Beachy Head to Selsey Bill Shoreline Management Plan

Appendix H: Economic Appraisal and Sensitivity Testing

Contents

Contents by Policy Unit

Note the geographic breakdown of the appraisals presented in this Appendix is not necessarily the same as the final Policy Units (PU). Here the breakdown has been based upon coastal process and morphological changes along the shoreline. For ease of reference, the following table identifies the page number on which appraisals relevant to each PU start.

H.1 Introduction

A review of economic viability has been carried out for the preferred SMP policies. A review has not been carried out for locations where no capital or maintenance expenditure is envisaged.

It should be noted that this review is not to establish the economic justification for a scheme (as defined by FCDPAG3), but simply to make a broad assessment of the economic robustness of the preferred policies. The economic review therefore determines whether or not each policy is:

- economically viable
- not economically viable, or
- of marginal viability (and therefore may be in need of more detailed assessment at a later date, e.g. as part of a strategic plan, although some commentary on this is provided within this report).

It must be recognised that the justification for a particular policy is not necessarily dependent on economic viability, as impacts on other benefits may be considered more important (e.g. holding existing defences to sustain a designated habitat). Any policies where this is the case could be considered economically insufficient under current Treasury guidance.

The following sections detail how the economic assessment has been undertaken. This is followed by a series of economic statements for each policy unit, and spreadsheets providing the numerical analysis performed as part of the SMP (see Sections H5, H6 and H7).

H.2 Use of existing information

A number of strategy plans and scheme assessments have been developed for this coast over recent years. These contain detailed information on assets, benefits and management costs. Where it is directly applicable, such information has been used.

However, the justifications in these previous studies are only applicable if all other aspects are the same, i.e.

- the timeframe: many strategies have looked at economics over only 50 years and use different discount factors to those now required by Treasury
- the area determined to be at risk: the SMP may have a modified assessment of the area that could be affected by erosion or flooding
- the preferred policy matches that in the strategy: the SMP may be advocating a change from previous policy or management practice.

Where the above conditions are not realised, some of the raw data from the strategy plans has still been used, where it is readily available, as it is useful in validating or modifying information from the broad-scale SMP assessment.

H.3 Generation of new data

Where there is not existing information that can be used directly to confirm the robustness of the SMP policies, new economic data has been derived through application of the Modelling and Decision Support Framework (MDSF) tool, which consists of a customised GIS (ESRI ArcView) and a data management toolkit. This 'Broad-scale Economic Review', described below, uses nationally available information on property locations and values, and the risk maps developed through the assessment of shoreline interactions and responses (see Appendix C: Baseline Process Understanding).

H.3.1 DETERMINING DAMAGES AND BENEFITS

The benefits are the damages averted or deferred by the preferred policy, i.e. the difference in losses between implementing this and No Active Intervention (NAI) scenario. These have been calculated for each epoch.

Although the policy appraisal has determined a zone of likely future erosion, only the most landward extents of the indicative erosion zones, for the periods 0 to 20, 20 to 50 and 50 to 100 years, have been used. These lines have been mapped and overlain with the property location/value data to calculate potential economic losses and economic benefits for the NAI scenario and the preferred policy scenario. However, where the economic appraisal indicates a marginal case, a sensitivity assessment has been undertaken assuming a lower rate of erosion.

In areas where there is a flooding risk, no attempt has been made to undertake detailed flood risk modelling; rather areas identified as at flooding risk by the Environment Agency's flood mapping have been used to identify assets potentially at risk. The potential damages in these areas are simply taken as the summed value of all the 'at risk' assets. This is based on the assumption that under a NAI scenario flood defences would fail and all at risk assets would be inundated and become inhabitable. This is taken as an indicative figure for the assets potentially protected by defence structures.

In calculating damages and benefits for the preferred policy scenario, no account has been taken of the potential for short-term accelerated or delayed losses down-drift compared to NAI, other than the total adjustment in shoreline position at the end of each epoch.

The SMP does not take account of standards of protection as it is only defence management policy that is being determined, whereas standards of protection relate to implementation (i.e. will be determined at strategy level).

H.3.1.1 Benefit values

Losses and benefits have been calculated only on the basis of property values. Other assets, such as utilities, highways and intangibles, such as recreation, impacts upon the local economy or environment, have not been valued or included. For erosion losses and benefits, both residential and commercial property values and agricultural land have been accounted for. For flooding losses and benefits, only residential property and agricultural land have been taken into account. Exclusion of these other assets will robustly confirm economic viability, as these would provide added value.

Losses and benefits have been calculated using MDSF. This was populated with the Address Point dataset, which identifies the location of residential properties and current average residential property prices were obtained from www.upmystreet.co.uk, which provides property price statistics by postcode. For non-residential properties, commercial values have been obtained from the Focus database (from the Valuation Office).

Using the 20, 50 and 100 year erosion contours, MDSF has been used to calculate the Capital Value (CV) and discounted Present Value (PV). For the flood risk areas (generally defined by the coastal and tidal/fluvial indicative flood mapping (IFM)), GIS has been used to simply sum the CV for all residential assets within the flood area. This is based upon the assumption that under NAI, all properties at risk would be written off once defences failed. This is taken as an indicative figure for the assets potentially protected by defence structures.

For the flood risk areas, GIS has been used to simply sum the CV for all residential assets and agricultural land within the flood area, using the property database and agricultural land classification database.

H.3.1.2 Generation of new defence cost information

Future coastal defence management approaches for each Policy Unit have been developed as part of the SMP. From this, the broad replacement and maintenance requirements for each epoch have been determined.

Where there is no existing information relating to future defence costs for an area, e.g. from a strategy plan, costs have been generated using other nationally available information.

(a) Cost Rates

Replacement costs for general defence types have been taken from the recently developed Environment Agency database. This suggests average replacement costs for linear structures (e.g. revetments, seawalls) as £2.7million/km and costs for beach management schemes at £5.1million/km. Groyne field costs are taken as £0.6million/km.

Maintenance costs have been taken from the Defra National Appraisal of Defence Needs And Costs (NADNAC) study (2004). This used annual maintenance costs for linear structures and for groyne fields at £10,000/km, and for beach schemes £20,000/km.

Both replacement and maintenance costs for "low cost" defence structures (e.g. timber revetments) have been taken to be the same rate as for timber groynes.

(b) Cost Calculations

It has been assumed that the timing of full scheme reconstruction (i.e. design life) is at least once every 100 years for linear defences such as seawalls, every 50 years for beach schemes and every 30 years for groynes. However, these periods may become more frequent for areas where erosion potential is high, e.g. Selsey, and thus subject to increasingly high exposure. Maintenance has been assumed to be the same rate every year throughout the life of the scheme; however, in reality, this will be less in early years and will increase in later years of the scheme's life.

Allowance has also been made for the increase in costs due to climate change, based upon factors developed for the NADNAC study. This takes account of the need to make structures higher, deeper and more resilient to increased exposure. The assumptions were: no cost increase for the 0-20 year epoch; costs factored up by 1.5 times present day rates for the 20-50 year epoch; and costs factored up by 2.0 times present day rates for the 50-100 year epoch.

Finally, optimism bias in accordance with the most recent Defra guideline was applied to all costs (at 60%) to reflect uncertainty in broad level analysis at the SMP scale.

H.3.2 COMPARISON OF COSTS AND BENEFITS

As this review is not a full economic assessment, a formal benefit-cost assessment using BCR has not been conducted; rather, the information available has been used to review robustness of the preferred policies.

In comparing likely benefits and likely costs for the policies for an individual location over the full 100 year period it is, however, still useful in some instances to be able to consider these in terms of Present Value (PV).

Present Value is the value of a stream of benefits or costs when discounted back to the present day. For this SMP the discount factors used are the latest provided by the Treasury for assessment of schemes.

For calculation of PVdamages and PVbenefits, the approximate timing of property losses has been determined using MDSF and corresponding discount factors applied accordingly. For calculation of PVcosts for defence replacement, the average discount factor for each epoch has been used, the actual timing of works being uncertain at present. The year-on-year maintenance PVcosts have been calculated using the total of the discount rates for that epoch.

H.4 Economic appraisal summary table

Location		Calculation of Damages and Benefits		Assumed Defence Works & Costs Broad-scale Economic Review			Comments
		Previous Studies	Broad-scale Review (this SMP)[1]	Years 0 to 20	Years 20 to 50	Years 50 to 100	
4d01	Beachy Head to Cuckmere Haven	No Study	***NAI Damages:*** By 2025: none By 2055: £0.8million By 2105: up to £2.4million ***Preferred Plan Damages:*** By year 2025: none By 2055: none By 2105: up to £2.4million	No defence works No economic case to be made	No defence works No economic case to be made	No defence works No economic case to be made	*Policy Justified*
4d02	Cuckmere Haven and Cuckmere Valley	**Cuckmere Haven to Redoubt Gardens PAR, 2003.**	***NAI Damages:*** NAI on the eastern part of this frontage/east bank of River Cuckmere would result in inundation of Cuckmere Haven, which has 18 properties with a capital value of c. £4.9 million. NAI on the western part of this frontage/west bank River Cuckmere would result in inundation of Cuckmere Haven, which has 2 properties with a capital value of c. £710,000.	Managed realignment Up to £45,000 to be expended in the initial 5 year period maintaining existing management practices			*Policy Justified*

[1] The maximum extents of the indicative erosion zones were used in MDSF calculations. Flood risk damages are also included within this section of the table.

Location		Calculation of Damages and Benefits		Assumed Defence Works & Costs			Comments
				Broad-scale Economic Review			
		Previous Studies	Broad-scale Review (this SMP)[1]	Years 0 to 20	Years 20 to 50	Years 50 to 100	
			Preferred Plan Damages: By year 2025: none By year 2055: none By year 2105: none				
4d03	Seaford Head	Strategy study in progress – no data currently available.	***NAI Damages:*** By 2025: none By 2055: £0.15million By 2105: £0.75million ***Preferred Plan Damages:*** By year 2025: none By year 2055: £0.15million By year 2105: £0.9million	The gabions at Hope Gap would remain for a short period. There are no other defences. No economic case to be made	No defences. Properties would be at risk by this epoch. No economic case to be made	 No economic case to be made	
4d04	Seaford	**Seaford Bulk Recycling Scheme PAR, 2004.**	***NAI Damages:*** NAI on this frontage or the eastern part of Newhaven/east bank of the River Ouse would result in inundation of property across policy units 4, 5 and 6, which together have 2140 properties with a capital value of c. £2.3 billion. ***Preferred Plan Damages:*** By year 2025:none By year 2055: none	Maintain/ replace the existing structures and continue with the renourishment of Seaford Beach using material dredged from Newhaven Harbour). £1.8 million management and maintenance costs	Continue renourishing the beach and maintaining the structures £2.6 million management and maintenance costs	Continue renourishing the beach and maintaining and upgrade the structures £3.5 million management and maintenance costs	*Policy Justified*

Location		Calculation of Damages and Benefits		Assumed Defence Works & Costs			Comments
				Broad-scale Economic Review			
		Previous Studies	Broad-scale Review (this SMP)[1]	Years 0 to 20	Years 20 to 50	Years 50 to 100	
			By year 2105: none				
4d05	Seaford (Tide Mills to Newhaven Harbour)	**Saltdean to Newhaven Western Breakwater Strategy Study, 2002.**	***NAI Damages:*** NAI on this frontage or the eastern part of Newhaven/east bank River Ouse would result in inundation of property across policy units 4, 5 and 6, which together have 2140 properties with a capital value of c. £2.3 million. ***Preferred Plan Damages:*** By year 2025: none By year 2055: none By year 2105: none	No defences. No economic case to be made.	No defences. Possible secondary embankments £4.1 million possible costs for secondary embankments.	No defences. Maintain and upgrade secondary defences. £4.3 million management, maintenance and upgrade costs.	
4d06	Newhaven and Ouse Valley	**Saltdean to Newhaven Western Breakwater Strategy Study, 2002.**	***NAI Damages:*** NAI on this frontage or the eastern part of Newhaven and the Ouse Valley would result in inundation of property across policy units 5 and 6, which together have 2140 properties with a capital value of c. £2.3 million. NAI on the western part of Newhaven and the Ouse Valley would result in inundation of 1529 properties, with a capital value of c. £1.6 million.	Maintain seawall and breakwaters. Continue dredging of the Harbour £0.3 million for management costs, maintenance of existing defences, and dredging.	Maintain seawall and breakwaters. Continue dredging of the Harbour Up to £0.5 million for management costs, continued maintenance of existing defences, and dredging.	Maintain seawall and breakwaters. Continue dredging of the Harbour Up to £0.7 million management costs, continued maintenance of existing defences, and dredging.	*Asset value uncertain though significant assets and infrastructure in place. Thus policy justified.*

Location		Calculation of Damages and Benefits		Assumed Defence Works & Costs			Comments
				Broad-scale Economic Review			
		Previous Studies	Broad-scale Review (this SMP)[1]	Years 0 to 20	Years 20 to 50	Years 50 to 100	
			Preferred Plan Damages: By year 2025: unknown By year 2055: unknown By year 2105: unknown				
4d07	Newhaven Harbour to Peacehaven Heights	**Saltdean to Newhaven Western Breakwater Strategy Study, 2002.**	***NAI Damages:*** By 2025: none By 2055: £0.7million By 2105: £2.7million ***Preferred Plan Damages:*** By year 2025: none By year 2055: £0.7million By year 2105:£2.7million	No defence works	No defence works	Cliff works and defences may be required to slow erosion at Harbour Heights	
				No economic case to be made.	No economic case to be made.	No economic case to be made.	
4d08	Peacehaven	**Saltdean to Newhaven Western Breakwater Strategy Study, 2002.**	***NAI Damages:*** By 2025: none By 2055: none By 2105: £0.4million ***Preferred Plan Damages:*** By year 2025: none By year 2055: none By year 2105: none	Maintain/upgrade the concrete seawall and concrete groynes.	Maintain/upgrade the concrete seawall and concrete groynes.	Management practices that reduce risk to assets in an environmentally acceptable manner.	*Property assets only measured. Policy viable given known infrastructure present.*
				£1.4 million management, maintenance and upgrade costs.	£5.5 million management cost and defence upgrade.	To be identified after monitoring.	
4d09	Telscombe Cliffs	**Saltdean to Newhaven Western Breakwater Strategy Study, 2002.**	***NAI Damages:*** By 2025: none By 2055: none By 2105: £0.15million ***Preferred Plan Damages:*** By year 2025: none	Maintain defences to Potabello Outfall, otherwise no defences.	Maintain defences to Potabello Outfall, otherwise no defences.	Relocation of Potabello Outfall, otherwise no defences.	
				£23,000 for maintenance of Portabello Outfall defences.	Up to £0.2 million for maintenance of Portabello Outfall defences.	£0.7million for management of Portabello Outfall.	

Location		Calculation of Damages and Benefits		Assumed Defence Works & Costs			Comments
				Broad-scale Economic Review			
		Previous Studies	Broad-scale Review (this SMP)[1]	Years 0 to 20	Years 20 to 50	Years 50 to 100	
			By year 2055: none By year 2105: £0.14million				
4d10	Saltdean to Rottingdean	**Brighton Marina to Saltdean Strategy Study, 2001.**	***NAI Damages:*** By 2025: none By 2055: £7.3million By 2105: £8.5million	Maintain/Upgrade existing defences.	Maintain/Upgrade existing defences.	Management practices that reduce risk to assets in an environmentally acceptable manner.	
			Preferred Plan Damages: By year 2025:none By year 2055: none By year 2105: £8.5million	£1.0 million for management and defence maintenance and upgrade.	£4.1 million for management cost and defence upgrade.	To be identified after monitoring.	
4d11	Rottingdean to Brighton Marina	**Brighton Marina to Saltdean Strategy Study, 2001.**	***NAI Damages:*** By 2025: none By 2055: none By 2105: none	Maintain/Upgrade existing defences.	Maintain/Upgrade existing defences. Continue recycling of material at Rottingdean and extended to the west to prevent groyne failure.-	Monitor cliff retreat and implement management practices that reduce risk to assets in an environmentally acceptable manner.	
			Preferred Plan Damages: By year 2025: none By year 2055: none By year 2105: none	£1.0 million management costs and defence maintenance/upgrade.	£2.2 million management costs and defence maintenance/upgrade.	£2.8 million management costs, monitoring costs and defence maintenance/upgrade.	
4d12	Brighton Marina to Portslade-by-Sea	**River Adur to Brighton Marina Strategy Study, 2003.**	***NAI Damages:*** By 2025: £0.4million By 2055: £7.8million By 2105: £135.4million	Maintain existing defences.	Maintain existing defences. Introduce beach renourishment.	Maintain and upgrade all defences, and erect groynes and beach renourishment. There may be the potential need to renew defences.	
			Preferred Plan Damages: By year 2025: none By year 2055: none	£3.0 million management costs and	£20 million management costs and	£31 million management costs and	

Location		Calculation of Damages and Benefits		Assumed Defence Works & Costs			Comments
				Broad-scale Economic Review			
		Previous Studies	Broad-scale Review (this SMP)[1]	Years 0 to 20	Years 20 to 50	Years 50 to 100	
			By year 2105: none	defence maintenance.	defence maintenance.	defence maintenance.	
4d13	Shoreham Harbour (Southwick)	**River Adur to Brighton Marina Strategy Study, 2003.**	***NAI Damages:*** NAI on this frontage or the eastern part of Shoreham Harbour would result in inundation of property across policy units 13 and 14, which has 1184 properties with a capital value of c. £2.3 million.	Maintain existing defences. Sediment bypassing across the harbour entrance would continue.	Maintain existing defences. Possibility for the defences to be raised or set back. Sediment bypassing across the harbour entrance would continue.	New groynes would be required in conjunction with raised sea defences. Sediment bypassing across the harbour entrance would continue.	
			Preferred Plan Damages: By year 2025: none By year 2055: none By year 2105: none	£2.3 million management costs and defence maintenance	£7.9 million	£12.9 million management costs and defence maintenance. Construction of new groynes.	
4d14	River Adur and Adur Valley	**River Adur to Brighton Marina Strategy Study, 2003.** **&** **River Adur to Arun Strategy Study, 1999.**	***NAI Damages:*** NAI on this frontage or the eastern part of Shoreham Harbour would result in inundation of property across policy units 13 and 14, which has 1184 properties with a capital value of c. £2.3 million. NAI along this frontage or the western part of Shoreham Harbour would result in inundation of property across policy units 14, 15, 16 and 17, which have 4035 properties with a capital value of c. £7.4 million.	Maintain the existing river walls and embankments.	Increased maintenance and upgrading of the existing defences.	Maintain and upgrade the existing defences. Construction of new defences due to difficulties in maintaining the existing structures.	*Asset value unknown, however policy justified based on assets in place.*
				£2.3 million.	£15.9 million.	£22 million.	

Location		Calculation of Damages and Benefits		Assumed Defence Works & Costs			Comments
				Broad-scale Economic Review			
		Previous Studies	Broad-scale Review (this SMP)[1]	Years 0 to 20	Years 20 to 50	Years 50 to 100	
			By year 2105: none				
4d05	Seaford (Tide Mills to Newhaven Harbour)	**Saltdean to Newhaven Western Breakwater Strategy Study, 2002.**	***NAI Damages:*** NAI on this frontage or the eastern part of Newhaven/east bank River Ouse would result in inundation of property across policy units 4, 5 and 6, which together have 2140 properties with a capital value of c. £2.3 billion. ***Preferred Plan Damages:*** By year 2025: none By year 2055: none By year 2105: none	No defences.	No defences. Possible secondary embankments	No defences. Maintain and upgrade secondary defences.	
				No economic case to be made.	£4.1 million possible costs for secondary embankments.	£4.3 million management, maintenance and upgrade costs.	
4d06	Newhaven and Ouse Valley	**Saltdean to Newhaven Western Breakwater Strategy Study, 2002.**	***NAI Damages:*** NAI on this frontage or the eastern part of Newhaven and the Ouse Valley would result in inundation of property across policy units 5 and 6, which together have 2140 properties with a capital value of c. £2.3 billion. NAI on the western part of Newhaven and the Ouse Valley would result in inundation of 1529 properties, with a capital value of c. £1.6 billion.	Maintain seawall and breakwaters. Continue dredging of the Harbour	Maintain seawall and breakwaters. Continue dredging of the Harbour	Maintain seawall and breakwaters. Continue dredging of the Harbour	*Asset value uncertain though significant assets and infrastructure in place. Thus policy justified.*
				£0.3 million for management costs, maintenance of existing defences, and dredging.	Up to £0.5 million for management costs, continued maintenance of existing defences, and dredging.	Up to £0.7 million management costs, continued maintenance of existing defences, and dredging.	

Location		Calculation of Damages and Benefits		Assumed Defence Works & Costs			Comments
				Broad-scale Economic Review			
		Previous Studies	Broad-scale Review (this SMP)[1]	Years 0 to 20	Years 20 to 50	Years 50 to 100	
			By year 2105: none	defence maintenance.	defence maintenance.	defence maintenance.	
4d13	Shoreham Harbour (Southwick)	**River Adur to Brighton Marina Strategy Study, 2003.**	***NAI Damages:*** NAI on this frontage or the eastern part of Shoreham Harbour would result in inundation of property across policy units 13 and 14, which has 1184 properties with a capital value of c. £2.3 billion. ***Preferred Plan Damages:*** By year 2025: none By year 2055: none By year 2105: none	Maintain existing defences. Sediment bypassing across the harbour entrance would continue.	Maintain existing defences. Possibility for the defences to be raised or set back. Sediment bypassing across the harbour entrance would continue.	New groynes would be required in conjunction with raised sea defences. Sediment bypassing across the harbour entrance would continue.	
				£2.3 million management costs and defence maintenance	£7.9 million	£12.9 million management costs and defence maintenance. Construction of new groynes.	
4d14	River Adur and Adur Valley	**River Adur to Brighton Marina Strategy Study, 2003.** ***&*** **River Adur to Arun Strategy Study, 1999.**	***NAI Damages:*** NAI on this frontage or the eastern part of Shoreham Harbour would result in inundation of property across policy units 13 and 14, which has 1184 properties with a capital value of c. £2.3 billion. NAI along this frontage or the western part of Shoreham Harbour would result in inundation of property across policy units 14, 15, 16 and 17, which have 4035 properties with a capital value of c. £7.4 billion.	Maintain the existing river walls and embankments.	Increased maintenance and upgrading of the existing defences.	Maintain and upgrade the existing defences. Construction of new defences due to difficulties in maintaining the existing structures.	*Asset value unknown, however policy justified based on assets in place.*
				£2.3 million.	£15.9 million.	£22 million.	

Location		Calculation of Damages and Benefits		Assumed Defence Works & Costs			Comments
				Broad-scale Economic Review			
		Previous Studies	Broad-scale Review (this SMP)[1]	Years 0 to 20	Years 20 to 50	Years 50 to 100	
			Preferred Plan Damages: By year 2025: none By year 2055: none By year 2105: none				
4d19	River Arun and Arun Valley	**River Adur to Arun Strategy Study, 1999.**	***NAI Damages:*** NAI along this frontage would result in inundation of property across policy units 18 and 19, which together have 5095 properties with a capital value of c. £8 billion. NAI along the western part of the River Arun would result in inundation of 1193 properties with a capital value of c. £2.2 billion. ***Preferred Plan Damages:*** By year 2025: none By year 2055: none By year 2105: none	Maintain the existing clay embankment and defences. £0.6 million.	Maintain and upgrade the existing clay embankment and defences. £4.2 million.	Significant investment to maintain the existing clay embankment and defences. £6.9 million.	*This is based on the Arun to Adur strategy statement.*
4d20	Littlehampton to Poole Place	**River Adur to Arun Strategy Study &, 1999.** **River Arun to Pagham Strategy Study, 2002.**	***NAI Damages:*** NAI along the western part of the River Arun would result in inundation of 1193 properties with a capital value of c. £2.2 billion. ***Preferred Plan Damages:*** By 2025: none By 2055: none	Reconfigure primary defences. Construct new secondary defence and new linear flood defence/embankment. Periodic recycling/ renourishment. Potential costs of £11.7 million to reconfigure and construct secondary and new	Maintain reconfigured primary defences, secondary defences and linear flood defence. Periodic recycling/ renourishment. Potentially £12.7 management and defence maintenance costs.	Maintain reconfigured primary defences, secondary defences and linear flood defence. Periodic recycling/ renourishment. Potentially £13.5 management and defence maintenance costs.	

Location		Calculation of Damages and Benefits		Assumed Defence Works & Costs			Comments
				Broad-scale Economic Review			
		Previous Studies	Broad-scale Review (this SMP)[1]	Years 0 to 20	Years 20 to 50	Years 50 to 100	
			By 2105: none	linear defences and recycle and renourish the frontage.			
4d21	Elmer (Breakwaters)	**River Arun to Pagham Strategy Study, 2002.**	***NAI Damages:*** NAI along this frontage would result in inundation of property across policy units 21, 22 and 23, which together have 1247 properties with a capital value of c. £2.6 billion. ***Preferred Plan Damages:*** By year 2025: none By year 2055: none By year 2105: none	Maintain the existing defences. Continue beach renourishment/ recycling.	Maintain the existing defences. Continue beach renourishment/ recycling.	Maintain the existing defences. Increased beach renourishment/ recycling. Secondary defences required to prevent outflanking.	
				£1.5 million management and defence maintenance costs.	£2.4 million management and defence maintenance costs.	£4.0 million management costs, defence maintenance costs, and construction of renewed defences.	
4d22	Middleton-on-Sea	**River Arun to Pagham Strategy Study, 2002.**	***NAI Damages:*** NAI along this frontage would result in inundation of property across policy units 21, 22 and 23, which together have 1247 properties with a capital value of c. £2.6 billion. ***Preferred Plan Damages:*** By 2025: none By 2055: none By 2105: none	Maintain the existing defences.	New defences would be needed at Middleton Point, possibly set back to counter localised loss of beach.	Maintain and upgrade existing seawall. Construction of renewed defences, including a seawall and groynes would be required along Middleton Point.	
				£0.5 million to be expended in the initial 5 year period maintaining exiting management practices	£1.0 million for construction of new defences at Middleton Point.	£1.4 million for management costs, maintenance and upgrade of existing defences and construction of renewed defences.	
4d23	Felpham to Aldwick	**River Arun to Pagham Strategy**	***NAI Damages:*** NAI along this frontage	Maintain existing defences. Continue	Increased maintenance and upgrading of	Maintain and upgrade seawall. Renewed	

Location		Calculation of Damages and Benefits		Assumed Defence Works & Costs			Comments
				Broad-scale Economic Review			
		Previous Studies	Broad-scale Review (this SMP)[1]	Years 0 to 20	Years 20 to 50	Years 50 to 100	
		Study, 2002.	would result in inundation of property across policy units 21, 22 and 23, which together have 1247 properties with a capital value of c. £2.6 billion. ***Preferred Plan Damages:*** By year 2025: none By year 2055: none By year 2105: none	renourishment at Felpham.	existing seawall. Maintain other existing defences. Increased beach renourishment at Felpham.	defences to prevent outflanking of seawall and flooding of the frontage. New groynes will be needed to maintain the beach. Increased renourishment at Felpham to sustain beach levels.	
				£1.4 million for management and defence maintenance costs.	£10.9 million for management costs, defence upgrade and increased beach renourishment.	£13 million for management costs, seawall upgrade, increased beach renourishment, and construction of renewed defences.	
4d24	Aldwick to Pagham	**River Arun to Pagham Strategy Study, 2002.**	***NAI Damages:*** NAI along this frontage (via Pagham Harbour) could result in inundation of property across policy units 24 and 25, which together have 324 properties with a capital value of c. £8.5 billion. ***Preferred Plan Damages:*** By year 2025: none By year 2055: none By year 2105: none	No Active Intervention. Monitoring of beach levels.	Construction of primary defences. Secondary flood defences at two locations. Firstly Pagham and secondly to stop back-door flooding from Pagham Harbour into Pagham.	Maintain and sustain the new defences.	
				No economic case to answer	£2.0 million for management cost and construction of primary and secondary defences.	£2.2 million for maintenance of defences constructed in the previous epoch.	
4d25	Pagham to Church Norton	**Pagham to East Head Strategy Study, 1999.**	***NAI Damages:*** NAI via Pagham Harbour could result in inundation of	Managed Realignment with Secondary Defences at Specific	Managed Realignment with Secondary Defences at Specific	Managed Realignment with Secondary Defences at Specific	

Location		Calculation of Damages and Benefits		Assumed Defence Works & Costs			Comments
				Broad-scale Economic Review			
		Previous Studies	Broad-scale Review (this SMP)[1]	Years 0 to 20	Years 20 to 50	Years 50 to 100	
			property across policy units 24 and 25, which together have 324 properties with a capital value of c. £85 million. ***Preferred Plan Damages:*** By year 2025: none By year 2055: none By year 2105: none	Areas (refer to map). £0.4 million	Areas (refer to map). To be identified after monitoring, could be in the region of £0.7 million.	Areas (refer to map). To be identified after monitoring, could be in the region of £0.7 million.	
4d26	Church Norton to East Beach	**Pagham to East Head Strategy Study, 1999.**	***NAI Damages:*** NAI via Pagham Harbour along this frontage could result in inundation of property across policy units 26 and 27, which together have 37 properties with a capital value of c. £2.7 million. ***Preferred Plan Damages:*** By year 2025: £5.7million By year 2055: £12.5million By year 2105: £14.0million	Maintain existing defences but do not replace. £0.7 million.	New secondary defences to reduce flooding at Church Norton. £4.3 million	No defences. Continued maintenance and upgrading of the secondary defences at Church Norton. £4.5 million for management costs and maintenance/upgrade of secondary defences.	
4d27	East Beach to Selsey Bill	**Pagham to East Head Strategy Study**	***NAI Damages:*** NAI along this frontage would result in inundation of property across policy units 26 and 27, which together have 37 properties with a capital value of c. £2.7 million.	Maintain existing defences. £1.5 million for management costs and maintenance of existing defences.	Maintain existing defences. £5.9 million for management costs and maintenance of existing defences.	New seawall and groynes would form renewed defence line. £11.8 million for management costs and construction of renewed defences.	

Location		Calculation of Damages and Benefits		Assumed Defence Works & Costs			Comments
				Broad-scale Economic Review			
		Previous Studies	Broad-scale Review (this SMP)[1]	Years 0 to 20	Years 20 to 50	Years 50 to 100	
			Preferred Plan Damages: By year 2025: none By year 2055: none By year 2105: none				

H.5 Supporting economic appraisal data

H.5.1 SUMMARY OF NO ACTIVE INTERVENTION AND PREFERRED POLICY EROSION LOSSES

H.5.1.a No Active Intervention and Preferred Policy Erosion Loss Values

Explanation of Table Columns

(a) POLICY UNIT
These relate to the units defined in the main document. In places the coast has been sub-divided further for the economic analysis.

(b) YEAR
Relate to the epochs used for policy setting.

(c) ASSET VALUE LOSS PER EPOCH (DAMAGES): NAI
The calculated capital value of property (£m) that would be lost during the identified time period for NAI (No Active Intervention).

(d) ASSET VALUE LOSS PER EPOCH (DAMAGES): PREFERRED POLICY SCENARIO
The calculated capital value of property (£m) that would be lost during the identified time period for the preferred policies.

(e) CUMULATIVE DAMAGE/ LOSS (PV): NAI
The Present Value of the property loss under the NAI scenario (i.e. the values from column (c), discounted to reflect timing of loss). This is a cumulative measure, i.e. the 50 year value includes all losses or damages from year 0 to year 50, and the 100 year value includes all losses or damages from year 0 to year 100.

(f) CUMULATIVE DAMAGE/ LOSS (PV): PREFERRED POLICY SCENARIO

The Present Value of the property loss under the Preferred Plan scenario (i.e. the values from column (d), discounted to reflect timing of loss). This is a cumulative measure, i.e. the 50 year value includes all losses or damages from year 0 to year 50, and the 100 year value includes all losses or damages from year 0 to year 100.

(g) MANAGEMENT COST PER EPOCH (PREFERRED POLICY SCENARIO)
The calculated cost of defence and management measures for the preferred plan during that identified time period. The calculation of these values is presented in the subsequent table.

(h) PREFERRED POLICY SCENARIO BENEFITS (PV):
The cumulative benefits expressed in terms of Present Value. This is the difference between the Preferred Plan damages (column (f)) and the No Active Intervention damages (in column e).

(i) PREFERRED POLICY SCENARIO COSTS (PV):
The Present Value of the costs of providing the Preferred Plan (i.e. the values from column (g) discounted to reflect timing of activities). This is a cumulative measure, i.e. the 50 year value includes all losses or damages from year 0 to year 50, and the 100 year value includes all losses or damages from year 0 to year 100. However, for years where no defence works are proposed, columns have been left blank.

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
POLICY UNIT	**YEAR**	**ASSET VALUE LOSS PER EPOCH (DAMAGES)**		**CUMULATIVE PROPERTY DAMAGE / LOSS (PV)**		**MANAGEMENT COST PER EPOCH (PREFERRED POLICY SCENARIO)**	**PREFERRED POLICY SCENARIO**	
		NAI	**PREFERRED POLICY SCENARIO**	**NAI**	**PREFERRED POLICY SCENARIO**		**PROPERTY DAMAGES AVERTED (PV)**	**COSTS (PV)**
4d01 Beachy Head to Cuckmere Haven	20	0	0	0	0	0	0	0
	50	806,484	0	0	0	0	0	0
	100	2,419,452	2,419,452	1,525,486	2,200,703	0	-675,217	0
4d02 Cuckmere Haven and Cuckmere Valley	20	0	0	0	0	45,000	0	31,836
	50	0	0	0	0	0	0	31,836
	100	0	0	0	0	0	0	31,836
4d03 Seaford Head	20	0	0	0	0	0	0	0
	50	148,771	148,771	0	83,256	0	-83,256	0
	100	892,626	892,626	690,728	777,027	0	-86,299	0

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
POLICY UNIT	**YEAR**	**ASSET VALUE LOSS PER EPOCH (DAMAGES)**		**CUMULATIVE PROPERTY DAMAGE / LOSS (PV)**		**MANAGEMENT COST PER EPOCH (PREFERRED POLICY SCENARIO)**	**PREFERRED POLICY SCENARIO**	
		NAI	**PREFERRED POLICY SCENARIO**	**NAI**	**PREFERRED POLICY SCENARIO**		**PROPERTY DAMAGES AVERTED (PV)**	**COSTS (PV)**
4d04 Seaford	20	0	0	0	0	2,528,000	0	1,796,448
	50	9,083,705	0	0	0	4,176,000	0	2,621,222
	100	13,181,698	0	3,746,154	0	12,640,000	3,746,154	3,452,742
4d05 Seaford (Tide Mills) to Newhaven Harbour	20	0	0	0	0	0	0	0
	50	0	0	0	0	12,960,000	0	4,095,431
	100	0	0	0	0	3,200,000	0	4,305,943
4d06 Newhaven Harbour	20	0	0	0	0	480,000	0	341,098
	50	0	0	0	0	1,080,000	0	554,401
	100	0	0	0	0	2,400,000	0	712,285
4d07 Newhaven Harbour to Peacehaven Heights	20	0	0	0	0	0	0	0
	50	703,065	703,065	0	506,689	0	-506,689	0
	100	2,671,647	2,671,647	1,765,882	2,275,825	0	-509,943	0
4d08 Peacheaven	20	0	0	0	0	1,920,000	0	1,364,391
	50	0	0	0	0	14,040,000	0	5,545,144
	100	432,939	0	416,556	0	0	416,556	5,545,144
4d09 Telscombe Cliffs	20	0	0	0	0	32,000	0	22,740
	50	0	0	0	0	720,000	0	164,942
	100	144,313	144,313	139,436	139,587	5,280,000	-151	720,692
4d10 Saltdean to Rottingdean	20	0	0	0	0	1,408,000	0	1,000,553
	50	7,283,308	0	0	0	10,296,000	0	4,066,439
	100	8,545,804	8,545,804	1,198,085	8,008,744	0	-6,810,659	4,066,439
4d11 Rottingdean to Brighton Marina	20	0	0	0	0	1,920,000	0	1,364,391
	50	0	0	0	0	4,320,000	0	2,217,606
	100	0	0	0	0	9,600,000	0	2,849,140
4d12 Brighton Marina to Portslade-by-Sea	20	367,632	0	117,379	0	4,224,000	117,379	3,001,660
	50	7,762,204	0	485,011	0	60,912,000	485,011	20,885,043
	100	135,397,552	0	122,731,929	0	109,824,000	122,731,929	31,611,018
4d13 Shoreham Harbour (Southwick)	20	0	0	0	0	3,200,000	0	2,273,985
	50	2,423,055	0	0	0	19,512,000	0	7,910,891

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
POLICY UNIT	**YEAR**	**ASSET VALUE LOSS PER EPOCH (DAMAGES)**		**CUMULATIVE PROPERTY DAMAGE / LOSS (PV)**		**MANAGEMENT COST PER EPOCH (PREFERRED POLICY SCENARIO)**	**PREFERRED POLICY SCENARIO**	
		NAI	**PREFERRED POLICY SCENARIO**	**NAI**	**PREFERRED POLICY SCENARIO**		**PROPERTY DAMAGES AVERTED (PV)**	**COSTS (PV)**
	100	2,423,055	0	0	0	52,288,000	0	12,934,534
4d14 River Adur and Adur Valley	20	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
	50	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
	100	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
4d15 Shoreham Harbour (River Adur) to Worthing	20	0	0	0	0	6,304,000	0	4,479,750
	50	15,724,413	0	0	0	38,448,000	0	15,827,507
	100	63,070,952	0	44,228,194	0	85,248,000	44,228,194	24,610,883
4d16 Worthing to Goring-on-Sea	20	0	0	0	0	896,000	0	636,716
	50	3,980,865	0	0	0	6,552,000	0	2,587,734
	100	14,085,835	0	9,277,643	0	9,632,000	9,277,643	3,513,142
4d17 Kingston/ Ferring	20	145,017	0	69,300	0	1,600,000	69,300	1,136,992
	50	26,124,771	0	69,300	0	20,736,000	69,300	7,484,911
	100	55,621,917	0	27,095,500	0	29,184,000	27,095,500	10,405,124
4d18 Angmering-on-Sea to Littlehampton	20	0	0	0	0	1,952,000	0	1,387,131
	50	1,056,097	0	0	0	14,112,000	0	5,582,104
	100	3,168,291	0	1,965,913	0	20,800,000	1,965,913	7,575,646
4d19 River Arun and Arun Valley	20	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
	50	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
	100	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
4d20 Littlehampton to Poole Place	20	0	0	0	0	16,576	0	11,779,240
	50	0	0	0	0	4,896	0	12,746,217
	100	223,786	0	202,177	0	10,880	202,177	13,461,955
4d21 Elmer (Breakwaters)	20	0	0	0	0	2,112,000	0	1,500,830
	50	0	0	0	0	4,752,000	0	2,439,366
	100	29,053,778	0	26,864,997	0	19,200,000	26,864,997	4,043,463
4d22 Middleton-on-Sea	20	0	0	0	0	762,000	0	541,208
	50	2,390,421	0	0	0	1,296,000	0	950,751
	100	9,139,845	0	6,161,785	0	5,312,000	6,161,785	1,383,563
4d23 Felpham to	20	0	0	0	0	1,923,000	0	1,366,665

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
POLICY UNIT	**YEAR**	**ASSET VALUE LOSS PER EPOCH (DAMAGES)**		**CUMULATIVE PROPERTY DAMAGE / LOSS (PV)**		**MANAGEMENT COST PER EPOCH (PREFERRED POLICY SCENARIO)**	**PREFERRED POLICY SCENARIO**	
		NAI	**PREFERRED POLICY SCENARIO**	**NAI**	**PREFERRED POLICY SCENARIO**		**PROPERTY DAMAGES AVERTED (PV)**	**COSTS (PV)**
Aldwick	50	30,588,311	0	0	0	32,472,000	0	10,851,570
	100	71,958,327	0	37,557,156	0	25,754,000	37,557,156	12,987,587
4d24 Aldwick to Pagham	20	0	0	0	0	0	0	0
	50	0	0	0	0	6,480	0	2,047,716
	100	16,107,248	0	14,978,962	0	1,600	14,978,962	2,152,971
4d25 Pagham to Church Norton	20	0	0	0	0	576,000	0	409,317
	50	0	0	0	0	1,440,000	0	693,722
	100	0	0	0	0	0	0	693,722
4d26 Church Norton to East Beach	20	5,670,625	0	2,351,992	0	1,024,000	2,351,992	727,675
	50	14,341,625	0	2,367,617	0	11,448,000	2,367,617	4,345,306
	100	15,472,625	0	3,397,746	0	2,560,000	3,397,746	4,513,715
4d27 East Beach to Selsey Bill	20	0	0	0	0	2,048,000	0	1,455,350
	50	61,774,082	0	0	0	14,976,000	0	5,914,820
	100	130,020,429	0	61,931,690	0	57,920,000	61,931,690	11,809,138

H.5.1.b Preferred Policy Erosion Loss Commentary and Property Numbers

Policy Unit	Area	Losses Under Preferred Option			Residential Erosion Property Loss				Commercial Property Erosion Loss			
		20-25	25-50	50-100	0-20	20-50	50-100	**Total**	0-20	20-50	50-100	**Total**
4d01	Beachy Head to Cuckmere Haven	Cliff allowed to erode and natural processes allowed to take place. No loss of property, land or infrastructure.	Potential lose of coastal sections, risk to already diverted South Downs Way.	Predicted loss of some residential properties by year 100. Loss of sections of the coastal road (C89). It is expected that up to 30ha of agricultural land could also be lost between 2005 and 2105. Likely loss of Belle Tout Lighthouse.	0	0	6	**6**	0	0	0	**0**
4d02	Cuckmere Haven	No loss of property or infrastructure behind the existing coastal defences in the immediate term. Loss of agricultural land behind the existing defences. There is a risk that property access will be restricted.	No loss of property. Possible loss of infrastructure if A259 is not protected. Some agricultural land loss.	No loss of property. Possible loss of infrastructure if A259 is not protected. Some agricultural land loss.	0	0	0	**0**	0	0	0	**0**

4d03	Seaford Head	No loss of property, land or infrastructure.	Minimal loss, with only one residential property at risk.	It is expected that there is potential for loss of 4 residential and one commercial property by year 100. Up to 10ha of agricultural land loss could also take place by year 100.	0	1	4	**5**	0	0	1	**1**
4d04	Seaford	No loss of property, land or infrastructure behind the existing defences.	No loss of property, land or infrastructure behind the existing defences.	No loss of property, land or infrastructure behind the existing defences. Agricultural land losses would be minimal, with 1 ha of loss predicted to take place by year 2105.	0	0	0	**0**	0	0	0	**0**
4d05	Seaford (Tide Mills) to Newhaven Harbour	No loss of property, land or infrastructure.	No loss of property, land or infrastructure.	No loss of property, land or infrastructure. It is anticipated that up to 30ha of land loss could occur by years 2105.	0	0	0	**0**	0	0	0	**0**
4d06	Newhaven Harbour and River Ouse	No loss of property, land or infrastructure behind the existing defences.	No loss of property, land or infrastructure behind the existing defences.	No loss of property, land or infrastructure behind the existing defences. Agricultural land loss is minimal (in the region of 0.1ha).	0	0	0	**0**	0	0	0	**0**
4d07	Newhaven Harbour to Peacehaven Heights	One property at risk, although no loss anticipated	Increased engineering and management will protect properties, although some loss expected by the end of year 50 (5 houses to a value of	Expected loss of built assets – up to 14 residential properties with losses valued at £200,000. Over 10ha of agricultural land loss predicted by year 100.	0	5	14	**19**	0	0	0	**0**

			£200,000).									
4d08	Peacehaven	No loss of property, land or infrastructure behind the existing defences.	No loss of property, land or infrastructure behind the existing defences.	Up to 6Ha of agricultural land at risk within 100 year	0	0	0	**0**	0	0	0	**0**
4d09	Telscombe Cliffs	No loss of property along the frontage, although loss of land is expected with cliff retreat.	Land loss is expected with cliff top erosion, but no loss of property or built assets.	One property at risk, Potential for up to 2ha of agricultural land lost by year 100.	0	0	1	**1**	0	0	1	**1**
4d10	Saltdean to Rottingdean	No loss of property or land behind the existing defences.	No loss of property or land behind the existing defences.	Potential for increased risk to property and A259.	0	0	38	**38**	0	0	10	**10**
4d11	Rottingdean to Brighton Marina	No loss of property or land behind the existing defences. Reduced risk to property and A259.	No loss of property or land behind the existing defences. Reduced risk to property and A259.	Potential risk to property and A259, Potential for up to 10ha of agricultural land loss by year 2105.	0	0	0	**0**	0	0	0	**0**
4d12	Brighton Marina to Portslade-by-Sea	No loss of property or land behind the existing defences.	No loss of property or land behind the existing defences.	No loss of property, however some land behind the existing defences may be required for the construction of renewed defences.	0	0	0	**0**	0	0	0	**0**
4d13	Shoreham Harbour (Southwick)	No loss of property or land behind the existing	No loss of property or land behind the existing	No loss of property or land behind the existing defences.	0	0	0	**0**	0	0	0	**0**

		defences.	defences.									
4d14	River Adur	No loss of property behind the existing defences.	No loss of property behind the existing defences.	No loss of property behind the existing defences.	0	0	0	**0**	0	0	0	**0**
4d15	Shoreham Harbour to Worthing	No loss of property or land behind the existing defences.	No loss of property or land behind the existing defences. Increased risk of overtopping.	No change to the quality of the landscape, although, there is potential for some loss of residential and commercial assets as the defences are renewed. Despite a policy of “hold the line”, there is potential for an increased risk of overtopping.	0	0	0	**0**	0	0	0	**0**
4d16	Worthing to Goring-by-Sea	No loss of property or land behind the existing defences.	No loss of property or land behind the existing defences.	No loss of property or land behind the existing defences.	0	0	0	**0**	0	0	0	**0**
4d17	Ferring/ Kingston	No loss of property behind the existing defences.	No loss of property behind the existing defences.	No loss of property behind the existing defences.	0	0	0	**0**	0	0	0	**0**
4d18	Angmering-on-Sea to Littlehampton	No loss of property or land behind the existing defences.	No loss of property or land behind the existing defences.	No loss of property or land behind the existing defences. Properties may become more exposed and subject to overtopping and flood damage.	0	0	0	**0**	0	0	0	**0**
4d19	River Arun	No loss of property behind the existing defences.	No loss of property behind the existing defences.	No loss of property behind the existing defences.	0	0	0	**0**	0	0	0	**0**

4d20	Littlehampton Harbour to Poole Place	There is a potential risk of flooding to property at Atherington and flooding/erosion of land.	There is a potential risk of flooding to property at Atherington and flooding/erosion of land.	There is a potential risk of flooding/erosion to property at Atherington. Up to 10ha of land could be lost by 2105 depending on the method of managed realignment adopted.	0	0	1	**1**	0	0	0	**0**
4d21	Elmer (Breakwaters)	No loss of property behind the existing defences.	No loss of property behind the existing defences.	No loss of property behind the existing defences.	0	0	0	**0**	0	0	0	**0**
4d22	Middleton-on-Sea	No loss of property behind the existing defences.	No loss of property behind the existing defences.	No loss of property or built assets behind the existing defences.	0	0	0	**0**	0	0	0	**0**
4d23	Felpham to Aldwick	No loss of property behind the existing defences.	No loss of property behind the existing defences.	No loss of property behind the existing defences.	0	0	0	**0**	0	0	0	**0**
4d24	Aldwick to Pagham	No loss of property.	Risk to property reduced, no loss expected behind new defences.	No loss of property behind the new defences.	0	0	0	**0**	0	0	0	**0**
4d25	Pagham to Church Norton	Shingle rollback may result in some loss of the beach along the southern spit, although there will be no loss of residential or commercial property.	No loss of property or land behind the existing defences.	No loss of property or land behind the existing defences. Up to 10ha of agricultural land could however, be lost by year 2105.	0	0	0	**0**	0	0	0	**0**

4d26	Church Norton to Selsey East Beach	It is expected that up to 15 residential properties, and one commercial property may be under threat near the end of this period	No threat to commercial properties, but it is expected that residential losses of up to 20 properties by the end of this epoch.	Further loss of residential properties is anticipated. Other properties may become more exposed and subject to overtopping and flood damage. Expected loss of 20ha agricultural land by year 2105.	15	18	4	**37**	1	0	0	**1**
4d27	East Beach to Selsey Bill	No loss of property or land behind the existing defences.	No loss of property or land behind the existing defences.	No loss of property or land behind the existing defences, although some properties may become more exposed and subject to overtopping and flood damage.	0	0	0	**0**	0	0	0	**0**

H.5.2 SUMMARY OF NO ACTIVE INTERVENTION FLOODING LOSSES

Explanation of Table Columns

RESIDENTIAL, TOTAL CV VALUE
The calculated capital value of property (£) that would be lost during the identified time period for NAI (No Active Intervention).

POLICY UNIT	FLOOD AREA	RESIDENTIAL		AGRICULTURAL LAND (Ha)					NON-AGRICULTURE
		NUMBER OF PROPERTIES	TOTAL CV VALUE	GRADE 1	GRADE 2	GRADE 3	GRADE 4	URBAN	
4d27 East Beach to Selsey Bill **4d26 Church Norton to East Beach**	1	137	27,094,971	15,932	1,939,461	5,937,453	344,320		70,567
4d25 Pagham to Church Norton **4d24 Aldwick to Pagham**	2	324	85,119,283	201,025	524,969	3,680,526	1,371,864		
4d23 Felpham to Aldwick **4d22 Middleton-on-Sea** **4d21 Elmer (Breakwaters)**	3	1247	255,090,110	990,037	1,503,570	4,931,454			945,884
4d20 Littlehampton to Poole Place	4	1193	222,552,089	139,835	1,602,317	7,979,835	5,455,866		612,829
4d19 River Arun and Arun Valley **4d18 Angmering-on-Sea to Littlehampton**	5	5095	802,897,492	726,849	845,533	15,153,266	4,518,690		1,297,013
4d17 Kingston/ Ferring	6	8	1,808,992	21,367	10,285				156,345
4d17 Kingston/ Ferring	7	112	23,024,026						154,324

4d17 Kingston/ Ferring	8	601	91,795,524	114,005	40,944				649,445
4d17 Kingston/ Ferring **4d15 Shoreham Harbour (River Adur) to Worthing** **4d16 Worthing to Goring-on-Sea**	9	4035	742,595,818	485,247	189,045	5,877,129	4,482,679		1,277,870
4d14 River Adur and Adur Valley **4d13 Shoreham Harbour (Southwick)**	10	1194	233,937,903		12,981	2,020,928	4,794,822		328,667
4d06 Newhaven Harbour	11	1529	162,966,007		726,427	6,664,711	3,709,939		1,013,699
4d06 Newhaven Harbour **4d05 Seaford (Tide Mills) to Newhaven Harbour** **4d04 Seaford**	12	2140	234,001,840		84,652	3,984,474	3,994,930		1,668,509
4d02 Cuckmere Haven and Cuckmere Valley	13	2	708,976			243,321	833,759		
4d02 Cuckmere Haven and Cuckmere Valley	14	18	4,890,989			313,827	1,951,133		

* Note reverse order of policy units

H.6 Supporting economic appraisal data

COST CALCULATIONS

Explanation of Table Columns

(a) POLICY UNIT
These relate to the units defined in the main document. In places, e.g. Beachy Head to Cuckmere, the coast has been sub-divided further for the economic analysis.

(b) PERIOD
Relate to the epochs used for policy setting.

(c) NOTES
Additional information on assumptions made.

(d) REPLACEMENT LENGTH (B, L, G)
The length of shoreline (kilometres) over which certain defence replacement activities are required during each of the specified time periods: B=beach schemes, L=linear defences, G=groynes or lower cost protection measures (e.g. timber revetments).

(e) REPLACEMENT COST (£m)
The cost of providing the replacement works in column (d) during each of the specified time periods. Also see note below, with regard to assumptions made for costs.

(f) MAINTENANCE LENGTH (B, L, G)
The length of shoreline (kilometres) over which certain maintenance activities are required during each of the specified time periods: B=beach schemes, L=linear defences, G=groynes or lower cost protection measures (e.g. timber revetments).

(g) MAINTENANCE COST (£m)
The cost of providing the maintenance works in column (f) during each of the specified time periods. Also see note below, with regard to assumptions made for costs.

(h) TOTAL COST (£m)
The total replacement and maintenance costs for the specific time period. This is the sum of columns (e) and (g).

(i) TOTAL WITH OPTIMISM BIAS (£m)
Optimism bias (at 60%) applied to all costs when examining viability, to reflect uncertainty in broad level analysis at SMP scale.

(j) FINAL TOTAL (CUMULATIVE) (£m)
The cumulative total costs (including optimism bias), i.e. the 50 year total includes all costs from year 0 to year 50, and the 100 year total includes all costs from year 0 to year 100.

(k) PV COST: REPLACEMENT (£m)
The Present Value of the costs of providing the Preferred Plan, in terms of replacement works, i.e. the values from column (e) discounted to reflect timing of activities. This is a cumulative measure, i.e. the 50 year value includes all losses or damages from year 0 to year 50, and the 100 year value includes all losses or damages from year 0 to year 100.

(l) PV COST: MAINTENANCE (£m)
The Present Value of the costs of providing the Preferred Plan, in terms of maintenance works, i.e. the values from column (g) discounted to reflect timing of activities. This is a cumulative measure, i.e. the 50 year value includes all losses or damages from year 0 to year 50, and the 100 year value includes all losses or damages from year 0 to year 100.

(m) PV COST: CUMULATIVE TOTAL (£m)
The sum of columns (k) and (l).

Basis for cost assumptions

- Replacement costs taken from Environment Agency database. This sets replacement cost for linear structures (e.g. revetments, seawalls) at £2.7million/km and cost for beach management schemes at £5.1million/km. Groyne field costs are taken as £0.6million/km.
- Maintenance costs taken from NADNAC study prepared for Defra. This sets annual maintenance cost for linear structures and for groyne fields at £10k/km and for beach schemes £20k/km.
- Assumed design life (and thus full scheme reconstruction will be required) as 100 years for linear defences, 50 years for beach schemes and 30 years for groynes.
- Allow for maintenance as a linear cost, although realistically less in early years and increasing in latter years of scheme life.

- Allowance for increase in costs due to climate change: Period 20-50 years - costs factored up by 1.5 x present day rates; Period 50-100 years - costs factored up by 2.0x present day rates.
- For "low cost" defence structures use same rate as groynes
- Rates for typical defences types used:

	Replacement Rate	**Maintenance Rate**
BEACH (B)	£5.10m	£0.02m
LINEAR (L)	£2.70m	£0.01m
GROYNE/OTHER (G)	£0.60m	£0.01m

(a)	(b)	(c)	(d)		(e)		(f)			(g)	(h)	(i)	(j)	(k)	(l)	(m)
			REPLACEMENT (£1000s)				MAINTENANCE (£1000s)				TOTAL COST (£1000s)			PV COSTS (£1000s)		
			LENGTH				LENGTH									
POLICY UNIT	**PERIOD**	**NOTES**	**B**	**L**	**G**	**COST**	**B**	**L**	**G**	**COST**	**TOTAL COST**	**WITH OPTIMISM BIAS**	**CUMULATIVE TOTAL**	**REPLACEMENT**	**MAINTENANCE**	**CUMULATIVE PV TOTAL**
4d01 Beachy Head to Cuckmere Haven	**0 - 20**		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0		0	0	*£0*
	20 - 50		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0		0	0	*£0*
	50 - 100		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0	£0	0	0	*£0*
4d02 Cuckmere Haven and Cuckmere Valley	0 - 20		0.0	0.0	0.0	£0	0.0	0.1	0.0	£28	£28	£45		0	32	*£32*
	20 - 50		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0			0	*£32*
	50 - 100		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0	£45	0	0	*£32*
4d03 Seaford Head	**0 - 20**		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0		0	0	*£0*
	20 - 50		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0		0	0	*£0*
	50 - 100		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0	£0	0	0	*£0*
4d04 Seaford	**0 - 20**		0.0	0.0	0.0	£0	2.9	2.0	0.1	£1,580	£1,580	£2,528		*0*	*1,796*	*£1,796*
	20 - 50		0.0	0.0	0.0	£0	2.9	0.0	0.0	£1,740	£2,610	£4,176		*0*	*825*	*£2,621*
	50 - 100		0.0	0.0	0.0	£0	2.9	2.0	0.1	£3,950	£7,900	£12,640	£19,344	*0*	*832*	*£3,453*
4d05 Seaford (Tide Mills) to Newhaven Harbour	**0 - 20**		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0		*0*	*0*	*£0*
	20 - 50		0.0	2.0	0.0	£5,400	0.0	0.0	0.0	£0	£8,100	£12,960		*4,095*	*0*	*£4,095*
	50 - 100		0.0	0.0	0.0	£0	0.0	2.0	0.0	£1,000	£2,000	£3,200	£16,160	*0*	*211*	*£4,306*
4d06 Newhaven Harbour	**0 - 20**		0.0	0.0	0.0	£0	0.1	1.3	0.0	£300	£300	£480		*0*	*341*	*£341*
	20 - 50		0.0	0.0	0.0	£0	0.1	1.3	0.0	£450	£675	£1,080		*0*	*213*	*£554*

(a)	(b)	(c)	(d)		(e)		(f)			(g)	(h)	(i)	(j)	(k)	(l)	(m)
			REPLACEMENT (£1000s)				MAINTENANCE (£1000s)				TOTAL COST (£1000s)			PV COSTS (£1000s)		
			LENGTH				LENGTH									
POLICY UNIT	**PERIOD**	**NOTES**	**B**	**L**	**G**	**COST**	**B**	**L**	**G**	**COST**	**TOTAL COST**	**WITH OPTIMISM BIAS**	**CUMULATIVE TOTAL**	**REPLACEMENT**	**MAINTENANCE**	**CUMULATIVE PV TOTAL**
	50 - 100		0.0	0.0	0.0	£0	0.1	1.3	0.0	£750	£1,500	£2,400	£3,960	*0*	*158*	*£712*
4d07 Newhaven Harbour to Peacehaven Heights	**0 - 20**		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0		*0*	*0*	*£0*
	20 - 50		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0		*0*	*0*	*£0*
	50 - 100		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0	£0	*0*	*0*	*£0*
4d08 Peacheaven	**0 - 20**		0.0	0.0	0.0	£0	0.0	3.0	3.0	£1,200	£1,200	£1,920		*0*	*1,364*	*£1,364*
	20 - 50		0.0	1.5	1.5	£4,950	0.0	1.5	1.5	£900	£8,775	£14,040		*3,754*	*427*	*£5,545*
	50 - 100		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0	£15,960	*0*	*0*	*£5,545*
4d09 Telscombe Cliffs	**0 - 20**		0.0	0.0	0.0	£0	0.0	0.1	0.0	£20	£20	£32		*0*	*23*	*£23*
	20 - 50		0.0	0.0	0.0	£0	0.0	0.5	0.5	£300	£450	£720		*0*	*142*	*£165*
	50 - 100		0.0	0.5	0.5	£1,650	0.0	0.0	0.0	£0	£3,300	£5,280	£6,032	*556*	*0*	*£721*
4d10 Saltdean to Rottingdean	**0 - 20**		0.0	0.0	0.0	£0	0.0	2.2	2.2	£880	£880	£1,408		*0*	*1,001*	*£1,001*
	20 - 50		0.0	1.1	1.1	£3,630	0.0	1.1	1.1	£660	£6,435	£10,296		*2,753*	*313*	*£4,066*
	50 - 100		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0	£11,704	*0*	*0*	*£4,066*
4d11 Rottingdean to Brighton Marina	**0 - 20**		0.0	0.0	0.0	£0	0.0	3.0	3.0	£1,200	£1,200	£0		*0*	*1,364*	*£1,364*
	20 - 50		0.0	0.0	0.0	£0	0.0	3.0	3.0	£1,800	£2,700	£4,320		*0*	*853*	*£2,218*
	50 - 100		0.0	0.0	0.0	£0	0.0	3.0	3.0	£3,000	£6,000	£9,600	£13,920	*0*	*632*	*£2,849*

(a)	(b)	(c)	(d)		(e)		(f)			(g)	(h)	(i)	(j)	(k)	(l)	(m)
			REPLACEMENT (£1000s)				MAINTENANCE (£1000s)				TOTAL COST (£1000s)			PV COSTS (£1000s)		
			LENGTH				LENGTH									
POLICY UNIT	**PERIOD**	**NOTES**	**B**	**L**	**G**	**COST**	**B**	**L**	**G**	**COST**	**TOTAL COST**	**WITH OPTIMISM BIAS**	**CUMULATIVE TOTAL**	**REPLACEMENT**	**MAINTENANCE**	**CUMULATIVE PV TOTAL**
4d12 Brighton Marina to Portsalde-by-Sea	**0 - 20**		0.0	0.0	0.0	£0	0.0	6.6	6.6	£2,640	£2,640	£4,224		*0*	*3,002*	*£3,002*
	20 - 50		1.9	3.3	3.3	£20,580	4.7	3.3	3.3	£4,800	£38,070	£60,912		*15,608*	*2,275*	*£20,885*
	50 - 100		3.3	3.3	3.3	£27,720	3.3	3.3	3.3	£6,600	£68,640	£109,824	£174,960	*9,337*	*1,389*	*£31,611*
4d13 Shoreham Harbour (Southwick)	**0 - 20**		0.0	0.0	0.0	£0	1.2	3.8	3.8	£2,000	£2,000	£3,200		*0*	*2,274*	*£2,274*
	20 - 50		0.0	1.9	1.9	£6,270	1.2	1.9	1.9	£1,860	£12,195	£19,512		*4,755*	*882*	*£7,911*
	50 - 100		0.0	3.8	3.8	£12,540	0.0	3.8	3.8	£3,800	£32,680	£52,288	£75,000	*4,224*	*800*	*£12,935*
4d14 River Adur and Adur Valley	**0 - 20**		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0	£0	*0*	*0*	*£0*
	20 - 50		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0	£0	*0*	*0*	*£0*
	50 - 100		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0	£0	*0*	*0*	*£0*
4d15 Shoreham Harbour (River Adur) to Worthing	**0 - 20**		0.0	0.0	0.0	£0	1.5	7.2	9.5	£3,940	£3,940	£6,304		*0*	*4,480*	*£4,480*
	20 - 50		0.0	4.0	4.0	£13,200	1.5	3.2	3.2	£2,820	£24,030	£38,448		*10,011*	*1,337*	*£15,828*
	50 - 100		0.0	7.2	9.5	£25,140	1.5	0.0	0.0	£1,500	£53,280	£85,248	£130,000	*8,468*	*316*	*£24,611*
4d16 Worthing to Goring-on-Sea	**0 - 20**		0.0	0.0	0.0	£0	0.0	1.4	1.4	£560	£560	£896		*0*	*637*	*£637*
	20 - 50		0.0	0.7	0.7	£2,310	0.0	0.7	0.7	£420	£4,095	£6,552		*1,752*	*199*	*£2,588*

(a)	(b)	(c)	(d)		(e)		(f)			(g)	(h)	(i)	(j)	(k)	(l)	(m)
			REPLACEMENT (£1000s)				MAINTENANCE (£1000s)				TOTAL COST (£1000s)			PV COSTS (£1000s)		
			LENGTH				LENGTH									
POLICY UNIT	**PERIOD**	**NOTES**	**B**	**L**	**G**	**COST**	**B**	**L**	**G**	**COST**	**TOTAL COST**	**WITH OPTIMISM BIAS**	**CUMULATIVE TOTAL**	**REPLACEMENT**	**MAINTENANCE**	**CUMULATIVE PV TOTAL**
	50 - 100		0.0	0.7	0.7	£2,310	0.0	0.7	0.7	£700	£6,020	£9,632	£17,080	*778*	*147*	*£3,513*
4d17 Kingston/ Ferring	**0 - 20**		0.0	0.0	0.0	£0	0.0	1.7	3.3	£1,000	£1,000	£1,600		*0*	*1,137*	*£1,137*
	20 - 50		0.0	2.6	1.5	£7,920	0.0	0.9	1.5	£720	£12,960	£20,736		*6,007*	*341*	*£7,485*
	50 - 100		0.0	2.6	1.5	£7,920	0.0	0.9	1.5	£1,200	£18,240	£29,184	£51,520	*2,668*	*253*	*£10,405*
4d18 Angmering-on-Sea to Littlehampton	**0 - 20**		0.0	0.0	0.0	£0	0.0	3.1	3.0	£1,220	£1,220	£1,952		*0*	*1,387*	*£1,387*
	20 - 50		0.0	1.5	1.5	£4,950	0.0	1.6	1.5	£930	£8,820	£14,112		*3,754*	*441*	*£5,582*
	50 - 100		0.0	1.5	1.5	£4,950	0.0	1.6	1.5	£1,550	£13,000	£20,800	£36,864	*1,667*	*326*	*£7,576*
4d19 River Arun and Arun Valley	**0 - 20**		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0	£0	*0*	*0*	*£0*
	20 - 50		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0	£0	*0*	*0*	*£0*
	50 - 100		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0	£0	*0*	*0*	*£0*
4d20 Littlehampton to Poole Place	**0 - 20**		0.0	3.6	0.0	£9,720	1.6	0.0	0.0	£640	£10,360	£16,576	£16,576	*11,052*	*728*	*£11,779*
	20 - 50		0.0	0.0	0.0	£0	1.6	3.6	0.0	£2,040	£3,060	£4,896	£21,472	*0*	*967*	*£12,746*
	50 - 100		0.0	0.0	0.0	£0	1.6	3.6	0.0	£3,400	£6,800	£10,880	£32,352	*0*	*716*	*£13,462*
4d21 Elmer (Breakwaters)	**0 - 20**		0.0	0.0	0.0	£0	2.2	0.0	2.2	£1,320	£1,320	£2,112		*0*	*1,501*	*£1,501*
	20 - 50		0.0	0.0	0.0	£0	2.2	0.0	2.2	£1,980	£2,970	£4,752		*0*	*939*	*£2,439*
	50 - 100		0.0	1.0	0.0	£2,700	2.2	0.0	2.2	£3,300	£12,000	£19,200	£26,064	*909*	*695*	*£4,043*
4d22 Middleton-on-	**0 - 20**		0.0	0.0	0.0	£0	0.0	1.2	1.2	£476	£476	£762		*0*	*541*	*£541*

(a)	(b)	(c)	(d)		(e)		(f)			(g)	(h)	(i)	(j)	(k)	(l)	(m)
			REPLACEMENT (£1000s)				MAINTENANCE (£1000s)				TOTAL COST (£1000s)			PV COSTS (£1000s)		
			LENGTH				LENGTH									
POLICY UNIT	**PERIOD**	**NOTES**	**B**	**L**	**G**	**COST**	**B**	**L**	**G**	**COST**	**TOTAL COST**	**WITH OPTIMISM BIAS**	**CUMULATIVE TOTAL**	**REPLACEMENT**	**MAINTENANCE**	**CUMULATIVE PV TOTAL**
Sea	**20 - 50**		0.0	0.2	0.0	£540	0.0	0.0	0.0	£0	£810	£1,296		*410*	*0*	*£951*
	50 - 100		0.0	0.2	0.2	£660	0.0	1.0	1.0	£1,000	£3,320	£5,312	£7,370	*222*	*211*	*£1,384*
4d23 Felpham to Aldwick	**0 - 20**		0.0	0.0	0.0	£0	1.0	4.0	0.0	£1,202	£1,202	£1,923		*0*	*1,367*	*£1,367*
	20 - 50		0.0	4.0	0.0	£10,800	1.0	7.1	0.0	£2,730	£20,295	£32,472		*8,191*	*1,294*	*£10,852*
	50 - 100		0.3	0.7	0.0	£3,498	1.0	7.1	0.0	£4,550	£16,096	£25,754	£60,149	*1,178*	*958*	*£12,988*
4d24 Aldwick to Pagham	**0 - 20**		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0		*0*	*0*	*£0*
	20 - 50		0.0	1.0	0.0	£2,700	0.0	0.0	0.0	£0	£4,050	£0		*2,048*	*0*	*£2,048*
	50 - 100		0.0	0.0	0.0	£0	0.0	0.0	1.0	£500	£1,000	£0	£0	*0*	*105*	*£2,158*
4d25 Pagham to Church Norton	**0 - 20**		0.0	0.0	0.0	£0	0.0	0.9	0.9	£360	£360	£576		*0*	*409*	*£409*
	20 - 50		0.0	0.0	0.0	£0	1.0	0.0	0.0	£600	£900	£1,440		*0*	*284*	*£694*
	50 - 100		0.0	0.0	0.0	£0	0.0	0.0	0.0	£0	£0	£0	£2,016	*0*	*0*	*£694*
4d26 Church Norton to East Beach	**0 - 20**		0.0	0.0	0.0	£0	0.0	1.6	1.6	£640	£640	£1,024		*0*	*728*	*£728*
	20 - 50		0.0	1.5	1.2	£4,770	0.0	0.0	0.0	£0	£7,155	£11,448		*3,618*	*0*	*£4,345*
	50 - 100		0.0	0.0	0.0	£0	0.0	1.6	0.0	£800	£1,600	£2,560	£15,032	*0*	*168*	*£4,514*
4d27 East Beach to Selsey Bill	**0 - 20**		0.0	0.0	0.0	£0	0.0	3.2	3.2	£1,280	£1,280	£2,048		*0*	*1,455*	*£1,455*

(a)	(b)	(c)	(d)		(e)		(f)			(g)	(h)	(i)	(j)	(k)	(l)	(m)
			REPLACEMENT (£1000s)				**MAINTENANCE (£1000s)**				**TOTAL COST (£1000s)**			**PV COSTS (£1000s)**		
			LENGTH				**LENGTH**									
POLICY UNIT	**PERIOD**	**NOTES**	**B**	**L**	**G**	**COST**	**B**	**L**	**G**	**COST**	**TOTAL COST**	**WITH OPTIMISM BIAS**	**CUMULATIVE TOTAL**	**REPLACEMENT**	**MAINTENANCE**	**CUMULATIVE PV TOTAL**
	20 - 50		0.0	1.6	1.6	£5,280	0.0	1.6	1.6	£960	£9,360	£14,976		*4,004*	*455*	*£5,915*
	50 - 100		2.2	1.6	1.6	£16,500	0.0	1.6	1.6	£1,600	£36,200	£57,920	£74,944	*5,557*	*337*	*£11,809*

H.7 References

Pagham to East Head Coastal Defence Strategy. 1999.
River Arun to Pagham Coastal Defence Strategy. Part 1: The Strategy Plan. 2002.
Rivers Arun to Adur Coastal Defence Strategy Plan. 1999.
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Saltdean to Newhaven Western Breakwater Strategy Plan. Final Report. 2002.