largest caravan parks in Europe.

The area is popular for water-based recreational activities and as a seaside resort attracting thousands of visitors each summer. Pagham Harbour and Chichester Harbour have important coastal habitats designated within the European Natura 2000 network. Inter-tidal mudflats and saltmarsh contain numerous plant and animal species and provide feeding areas for birds, supporting internationally important numbers of overwintering wildfowl.

Because of the international importance of these sites, the Government has obligations to create new inter-tidal habitats to compensate for losses elsewhere. Studies have identified the low-lying land at Medmerry as a prime site for new habitat creation. We therefore need to consider this in conjunction with the strategy even though losses along the coastline of this area are expected to be small.

options for managing Pagham to East Head

For the purpose of this strategy we have divided the coastline into three areas:

Pagham Beach, Pagham Harbour and Church Norton
Dominated by large shingle banks; the way these move under the sea's influence connect all these areas.

Selsey and Medmerry
Without the shingle bank at Medmerry the low-lying area to the west and north of Selsey town would flood on high tides. As well as isolating the town, the land drainage and essential utility services for the wider peninsula would be affected.

The Witterings and Cakeham
These areas are on the western side of the peninsula at Bracklesham, East and West Wittering and Cakeham. They include the sand spit at East Head that helps protect part of West Wittering.

The *Pagham to East Head coastal defence strategy 2007* will set out how we need to manage the coastal flood and erosion risks for the next 100 years. To do this, we consider a range of options described in the table below.

Each option is analysed in terms of:

- the flood and erosion risk to people and properties;
- predicted sea level rise and climate change;
- how much the option will cost and the value of the assets it will protect;
- effects on the natural environment.

We have considered management options for all of the areas. Each one is described, along with the positive and negative impacts and an estimate of cost, on pages 12 to 17. There are two maps. Figure 1 shows the area boundaries, and the potential flood risks from failed defences. Figure 2 outlines some possible realignment options at Medmerry.

Option	Description
No active intervention	Let nature take its course – no work will be carried out to repair defences, allowing them to deteriorate over time
Active intervention to hold the line	**Maintain –** defences are maintained, but as the sea level rises, flood risk increases over time **Sustain –** defences are raised and strengthened to cater for rising sea levels **Improve –** defences are improved to increase the standard of protection
Managed realignment	Moving defences inland in a controlled way to a more sustainable position

Pagham Beach and harbour entrance

In this document, we set out the indicative preferred option for each frontage. We derive these by applying the standard set of technical, economic and environmental rules used for analysing any flood and erosion risk. If you would like more details, a summary of our *2005 Technical Review* is available online or by contacting us using the details at the end of this document.

You will see that, when we apply these rules the indicative preferred option for the majority of urban frontages is to hold the existing defence line. However, as we explain on page 9, the options are unlikely to attract national funding, so alternative funding will still be needed if we are to maintain and renew existing defences.

what do these options mean for me?

What the indicative preferred options mean for you depends upon where you live. Risk of flooding and erosion varies across each of the three areas, as does the condition of the existing coastal flood defences. Some are in better condition than others.

Pagham Beach, Pagham Harbour and Church Norton

The indicative preferred option is to hold the existing line of defences (sustain) at Pagham Beach. This means that land and property would be subject to the same level of risk from the sea as they have been up to now. If the funds to hold the line are not available, the beach will start to erode. If this were the case, the first houses are likely to be reached in about 20 years time and 160 properties would be lost over 100 years.

At Pagham Harbour and Church Norton the situation is more complex as it is already experiencing fast natural changes. For this reason, we can only set a management option for the next 20 years. As time progresses, the options available to us should become clearer.

Within this context, the existing defences will be maintained for the next 20 years, with a possible minor realignment of the shingle spit on the west side of the harbour entrance. This means that 350 properties currently behind the defences will continue to be protected to the current standard.

Selsey and Medmerry

The existing defences at Selsey's East Beach provide protection from flooding and erosion for 1,000 houses. Given the good condition of these defences, no major work should be needed for the next 20 years. The indicative preferred option means that the defences should be maintained to the same height over the 100 years of the strategy. However, irrespective of this, as climate changes and sea levels rise, the risk of flooding is still likely to increase.

At the Bill, our work has shown that the cost of renewing and maintaining defences against erosion are greater than the value of the properties protected. The indicative preferred option is for no active intervention to take place. This means we will allow the existing defences to wear away and let the land erode. We expect the sea to reach the first houses within 50 years. A total of 100 houses could be lost within 100 years.

The indicative preferred option for Selsey's West Beach is to hold the line. This means carrying out urgently needed work to stop the deterioration of the large concrete defences. This option would not involve raising the defences. Properties would be subject to an increasing risk of flooding over time. If we don't carry out these works, we expect the defences to start to fail within five years; the sea would continue to erode the land and could claim 150 houses over the next 100 years.

Medmerry realignment options

Our studies have shown that realigning the coast inland at Medmerry can provide protection for people and property in the long-term. Banks constructed inland will not need to be as large as those on the coast as they won't receive the full force of the waves as they would on the open coast. The option will however mean the flooding of a relatively large area of land and additional works to re-route local drainage.

The current shingle bank defence at Medmerry is likely to be breached within a year without the costly works each winter to maintain and restore it. Such a breach would leave the whole of the low-lying area shaded blue on the map (Figure 2) open to regular flooding. It is likely that 50 properties, together with sewage pumping stations and electricity sub-stations, would flood within a year after the bank is breached.

There are several options for the position of the new inland banks. Each bank would need to run from high ground on the current coastline to high ground inland. One bank would be needed to protect Earnley and Bracklesham to the west and another eastern bank to protect the sewage works, B2145 road and properties to the west of Selsey.

Figure 2 shows a possible location for the western bank and two options for positions of an eastern bank. Other options are possible. The map shows the likely scale of bank lengths needed. Under the realignment option, once the shingle bank has breached we would expect the areas between the banks to flood, covering the blue shaded area now and the additional green area by the year 2100.

The eastern bank option 1, stretching north from the Embassy Club at West Sands Holiday Park would protect properties and their access. The Eastern bank option 2, would create more inter-tidal habitat but also lead to the loss of some properties and much of the West Sands Holiday Park.

We want to work with the Manhood Peninsula community to choose locations for the inland banks.

East Wittering, Cakeham and West Wittering

Our assessment shows that we should continue to maintain the beaches between East Wittering and Cakeham as they are now. Irrespective of this, the level of flood risk to people and properties will increase as sea levels rise.

The scale of works needed to maintain defences at East Wittering and Cakeham depend upon the amount of shingle that drifts naturally along the coast from the bank at Medmerry. This provides protection against erosion even as the groynes and wooden defences wear out. As some properties in East Wittering are very close to the beach, they would be at risk from erosion if the shingle is lost. Without any action this could be in as little as five years time. Over 100 years, the eroding coastline could result in the loss of 550 properties.

East Wittering

West Wittering managed realignment

Chichester Harbour is important to the local economy; the Harbour Conservancy estimate that many of the 650 marine related jobs depend on continued navigability of the harbour. The indicative preferred option of managed realignment at West Wittering's frontage would allow East Head spit to change in response to the sea's actions. The changes would need managing to take account of the spit's important role in coastal protection for West Wittering, maintaining navigation in the harbour and as an attractive amenity for people. Management needs to be sensitive to the environmental importance of East Head and the Harbour and avoid unnecessary impacts.

If the sea breaks through the spit it could create a second channel into the harbour reducing the tidal flows that help keep the main channel clear. Alternatively, the sea may simply wash over the spit and have no impact on navigation. There would be a need to manage visitor access if the spit became cut off at high tide. The defences that hold the Hinge in its current position would need to be removed to allow the spit to realign. The management of this realignment would involve taking out defences gradually. Over time, the western end of the car park would probably erode away and the beach would move inland. Flood banks would need to be built to protect the centre of West Wittering village from flooding. Without any works, around 100 properties in West Wittering would be at risk of flooding. Careful monitoring will be needed after each change to find out effects on the spit, channels and neighbouring frontages. If adverse effects are seen, such as the formation of a second channel into the harbour as a result of the spit breaching, adaptive management actions may be needed. This could include recycling of local beach materials, sand trapping or other appropriate measures. It will be important that such operations don't harm the internationally designated habitat of the harbour. We want to consult with the local community to determine the best way to manage this stretch of the coast.

funding

Despite our indicative preferred options, we have to accept that there is a limit to the national funding available for coastal defence schemes. Central government funds are currently only given to those schemes that result in the highest priority scores across England, based on detailed analysis of economic, social and environmental criteria.

This means that even if locally the benefit of protecting a lot of houses at risk from flooding significantly outweighs the costs, there can still be another scheme in the country that rates higher. Getting a share of national funds is not guaranteed in the long-term and is unlikely in the near future.

In this document, we have set out the indicative preferred options identified by our recent studies for managing flood and erosion risk between Pagham to East Head. It should be noted that there is an urgent need to carry out works along some of the urban coastline now. Given the uncertainty of national funding however, we need to explore other alternatives together with those communities affected.

The choices:

1) Await national funding

The indicative preferred options we have identified based on the economic, technical and environmental criteria are unlikely to gain central government funding; we have to accept that waiting for national funding could be high-risk and lengthy. This may change if the criteria themselves change or if more money is made available, but there is always the risk that other schemes around the country will continue to have a higher priority.

2) Find private funding

Land and property owners may have the opportunity to fund their own defences. This will only be effective if the works are co-ordinated and planned so that they don't inadvertently cause more problems for others (reducing the amount of shingle that naturally moves along the beach to protect others). These will also only cover a portion of the areas at risk and elsewhere further funding through other sources will be needed. The Environment Agency and local authorities would only support proposals funded separately if they are sustainable in the longer term.

3) Alternative public funding

Local levies or council tax increases could be explored. Consideration needs to be given to whether only those living on the peninsula should contribute or if the whole of Chichester and Arun Districts would be more appropriate.

4) No funding

Under the current funding criteria, the only choice available may be to stop maintaining the defences and allowing natural processes to take their course. This would leave a large number of properties and areas of land at risk of flooding and erosion at various stages over the next 100 years.

Plans would be needed to detail how the affected communities could cope with this option. This could range from improving flood warning systems, protecting individual properties and introducing emergency evacuation plans, to abandoning properties altogether at a future date.

Such plans would also be needed with a no active intervention option. The costs for this will be small compared with other options but are included in the tables on pages 13, 15 and 17.

We now want your views. Please use the questionnaire included with this document to have your say.

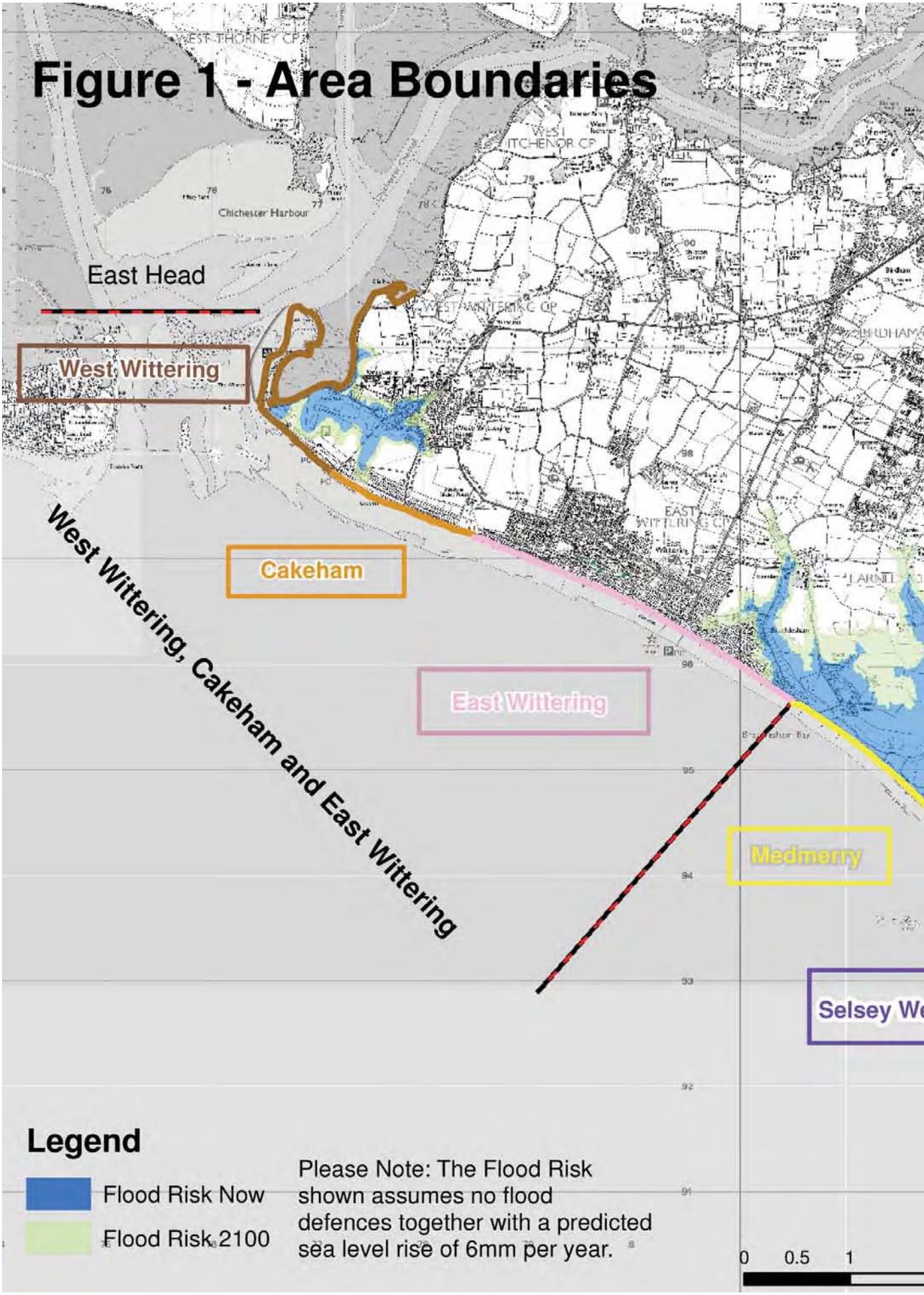
Figure 1 - Area Boundaries
East Head
West Wittering
Cakeham
East Wittering
Medmerry
West Wittering, Cakeham and East Wittering
Chichester Harbour
Legend
Flood Risk Now
Flood Risk 2100
Please Note: The Flood Risk shown assumes no flood defences together with a predicted sea level rise of 6mm per year.
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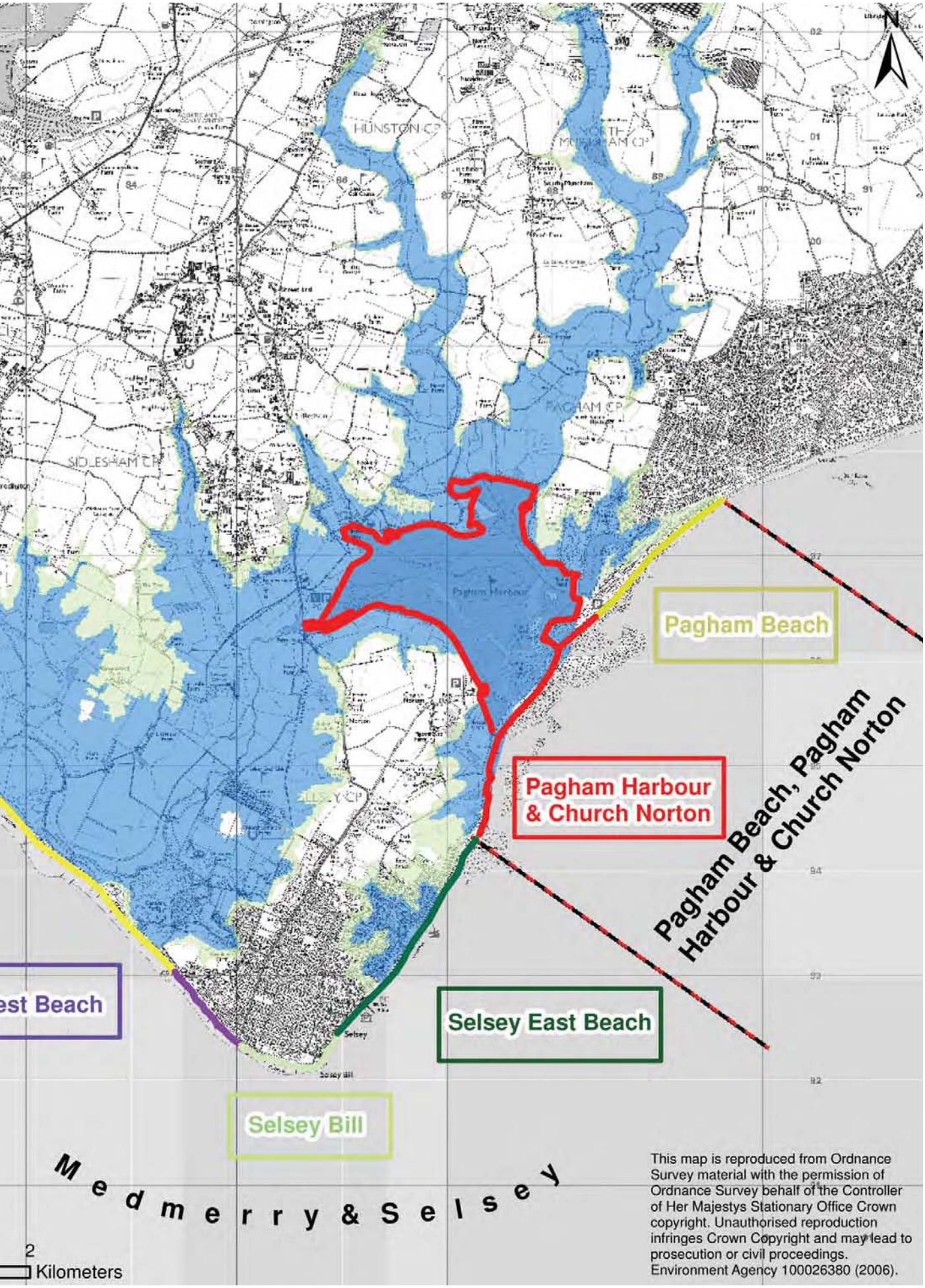
1


Pagham Beach
Pagham Harbour & Church Norton
Pagham Beach, Pagham Harbour & Church Norton
Selsey East Beach
Selsey Bill
Medmerry & Selsey
2
Kilometers
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options for Pagham Beach, Pagham Harbour and Church Norton

Photo courtesy of West Sussex County Council

Large shingle banks in front of and on either side of Pagham Harbour, provide the defences in this area. Erosion to the north of the Harbour entrance will lead to the loss of 160 houses actually built on the shingle bank at Pagham Beach. Erosion or breakthrough of the banks in front of the Harbour will change the environment in this internationally designated site and expose the defences inside the Harbour to wave attack. Failure of these in turn would lead to flooding of a further 350 properties, over 300 hectares of land, and place the causeway joining Selsey to the mainland at risk.

Indicative preferred option		
	PAGHAM BEACH	**PAGHAM HARBOUR/CHURCH NORTON**
Preferred option from technical review	Hold the existing defence line – sustain	Hold the existing defence line – sustain for 20 years. Realign the southern spit
Managing body	Arun District Council	Environment Agency, Chichester District Council
Current flood risk in any given year	Less than 1 in 100	Between 1 in 20 to 1 in 100
Remaining lifetime of sea defences	10 years	10-30 years
Approximate value of benefit	£4 million	£28 million
Approximate cost of work	£3 million	£5 million

Option	Description	Positives	Negatives	Estimated cost
No active intervention	• Cease all maintenance activities • Walls, groynes and shingle banks allowed to deteriorate or fail • Shingle spits would realign and breach under the influence of the sea	• Coastline develops naturally • Low cost • No maintenance commitment	• Unpredictable • High flood and erosion risk to 510 properties • Risk of loss of nationally important wildlife habitats	Pagham Beach Less than £1 million Pagham Harbour and Church Norton Less than £1 million
Hold the line	• Pagham Beach – maintained through recycling of beach material, or long-term importing additional material • Pagham Harbour – existing inner defences maintained • Pagham spits – maintain the shingle spits by recycling local beach material • Church Norton – maintain the existing defences and shingle bank. Groyne systems would need replacing after about 20 years	• All property and land given some protection • Fulfils legal responsibility to protect internationally designated areas • Maintains Pagham Beach • Allows time to consider longer term options	In the medium to long-term may be: • Out of step with natural processes • Increasingly difficult to achieve technically	Pagham Beach £3 million Pagham Harbour and Church Norton £5 million
Managed realignment	• Pagham Beach would be allowed to evolve with natural processes • Pagham Harbour inner defences – options to maintain or allowed to fail • Pagham spits allowed to realign • Church Norton defences would be allowed to fail and the beach would respond to natural processes • Some requirement for the construction of local defences	• Adapts to the effects of climate change • Works with natural coastal processes • Reduced need for long-term expenditure on maintenance	• Impacts on designated wildlife habitats uncertain • Potential loss of beach for public use • Potential wider consequences for coast to the East (Aldwick) • Increasing flood risk where defences not improved	May be appropriate in the medium to long-term depending how Pagham Harbour develops over the next 20 years

The shading in the table above highlights indicative preferred options. The table on the facing page gives details of this option for each of the frontages. Present Value (PV) costs are shown in the tables.

options for Selsey and Medmerry

The defences at East Beach protect over 1,000 properties most of which are situated on low-lying land and will flood if the defences are permanently breached. Around the Bill and towards the west side of Selsey the ground level is higher and 250 properties close to the sea would be lost to erosion over the next 100 years should the defences fail.

The existing defences at both East Beach and the Bill's frontages are generally in good condition and with minor maintenance are estimated to have a remaining lifespan in excess of 20 years. The defences on West Beach however, are in much poorer condition and are estimated to only have a remaining life of five years in places.

On the west side of Selsey, the shingle bank at Medmerry provides flood protection to 300 properties, large caravan sites and 650 hectares of land. Storms have breached this bank many times during the last 15 years and extensive maintenance is required every winter. It is anticipated that a breach of the bank is likely to occur on a yearly basis.

The majority of the housing in Selsey Town is above the 1 in 200 year flood level and will not be affected by erosion in the next 100 years. However, the only road (B2145) and all the utilities that serve the town, cross low-lying land protected by the Medmerry defences. Costs for protecting the road and services are included in the no active intervention option for Medmerry in the table below. This infrastructure is essential to maintain the community of Selsey.

Indicative preferred option				
	SELSEY EAST	**SELSEY BILL**	**SELSEY WEST**	**MEDMERRY**
Preferred option from technical review	Hold the existing defence line – maintain	No active intervention	Hold the existing defence line – maintain	Managed realignment
Managing body	Chichester District Council			Environment Agency
Current flood risk in any given year	1 in 50	1 in 100	1 in 20	1 in 1
Remaining lifetime of sea defences	20 years	20 years	5-15 years	1 year
Approximate value of benefit	£57 million	£3 million	£9 million	£40 million
Approximate cost of work	£13 million	£6 million	£4 million	£10 million

Option	Description	Positives	Negatives	Estimated cost
No active intervention	• Cease all maintenance activities • Walls, groynes and shingle banks allowed to deteriorate or fail	• Coastline develops naturally • No maintenance commitment • Potentially creates large area of wildlife habitat	• 1,550 properties and 2,000 caravans as well as other services and amenities at risk from flooding and erosion • Potential for Selsey to become an island	Selsey East Beach Less than £1 million Selsey Bill Less than £1 million Selsey West Beach Less than £1 million Medmerry £8-10 million
Hold the line	• Selsey East Beach, Selsey Bill and Selsey West Beach – existing sea wall repaired and maintained, groynes replaced • Medmerry frontage – holding the present line is not practical	• All property and land given some protection • Delays loss of land due to erosion	• Increased risk of flooding • Increased need for future funding • Over time, increasingly out of step with natural processes	Selsey East Beach £13 million Selsey Bill £6 million Selsey West Beach £4 million Medmerry £80 million
Managed realignment	• Selsey Beaches – proximity of properties mean realignment not possible • Selsey Bill – limited realignment possible in the centre of this section • Medmerry – either shingle banks realigned, or allow banks to breach and control tidal flooding with flood banks	• Works with natural coastal processes • Reduced need for long-term expenditure on maintenance • Manages the risk of flooding • Potentially creates large area of wildlife habitat	• Impact of flooding on property and land • Potential loss of access to the beach • Potential to interrupt supply of shingle to Witterings	Selsey East Beach N/A Selsey Bill £12 million Selsey West Beach N/A Medmerry £10 million

The shading in the table above highlights indicative preferred options. The table on the facing page gives details of this option for each of the frontages. Present Value (PV) costs are shown in the tables.

options for East Wittering, Cakeham and West Wittering

Photo courtesy of Chichester Harbour Conservancy

Coastal defences along East Wittering and Cakeham frontages comprise a mixture of shingle and sand beaches backed by concrete walls and timber breastworks ending with the sand spit at East Head. The failure of these defences would lead to the loss of 550 properties through erosion over the next 100 years. These defences benefit from shingle transferred naturally from the replenished Medmerry frontage. However, many of the timber groynes and breastworks are in poor condition with a remaining lifespan of less than five years.

The situation at West Wittering is more complex. As a dynamic sand and shingle spit, East Head is of international environmental value. It also acts as an offshore breakwater reducing the risk of wave action affecting the harbour shoreline of West Wittering. The spit has changed position over the past 250 years in response to coastal processes, gradually rotating towards the shoreline at West Wittering. The existing groynes at the Hinge, where it joins the land, have contributed to erosion of East Head.

Options for different ways of managing this frontage need to be considered. If no action is taken around 100 properties at West Wittering would be subject to flooding.

Indicative preferred option			
	EAST WITTERING	**CAKEHAM**	**WEST WITTERING**
Preferred option from technical review	Hold the existing defence line – maintain	Hold the existing defence line – maintain	Managed realignment with construction of flood banks
Managing body	Chichester District Council		
Current flood risk in any one year	1 in 50	1 in 100	1 in 5 to 1 in 50
Remaining lifetime of sea defences	5-15 years	15 years	5-15 years
Approximate value of benefit	£28 million	£10 million	£11 million
Approximate cost of work	£8 million	£5 million	£3 million

Option	Description	Positives	Negatives	Estimated cost
No active intervention	• Cease all maintenance activities • Walls, groynes and shingle banks allowed to deteriorate or fail • East Head spit allowed to realign	• Coastline develops naturally • Potentially creates area of inter-tidal habitat • No maintenance commitment	• 650 properties and holiday parks, as well as other local amenities, at risk from flooding and erosion • Coastal defence uncontrolled; may impact upon navigation	East Wittering Less than £1 million Cakeham Less than £1 million West Wittering Less than £1 million
Hold the line	• East Wittering – existing sea wall repaired and maintained, groynes replaced • Cakeham – existing groynes and breastworks repaired/ maintained, harder defences required over time • West Wittering – a new sea wall required	• All property and land given some protection • Delays loss of land due to erosion • Reduced risk to changes in the Harbour	• Increased need for future funding • Over time, increasingly out of step with natural processes • Continued risk of erosion of East Head • Loss of protected habitat to rising sea levels	East Wittering £8 million Cakeham £5 million West Wittering Greater than £50 million
Managed realignment	• East Wittering – proximity of properties mean realignment not possible • Cakeham – any realignment must be consistent with actions at East Head • West Wittering – phased removal of defences around the Hinge, possible intervention to maintain integrity of spit, flood banks inland to protect the village	• Most property and land given some protection • Adapts to the effects of climate change • Works with natural coastal processes • Reduced need for maintenance • Amenity value of East Head can be maintained	• Loss of small area of existing car park (West Wittering) • Sediment build-up in Harbour entrance possible • Some changes to land use in some areas necessary	East Wittering N/A Cakeham Less than £1 million West Wittering £3 million

The shading in the table above highlights indicative preferred options. The table on the facing page gives details of this option for each of the frontages. Present Value (PV) costs are shown in the tables.

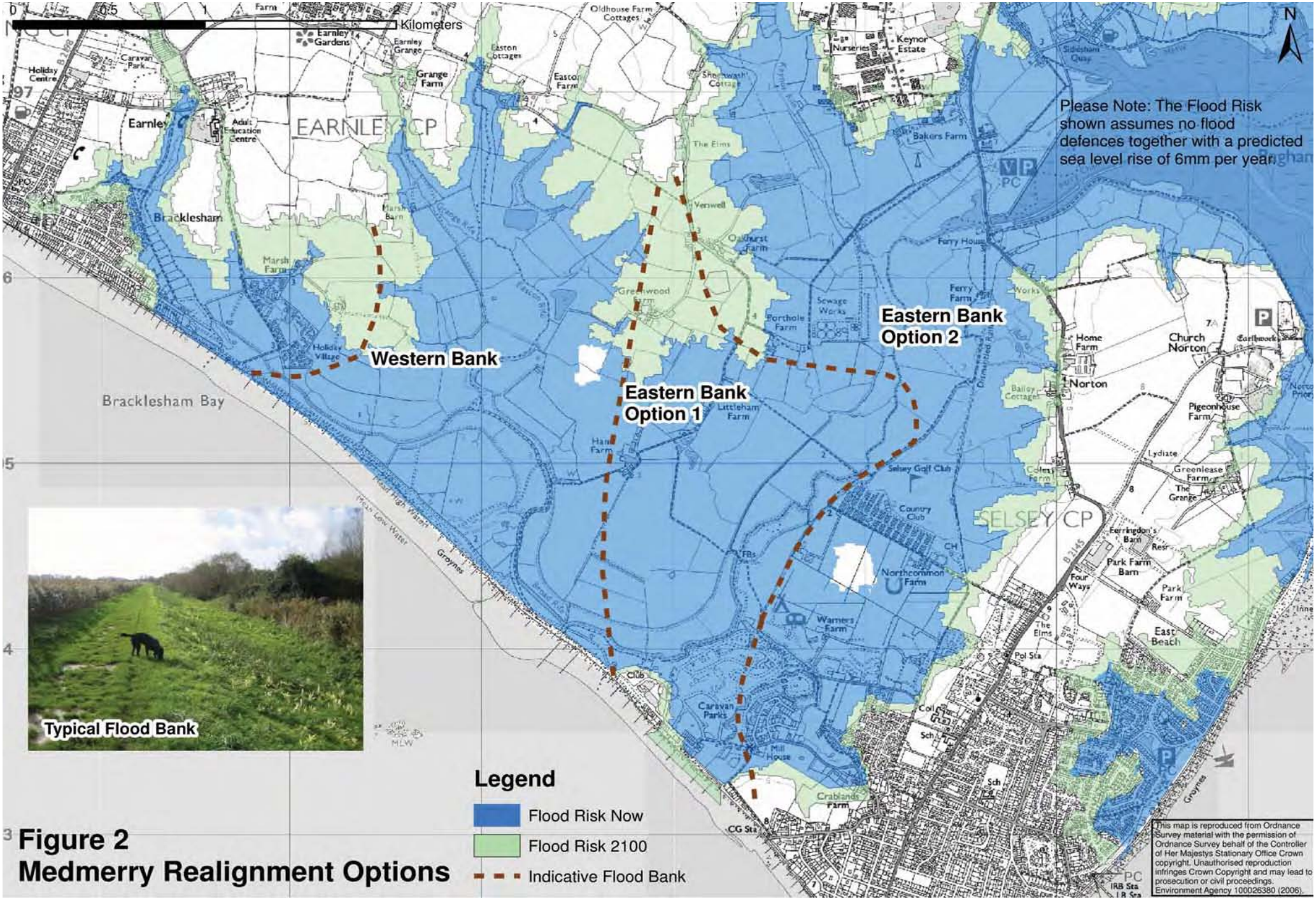

Figure 2
Medmerry Realignment Options

Have your say

This document is a summary of a technical study of available options for the future defence of the coast from Pagham Beach to Chichester Harbour entrance. It has been produced by the Environment Agency in Partnership with Chichester District Council and Arun District Council.

If you want to provide feedback, please complete the form enclosed with this booklet or visit: www.environment-agency.gov.uk/yourenv/consultations/current_consultations/

A summary of our *Technical Review* document giving details of the management options is available online from the address shown above, or by contacting us using the details below:

Environment Agency
Saxon House
Little High Street
Worthing
West Sussex
BN11 1DH

Completed forms should be returned before Wednesday 14 February 2007 to the address above or by email to: pehcds@environment-agency.gov.uk

Further copies of this document are available from the addresses above or by calling the Environment Agency on: 08708 506 506 (Mon-Fri 8-6)

Next steps

We will gather and analyse the feedback provided and use it in defining the draft strategy. We will work on the issues that have arisen so that we can finalise preferred options for managing risks from coastal flooding and erosion for the area over the next 100 years. To go with this, we will produce a report giving details of environmental effects. We will then consult communities on the Manhood Peninsula and Pagham to get their views on the draft strategy.

The Pagham to East Head coastal defence strategy 2007 will then be finalised for approval by the Government.

Environment first: This publication is printed on paper made from 100 per cent previously used waste. By-products from making the pulp and paper are used for composting and fertiliser, for making cement and for generating energy.

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