

## Strategy Approval Report

Authority strategy  
reference

KY09

Defra/WAG LDW  
number

1559

Promoting  
authority

Portsmouth City Council

Strategy name

Portsea Island Coastal Strategy Study



Typical wave overtopping along Clarence Esplanade (Flood Cell 1b) - photo courtesy of The News

Date

April 2011

Version

4

## StAR for Portsea Island Coastal Strategy Study

Version	Status	Signed off by	Date signed	Date issued
1	First Submission to LPRG	Lyall Cairns	May 2009	June 2009
2	Updated Submission to LPRG	Lyall Cairns	30 April 2010	04 May 2010
3	FINAL LPRG Submission	Lyall Cairns	08 September 2010	10 September 2011
4	Updates to NFSoD	Lyall Cairns	19 April 2011	21 April 2011

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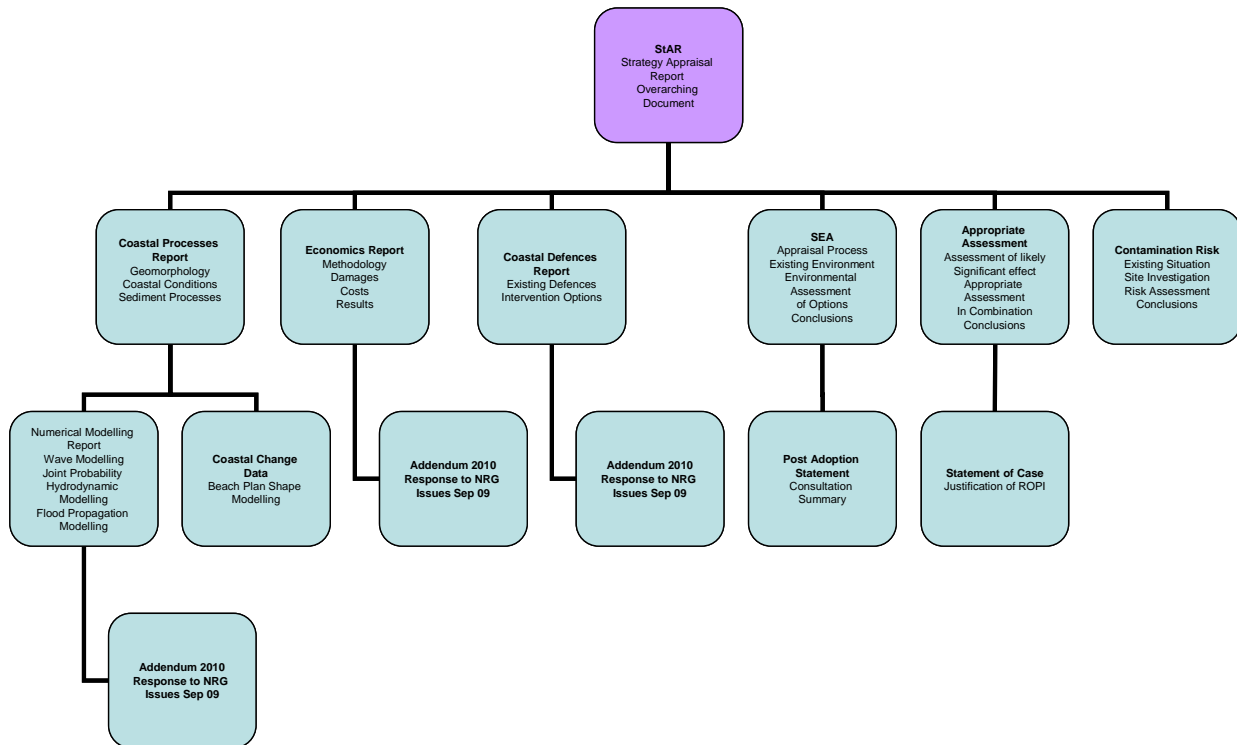
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## **For Technical approval of the Business Case**

**Environment Agency Region:** South East

**Project name:** Portsea Island Coastal Strategy Study

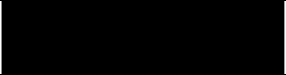
**Approval Value:** £ 372 million

**Sponsoring Director:** David Jordan - Director of Operations

## **Non-financial Scheme of Delegation**

Part 11 of the Non-financial scheme of delegation states that approval of FCERM Strategies/Complex Change Projects, following recommendation for approval from the Large Projects Review Group, is required from the Regional Director or Director, Wales and Director of Operations.

# Approval History Sheet

APPROVAL HISTORY SHEET (AHS)			
<b>1. Submission for review (to be completed by team)</b>			
<b>Project Title:</b> Portsea Island Coastal Strategy Study		<b>Project Code:</b> KY09	
<b>Project Manager:</b> Bret Davies		<b>Date of Submission:</b> July 2009	
<b>Lead Authority:</b> Portsmouth City Council		<b>Version No:</b> 4	
<b>Consultant Project Manager:</b> Ian Taylor		<b>Consultant:</b> Halcrow	
<p><i>The following confirm that the documentation is ready for submission to PAB or LPRG. The Project Executive has ensured that relevant parties have been consulted in the production of this submission.</i></p>			
<b>Position</b>	<b>Name</b>	<b>Signature</b>	<b>Date</b>
Project Executive	Lyll Cairns		15 April 2011
	<b>Job Title:</b>	Havant, Portsmouth & Gosport Coastal Defence Partnership Manager	
<b>2. Review by: Large Projects Review Group (LPRG)</b>			
Date of Meeting(s):		Chairman:	
Recommended for approval: In the sum of £:		Date:	Version No:
<b>3. Environment Agency NFSoD approval</b> <i>Officers in accordance with the NFSoD.</i>			
Version No:		Date:	
<b>Project Approval</b>	By: In the sum of: £	Date:	
<b>4. Defra or WAG approval</b> <i>(Delete as appropriate)</i>			
<b>Submitted to Defra / WAG or Not Applicable (as appropriate)</b>			Date:
<b>Version No. (if different):</b>			
<b>Defra/ WAG Approval: or Not applicable (as appropriate)</b>			Date:
<b>Comments:</b>			

## NON FINANCIAL SCHEME OF DELEGATION (NFSoD) COVERSHEET FOR A FCRM COMPLEX CHANGE PROJECT / STRATEGIC PLAN

1.	<b>Project name</b>	Portsea Island Coastal Strategy Study		<b>Start date</b>	September 2001
				<b>End date</b>	July 2009
	<b>Business unit</b>	Portsmouth City Council (M032)	<b>Programme</b>	Capital	
	<b>Project ref.</b>	KY09	<b>Regional SoD ref.</b>	<b>Head Office SoD ref.</b>	

2.	<b>Role</b>	<b>Name</b>	<b>Post Title</b>
	<b>Project Sponsor</b>	Kathy Wadsworth	Strategic Director (Portsmouth City Council)
	<b>Project Executive</b>	Lyall Cairns	Havant, Portsmouth & Gosport Coastal Defence Partnership Manager
	<b>Project Manager</b>	Bret Davies	Havant, Portsmouth & Gosport Coastal Project Engineer

3.	<b>Risk Potential Assessment (RPA) Category</b>	Low	<input type="checkbox"/>	Medium	<input type="checkbox"/>	High	<input checked="" type="checkbox"/>
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4.	<b>NFSoD value</b>	<b>£k</b>
	<b>Whole Life Costs (WLC) of Complex Change Project / Strategic Plan</b>	372,000

5.	<b>Required level of Environmental Impact Assessment (EIA)</b>	N/A	Low	Medium	High
		<input checked="" type="checkbox"/> SEA	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6.	<b>NFSoD approver name</b>	<b>Post title</b>	<b>Signature</b>	<b>Date</b>
	Howard Davidson	Regional Director (South East)		
	David Jordan	Director of Operations		
	<b>NFSoD consultee name</b>	<b>Post title</b>	<b>Signature</b>	<b>Date</b>
	Ken Allison	LPRG Chair		
	Andrew Gilham	Area Flood & Coastal Risk Manager (Solent & South Downs)		





# **1 EXECUTIVE SUMMARY**

## **1.1 Introduction and background**

1.1.1 This report describes the proposals for a 100 year flood and coastal erosion risk management strategy for Portsea Island, Portsmouth, Hampshire. The strategy has been led by Portsmouth City Council (PCC) and developed in partnership with the Environment Agency. This strategy, in combination with the Portchester Castle to Emsworth coastal flood and erosion risk management study (2009), completes the long-term strategic approach to Portsmouth's entire coastline.

1.1.2 The study area is a low-lying island and is home to the City of Portsmouth, the UK's only island city. The City is at significant risk of flooding with 4,211 residential, 364 commercial and 48 Ministry of Defence (MoD) properties currently at risk from a 0.5% annual exceedence probability of flooding (AEP) due to breaching of the existing coastal defences.

1.1.3 Due to climate change the number of properties at risk in 2109 from a 0.5% AEP event would increase to 9,355 residential, 950 commercial and 117 MoD properties.

1.1.4 This strategy is consistent with the North Solent Shoreline Management Plan (SMP2), which was submitted to the EA for review in 2010. The data and analysis from this strategy has been used to assist in the preparation of the SMP2.

1.1.5 Works identified in this strategy will be implemented using powers under the Land Drainage Act 1991 and the Coast Protection Act 1949. Schemes will be subject to the town and country planning regulations and land drainage regulations where required.

1.1.6 The key objective of this strategy is to recommend sustainable coastal flood and erosion risk management options that; reduce risk to life, protect and enhance the population's well-being, protect property (residential and commercial), protects existing infrastructure and to protect and enhance biodiversity, cultural heritage and landscape.

## **1.2 Problem**

1.2.1 There are currently 1,755 residential properties at risk of flooding from a 5% AEP storm event, 3,805 residential properties from a 1.3% AEP storm event and 4,211 properties from a 0.5% AEP storm event. Many properties behind the sea wall at South Parade have floor levels 4.0m below the current sea wall crest height. In the event of a breach, deep fast flowing water is likely to result in extensive internal flooding to hundreds of properties. An assessment of the distribution of social class groups through the strategy area did not reveal a predominance of either AB or DE social class groups.

1.2.2 The strategy area is a low-lying, urban island, which is home to the densely populated City of Portsmouth. Portsmouth is the second most densely populated city in the UK, behind Inner London. The risk area is defined as land use Band A in accordance with the Department of Environment Food and Rural Affairs (Defra) 'Flood and Coastal Defence Project Appraisal Guidance Note 3' (FCDPAG3).

1.2.3 The study frontage extends over 27km in length incorporating a variety of different defence types, of which over 14km have an assessed residual life of less than 10 years. Approximately 6.5km of the defences currently provide a standard of protection (SoP) less than the indicative range for the land use type. This increases to approximately 11.5km in 50 years time due to the effects of sea level rise.

1.2.4 The strategy area contains assets at risk of flooding with a total present value of over £1.25 billion based on damages expected over the next 100 years. These include; 9,335 residential properties, 950 commercial properties, 117 MoD properties, HM Naval Base, Historic Dockyards including the HMS Victory and Mary Rose, Continental Ferry Port, 15 areas of known landfill, main road and rail arteries on and off Portsea Island, Eastney pumping station, hospitals, schools, colleges, emergency services and power supplies, 40 scheduled monuments and more than 450 listed buildings and 70 sites of archaeological interest.

1.2.5 The study area comprises sites of international and national importance for nature conservation. Langstone Harbour and the north of Portsmouth Harbour are Natura 2000 sites and are designated Sites of Special Scientific Interest (SSSI), Special Protection Areas (SPA), Special Areas of Conservation (SAC) and Ramsar sites.

1.2.6 Much of the coastline around Portsea Island has been artificially altered through reclamation using waste material. This land is potentially contaminated and could form a risk to the environmentally-designated areas within the harbours if the sea defences were to fail. The areas of landfill are shown in Key Plan 1.

1.2.7 To comply with the Habitat Regulations Assessment there is a legal requirement to prevent any erosion failure of the defences surrounding the landfill sites which could otherwise lead to pollution of the surrounding designated sites.

### **1.3 Options**

1.3.1 Flood modelling identified 7 discreet areas of flooding. There is no interdependency of flooding between these 7 areas and there are no shared benefits across cells. A preferred option has therefore been selected for each of the seven flood cells enabling optimisation of the preferred strategy for the whole of the study area.

1.3.2 From a longer list of options considered a short-list for each flood cell was taken forward for further consideration. These included maintain, sustain and improve options see Table 5. Improvement options include raising the crest of seawalls, providing splash walls or replacing a sea wall or embankment. Sustain options included providing new sea walls, embankments, splash walls or revetments.

### **1.4 Recommended strategy**

1.4.1 The preferred option for each flood cell was selected using a strategic approach, ensuring compatibility with neighbouring coastal processes. The strategy confirms the Shoreline Management Plan (SMP) policy for Portsea Island is to hold the line to protect the populated frontages and to reduce the risk of contaminating the harbours from erosion of the landfill sites.

1.4.2 Improvements are required to Flood cells 1 and 2 to raise the current SoP from 100% to 0.5% AEP in order to protect 4,130 properties in 100 years time. Works will consist of raising seawalls, improving seawall structural integrity and establishing sustainable methods of retaining beach materials.

1.4.3 The recommendation for Flood cells 3, 4, 6 and 7 is to sustain the current AEP provided by the flood defences over the 100 year life of the strategy by periodically raising the flood defences to keep pace with sea level rise. Works will involve raising sea wall and embankment crest heights and replacing some of the existing structures with enhanced defences.

1.4.4 The recommendation for flood cell 5 is to maintain the current AEP to prevent contamination of the harbour. Over the 100 year life of the strategy the AEP will decrease from 10% to 100%. A least cost assessment was undertaken to determine the most appropriate method of securing the area of contamination which found that continuing to maintain the existing defences was considerably less costly than remediation of the areas of contamination.

1.4.5 The key benefits of the preferred options for the life of the strategy are; reduced flood risk to 4,211 residential properties, 364 commercial, and 48 MoD properties. This increases to 9335 residential properties, 950 commercial properties and 117 MoD owned properties by 2109.

1.4.6 Works which require Capital Grant are proposed to flood cells 1 and 4 within the first ten years of the Strategy.

## 1.5 Economic case and priority Score

**Table 1- Benefit-cost ratios (BCR) and priority scores**

Location	Flood Cell							TOTAL
	1	2	3	4	5 <sup>1</sup>	6	7	
Proposed SoP (%AEP)	1 in 200 (0.5%)	1 in 200 (0.5%)	1 in 200 (0.5%)	1 in 200 (0.5%)	Maintain – (0.5% falling to >100% AEP)	1 in 75 (1.3%)	1 in 200 (0.5%)	
PVC (£k)	57,447	16,367	4,719	46,419	5,323	13,332	10,737	154,345
PVB (£k)	585,753	15,062	11,792	568,529	7,593	34,217	26,268	1,249,214
NPV (£k)	528,306	-1,305	7,073	522,110	2,268	20,885	15,531	1,094,869
BCR	10.2	0.9	2.5	12.3	1.4	2.6	2.4	8.1
PVC per residential property (£k)	15	80	12	11	5,323	23	10,737	16
Outcome measure score								
OM1	10.2	0.9	2.5	12.2	1.4	2.6	2.4	8.1
OM2	2,311	198	0	1,414	0	0	0	3,924
OM2b	2,298	198	0	1,405	0	0	0	3,901
OM3	0	0	0	0	0	0	0	0
OM4	0	0	0	0	0	0	0	0
OM5	0	0	0	0	0	0	0	0
OM Total	3.9	0.6	0.7	4.2	0.4	0.7	0.7	2.9
Flood Cell								
FDGiA funding details	OM score suggests FDGiA funding likely via EA Medium term Plan, See 2.7.25	OM score suggests FDGiA funding unlikely, private funding envisaged for future work. See 2.7.27.	OM score suggests FDGiA funding unlikely. PCC to fund required activities See 2.7.28.	OM score suggests FDGiA funding likely via EA Medium term Plan, See 2.7.25.	OM score suggests FDGiA funding unlikely. See 2.7.29 for details.	OM score suggests funding unlikely. Joint PCC and port operative funding to be sought. See 2.7.30	OM score and BCR suggest funding is unlikely and would primarily be funded by MoD. See 2.7.26	BCR is higher than EA target of 5:1 and OM's score is favourable.

<sup>1</sup> Preferred option protects the marine Natura 2000 site

## 1.6 Environmental and social considerations

1.6.1 The area supports large areas of coastal habitats designated within the Natura 2000 network. A Strategic Environmental Assessment (SEA) and an Appropriate Assessment has been prepared

1.6.2 The Appropriate Assessment concluded that the proposed strategy will have likely significant effects on the designated sites within the harbours. The estimated loss of intertidal habitat due to coastal squeeze over the 100 year assessment period is 56ha, with 132ha of habitat changing from upper to lower salt marsh. Since there are no alternative solutions and there is a case of overriding public interest, compensatory habitat will need to be provided. This will be undertaken in conjunction with the Regional Habitat Creation Programme, reviewing the regional opportunities and constraints.

1.6.3 Consultation has been carried out with stakeholders throughout the preparation of this strategy. Positive and supportive feedback on the preferred options was received from the public during a public exhibition held at Portsmouth Guildhall.

1.6.4 The key social and environmental issues are the management of flood risk to the human population, the impact on internationally and nationally designated sites for nature

conservation and the visual impacts caused by raising the defences to provide the requisite standard of protection.

## 1.7 Risks

1.7.1 The five key risks with the implementation of the strategy are identified in Table 2

**Table 2 - Risks and mitigation**

<b>Risk</b>	<b>Key Mitigation</b>
Public liaison inadequate or results in adverse reaction	Future schemes will need stakeholder engagement plans to build on the strategy liaison work and maintain the support of the public and other organisations
Provision of compensatory habitat delayed or not possible	Procurement of compensatory habitat will be taken forward by the Southern Regional Habitat Creation Programme (SRHCP) prior to the schemes being developed at Project Appraisal Report (PAR) stage. A copy of a letter received from the SRHCP, confirming a commitment to deliver the compensatory habitat required to offset the losses resulting from the findings of the Portsea Island Coastal Strategy Study is attached to this report as Letter of Support A
Agreement of level of MoD contribution	Early liaison with MoD, and current approval of strategy recommendations. However no contributions envisaged for at least first five years of works.
Damage to the environment during the works	Continued assessment and mitigation at scheme level, including addressing the need for habitat creation
Reliance on regular capital funding	Maintain a rolling 5 year programme for approval by the Environment Agency

## 1.8 Implementation

1.8.1 The cost of the strategy over the next 100 years is presented in Table 3. The schemes presented will progress to scheme appraisal following strategy approval by the Environment Agency Board. Construction work to priority areas is forecast to start within 5 to 10 years of Strategy approval.

**Table 3 - Strategy costs**

Flood Cell / Item (£k)	Flood Cell 1	Flood Cell 2	Flood Cell 3	Flood Cell 4	Flood Cell 5	Flood Cell 6	Flood Cell 7	Total
Responsible Authority	PCC FDGiA	Landowner / developer	Landowner/ PCC	PCC FDGiA	MoD/ Developer	Landowner/ PCC	MoD	
Costs pre StAR (assumed spread evenly between flood cells – Consultant and PCC fees)								
Total sunk costs since 2000	64	64	64	64	64	64	64	449
Professional fees (Portsmouth City Council and Consultant)	1,336	185	0	879	56	0	242	<b>2,698</b>
Investigations	2,087	402	0	2,296	137	0	327	<b>5,249</b>
Construction (first 10 years)	20,591	2,681	0	13,485	616	0	3,179	<b>40,552</b>
Environmental enhancements	626	121	0	689	41	0	98	<b>1,575</b>
Habitat Replacement	253	1,319	0	9,428	740	0	62	<b>11,802</b>
Compensation <sup>2</sup>	28	19	0	45	12	0	27	<b>131</b>
Contingency (%)	14,953 (60)	2,836 (60)	0	16,093 (60)	962 (60)	0	2,361 (60)	<b>37,205</b>
Inflation @5% per annum	7,974 (4yrs)	2,236 (6yrs)	0	10,818 (5yrs)	897 (7yrs)	0	3,148 (10yrs)	
<b>Total Capital Cost</b>	<b>47,848</b>	<b>9,799</b>	<b>0</b>	<b>53,733</b>	<b>3,461</b>	<b>0</b>	<b>9,444</b>	
Future construction costs (including professional fees and 60% contingency) beyond first 10 years	90,971	29,788	8,257	44,478	7,513	41,057	22,667	<b>244,731</b>
Maintenance (including contingency)	5,624	2,896	1180.8	8,229	1,920	2,382	5,398	<b>27,630</b>
Whole life cash cost with 60% contingency inc. maintenance but without inflation, or pre-StAR fees	136,469	40,247	9,438	95,622	11,997	43,439	34,361	<b>371,573</b>

<sup>2</sup> Compensation based on 3m wide footprint throughout at £19k/ha. However, in most locations the footprint will be within the current footprint of the defences and as the defences are predominantly PCC owned will not require compensation.

For a full breakdown of costs see the Economics Report – Key Plan 2 shows a more detailed breakdown of the major scheme costs for the 10 year implementation plan.

## **1.9 Contributions and funding**

1.9.1 Funding for the capital improvement and capital maintenance schemes will principally be sourced through Environment Agency Flood and Coastal Defence Capital Grant. Third party contributions and funding from other sources will be pursued from the Ministry of Defence, Landowners, local developers and Continental Ferry Port Operators. As a planning authority PCC will request external contributions from developers and will bid for infrastructure levy funds to contribute to the improvement to or provision of new coastal defences, particularly to regeneration sites.

## **1.10 Status**

1.10.1 This strategy has been developed to implement the policies identified in the North Solent Shoreline Management Plan (SMP2) and incorporates outputs from the Partnership for Urban South Hampshire Strategic Flood Risk Assessment (PUSH SFRA) which considers all forms of flooding.

1.10.2 Implementing this strategy will protect 4,211 residential properties now, increasing to 9,355 by the end of the 100 year strategy period.

1.10.3 Portsmouth City Full Council has approved the Portsea Island coastal strategy study in July 2009. The council will be kept fully involved throughout the scheme appraisal and detailed design stages.

1.10.4 Natural England has provided a letter of support to this strategy (See Letter of Support B). Defra approval is required as the whole life cost for the strategy exceeds £250 million. Subject to Defra's assessment Treasury approval may also be required.

## **1.11 Recommendations**

1.11.1 It is recommended that the Portsea Island coastal strategy study is approved under Part 11 of the Non-financial scheme of delegation, at a whole life cost (excluding inflation) of £372 million, including £131 million contingency

**The Executive summary ends here**

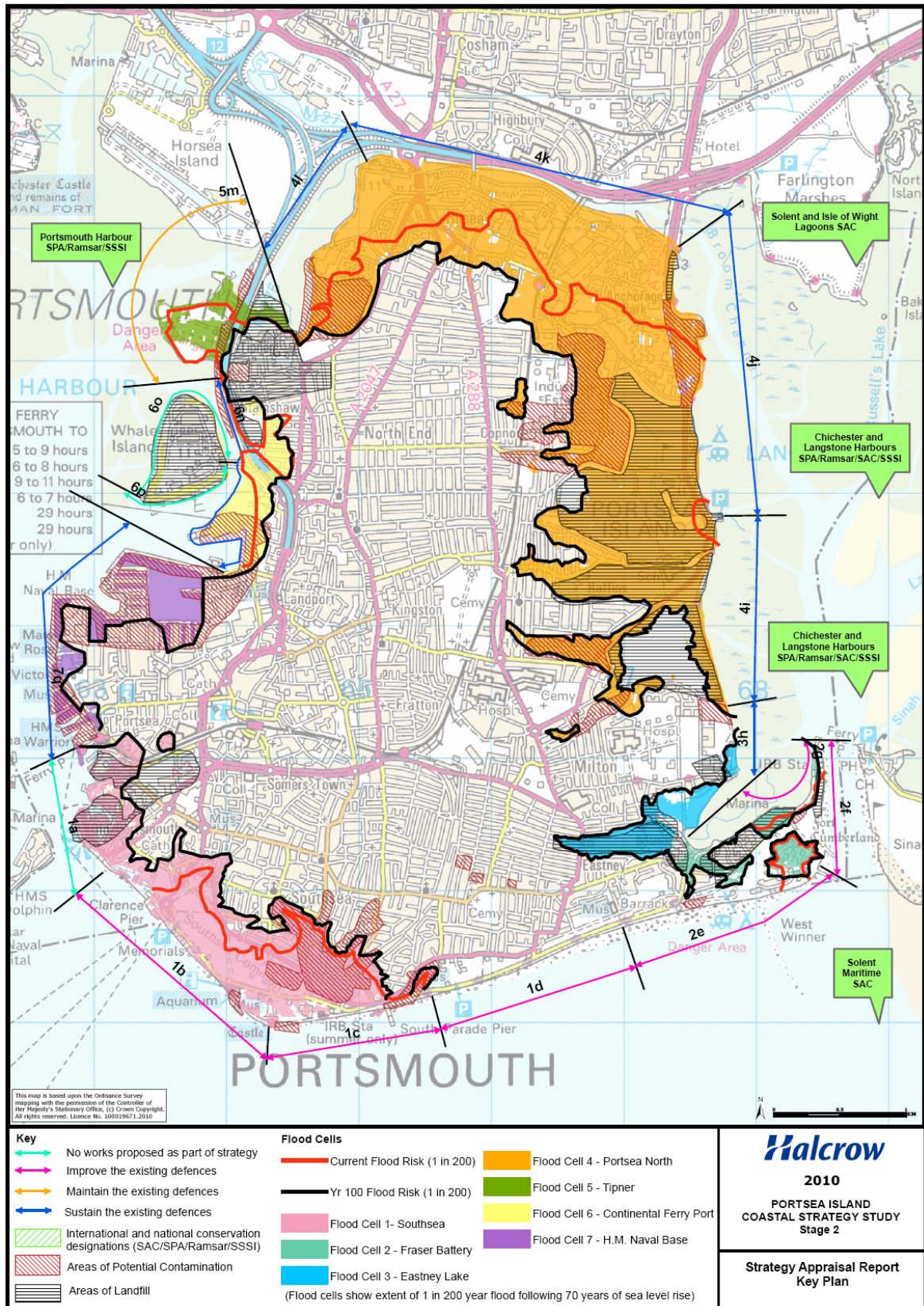
## 1.12 Director's Briefing Paper

Region:	South East		Project Executive:	Lyll Cairns (H&PCDP)	
Function:	Flood Risk Management		Project Manager:	Bret Davies (H&PCDP)	
Strategy Title:	Portsea Island Coastal Strategy Study		Code:	KY09	
NEECA Consultant:	Halcrow Group Ltd	NCF Contractor:	-	Cost Consultant:	-
The Problem:	The strategy area contains seven discrete flood cells. Flood cells 1 and 2 have a low existing standard of protection and require improvements works to raise defence levels. Flood cells 3, 4, 6 and 7 have an appropriate standard of protection now but need future improvement works due to sea level rise. Flood Cell 5 contains a large area of contaminated land and requires defence improvement works to protect against leaching of contaminants. All flood cells contain defences with a low residual life that require improvement works to protect against potential breach formation.				
People at risk: Probability of exposure: Consequence of exposure:		Risk to life assessments were carried out for flood cells 1 and 4 only. Values given below are estimated for year 70 under a Do Nothing option: Flood cell 1 – 100% AEP event, consequence 6 fatalities rising to 14 fatalities during a 0.33% AEP event. Flood cell 4 – 100% AEP, consequence 4 fatalities rising to 13 fatalities during a 0.33% AEP event.			
Environmental resources at risk: Probability of exposure: Consequence of exposure:		Portsmouth and Langstone Harbour SPA SAC and Ramsar sites at risk of ingress of contamination in the event of failure of defences. Hold the line option results in net loss of habitat due to coastal squeeze.			
Assets at risk from flooding: Probability of exposure: Consequence of exposure:		9,335 Residential, 950 Commercial and 117 MoD properties, 2 major road arteries, 1 Rail link, the continental ferry port, the historic dockyards and 15 landfill sites.			
Description of proposed strategy:		Two Major schemes proposed for the first 5 years within flood cells 1 and 4 to provide a long term standard of protection of 0.5% by holding the existing line of defence			
Outcome for people at risk:		Implementing the proposed strategy would reduce risk to life to 0 in year 70 up to a 0.33% AEP event. For Flood cell 4 the risk to life reduces to 0 in year 70 from a 100% AEP event and down to 4 fatalities during a 0.33% AEP event.			
Outcome for environmental resources at risk:		Hold the line option protects against ingress of contamination in to harbour. Compensatory habitat for coastal squeeze to be delivered through the regional habitat creation plan.			
Outcome for assets at risk:		Implementing the proposed strategy will provide long term risk management of the coastal flood and erosion risks to those assets at risk			
Costs (PVc): (100 year life inc. maintenance)	£154m	Benefits: (PVb)	£1,249m	Ave. B: C ratio: (PVb/PVc)	8.1
NPV:	£1,095m	Incremental B: C ratio:	N/A	Whole life cost (cash value):	£372m
Choice of Preferred Option:	Hold the line the improving existing flood defences.				
Total cost for which approval is sought:			£372,000k (including £139,000k contingency)		
Delivery programme:	Strategy Programme Years 0- 5: Flood Cell 1 – Southsea (£39.9m ex inflation, 47.8 m inc inflation) construction 2012 - 2019				

	Flood Cell 4 – Portsea North (£42.9m ex inflation, 53.7 m inc inflation) construction 2012 – 2019
<b>Are funds available for the delivery of this programme?</b>	
<b>External approvals:</b>	Natural England, Portsmouth City Council, and the Ministry of Defence have agreed the strategy
<b>Defra approval:</b>	Outcome measures: Cell 1: 3.9, Cell 2: 0.6, Cell 3: 0.7, Cell 5: 4.2, Cell 5: 0.4, Cell 6: 0.7, Cell 7: 0.7. Defra approval and Habitat Regulation Assessment Required



## Key Plan 1 – Study Area





Key Plan 2 – 10 Year Implementation Plan

	Defence Code	Defence Length (km)	Responsible Authority	Location Description	Works Description	Residual Life	Current Standard of Protection (%) AEP																									
Sub-Cell								2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019													
					Strategy Year			2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020													
								0	1	2	3	4	5	6	7	8	9	10														
Flood Cell 1 - Southsea																																
	Habitat Replacement (proportioned individually against construction costs)																															
	PAR/Detailed Design																															
1d	571/3228a	0.85	PCC/FCDGIA	Southsea Esplanade	no works planned in first 10 years - continue general maintenance	10-15 yrs	0.5																									
	571/3228b	0.90	PCC/FCDGIA	Southsea Esplanade	New flood wall on landward side of promenade approx 1m above EGL	10-15 yrs	100							£ 14,834.20																		
1c	571/3228c	1.21	PCC/FCDGIA	Southsea Esplanade	New flood wall on landward side of promenade approx 1m above EGL	10-15 yrs	1																									
	571/3229	0.45	PCC/FCDGIA	Pyramids Wave Return Wall	no works planned in first 10 years - continue general maintenance	10-15 yrs	0.5																									
1b	571/3230a	0.28	PCC/FCDGIA	Sealife Centre	Replace existing seawall with higher bullnose seawall and raise promenade level by approximately 1.2m. Provide additional rock toe protection to the new structure.	10-15 yrs	20												£ 9,281.84													
	571/3230b	0.06	PCC/FCDGIA	Sealife Centre		10-15 yrs	20																									
	571/3230c	0.30	PCC/FCDGIA	Sealife Centre		10-15 yrs	20																									
	571/3231	0.42	PCC/FCDGIA	Clarence Esplanade	New seawall approximately 1m above existing seawall with rock to protect against beach scour.	5-10 yrs	10					£ 3,740.74																				
	571/3232	0.20	PCC/FCDGIA	Clarence Pier	New seawall on landward side of promenade	5-10 yrs	>100					£ 1,937.92																				
	571/3233	0.14	PCC/FCDGIA	Long Curtain Promenade	Construct a new seawall on the landward side of the promenade approximately 1m above EGL	10-15 yrs	>100					£ 1,775.79																				
	571/3234	0.14	PCC/FCDGIA	Long Curtain Promenade		10-15 yrs	10					£ 1,775.79																				
Flood Cell 2 - Fraser Battery																																
	Habitat Replacement (proportioned individually against construction costs)																															
2g	571/3220	0.70	PCC/FCDGIA	Eastney Lake	No Capital works in first 10 years - continue with maintenance and monitoring	5-10 yrs	0.5																									
	571/3221	0.14	PCC/FCDGIA	Eastney Lake		10-15 yrs	0.5																									
2f	571/3222	0.42	PCC/FCDGIA	Langstone Marine		<5 yrs	0.5																									
	571/3223	0.74	PCC/FCDGIA	Langstone Channel		<5 yrs	0.5																									
2e	571/3224	0.30	Developers	Eastney Outfall	Replace existing structure at risk of failure with new revetment and seawall.	<5 yrs	0.5									£ 6,444.12																
	571/3225	0.12	Developers	Fraser Battery	provide setback wall with increased crest level to protect against overtopping of existing wall. Maintain existing structure	5-10 yrs	100																									
	571/3226	0.42	Developers	Fraser Battery		5-10 yrs	100								£ 3,354.88																	
	571/3227	0.52	PCC/FCDGIA	Melville Road Caravan Site	no works planned in first 10 years - continue general maintenance	5-10 yrs	0.5																									
Flood Cell 3 - Eastney Lake																																
3h	571/3217	0.26	PCC/FCDGIA	Langstone Harbour	No Capital works in first 10 years - continue with maintenance and monitoring	5-10 yrs	0.5																									
	571/3218	0.18	PCC/FCDGIA	Milton Locks		10-15 yrs	0.5																									
	571/3219	0.12	PCC/FCDGIA	Thatched House PH Seawall		<5 yrs	0.5																									
	Other defences	1.50	PCC/FCDGIA	Un named defences		-	-																									
Flood Cell 4 - Portsea Island (North)																																
	Habitat Replacement (proportioned individually against construction costs)																															
	PAR/Detailed Design																															
4l	571/3263	1.45	PCC/FCDGIA	Tipner Lake	Replace existing wall with a new higher wall to provide an improved standard of flood protection	5-10 yrs	10																									
	571/3264	0.30	PCC/FCDGIA	Hilsea Lido	Raise existing revetment systems with earthworks and appropriate structure	10-15 yrs	10							£ 7,415.60																		
4k	571/3205	1.35	PCC/FCDGIA	Ports Creek South	Raise the level of the existing flood embankment and widen with crest footpath. Continue to maintain existing wall and revetment	5-10 yrs	0.5																									
	571/3206	0.83	PCC/FCDGIA	Ports Creek South		5-10 yrs	1					£ 6,239.73																				
4j	571/3207	0.10	PCC/FCDGIA	Easton Road Langstone Harbour	Replace old revetment with new revetment system and raise defence level with a new earth embankment	5-10 yrs	0.5					£ 597.48																				
	571/3208	0.63	PCC/FCDGIA	Easton Road Langstone Harbour		5-10 yrs	0.5									£ 3,394.97																
	571/3209	0.25	PCC/FCDGIA	Kendalls Wharf	Replace old sheet piled wall with new to extend life of structure	5-10 yrs	0.5																									
	571/3210	0.49	PCC/FCDGIA	"Tudor" Sailing Club	Raise level of existing seawall and strengthen to provide improved standard of flood protection	15-30 yrs	0.5											£ 2,685.49														
	571/3211	0.46	PCC/FCDGIA	Harbour Side Caravan Park		15-30 yrs	0.5												£ 3,256.09													
	571/3212	0.25	PCC/FCDGIA	Great Salterns Seawall		10-15 yrs	0.5													£ 3,256.09												
		571/3213	0.21	PCC/FCDGIA	Great Salterns Quay	no works planned in first 10 years - continue general maintenance	5-10 yrs	0.5																								
4i	571/3214	0.25	PCC/FCDGIA	Baffins	Provide new setback splash wall to protect against overtopping and maintain existing seawall.	5-10 yrs	0.5									£ 3,546.65																
	571/3215	0.36	PCC/FCDGIA	Tangier Road Seawall	Replace old seawall with new higher seawall to provide improved flood protection	5-10 yrs	0.5									£ 3,546.65																
	571/3216	1.03	PCC/FCDGIA	Milton Bund	Raise defence level with new earth embankment - provide rock toe protection/re-grade existing embankment to stable profile	5-10 yrs	0.5											£ 10,066.89														
Flood Cell 5 - Tipner																																
	Habitat Replacement (proportioned individually against construction costs)																															
5m	571/3260	1.10	MoD/Developer	Horsea Island MOD	No capital works in first 10 years - continue with maintenance and monitoring	5-10 yrs	0.5																									
	571/3261	0.16	MoD/Developer	Tipner Point		10-15 yrs	10																									
		571/3262	0.85	MoD/Developer	Tipner Lake	Repair existing seawall and re-profile flood embankment to protect area of contaminated land against erosion	<5 yrs	10												£ 3,462.00												
Flood Cell 6 - Continental Ferry Port																																
6n	571/3255	0.85	PCC/FCDGIA	Albert Johnson Quay	No Capital works in first 10 years - continue with maintenance on monitoring	10-15 yrs	10																									
	571/3256	0.41	PCC/FCDGIA	Rotten Row		5-10 yrs	2																									
	571/3257	0.05	PCC/FCDGIA	Rotten Row		10-15 yrs	2																									
6p & 6o	571/3258	2.75	PCC/FCDGIA	Whale Island		N/A	N/A																									
6n	571/3259	0.85	PCC/FCDGIA	Stamshore Lane		10-15 yrs	0.5																									
Flood Cell 7 - HM Naval Base																																
	Habitat Replacement (proportioned individually against construction costs)																															
7q	571/3251	0.11	PCC/FCDGIA	The Hard	Repair existing seawall to provide continued flood protection	5-10 yrs	0.5													£ 265.17												
	571/3252	0.07	PCC/FCDGIA	The Hard	Construct new setback/splash wall to provide improved flood protection and maintain existing seawall	10-15 yrs	0.5													£ 9,179.49												
	571/3253	4.05	MOD	The Hard	No capital works in first 10 years - continue with maintenance and monitoring	15-30 yrs	0.5																									
	571/3254	0.52	MOD	Flathouse Quay		5-10 yrs	2																									
Expected route for funding																																
	Total Annual Expenditure (PCC FDGIA) £k												£ 733.00	£ 733.00	£ 16,067.45	£ 13,211.21	£ 14,834.20	£ 7,093.31	£ 17,106.38	£ 12,752.39	£ 15,794.03	£ 3,256.09										
	Total Cumulative Expenditure (PCC FDGIA) £k							£ -	£ -				£ 733.00	£ 1,466.00	£ 17,533.45	£ 30,744.66	£ 45,578.86	£ 52,672.17	£ 69,778.55	£ 82,530.94	£ 98,324.97	£ 101,581.06										
	Total Annual Expenditure (Landowner/ Developer) £k												£ -	£ -	£ -	£ -	£ -	£ 9,799.00	£ -	£ -	£ -	£ -										
	Total Cumulative Expenditure (Landowner/Developer) £k							£ -	£ -				£ -	£ -	£ -	£ -	£ -	£ 9,799.00	£ 9,799.00	£ 9,799.00	£ 9,799.00	£ 9,799.00										
	Total Annual Expenditure (MoD/Developer) £k													£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 12,906.66										
	Total Cumulative Expenditure (MoD/Developer) £k							£ -	£ -					£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 12,906.66										
Total Annual Expenditure £k																					£ -	£ -	£ 733.00	£ 733.00	£ 16,067.45	£ 13,211.21	£ 14,834.20	£ 16,892.31	£ 17,106.38	£ 12,752.39	£ 15,794.03	£ 16,162.75
Total Cumulative Expenditure £k																					£ -	£ -	£ 733.00	£ 1,466.00	£ 17,533.45	£ 30,744.66	£ 45,578.86	£ 62,471.17	£ 79,577.55	£ 92,329.94	£ 108,123.97	£ 124,286.72



## Key Plan 3 - Portsea Island Coastal Strategy Study - Economics Summary Table

Flood Cell	Probability of flooding/properties at risk (Year 0)			Residential and non-residential flood damages year 0 (£k). Capped damages shown in brackets (Preferred option shown in bold)										Results description/commentary
	Average Standard of Protection due to overtopping (%)	Probability of residential flooding in the event of a breach (%)	No of residential properties at risk in event of a breach 0.5% AEP storm	Do Nothing	Do Min	Maintain	Sustain	2% AEP	1% AEP	0.5% AEP	0.3% AEP	0.2% AEP	0.1% AEP	
1	100	100	2,311	387 (392,088)	387 (392,088)	387 (40,040)	902 (0)	70 (0)	28 (0)	<b>14 (0)</b>	9 (0)	6 (0)	3 (0)	Flood damages occur on an annual basis with storm events causing localised damage to promenades and the seawall and result in closures of the coastal road. A breach in the defences would place a large number of properties at risk of flooding (flood modelling predicts that 2,311 properties would be affected by the 0.5% AEP storm). Early improvements are required to the existing defences to reduce overtopping and manage the risk of breach occurrence.
2	100	10	102	0 (11,877)	0 (11,877)	0 (11,877)	0 (1,798)	N/A	10 (0)	<b>5 (0)</b>	3 (0)	2 (0)	1 (0)	Localised overtopping of the existing defences does occur along this length of the coastline. However, residential flood damages would not be accrued unless the defences failed (and as a result of the 10 AEP storm) or as a result of a storm event greater than 1.3% AEP. Failure of the defences would also result in erosion of the foreshore causing a widening of the Langstone Harbour entrance channel and increasing wave exposure within Langstone Harbour compromising the flood protection provided elsewhere on the island. Localised improvement works are required to manage the risk of breach occurrence and it has been identified that these improvement works will be funded by local developers See Section 1.9.1
3	0.5	4	0	0 (0)	0 (0)	0 (0)	<b>0 (0)</b>	N/A	N/A	N/A	0 (0)	0 (0)	0 (0)	The existing defences provide a good standard of flood protection (0.5% AEP) to residential properties and therefore no improvements are required immediately to raise defence levels. Ongoing maintenance of the existing defences will manage flood risk until, the onset of sea level rise results in more frequent overflowing of the defences (around year 31 – see also Key Plan 3b). Ongoing maintenance is a necessity particularly to those defences in poor condition.
4	0.5	100	1,414	0 (268,411)	0 (268,411)	0 (255,077)	<b>0 (0)</b>	N/A	N/A	N/A	0 (0)	0 (0)	0 (0)	Overtopping of the defences has occurred along a localised length of this coastline (probably due to wave focussing against Great Salterns Quay). This has resulted in a temporary closure of the adjacent road. However, in general the existing defences provide a good standard of flood protection to residential properties under current sea level conditions. A breach in the defences would place a large number of properties at risk of flooding (flood modelling predicts that 1,414 properties would be affected by the 0.5% AEP storm). Early improvements are required to the existing defences to reduce the risk of breach occurrence and to manage overtopping rates against predictions for future sea levels resulting from climate change.
5	10	1	0	0 (1,264)	0 (1,264)	<b>0 (1,264)</b>	0 (1,264)	N/A	6	3	2	1	<1	Defences in this region primarily protect an area of contaminated land. There is only 1 residential property that would be impacted by flooding. Defence improvements are required to protect the Portsmouth Harbour SPA from ingress of harmful contaminants caused by exposure of the hinterland to a breach in the defences
6	0.5	10	384	66 (10,024)	66 (10,024)	66 (10,024)	<b>105 (0)</b>	N/A	12 (0)	6 (0)	4 (0)	2 (0)	1 (0)	The existing defences provide a good standard of flood protection to residential properties under current sea level conditions and therefore no improvements are required immediately to raise defence levels.
7	2	<0.5 (<0.5) <sup>3</sup>	0 (0) <sup>1</sup>	0 (0)	0 (0)	0 (0)	<b>0 (0)</b>	N/A	N/A	N/A	0 (0)	0 (0)	0 (0)	Localised poor condition of the existing defences necessitates that some improvement works are required by year 10 to prevent breaching resulting in increased exposure of the hinterland to flooding.

Key Plan 3a – Summary of Average Annual Damage by Flood Cell and Option Considered (Year 0)

<sup>3</sup> Residential flooding is not a major issue in this location. Flood damages are primarily built up from non residential and MOD properties. The probability of flooding to MOD and non residential flooding is shown in brackets

Flood Cell	Probability of flooding/properties at risk (Year 100)			Residential and non residential flood damages year 100 (£k)										Results description/commentary
	Standard of Protection due to overtopping (%)	Probability of residential flooding in the event of a breach (%)	No of residential properties at risk in event of a breach (0.5% AEP storm)	Do Nothing	Do Min	Maintain	Sustain	2% AEP	1% AEP	0.5% AEP	0.3% AEP	0.2% AEP	0.1% AEP	
1	100	100	3,932	18,692	18,692	41,914	2,347	2,208	1,108	<b>554</b>	369	221	111	Climate change results in higher sea levels which will increase the volume and frequency of overtopping events causing flood damage to residential properties. It is predicted that in 100 years time 3,932 residential properties would be at risk of flooding. Periodic raising and replacement of the defences will be required to sustain the preferred standard of flood protection (0.5% AEP) against rising sea levels and increased wave climate and to manage an increasing risk of breaching of the defences.
2	100	100	377	875	875	823	6	N/A	91	<b>46</b>	31	18	9	Increasing sea levels result in increased exposure of the defences to erosive and overtopping forces. Improvements will be required to all defences over the 100 year planning horizon to ensure that the risk of breach of defence is managed and to sustain levels of overtopping at an acceptable level
3	100	100	383	4,979	4,979	684	<b>22</b>	N/A	N/A	N/A	15	9	4	Flood protection in this region is sensitive to small increments in sea levels as the wave climate is low and overtopping is driven primarily by water level. More frequent overflowing of the defences is predicted to occur around year 31 as a result of sea level rise. At this point defences will need to be raised or replaced with new higher defences to ensure continued protection to the 383 residential properties that will be at risk of flooding in 100 years time.
4	100	100	4,234	44,051	44,051	15,411	<b>1,998</b>	N/A	N/A	N/A	1,332	799	400	Similarly to flood cell 3, defence overtopping in this region is driven primarily by water level. With defences at their current height the number of properties at risk of flooding will increase from 1,414 to 4,234 over the next 100 years. A programme of systematic defence improvements is required to keep pace with sea level rise and to manage the risk of defence failure.
5	100	100	1	142	142	<b>137</b>	100	N/A	89	45	30	18	9	The primary concern for this flood cell is to protect Portsmouth harbour from ingress of contaminants likely to be caused by a failure of the defences. Ongoing maintenance/replacement of the flood defences will manage the risk of contamination.
6	100	100	586	9,363	9,363	8,573	<b>285</b>	N/A	265	132	88	53	27	Ongoing maintenance of the existing defences will manage flood risk until, the onset of sea level rise results in more frequent overflowing of the defences (around year 31). Under a do nothing option defences would fail and flood risk would be more immediate. Ongoing maintenance is a necessity.
7	100	1 (100) <sup>4</sup>	1 (58) <sup>2</sup>	605	605	586	<b>18</b>	N/A	N/A	N/A	12	7	4	On going sea level rise increases flood frequency and depth and threatens important assets such as the HM Naval Base and historic dockyards including the Mary Rose and HMS Victory.

**Key Plan 3b – Summary of Average Annual Damage by Flood Cell and Option Considered (Year 100)**

<sup>4</sup> Residential flooding is not a major issue in this location. Flood damages are primarily built up from non residential and MOD properties. The probability of flooding to MOD and non residential flooding is shown in brackets

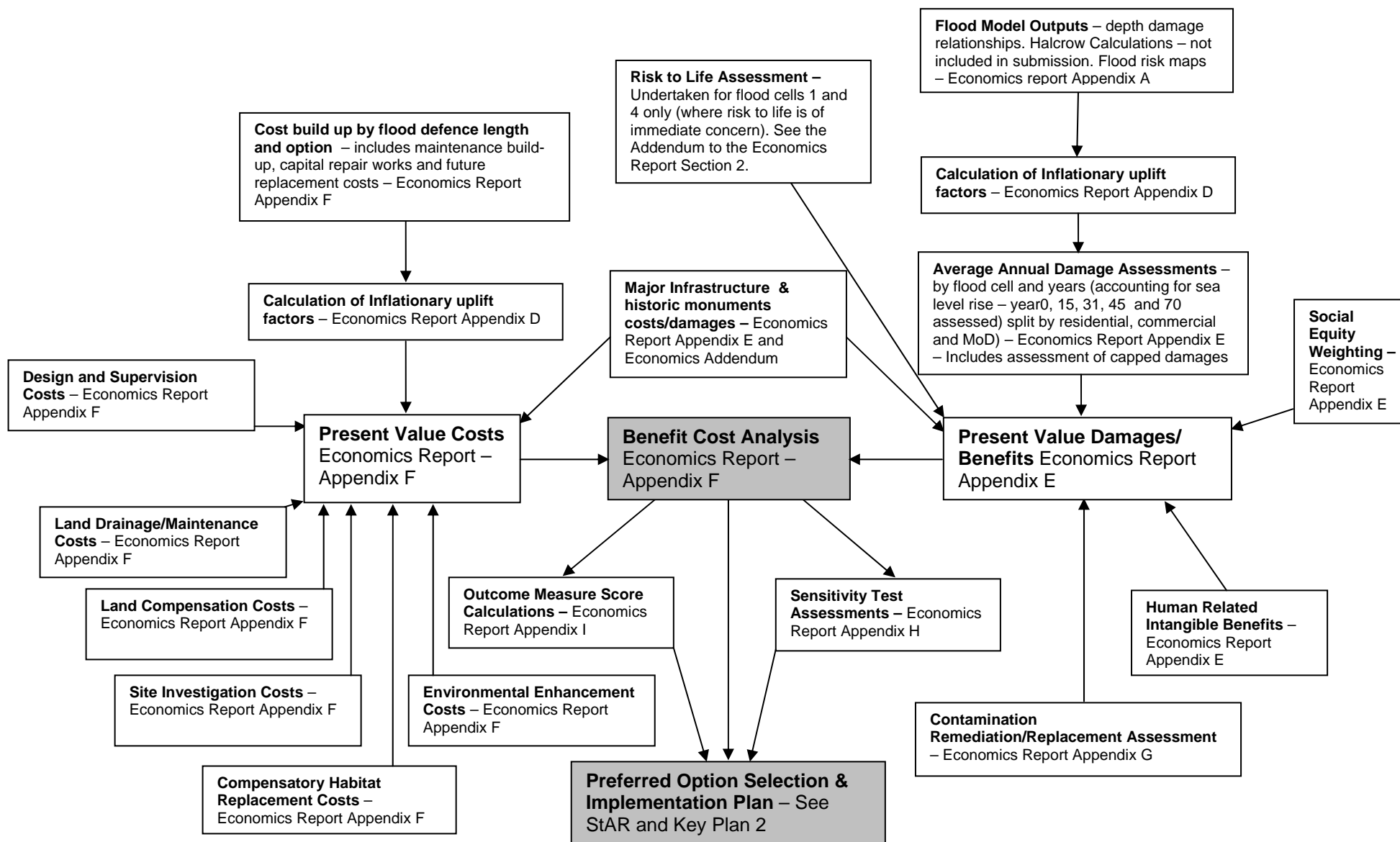
Flood Cell	Impact of Sensitivity Testing						Results Description/Commentary
	Economic Preferred Option (Expressed as AEP % where relevant) – See Key Plan 3d for description of sensitivity tests – changes to preferred option shown in bold text						
	Baseline	Sensitivity Test 1	Sensitivity Test 2	Sensitivity Test 3	Sensitivity Test 4	Sensitivity Test 5	
1	0.5	0.5	0.5	1	0.5	0.5	A 100% increase in construction costs estimates would result in the preferred option for this flood cell changing from 0.5% AEP to 1% AEP. It is considered that such in increase in cost is unlikely and therefore the baseline preferred option is robust.
2	0.5	1.3	0.5	0.5	0.5	0.5	Sensitivity testing shows that the preferred option is robust with only a potential increase in storminess resulting in a change to the preferred option.
3	0.5	0.5	0.5	Maintain	0.5	Maintain	Sensitivity testing identifies that selection of the preferred option changes from sustain at 0.5% AEP to maintain under tests 3 and 5. Both these options relate to increasing costs. In all other tests the preferred option remains that of the baseline. A more detailed and thorough costing exercise should therefore be undertaken prior to construction
4	0.5	0.2	0.5	0.5	0.5	0.5	Sensitivity testing shows that the preferred option is robust with only a potential increase in storminess resulting in a change to the preferred option.
5	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Sensitivity testing shows that the preferred option is robust with no change from the baseline under any of the tests undertaken
6	1.3	0.5	1.3	1.3	1.3	1.3	Sensitivity testing shows that the preferred option is robust with only a potential increase in storminess resulting in a change to the preferred option.
7	0.5	0.5	0.5	0.5	0.5	0.5	Sensitivity testing shows that the preferred option is robust with no change from the baseline under any of the tests undertaken

**Key Plan 3c – Flood Probability and Sensitivity Test Results Summary Table**

Sensitivity Test	Description	Purpose
1	<u>Effect of Increased Storminess</u> – Flood Damages from specific events have been redistributed as shown below: Damages moved from 20% AEP to 100% AEP Damages moved from 10% AEP to 20% AEP Damages moved from 2% AEP to 10% AEP Damages moved from 1% AEP to 2% AEP Damages moved from 0.5% AEP to 1% AEP	To test the robustness of the selected option against the assessed probability of occurrence of extreme storm events, and to determine how changes in increased storminess resulting from climate change may affect the selection of the preferred option
2	<u>Construction costs halved</u> , the future scheme costs have been halved and the preferred option re-selected	To determine the sensitivity of selection of preferred option to changes in cost
3	<u>Construction costs doubled</u> , the future scheme costs have been doubled and the preferred option re-selected	To determine the sensitivity of selection of preferred option to changes in cost
4	<u>Do Minimum Sustainable over a longer period</u> , onset of do nothing damages delayed by a further 5 years	To test the sensitivity of change due to the assumption that a do minimum option is only sustainable over a 25 year period.
5	<u>Increased sustain and improve costs</u> , Sustain and Improve option costs increased by 15% (maintain and do minimum costs unchanged)	The costs for the sustain and improve options have been calculated using assessments to determine the height of defence required to control overtopping rates to the level required at the end of the defence's design life. The calculations use the joint probability wave and water level data calculated as described in the Numerical Modelling Report. These make use of extreme water levels that have recently been superseded by a study completed by JBA in 2005. Recalculating the costs associated with these revised sea levels would require significant additional analysis to recalculate joint probability data to allow the revised defence heights to be calculated before reviewing the cost calculations. It is considered that the revised sea levels would be unlikely to change costs significantly to justify a full reassessment of these costs and therefore a sensitivity test has been undertaken to investigate the potential for a change in the preferred option

**Key Plan 3d - Sensitivity Test Description**

## Key Plan 3e - Economic Assessment “Roadmap/ Flow diagram”







## Key Plan 4 – Potential Environmental Enhancements

Sub-Cell	Defence Code	Location Description	Enhancement Description
			<b>Strategy Year</b>
<b>Flood Cell 1 - Old Portsmouth to Royal Marines Barracks</b>			
		Habitat Replacement	
1d	571/3228a	Southsea Esplanade	no works planned in first 10 years - No allowance for enhancements
	571/3228b	Southsea Esplanade	
1c	571/3228c	Southsea Esplanade	Provide landscape plan as part of wider regeneration proposals
	571/3229	Pyramids Wave Return Wall	no works planned in first 10 years - No allowance for enhancements
1b	571/3230a	Sealife Centre	Raise promenade levels to a greater extent than the proposed defence raising works and provide landscape plan as part of wider regeneration proposals
	571/3230b	Sealife Centre	
	571/3230c	Sealife Centre	
	571/3231	Clarence Esplanade	
	571/3232	Clarence Pier	
	571/3233	Long Curtain Promenade	
	571/3234	Long Curtain Promenade	Provide landscape plan as part of wider regeneration proposals
<b>Flood Cell 2 - Langstone Harbour Entrance Channel</b>			
		Habitat Replacement	
2g	571/3220 - 23	Eastney Lake - Langstone Channel	no works planned in first 10 years - No allowance for enhancements
	571/3224	Eastney Outfall	None identified
2e	571/3225	Fraser Battery	Consider provision of appropriate public outlook posts to provide improved sea views
	571/3226	Fraser Battery	
	571/3227	Melville Road Caravan Site	no works planned in first 10 years - No allowance for enhancements
<b>Flood Cell 3 - Eastney Lake</b>			
3h	571/3217 - 19	Langstone Harbour - Thatched House	no works planned in first 10 years - No allowance for enhancements
<b>Flood Cell 4 - Northern Portsea Island</b>			
		Habitat Replacement (proportioned individually against	
4l	571/3263	Tipner Lake	Raise promenade levels to a greater extent than the proposed defence raising works and provide landscape plan as part of wider regeneration proposals
	571/3264	Hilsea Lido	Provide improved footpath along shoreline
4k	571/3205	Ports Creek South	Widen crest of embankment with public access along the crest to provide improved footpath
	571/3206	Ports Creek South	
	571/3207	Easton Road Langstone Harbour	Provide improved footpath along shoreline
	571/3208	Easton Road Langstone Harbour	
	571/3209	Kendalls Wharf	private land - none identified
4j	571/3210	"Tudor" Sailing Club	Raise promenade levels to a greater extent than the proposed defence raising works and provide landscape plan as part of wider regeneration proposals
	571/3211	Harbour Side Caravan Park	
	571/3212	Great Salterns Seawall	
	571/3213	Great Salterns Quay	no works planned in first 10 years - No allowance for enhancements
	571/3214	Baffins	improve footpath along shoreline and provide landscape plan as part of wider regeneration proposals
4i	571/3215	Tangier Road Seawall	
	571/3216	Milton Bund	Widen crest of embankment with public access along the crest to provide improved footpath
<b>Flood Cell 5 - Tipner</b>			
		Habitat Replacement	
5m	571/3260 & 61	Horsea Island MOD & Tipner Lake	no works planned in first 10 years - No allowance for enhancements
	571/3262	Tipner Lake	private land - none identified
<b>Flood Cell 6 - Continental Ferry Port</b>			
6n - p	571/3255 - 59	Albert Johnson Quay	no works planned in first 10 years - No allowance for enhancements
<b>Flood Cell 7 - HM Naval Base</b>			
		Habitat Replacement	
7q	571/3251	The Hard	Provide landscape plan as part of wider regeneration proposals
	571/3252	The Hard	
	571/3253 & 54	The Hard & Flathouse Quay	no works planned in first 10 years - No allowance for enhancements



## **2 Business Case**

### **2.1 Introduction and background**

#### **Purpose and objectives**

2.1.1 The purpose of the Portsea Island Coastal Strategy is to plan and co-ordinate technically sound, environmentally acceptable and economically viable proposals for flood risk management to the strategy area, over the next 100 years. This submission seeks approval for a new strategy for managing coastal flooding risks for the 27km of flood defences that surround Portsea Island.

2.1.2 The strategy area incorporates Portsea Island and surrounding coastline within Portsmouth and Langstone estuaries. Portsmouth City Council has worked in conjunction with the Environment Agency, Natural England and the Ministry of Defence (MoD) to develop this strategy plan.

2.1.3 The strategic objectives are to:

- a) Protect properties against flooding and erosion including allowance for future predictions of sea level rise, where economically justified.
- b) Avoid pollution of water.
- c) Ensure compliance with the European Union (EU) Habitats Regulations by maintaining the integrity of the environmentally designated sites.
- d) Maintain access to the sea.
- e) Maintain sea views where appropriate/possible.
- f) Maintain the heritage sites within the study area.
- g) Ensure that flood and erosion risk does not lead to pollution from contaminated land.
- h) Maintain the integrity of existing tourist facilities
- i) Protect areas of public open space
- j) Maintain and, where feasible, enhance landscape character and appearance.

2.1.4 This Strategy Approval Report provides the business justification for future investment in the strategy area.

#### **Previous Study History**

2.1.5 The Strategy area is covered by the East Solent Shoreline Management Plan (SMP) which was published in 1997. This strategy builds on the East Solent SMP by examining the local issues in more detail in the context of specific strategic implementation options.

2.1.6 The North Solent SMP2 update commenced in 2007 and is due to be completed in 2010. The data and analysis from this strategy has been used to assist in the preparation of the SMP2 and is therefore consistent with the SMP2.

2.1.7 Adjacent coastal strategy studies include the Portchester Castle to Emsworth Coastal Defence Strategy (2009) covering the mainland coastline to the north of Portsea Island, the Portchester Castle to Hoeford Lake Shoreline Defence Strategy (2005) covering the mainland coastline to the east, and various sectoral strategies and studies on Hayling Island.

2.1.8 The Strategy frontage is separated from adjacent strategy study frontages by Langstone and Portsmouth Harbours and Port Creek. Due to the sheltered nature of the estuaries the recommendations put forward will not impact on the supply of sediment to adjacent strategy frontages.

#### **Strategy Area**

2.1.9 Portsea Island lies on the south coast of England, to the east of Portsmouth Harbour, to the west of Langstone Harbour, to the south of Port Creek and to the north of the Solent.

2.1.10 The study frontage extends over 27km in length incorporating a variety of different

defence types, of which over 14km have an assessed residual life of less than 10 years. Approximately 6.5km of the defences currently provide a standard of protection less than the indicative range for the land use type. This increases to approximately 11.5km in 50 years time due to the effects of sea level rise.

2.1.11 Portsea Island is the second most densely populated area in England. The Island is also home to significant MoD estate buildings, historic dockyards and a Continental Ferry Port, with associated infrastructure serving these assets. Current flood risk exposes some 4,211 residential dwellings, 364 commercial properties, 48 MoD properties, a major arterial road and 6 landfill sites to a 0.5% AEP (1 in 200 year) event.

2.1.12 Much of the coastline around Portsea Island has been artificially altered through reclamation using waste material to provide land for development. Large areas of this land are potentially contaminated and could form a risk to the environmentally-designated areas within the harbours if the sea defences were to fail. The areas of contamination and landfill are shown in Key Plan 1.

2.1.13 The strategy area is divided into seven discrete and separate areas of flood risk. These are referred to as 'Flood Cells' and are illustrated in Key Plan 1. The seven flood cells have been further divided into sub-cells based on existing defences and changes in coastal conditions (wave climate and sediment transport). There are 18 sub-cells in total. Improvement works are required to each of the seven discrete flood cells to secure long term protection to the hinterland. Key Plan 1 shows the current area of flood risk and the area at risk following 100 years of sea level rise due to a 0.5% AEP storm event.

#### **Current systems of flood and erosion risk management.**

2.1.14 The coastline is naturally dynamic. Along the open coast the shoreline is dominated by shingle barrier beaches backed by a series of sea walls and revetments. There are pockets of localised erosion along this section of the shoreline. Emergency works have previously been undertaken to replace shingle and repair seawalls where storm events have resulted in losses of beach material and subsequent damage to the seawall and promenade.

2.1.15 Within the sheltered areas of Langstone Harbour, Port Creek, and the northern half of Portsmouth Harbour, the shoreline is dominated by mud flats and salt marsh backed by a series of seawalls and revetments. There is little evidence to suggest any long term trends of erosion or accretion of the coastline in these areas.

2.1.16 The southern section of Portsmouth Harbour is dominated by deep navigable shipping channels supporting the main harbour entrance channels and dock walls of the HM Naval Base, Continental Ferry Port and the Isle of Wight ferry terminal. Existing defences comprise primarily of concrete and sheet piled retaining walls.

#### **Legal and planning framework and Designations**

2.1.17 Portsmouth City Council is the operating authority for all frontages in flood cells 1 to 6 while the Ministry of Defence is responsible for maintaining the majority of defences in flood cell 7 which is dominated by the HM Naval Base.

2.1.18 The shoreline surrounding the strategy area contains numerous nature conservation designations including the Solent Maritime Special Area of Conservation (SAC), the Solent and Isle of Wight SAC, Portsmouth Harbour Special Protection Area (SPA) and Ramsar site, and Chichester and Langstone Harbour SPA and Ramsar site. National designations include two Sites of Special Scientific Interest (SSSI) and five locally important wildlife areas. The environmentally designated areas are shown on Key Plan 1.

2.1.19 The Solent Coastal Habitat Management Plan (CHaMP, English Nature et al, 2003) was developed to provide an overview of potential habitat loss and creation opportunities within the Solent and its neighbouring harbours.

2.1.20 The Solent Dynamic Coastline Project (SDCP) is currently being developed to build

on the CHaMP and provide more detailed information for the North Solent SMP2. So far, the SDCP project has verified the loss of mudflat and salt marsh calculated by the CHaMP and calculated the area of replacement habitat required for habitat lost to coastal squeeze over the next 100 years assuming that all existing defences are maintained over that period. It has also identified potential habitat creation sites in the North Solent. It is envisaged that the required areas of replacement habitat will be delivered through consideration of programming (to avoid multiple projects affecting the same geographic areas at the same time) and through the development of the Southern Regional Habitat Creation Programme (SRHCP) to ensure the timely and appropriate creation of compensatory habitat.

2.1.21 Portsmouth City Council is a competent authority under the Habitat's Regulations and has a responsibility to deliver compensatory habitat resulting from coastal squeeze as a direct result of implementing the flood defences around Portsea Island. In order for this to be achieved it has been agreed with Natural England and the Environment Agency that compensatory habitat will be delivered strategically across the North Solent Shoreline Management Plan area (a whole estuary system) through the SRHCP. Natural England are clear that intertidal habitat creation to compensate for coastal squeeze should be developed within the context of strategic plans for whole estuary systems, such as SMP's, which deal with all frontages and not just those within conservation designations. As there is a range of organisations and individuals that have coastal flood protection duties/powers the Environment Agency, according to Natural England, should lead on the development of strategic plans to address coastal squeeze across the Solent (SRHCP)

2.1.22 Under Defra guidance, the Strategic Environmental Assessment (SEA) Directive 2001/42/EC and associated national regulations do not legally apply to this Strategy. However, they have been adhered to in line with Defra's recommendation to apply SEA to flood risk management strategies.

2.1.23 The recommendations of this strategy are likely to have a significant effect on the Natura 2000 network and an Appropriate Assessment has been undertaken. Portsmouth City Council is the competent authority under the regulations.

2.1.24 The Environment Agency has permissive powers for flood risk management works under Section 165 of the Water Resources Act 1991. Portsmouth City Council has powers to address coastal flood risk and erosion as the local Coastal Protection Authority. This is the main legislation governing the focus of this Strategy and under which future works will be carried out.

2.1.25 All new work recommended by this Strategy will be subject to the Town and Country Planning (Environmental Impact Assessment) Regulations 1999 and Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999. Planning permission will be required where works are not classed as permitted development under Article 3 and Schedule 2, Part 15 of the General Permitted Development Order (1995). This will be agreed with the planning authorities at scheme design stage. The planning authorities have been involved throughout the development of the strategy.

## **2.2 Problem**

2.2.1 Due to the low lying nature of the land, condition of the existing flood defences and the predicted effects of sea level rise, there is considerable and immediate flood risk to the assets located in the strategy area, particularly in flood cells 1 and 4.

### **Assets at risk**

2.2.2 The strategy area contains assets at risk of flooding with a present value of over £1 billion based on damages expected over the next 100 years with no active intervention. These include:

- a) 9,335 residential properties
- b) 950 commercial properties

- c) 117 MoD Properties
- d) HM Naval Base
- e) Historic Dockyards including the HMS Victory and Mary Rose
- f) Continental Ferry Port
- g) 15 areas of known landfill
- h) 2 main road arteries on and off Portsea Island
- i) The rail line
- j) 40 scheduled monuments and more than 450 listed buildings
- k) 70 sites of archaeological interest
- l) Key infrastructure such as local roads, rail links and utilities serving these assets

### **Extent and scale of problem**

2.2.3 Certain lengths of the strategy frontage have flood defences with low crest levels. During extreme storm events these would be subject to rapid rates of overtopping which would eventually result in collapse of the flood defences. There are currently 1,755 residential properties at risk of flooding from a 5% AEP storm event, 3,805 residential properties from a 1.3% AEP storm event and 4,211 properties from a 0.5% AEP storm event.

2.2.4 Analysis has incorporated the latest Defra 2006 sea level rise guidance to determine how the increased sea levels impact the extent and depth of flooding throughout the study area. The methods of analysis used are explained in more detail in the Economics Report.

2.2.5 The coastal fringes of Portsea Island are low-lying and fairly flat, with land generally rising gently towards the centre of the landmass. There are few embankments or other features that can act as barriers to stop the propagation of flood waters once a breach or overtopping event has occurred in each of the seven discrete flood cells.

2.2.6 Ground levels inland of South Parade within Flood Cell 1 fall away and in some cases property ground levels are as much as 4m below the current crest level of the flood defences. This area is known as the “Great Morass” and was subject to sewer flooding in 2000 due to sewer surcharge. A breach in the defences in this location would lead to a very fast onset of flooding with flood levels rising quickly. Consequently a breach of the defences in this location represents a significant risk to life to the inhabitants. The risk to life assessment completed for flood cell 1 (see the Addendum to the Economics Report, Halcrow 2010 – The Economics Addendum) concluded that, the PV benefits associated with providing continued protection to life by sustaining the existing standard of protection against overtopping (in response to sea level rise) and by protecting against a breach of the defences, totalled £114million.

2.2.7 During high tides any water trapped in these low lying areas cannot drain away. Portsmouth’s urban flood risk issue was recognised in the South East Hampshire Catchment Flood Management Plan (SECFMP) which actioned Portsmouth City Council (PCC) to address this flood risk issue through delivery of an Integrated Urban Drainage Plan. PCC have formally signed up to Local Area Agreements which include ‘National Indicator 183 – Flood and coastal erosion risk management’ and are preparing a Surface Water Management Plan to address the flood risk issues in Portsmouth. All schemes designed as part of this strategy will look for opportunities to reduce surface water flood risk.

2.2.8 The low and flat nature of the hinterland results in considerable increases to the extent of potential flooding following small rises in sea level. A breach in the existing defences would also result in a significant additional flood risk particularly in those flood cells protected by the defences fronting Portsmouth and Langstone Harbours and Port Creek, where the effects of wave overtopping are less prominent.

2.2.9 There are 15 areas of known landfill that fringe the shoreline of Portsea Island. Contamination risk studies have shown that they represent a significant risk to the integrity of the designated sites in Langstone and Portsmouth Harbour in the event of a failure of the existing defences. Flood Cell 5 is formed entirely from landfill and represents an extreme risk

to the integrity of the designated sites within Portsmouth Harbour in the event of a failure of the existing defences.

2.2.10 The Mary Rose and HMS Victory are located in safe areas to protect against ingress of salt water. A failure of these flood defences could cause irreparable damage to these important heritage landmarks.

2.2.11 There are few areas of recreational open space on Portsea Island. The majority of these areas of open space fringe the shoreline of Portsea Island and are therefore at the highest risk of flooding.







### **Strategic Issues**

2.2.12 Flood modelling has identified that each flood cell is a discrete flood risk area incorporating allowances for 70 years of sea level rise. As each flood cell is a discrete flood risk area, all of the frontages within each cell need to adopt the same standard to provide a consistent level of flood risk for each cell.

2.2.13 There are no shared assets between flood cells which would indicate a requirement to adopt consistent standards of protection for adjacent flood cells. However, provision of a consistent management regime across adjacent flood cells has been considered to avoid adverse effects on adjacent cells.

2.2.14 Table 4 summarises the extent of flood risk within each flood cell showing the number of residential properties at risk in the current year and takes account of climate change, to show the number of properties at risk following 100 years of sea level rise. The table also set out the current standard of protection and residual life of each frontage. The condition grade is given based on the National Sea and River Defence Surveys - Condition Assessment Manual (Environment Agency), where 1 is very good and 5 is very poor. Further information on the residual life is in the Coastal Defences Report.

**Table 4 – Summary of flood risk in each flood cell**

	Sub-cell	Defence data					Assets at risk (current year)			Assets at risk (year 100)		
		Condition	<sup>5</sup> AEP now (%) – overtopping	<sup>6</sup> AEP now (%) – residential flooding	AEP yr 100 (%)	Residual life	Residential properties at risk	Commercial properties at risk (AEP)	MoD properties at risk (AEP)	Residential properties at risk (AEP)	Commercial properties at risk (AEP)	MoD properties at risk (AEP)
Flood Cell 1	1a <sup>7</sup>	1	0.5	100	0.5	30+	2,311	202	0	3,932	377	0
	1b	4/3	100	100	>100	5-10						
	1c	3	0.5	0.5	>100	10-15						
	1d	3	10	0.5	>100	10-15						
	Other Comments						Typical Photos of the Existing Defences					
	Flood cell 1a (Old Portsmouth) is not considered within this Strategy plan <sup>7</sup> . Overtopping regularly occurs along this frontage causing damage to the promenade and foreshore. Flood cell 1 is the most exposed flood cell with the most aggressive wave climate. Land behind the defences is generally lower than the defence crest level representing a significant risk to life in the occurrence of a breach. (See the Economics Addendum)											
Flood Cell 2	2e	4	100	10	>100	5-10	102	4	15	198	4	17
	2f	5	0.5	0.5	0.5	< 5						
	2g	3	0.5	0.5	>100	10-15						
	Other Comments						Typical Photos of the Existing Defences					
	In addition to the assets listed above, the defences protect Fort Cumberland Scheduled Monument and 3 areas of known landfill. The flood cell includes Langstone Harbour Entrance Channel. Management regimes selected for flood cells 3 and 4 are reliant on a consistent approach being adopted for flood cell 2.											
Flood Cell 3	3h	5	0.5	4	>100	< 5	0	0	0	383	41	0
	Other Comments						Typical Photos of the Existing Defences					
	In addition to the assets listed above, the defences in this flood cell provide protection to 3 areas of known landfill.											









<sup>5</sup> The AEP which results in overtopping of the existing defences compromising public safety or structural stability.

<sup>6</sup> The AEP which causes flooding to residential property following a defence breach. Where defences are higher than current ground levels a breach would increase the risk of flooding. Where ground levels are the same as defence level breaches do not impact on overtopping and higher volumes of overtopping may be required to cause flooding to residential properties.

<sup>7</sup> The flood defences in sub-cell 1a were raised following completion of the Old Portsmouth Strategy Study (1999), providing a discrete flood risk area with a 0.5% AEP to be sustained over a 100 year period. The Scope of the Portsea Island Coastal Strategy Study omitted this area as the improvement works were being implemented at the strategy study was commenced in 2005, and any improvements resulting from recommendations within this Strategy will not impact on flood risk within Old Portsmouth



Table 4 (continued) – Summary of flood risk in each flood cell

	Sub-Cell	Defence data					Assets at risk (current year)			Assets at risk (year 100)						
		Condition	<sup>5</sup> AEP now (%)	<sup>6</sup> AEP now (%) residential	AEP yr 100 (%)	Residual life	Residential properties at risk (AEP)	Commercial properties at risk (AEP)	MoD properties at risk (AEP)	Residential properties at risk (AEP)	Commercial properties at risk (AEP)	MoD properties at risk (AEP)				
Flood Cell 4	4i	4	0.5	0.5	>100	5-10	1,414	147	0	4,234	490	2				
	4j	2-4	0.5	0.5	>100	5-30										
	4k	3/4	10	100	>100	5-10										
	4l	3/4	10	100	>100	5-10										
	Other Comments						Typical Photos of the Existing Defences									
	The majority of defences in this flood cell provide a high standard of protection (currently > 0.5% AEP), but the flat nature of the hinterland means that the low defences place a large number of assets at risk. The defences also protect Hilsea Lines Scheduled Monument, 5 areas of known landfill, the rail line and Eastern Road.						 									
Flood Cell 5	5m	3-5	10	1	>100	< 5	0	0	0	1	1	9				
	Other Comments						Typical Photos of the Existing Defences									
	Although there are few properties at risk of flooding, works are required to protect against leaching of contaminants from Tipner Landfill site. Tipner is a key development area identified within the Portsmouth City Local Plan and emerging Portsmouth Plan)						 									
Flood Cell 6	6n	3/4	0.5	10	>100	10-15	384	12	33	586	18	50				
	6o	1	0.5	N/A	50	50+										
	6p	1	0.5	N/A	50	50+										
	Other Comments						Typical Photos of the Existing Defences									
	Flood cells 6o & 6p outside the study area (Whale Island). In addition to the assets listed above the flood defences protect the Continental Ferry Port and M275 slip road. 384 res props currently at risk of 0.5% AEP storm to east of M27 slip road. Assessment show defences protect against overtopping for storm events with AEP < 0.5%						 									
Flood Cell 7	7q	1-4	2	0.5	>100	5-30	0	0	0	1	19	39				
	Other Comments						Typical Photos of the Existing Defences									
	In addition to the assets listed above the flood defences protection the Mary Rose, HMS Victory, Historic Dockyard & Royal Naval Base						 									

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## History of flooding

2.2.15 In Flood Cell 1 sections of the seawall regularly overtop (on average 6 times a year). During such storms Portsmouth City Council close sections of the coastal road. Storms can result in damage to the seawall and promenade and localised losses of beach material. Portsmouth City Council undertakes regular repair works to the affected areas at an average annual cost of £30k/year.

2.2.16 In December 1989 a breach occurred in an earth bund in flood cell 2, leading to extensive flooding of a caravan park and road. No internal flooding was experienced due to the use of sandbags. In February 1989 and December 1994 wave overtopping flooded a leisure centre plant room.

2.2.17 Localised overtopping has periodically occurred (most recently in 1995) within Flood Cell 4, resulting in temporary closures of the adjacent road. It is considered that this is a localised issue caused by focussing of wave energy against Great Salterns Quay. Historic evidence suggests that overtopping events of this nature occur approximately once every ten years. An assessment of the damages associated with flooding to the road network in flood cell 4 is included in the Economics Addendum Section 6.3.

## Time scale of strategy

2.2.18 This appraisal recommends proposals for new and existing schemes over 100 years.

## 2.3 Options Considered

2.3.1 The current SMP policy for Portsea Island is Hold the Line for all locations. The following strategic options however, were considered initially for each sub-cell:

- No Active Intervention – Do nothing (baseline option)
- Limited Intervention – Do minimum
- Hold the existing defence line
- Advance the existing defence line
- Managed re-alignment

2.3.2 Do nothing forms the baseline for the assessment of economic benefits of other do something options. It is not considered technically feasible due to the large number of assets that would be placed at increasing risk of flooding.

2.3.3 The do minimum option similarly places a large number of assets at risk of flooding and is technically not preferred. However, it is considered in the economic appraisal to determine the benefits associated with undertaking the least cost option.

2.3.4 Advance the existing defence line was not considered viable for the study area due to the resultant direct loss of habitat within the environmentally designated regions.

2.3.5 Managed re-alignment was considered for all frontages. It was, however, found to be unsuitable in all regions due to the presence of areas of contaminated landfill (estimated cost of remediating contamination within the flood risk area is approximately £750 million), the close proximity of built up areas and the local importance of amenity features such as the promenade and shingle beach.

2.3.6 For a hold the line option, a comprehensive range of standards of protection were considered:

- Maintain – existing defences maintained/replaced as necessary over the 100 year assessment period. Standard of protection provided to the hinterland falls in response to sea level rise.
- Sustain – Existing defences raised/replaced in response to sea level rise to ensure current level of protection is sustained over the 100 year assessment period. Likely to comprise 2 or 3 phases of raising.

- Improve – Existing defences are raised/replaced such that they provide a consistent standard of improved protection, also allowing for future sea level rise prediction. A range of different standards of protection were considered up to and including the level that would protect against a storm with a 0.1% annual probability.

2.3.7 Where possible, improvement options have considered the provision of a secondary line of defence. This option requires that the existing defence line is maintained to hold the existing line of defence against erosion and the secondary defence provides an improved standard of protection along an inland alignment.

2.3.8 Within each sub-cell, a wide range of engineering options has been considered to establish their suitability and sustainability. Table 5 below summarises the options that have been considered (excluding the Do nothing and Do Minimum options which have been considered for all Flood cells), those taken forward to the economic assessment and the option selected.

2.3.9 Full details of all the options considered and appraisal methodology employed are in the Coastal Defences Report (Appendix B – Technical Assessment of Options) and in the Strategic Environmental Assessment. Defence lengths that either do not meet the strategies recommended safe standard of protection or where defences are visually assessed as having a low residual life will be prioritised. More detailed site investigations on the condition of all structures (especially under extreme loads) will be required during the project appraisal stage which should consist of non-destructive testing (e.g. radar surveys) and destructive testing (e.g. trial holes) in order to focus investment where it is most needed.

**Table 5 - Options Considered for Each Flood Cell**

Flood Cell	Options considered	Comment	Shortlisted	Selected
<b>1</b> SMP Policy – Hold the line  Indicative Range (1% AEP – 0.3% AEP)  AEP considered (improve options) 2%, 1%, 0.5%, 0.3%, 0.2%, 0.1%	Hold the line (Maintain)	Large number of assets at increasing risk of flooding. <sup>8</sup>	✓	×
	Hold the line (Sustain <20%AEP)	Large number of assets at risk of flooding <sup>8</sup>	✓	×
	Hold The Line Improve (Crest wall)	Reduced views from road and promenade <sup>8</sup>	✓	×
	<b>Hold the line Improve (Splash Wall)</b>	<b>Views from promenade retained. Reduced views from road. Option preferred over crest wall where there is sufficient space. Where insufficient space a crest wall is proposed<sup>8</sup></b>	✓	<b>✓ 0.5%AEP</b>
	Hold the line Improve (Shoreline Control)	Shoreline control not possible without large engineering structures which would impact shipping	×	×
	Hold the line Improve (Beach recharge)	Beach recharge not sustainable	×	×
	Hold the line Improve (secondary Defence)	Secondary defence possible around Southsea Common. Expensive option <sup>1</sup>	✓	×
<b>2</b> SMP Policy – Hold the line  Indicative Range (1% AEP – 0.3% AEP)  AEP considered (improve options) 1%, 0.5%, 0.3%, 0.2%, 0.1%	Hold the line (Maintain)	Increasing flood risk. Option provides few benefits	✓	×
	Hold the line (Sustain at 1.3% AEP – crest wall)	Suitable option but not economically preferred. Causes a loss of some seaward views	✓	×
	<b>Hold The Line Improve (Crest wall)</b>	<b>Preferred option reduced seaward views.</b>	✓	<b>✓ 0.5%AEP</b>
	Hold the line Improve (Splash Wall)	No suitable locations for splash walls	✓	×
	Hold the line Improve (Shoreline Control)	Shoreline control not possible without large and costly structures.	×	×
	Hold the line Improve (Beach recharge)	Beach recharge not sustainable	×	×
	Hold the line Improve (secondary Defence)	No suitable locations for secondary defences.	×	×

<sup>8</sup> Options include provision of rock toe protection for defences adjacent to the sea life centre and war memorial in flood cell 1b. In this location there is no natural supply of beach sediment from the east resulting in a net loss of material particularly following storm events. This net loss of beach sediment results in undermining of the defences causing structural damage – Portsmouth City Council undertake annual beach management in this area to maintain beach levels. These annual beach management costs are included in the maintenance costs for flood cell 1. Beach levels along the remainder of Flood Cells 1 and 2 are stable with a natural accumulation of material occurring to the eastern extent of flood cell 1. A fully developed beach management plan will be adopted as part of the preferred option for flood cell 1. The preferred option included in the StAR submitted to LPRG in September 2009 included a length of demountable flood defences in flood cell 1. This option was reviewed to address issues raised by LPRG and the preferred option has been changed to a permanent solution along the whole frontage. See the Portsea Island Coastal Strategy Study, Addendum to the Economics Report, Halcrow 2010 for more details.

**Table 5 (continued) - Options Considered for Each Flood Cell**

Flood Cell	Options considered	Comment	Shortlisted	Selected
<b>3</b> SMP Policy – Hold the line  Indicative Range (1% AEP – 0.3% AEP)  AEP considered (improve options) 0.3%, 0.2%, 0.1%	Hold the line (Maintain)	Flood risk increases greatly with small increments in water level	✓	x
	<b>Hold the line (Sustain at 0.5% AEP)</b>	<b>Existing defences provide high SoP in sheltered region. Defences raised in response to sea level rise. Defences raised with mixture of seawalls and embankments</b>	✓	✓ <b>0.5%AEP</b>
	Hold The Line Improve (new seawall)	Standard of protection improved to provide higher SoP than current.	✓	x
	Hold The Line Improve (replace seawall with embankment)	Standard of protection improved to provide higher SoP than current.	✓	x
	Hold the line Improve (Shoreline Control)	Not appropriate in harbour area	x	x
	Hold the line Improve (Beach recharge)	Not appropriate in harbour area	x	x
	Hold the line Improve (secondary Defence)	No suitable locations for secondary defences	x	x
<b>4</b> SMP Policy – Hold the line  Indicative Range (1% AEP – 0.3% AEP)  AEP considered (improve options) 0.3%, 0.2%, 0.1%	Hold the line (Maintain)	Large number of assets at increasing risk of flooding	✓	x
	<b>Hold The Line Improve &amp; sustain at 0.5% AEP (new seawalls &amp; embankments)</b>	<b>Where possible it is preferred to raise the defences as splash walls to limit the impact on seaward views. The preferred option involves a mixture of splash walls and new online defences. Existing defences provide high SoP in sheltered region – some low defences impact on current flood risk but it is assumed that sustain option is based on average SoP for flood cell as whole at 0.5% AEP.</b>	✓	✓ (0.5% AEP – sustain)
	<b>Hold The Line Improve &amp; sustain at 0.5% AEP (new splash wall)</b>			
	Hold the line Improve (Shoreline Control)	Not appropriate in harbour area	x	x
	Hold the line Improve (Beach recharge)	Not appropriate in harbour area	x	x
	Hold the line Improve & sustain (secondary Defence at Great Salterns Quay) –	Additional secondary defence at Great Salterns Quay to protect against localised flooding caused by wave focussing at narrowed channel. Proposal additional over and above other improve & sustain options	✓	x
<b>5</b> SMP Policy – Hold the line  Indicative Range (10% AEP – 1% AEP)  AEP considered (improve options) 1%, 0.5%, 0.3%, 0.2%, 0.1%	<b>Hold the line (Maintain)</b>	<b>Standard of protection falls but option secures contaminated land against erosion.</b>	✓	✓ <b>(AEP drops)</b>
	Hold the line sustain and improve (sustain at 1.3% AEP) – New embankment.	Few additional benefits achieved by raising defences	✓	x
	Hold the line sustain and improve (sustain at 1.3% AEP) – new hard structures	Few additional benefits achieved by raising defences	✓	x
	Secondary Defences with hold the line option along main shoreline	No suitable locations for secondary defences	x	x

**Table 5 (continued) - Options Considered for Each Flood Cell**

Flood Cell	Options considered	Comment	Shortlisted	Selected
<b>6</b>  SMP Policy – Hold the line  Indicative Range (1% AEP – 0.3% AEP)  AEP considered (improve options) 1%, 0.5%, 0.3%, 0.2%, 0.1%	Hold the line (Maintain)	Large number of assets at increasing risk of flooding	✓	x
	<b>Hold the line (Sustain at 1.3%AEP)</b>	<b>Preferred option</b>	✓	✓ (1.3% AEP)
	Hold the line (Improve) – raise quay wall	Benefits achieved in raising defences do not warrant additional expenditure	✓	x
	Hold the line (Improve) – construct new splash wall	Benefits achieved in raising defences do not warrant additional expenditure	✓	x
	Hold the line Improve (Shoreline Control)	Not appropriate in harbour areas	x	x
	Hold the line Improve (Beach recharge)	Not appropriate in harbour areas	x	x
	Hold the line Improve & sustain (secondary Defence)	Secondary defence possible at M275 underpass – costly option with reduced benefit area	✓	x
<b>7</b>  SMP Policy – Hold the line  Indicative Range (1% AEP – 0.3% AEP)  AEP considered (improve options) 0.3%, 0.2%, 0.1%	Hold the line (maintain)	Large number of assets at increasing risk of flooding	✓	x
	Hold the Line sustain & improve (sustain at 0.5%AEP) – Raise quay level	Existing defences provide High SoP. Little additional benefit in raising defences further. Raising quay walls impacts on dock operations	✓	x
	<b>Hold the line sustain &amp; improve (sustain at 0.5% AEP) – new splash Wall</b>	<b>Less impact on dock operations. Ramps can be provided to maintain access at agreed locations.</b>	✓	✓ (0.5%AEP)
	Hold the line (Sustain & Improve) – Shoreline control	Not appropriate in deep channelled areas	x	x
	Hold the line (Sustain & Improve) – beach recharge	Not appropriate in deep channelled areas	x	x
	Hold the line (Sustain & Improve) – secondary Defence	Key assets close to existing shoreline – secondary defences not suitable	x	x

### Standard of protection considered

2.3.10 The standards of protection considered for each flood cell have been selected at appropriate ranges above the standard currently provided by the existing defences. Options have not been considered for standards of protection lower than those currently provided. For flood cells that have defences which provide a range of different standards of protection, the most abundant standard currently provided was selected as the average and used as the standard of protection for the sustain option. Improvement options then considered standards above this.

## 2.4 Costs of options

2.4.1 This section contains a summary of the costing methodology. The Economics Appendix includes the cost streams for all options over the 100 years Key Plan 3e shows a flow diagram detailing how the PV damages were built up.

2.4.2 Costs have been estimated and updated to a base date of Quarter 2 2009 for each of the short listed options over the appraisal period, including:

- a) Capital works costs
- b) Consultancy fees (design and site supervision)
- c) Portsmouth City Council costs
- d) Maintenance costs

2.4.3 Appendix F of the Economics Report contains a summary of primary costs for each 'do something' option on every defence length surrounding the study area. Appendix F of the Economics Report also includes the breakdown detailing how the construction costs were estimated.

2.4.4 When schemes are developed, discussions will need to be held to confirm potential sources of project funding and contributions from a range of organisations, including investigation of levy funding and partnership funding. The primary source of funding will be via Environment Agency Flood Risk Management Capital Grant and there are opportunities for contributions from the MoD

#### **Methodology for assessing costs**

2.4.5 Construction and maintenance costs were based mainly on location specific information, where supplied, supplemented by a survey undertaken as part of the National Appraisal of Economic Assets at Risk study for Defra, the Flood Defence Investment Strategy for the Environment Agency and costs on recent similar projects including the Swinefleet and Brough Flood Defence Improvement Schemes (Humber Estuary), Southwold Flood Defence Improvements and the Roach and Crouch Strategy..

2.4.6 Intervention works for each option are split into five phases, depending on the residual life of the defence.

2.4.7 Costs are included for the provision of compensatory habitat to offset the losses caused by coastal squeeze. Costs are included at a rate of £75k/ha, as advised by SRHCP team (appropriate costs for provision of intertidal habitat). The cost includes allowance for land purchase and appropriate environmental enhancements to create the required habitat.

2.4.8 An optimism bias of 60% has been applied to all costs, which were discounted using the current Treasury variable discount rates.

2.4.9 A summary of the whole life cash and present value costs for all options considered is shown in Table 6 below:

**Table 6 – Whole life Cash and Present Value Costs for Options Assessed**

Flood Cell	Options Considered									
	Do Min	Maint	Sus	2% AEP	1% AEP	0.5% AEP	0.3% AEP	0.2% AEP	0.1% AEP	Sec defence <sup>9</sup>
1	1,734	113,777	130,079	127,002	132,992	136,469	141,202	145,936	155,403	152,654
2	677	33,234	37,835		40,149	40,247	42,659	45,071	49,895	
3	307	7,888	9,438				9,769	10,100	10,761	
4	2,362	84,658	95,622				100,546	103,178	110,735	
5	499	11,997	15,010		15,003	15,601	16,203	16,807	18,024	
6	619	28,027	43,439		40,898	42,162	43,425	44,689	47,216	36,663
7	1,403	31,559	34,361				35,295	36,229	38,096	
<b>PV costs (£k)</b>										
1	1,166	38,514	49,566	53,326	55,932	57,447	59,508	61,568	65,690	63,691
2	455	13,437	15,271		16,146	16,367	17,463	18,559	20,751	
3	206	4,251	4,719				4,850	4,980	5,242	
4	1,588	35,755	46,419				48,564	49,731	53,043	
5	336	5,324	6,187		6,520	6,767	7,014	7,262	7,758	
6	416	9,210	13,332		15,832	16,317	16,802	17,287	18,258	15,765
7	944	9,650	10,737				11,033	11,328	11,918	

<sup>9</sup> Secondary defence option considers provision of 0.5% AEP level at the line of the secondary defence

### Capital, future construction and maintenance costs

2.4.10 Capital costs for the preferred option for each of the flood cells are shown in Table 7 below together with future and maintenance costs over the 100 year strategy appraisal period.



**Table 7 - Strategy expenditure profile (£k)**

Flood Cell / Item (£k)	Flood Cell 1	Flood Cell 2	Flood Cell 3	Flood Cell 4	Flood Cell 5	Flood Cell 6	Flood Cell 7	Total
Responsible Authority	PCC FDGiA	Landowner/ developer	Landowner/ PCC	PCC FDGiA	MoD/ Developer	Landowner/ PCC	MoD	
Costs pre StAR (assumed spread evenly between flood cells – Consultant and PCC fees)								
Total sunk costs since 2000	64	64	64	64	64	64	64	449
Professional fees (Portsmouth City Council and Consultant)	1,336	185	0	879	56	0	242	<b>2,698</b>
Investigations	2,087	402	0	2,296	137	0	327	<b>5,249</b>
Construction (first 10 years)	20,591	2,681	0	13,485	616	0	3,179	<b>40,552</b>
Environmental enhancements	626	121	0	689	41	0	98	<b>1,575</b>
Habitat Replacement	253	1,319	0	9,428	740	0	62	<b>11,802</b>
Compensation <sup>10</sup>	28	19	0	45	12	0	27	<b>131</b>
Contingency (%)	14,953 (60)	2,836 (60)	0	16,093 (60)	962 (60)	0	2,361 (60)	<b>37,205</b>
Inflation @5% per annum	7,974 (4yrs)	2,236 (6yrs)	0	10,818 (5yrs)	897 (7yrs)	0	3,148 (10yrs)	
<b>Total Capital Cost</b>	<b>47,848</b>	<b>9,799</b>	<b>0</b>	<b>53,733</b>	<b>3,461</b>	<b>0</b>	<b>9,444</b>	
Future construction costs (including professional fees and 60% contingency) beyond first 10 years	90,971	29,788	8,257	44,478	7,513	41,057	22,667	<b>244,731</b>
Maintenance (including contingency)	5,624	2,896	1180.8	8,229	1,920	2,382	5,398	<b>27,630</b>
Whole life cash cost with 60% contingency inc. maintenance but without inflation, or pre-StAR fees	136,469	40,247	9,438	95,622	11,997	43,439	34,361	<b>371,573</b>

<sup>10</sup> Compensation based on 3m wide footprint throughout at £19k/ha. However, in most locations the footprint will be within the current footprint of the defences and as the defences are predominantly PCC owned will not require compensation.

## 2.5 Benefits of Options

2.5.1 The economic benefits used are the total Present Value of all flood risk damage avoided within each flood cell and together these amount to approximately £1.25 billion over the Strategy life. Benefits associated with erosion risk are not included since it is not considered possible to accurately determine the effects of erosion. This is because there is no historic evidence to suggest potential erosion rates, as Portsea Island has been protected by hard flood defences, or the coastline has been altered by reclaiming land, for the period over which records are available. Due to the low lying nature of the hinterland, flooding is also considered to be the primary risk, particularly following a breach in the existing defences. Detail of the economic appraisal is contained in the Economics Report with some outline data provided in Key Plan 3. Key Plan 3 includes a flow diagram showing how the flood damages were built up (Key Plan 3e) The following sections contain a summary only.

2.5.2 The benefit of options has been quantified through assessment of the flood depths expected for a range of return periods. Property flood damages were capped at the market value of the asset and the price date for benefits is Quarter 2 2009.

2.5.3 Flood damages were estimated for Do Nothing, Do Minimum, Maintain, Sustain and a full range of Improvement options, giving a range of standards from 100% (1 in 1 year) to a 0.1% (1 in 1000 year) annual probability storm events. The extent and depth of flooding has been approximated for eight different extreme storm events using the ISIS flood propagation software.

2.5.4 Climate change has been accounted for by modelling the extent of flooding using the current predictions of sea level rise at 5 different time periods accounting for 60mm (year 15), 180mm (year 30), 300mm (year 45), 600mm (year 70) and 1017mm (year 100) sea levels.

2.5.5 The assessment of flood damages to properties made use of the Flood Hazard Research Centre (FHRC) at the University of Middlesex's "Multi-Coloured Manual" (MCM) (FHRC, 2003). This has been updated to current price date (2009 Quarter 2) using Consumer Price Index.

2.5.6 Assessment of flood damages to properties in the Strategy has been carried out on a statistical basis, using property types and the benefits assessment has focussed primarily on tangible damage to property. The benefits were calculated on a flood cell basis. The flood cells are shown on Key Plan 1. There is no interdependency of flooding between the flood cells. Assessing benefits on a flood cell basis enables full optimisation and prioritisation of schemes for discrete lengths of the study frontage.

2.5.7 Benefits have been appraised in accordance with Flood and Coastal Defence Project Appraisal Guidance (FCDPAG) 3 and supplementary Defra guidance notes taking into account Treasury guidelines (The Green Book - Appraisal and Evaluation in Central Government). The appraisal includes assessments for social deprivation weighting and human related intangible benefits

2.5.8 Due to the risk associated with leaching of contaminants in the event of a breach of the defences within flood cell 5, the preferred option has been selected on a cost effectiveness basis rather than a full benefit cost assessment. The predicted benefits, costs and optimism bias score for flood cell 5 are presented.

2.5.9 The PV benefits for the full range of options considered is summarised in Table 8 below:

**Table 8 – Summary of PV Benefit by Flood Cell**

Option	PV Benefit (£k)						
	Flood Cell 1	Flood Cell 2	Flood Cell 3	Flood Cell 4	Flood Cell 5	Flood Cell 6	Flood Cell 7
<b>Do Nothing</b>	0	0	0	0	0	0	0
<b>Do Minimum</b>	8,751	143	3	24,964	3,904	374	0
<b>Maintain</b>	225,258	1,023	10,287	199,103	7,593	1,741	17,342
<b>Sustain</b>	546,070	13,083	11,792	568,529	7,958	34,217	26,268
<b>Secondary Defences</b>	578,045					23,930	
<b>2% AEP</b>	561,111						
<b>1% AEP</b>	579,667	13,643			8,379	35,893	
<b>0.5% AEP</b>	585,753	15,062			8,806	37,094	
<b>0.3% AEP</b>	587,374	15,222	11,851	574,086	8,949	37,495	26,317
<b>0.2%AEP</b>	588,647	15,350	11,899	578,459	9,063	37,815	26,357
<b>0.1% AEP</b>	589,603	15,445	11,935	581,707	9,148	38,055	26,386

## 2.6 Environmental and social issues

2.6.1 The key social and environmental issues are the population at risk from flooding, the internationally and nationally designated sites for nature conservation and the visual impacts caused by raising the defences to provide the requisite standard of protection.

2.6.2 The Strategic Environmental Assessment (SEA) assesses impacts on all relevant receptors. Section 6 of the SEA assesses the environmental impacts of the options considered in the strategy.

2.6.3 The Strategy seeks to plan sustainable, technically sound, environmentally acceptable and economically viable flood and erosion risk management for the study area, to minimise impacts on the designated nature conservation sites and to identify opportunities for biodiversity enhancements.

2.6.4 Natural England have agreed the Appropriate Assessment (AA) and provided a letter of support for the Strategy (see letter of support B attached at the end of this document).

### Population at risk

2.6.5 Portsea Island forms the major part of the city of Portsmouth on the Hampshire coast. It is one of the most heavily urbanised and densely populated areas of Britain, containing major residential, commercial, military and historical assets. The Continental Ferry Port, the hovercraft terminal and the area of Southsea on the southern coast of Portsea Island are important to the tourist industry in addition Portsmouth Port is a “gateway” port and the second largest in England. This coupled with the tourist interests make a significant contribution to the local economy.

2.6.6 The most important issue relating to the population and human health is the risk to life from flooding. In excess of 9,000 residential properties are vulnerable to the devastating effects of flooding with associated stress and adverse impact on the quality of life to the inhabitants. The Strategy will address this by proposing an appropriate standard of defence

for protecting these households commensurate with the risk. A risk to life assessment has been undertaken for flood cells 1 and 4 where risk to life from flooding is considered to be a major concern (see the Economics Addendum). This assessment revealed that the preferred option provided PV benefits associated with risk to life alone of £114 million (flood Cell 1) and £98 million (flood cell 4)

2.6.7 A further risk to health is flooding of critical infrastructure such as roads (preventing access by emergency services) and sewage works (which could cause sanitation problems).

### **Designated nature conservation interest**

2.6.8 Portsmouth and Langstone Harbours are designated internationally (SAC/SPA/Ramsar site) and nationally (SSSI) for their nature conservation importance; there are also local designations landward of the existing defences. The strategy addresses the mitigation of coastal squeeze by identifying suitable methods of providing habitat replacement through the development of a Regional Habitat Creation Programme. :

### **Appropriate Assessment (AA)**

2.6.9 The Strategy will have an adverse effect on the designated within Portsmouth and Langstone Harbours. Since there are no alternative solutions and there is a case of overriding public interest, compensatory habitat will need to be provided.

2.6.10 In consultation with Natural England the assessment showed that the following significant impacts on the interest features of the environmentally designated sites may result from the proposed options.

- a) Loss of salt marsh, intertidal mudflats and sand flats and cordgrass swards due to 'coastal squeeze' against the fixed sea defence, which would impact upon the feeding and roosting behaviour of birds within the SPA.
- b) Temporary noise and visual disturbance during the construction works
- c) Permanent change in view lines for birds within the SPA, as a result of raising defences in some flood cells.

2.6.11 The results determined that the estimated loss of intertidal habitat due to coastal squeeze over the 100 year assessment period was 56.1ha and that a further 132 Ha of habitat will change from upper to lower salt marsh.

2.6.12 Alternative options that would meet the objectives and purpose of the strategy and have a lesser impact on the Natura 2000 sites would involve a retreated alignment of defence. These options are unsuitable for the study area due to the close proximity of residential properties, the presence of areas of contaminated landfill and the recreational importance of areas of open space to the city of Portsmouth.

2.6.13 Defra are satisfied that Imperative reasons of overriding public interest (IROPI) have been demonstrated for progressing the Strategy due to the adverse effect that it will cause. A copy of Defra's letter can be found in the Letter of Support section at the back of this document. The IROPI reasons are summarised as:

- a) Managing flood risk for public safety (9,335 residential buildings at risk).
- b) Social and economic benefits (£1.25 billion of potential flood damages protected by the proposed improvement works).
- c) National Security (HM Naval Base and other MoD assets at risk).
- d) Environmental protection (designated sites would be at risk following a breach and potential release of contaminants into the harbour areas).

2.6.14 Adverse effect on integrity of the environmentally designated sites will require the provision of compensatory habitat. No sites for compensatory habitat are available within Portsea Island so replacement intertidal habitat will be sought through a Regional Habitat Creation Programme. This will draw on the recommendations from the Coastal Habitat Management Plan, various coastal risk management strategies and the Solent Dynamic Coast Project.

2.6.15 The location and nature of replacement habitat provision will be agreed with Natural England in advance of implementation of any schemes. It is presently envisaged that a balance of gains and losses of intertidal habitat can be achieved across six strategies and schemes within Langstone, Portsmouth and Chichester Harbours. Costs for compensating for the 56 and 132ha of losses and changes in habitat due to coastal squeeze and climate change are included within this strategy. Habitat losses will be provided through the Regional Habitat Creation Programme which is currently under production.

### Visual Impact

2.6.16 Assessments have been completed to determine the changes in visual amenity within the study area that would be experienced by pedestrians, vehicle travellers and property owners over the lifetime of the strategy as a result of implementing the preferred strategic options. The results of this assessment are summarised in Table 9.

**Table 9 - Summary of Visual Impacts in Year 0, Year 50 and Year 100**

Receptor	Defence Lengths (km)		
	Existing or Partial View in Year 0	Partial or Complete view in Year 50	Partial or Complete View in Year 100
Vehicle Travellers	9.7	8.8	4.4
Standing Children	15.7	14.5	9.0
Standing Adults	16.7	16.7	12.3
Property Occupants	7.0	4.7	2.9

2.6.17 The results show that the length of the sea front affording a sea view will reduce in future years as a result of raising the levels of sea walls. In some instances, the impact on pedestrians can be wholly or partially mitigated by raising promenade levels or constructing raised walls landward of the promenade. These mitigation measures have been included within the PV costs as an additional 3% above capital cost and would need to be considered in more detail at scheme stage.

### Cultural, Archaeological and Material Assets

2.6.18 There are 40 Scheduled Monuments in the study area, which form a vital part of the City's historical heritage. Large clusters of Conservation Areas are present around the southern shoreline of the island and the historic dockyard (including HMS Victory, HMS Warrior and Mary Rose). There are a large number of listed buildings, and over 70 sites of archaeological interest within the study area. Localised managed realignment would adversely affect these assets.

### Tourism and Recreation

2.6.19 Southsea common is heavily used for informal recreational pursuits, and more formal tourism/recreation activities, including an aquarium, miniature railway, Southsea Castle and D-Day museums, Pyramids Centre swimming pool complex and the Rock Gardens. Extensive recreational use is made of shingle beaches spanning the entire southern coastal fringe, backed by various promenades. Clarence Pier is the largest amusement park on the south coast and boasts all manner of amusements, rides and activities for all the family.

2.6.20 The main recreational pursuits within Portsmouth Harbour are sailing, angling, canoeing and rowing, which are predominantly undertaken by local clubs and societies. Langstone Harbour is heavily used for sailing, fishing, windsurfing, sub-aqua sports and water ski-ing. There is a marina containing approximately 300 berths at Eastney Lake. Options should seek to maintain and where possible enhance these facilities.

### Consultation

2.6.21 Consultation was undertaken with statutory and interested parties to establish their views during the development of the strategy. In 2000, statutory and non-statutory parties

were consulted by Halcrow to describe the background to the strategy, to identify baseline information and to ascertain interest in the strategy. Following this initial consultation, Halcrow undertook a second round of consultation in July 2002 to establish the stakeholder's interests and concerns and collate additional data for the area. A final round of consultation was held in April 2008 where both statutory and non-statutory consultees were invited to attend a public exhibition and provide comment on the strategy proposals.

2.6.22 Support for the strategy has been received from the local community and other bodies. Further stakeholder 'scheme design' workshops will be hosted for the new schemes during the production of scheme PARs.

### **Environmental Enhancements**

2.6.23 As well as mitigating against a reduction in visual amenity due to defence raising, as described in 2.6.17 there are localised opportunities to provide enhancement in visual amenity. This would be done by raising the levels of promenades to a greater extent than existing defences as well as/or constructing raised seawalls on the landward side of the promenade. These measures have been discussed in the SEA and should be taken forward and developed further at scheme stage. The provision of a landscape plan as part of wider regeneration proposals will determine suitable measures to further enhance the environment. Key Plan 4 shows a summary of the environmental enhancements that have been identified

2.6.24 During the project planning and design stages of any schemes all opportunities for gaining any additional benefits will be explored. For example, integration with Portsmouth City Council's Seafront Strategy to deliver a joint coastal defence and landscape enhancement project and working closely with the City's Traffic and Transportation section could, where appropriate, increase the public's access for all to the coast.

## **2.7 Choice of Preferred Option**

### **Appraisal Process**

2.7.1 Following a review of the current defences and coastal processes (see Coastal Processes Report, Coastal Defences Report and Numerical Modelling Report), the baseline conditions were established, enabling a full understanding of the Do Nothing option.

2.7.2 The policies recommended by the Shoreline Management Plan were reviewed and the Strategy objectives were selected. The strategic options were then reviewed against the strategy objectives for each flood cell, and those that were found to be unsuitable were rejected. This identified which policies were viable for each frontage. A list of potential options was then compiled for each frontage.

2.7.3 The list of options was evaluated against cost, operation and maintenance requirements, environmental impacts and other general advantages or disadvantages to determine the technically and environmentally preferred option. This process drew on information in the Strategic Environmental Appraisal and the Coastal Defences Report. The results of this assessment are summarised below in Table 10

**Table 10 – Summary Assessment of Preferred Option**

Reach	Sub-cell	Option & Impact Assessment			
		Do Nothing	Maintain	Do Something 1 (Varies)	Do Something 2 (Varies)
1 Southsea	A				
	B	Moderate negative	Neutral	Crest Wall Moderate negative	Splash wall <sup>11</sup> Moderate negative
	C	Moderate negative	Neutral	Crest Wall Moderate negative	Splash wall <sup>11</sup> Moderate negative
	D	Moderate negative	Neutral	Crest Wall Moderate negative	Splash wall <sup>11</sup> Moderate negative
2 Fraser Battery	E	Moderate negative	Neutral	Crest Wall Moderate negative	Splash wall <sup>11</sup> Moderate negative
	F	Neutral	Neutral	Crest Wall Neutral	
	G	Negative	Neutral	Raise revetment Neutral	
3 Eastney	H	Negative	Moderate positive	Crest Wall Moderate positive	Flood bank Positive
4 Portsea North	I	Negative	Positive	Raised wall Moderate Positive	Flood bank Positive
	J	Negative	Positive	Raised wall Moderate Positive	Setback defence Positive
	K	Negative	Positive	Crest wall Moderate Positive	Flood bank Positive
	L	Negative	Positive	Crest wall Moderate Positive	Flood bank Positive
5 Tipner	M	Negative	Positive	Raise Wall Positive <sup>12</sup>	Setback defence Positive
6 Continental Ferry Port	N	Moderate negative	Neutral	Raise quay Neutral	Setback defence Neutral
	O				
	P				
7 H M Naval Base	Q	Negative	Negative	Raised Quay Positive	Setback defence Negative

Environmentally preferred option

Technically preferred option

<sup>11</sup> Where possible - along certain lengths there is not sufficient space for a splash wall. Moderate negative impact is in relation to reduced visual amenity caused by raising defence crest wall where there is no space for a splash wall. This can be mitigated by raising promenade levels.

<sup>12</sup> Although the environmentally preferred option would be to provide a higher standard of protection to the potentially contaminated landfill, the maintain option manages the risk at best cost and is therefore considered technically preferred and environmentally acceptable and is chosen as the preferred option

2.7.4 The suitable options were compared economically and the preferred option was selected using the decision process detailed in FCDPAG3. The proposed option for each frontage is given in Table 5 of Section 2.3. The benefit /cost summary table and outcome measures for each Flood Cell is presented below.

## Flood Cell 1 – Southsea

2.7.5 The benefit cost summary table for Coastal Cell 1 is shown below. The preferred option is hold the line of defence and improve the standard of protection to 0.5% AEP.

**Table 11 - Benefit Cost Summary Table for Flood Cell 1**

	Costs and benefits £k										
	Option 1 (do nothing)	Option 2 Do Minimum	Option 3 Maintain (<20% AEP falling to >100% AEP)	Option 4 Sustain (at < 20% AEP)	Option 5 Improve 2% AEP	Option 6 Improve 1% AEP	Option 7 Improve 0.5% AEP	Option 8 Improve 0.3% AEP	Option 9 Improve 0.2% AEP	Option 10 Improve 0.1% AEP	Option 11 Improve2
PV costs PVc		1,166	38,514	49,566	53,326	55,932	57,447	59,508	61,568	65,690	63,691
PV damage PVd	463,523	461,958	315,845	31,125	19,464	9,608	4,812	3,191	1,918	962	12,520
PV damage avoided		1,565	147,678	432,398	444,059	453,915	458,711	460,332	461,605	462,561	451,003
Risk to life Damages	113,672	106,485	36,092	-	-	-	-	-	-	-	-
PV assets Pva	-	-	-						-	-	-
PV asset protection benefits (HRIB)		-	-	-	3,383	12,080	13,370	13,370	13,370	13,370	13,370
Risk to Life Benefits		7,187	77,579	113,672	113,672	113,672	113,672	113,672	113,672	113,672	
Total PV benefits PVb		8,751	225,258	546,070	561,114	579,667	585,753	587,374	588,647	589,603	464,373
Net Present Value NPV		7,586	186,744	496,504	507,789	523,735	528,306	527,866	527,079	523,913	400,683
Average benefit/cost ratio		7.51	5.85	11.02	10.52	10.36	10.20	9.87	9.56	8.98	7.29
Incremental benefit/cost ratio			5.80	29.03	4.00	7.12	4.02	0.79	0.62	0.23	-5.78

## Flood Cell 2 – Fraser Battery

2.7.6 The benefit cost summary table for Flood Cell 2 is shown below. The preferred option is hold the line of defence and improve the standard of protection to 0.5% AEP.

**Table 12 - Benefit Cost Summary Table for Flood Cell 2**

	Costs and benefits £k								
	Option 1 (do nothing)	Option 2 Do Minimum	Option 3 Maintain (1.3% AEP falling to >100% AEP)	Option 4 Sustain (at 1.3% AEP)	Option 5 Improve 1% AEP	Option 6 Improve 0.5% AEP	Option 7 Improve 0.3% AEP	Option 8 Improve 0.2% AEP	Option 9 Improve 0.1% AEP
PV costs PVc	0	455	13,437	15,271	16,146	16,367	17,463	18,559	20,751
PV damage PVd	14,923	14,780	13,900	1840.79	957.53	479	319	191	96
PV damage avoided		143	1,023	13,083	13,083	14,444	14,604	14,732	14,828
PV assets Pva									
PV asset protection benefits (HRIB)					561	618	618	618	618
Total PV benefits PVb		143	1,023	13,083	13,643	15,062	15,222	15,350	15,445
Net Present Value NPV		-312	-12,414	-2,189	-2,503	-1,305	-2,241	-3,209	-5,305
Average benefit/cost ratio		0.31	0.08	0.86	0.84	0.92	0.87	0.83	0.74
Incremental benefit/cost ratio			0.07	6.58	0.64	6.43	0.15	0.12	0.04



## Flood Cell 3 – Eastney Lake

2.7.7 The benefit cost summary table Flood Cell 3 is shown below. The preferred option is to sustain the current standard of protection (0.5% AEP) against predicted levels of sea level rise.

**Table 13 - Benefit Cost Summary Table for Flood Cell 3**

	Costs and benefits						
	Option 1 (do nothing)	Option 2 Do Minimum	Option 3 Maintain (0.5% AEP falling to >100% AEP)	Option 4 Sustain (at 0.5% AEP)	Option 5 Improve 0.3% AEP	Option 6 Improve 0.2% AEP	Option 7 Improve 0.1% AEP
PV costs PVc	-	206	4,251	4,719	4,850	4,980	5,242
PV damage PVd	11,971	11,968	1,684	179	119	72	36
PV damage avoided		3	10,287	11,792	11,851	11,899	11,935
PV assets Pva	-	-	-	-	-	-	-
PV asset protection benefits (HRIB)		-	-	-	-	-	-
Total PV benefits PVb		3	10,287	11,792	11,851	11,899	11,935
Net Present Value NPV		- 204	6,036	7,073	7,002	6,919	6,693
Average benefit/cost ratio		0.01	2.42	2.50	2.44	2.39	2.28
Incremental benefit/cost ratio			2.54	3.22	0.46	0.36	0.14

## Flood Cell 4 – Portsea Island (North)

2.7.8 The benefit cost summary table for Flood Cell 4 is shown below. The preferred option is to sustain the current standard of protection (0.5% AEP) against predicted levels of sea level rise.

**Table 14 - Benefit Cost Summary Table for Flood Cell 4**

	Costs and benefits £k						
	Option 1 <sup>13</sup> (do nothing)	Option 2 Do Minimum	Option 3 Maintain (0.5/10% AEP falling to >100% AEP)	Option 4 Sustain (at 0.5% AEP)	Option 5 Improve 0.3% AEP	Option 6 Improve 0.2% AEP	Option 7 Improve 0.1% AEP
PV costs PVc	-	1,588	35,755	46,419	48,564	49,731	53,043
PV damage PVd	481,082	467,352	370,364	16,241	10,828	6,497	3,248
PV damage avoided		13,730	110,718	464,841	470,255	474,586	477,834
Risk to Life Damages	97,795	86,561	9,410	186	42	-	-
PV assets Pva	-	-	-	-	-	-	-
PV asset protection benefits (HRIB)		-	-	6,078	6,078	6,078	6,078
Risk to Life Benefits		11,234	88,385	97,609	97,753	97,795	97,795
Total PV benefits PVb		24,964	199,103	568,529	574,086	578,459	581,707
Net Present Value NPV		23,376	163,348	522,110	525,522	528,728	528,664
Average benefit/cost ratio		15.72	5.57	12.25	11.82	11.63	10.97
Incremental benefit/cost ratio			5.10	34.64	2.59	3.75	0.98

<sup>13</sup> Do nothing damages include the cost for provision of localised defences to protect the rail line in year 30 (the period at which it is considered that climate change will represent a significant flood risk to the asset). Do nothing damages to major roads (A2030 & A2047) have been based on a least cost approach of increasing maintenance costs relative to climate change. See the Portsea Island Coastal Strategy Study, Addendum to the Economics Report, Halcrow 2010 for more details

2.7.9 The standard of protection offered by the present defences in flood cell 4 ranges

between 10% AEP and 0.5% AEP. However, flood propagation modelling has shown that these defences along with the natural topography currently provide the hinterland with protection up to a 0.5% AEP event. The improve 0.3% AEP option has an incremental benefit cost ratio of 2.5 and although it is not possible to consider providing this as the preferred option under PAG rules it does demonstrate that there is a good case of providing a high standard of protection. It is therefore considered that reviewing benefits of options with lower standards of protection than sustain would not add value to the selection of the preferred option.

## Flood Cell 5 – Tipner

2.7.10 The benefit cost summary table for Flood Cell 5 is shown below. The preferred option is to maintain the existing level of defence. The preferred option has been selected as the least cost option to achieve the objective of securing the risk of contamination within Portsmouth Harbour.

**Table 15 - Benefit Cost Summary Table for Flood Cell 5**

	Costs and benefits £k								
	Option 1 (do nothing <sup>14</sup> )	Option 2 Do Minimum <sup>14</sup>	Option 3 Maintain (10% AEP falling to >100% AEP)	Option 4 Sustain (at 1.3% AEP)	Option 5 Improve 1% AEP	Option 6 Improve 0.5% AEP	Option 7 Improve 0.3% AEP	Option 8 Improve 0.2% AEP	Option 9 Improve 0.1% AEP
<b>PV costs PVc</b>	-	336	5,324	6,187	6,520	6,767	7,014	7,262	7,758
<b>PV damage PVd</b>	9,234	5,330	1,641	1,275	855	427	285	171	85
<b>PV damage avoided</b>		3,904	7,593	7,958	8,379	8,806	8,949	9,063	9,148
<b>PV assets Pva</b>	-	-	-	-	-	-	-	-	-
<b>PV asset protection benefits (HRIB)</b>		-	-	-	-	-	-	-	-
<b>Total PV benefits PVb</b>		3,904	7,593	7,958	8,379	8,806	8,949	9,063	9,148
<b>Net Present Value NPV</b>		3,568	2,268	1,771	1,859	2,040	1,935	1,801	1,390
<b>Average benefit/cost ratio</b>		11.63	1.43	1.29	1.29	1.30	1.28	1.25	1.18
<b>Incremental benefit/cost ratio</b>			0.74	0.42	1.26	1.73	0.58	0.46	0.17

<sup>14</sup> Damages in flood cell 5 include a £9M cost for providing leachate remediation in year 5 under do nothing and year 26 under do minimum (see the Economics Report Appendix G). This is based on when defences are expected to fail and a contamination risk realised and is therefore a benefit under options 3-9 where such measures are deemed unnecessary.

## Flood Cell 6 – Continental Ferry Port

2.7.11 The benefit cost summary table for Flood Cell 6 is shown below. The preferred option is to sustain the current standard of protection (1.3% AEP) against predicted levels of sea level rise.

**Table 16 - Benefit Cost Summary Table for Flood Cell 6**

	Costs and benefits £k									
	Option 1 (do nothing)	Option 2 Do Minimum	Option 3 Maintain (0.5% AEP falling to >100% AEP)	Option 4 Sustain (at 1.3% AEP)	Option 5 Improve 1% AEP	Option 6 Improve 0.5% AEP	Option 7 Improve 0.3% AEP	Option 8 Improve 0.2% AEP	Option 9 Improve 0.1% AEP	Option 10 Improve2
PV costs PVc	-	416	9,210	13,332	15,832	16,317	16,802	17,287	18,258	15,765
PV damage PVd	38,296	37,922	36,554	4,079	2,403	1,202	800	480	240	14,366
PV damage avoided		374	1,741	34,217	35,893	37,094	37,495	37,815	38,055	23,930
PV assets Pva	-	-	-	-	-	-	-	-	-	
PV asset protection benefits (HRIB)		-	-	-	-	-	-	-	-	-
Total PV benefits PVb		374	1,741	34,217	35,893	37,094	37,495	37,815	38,055	23,930
Net Present Value NPV		42	-7,469	20,885	20,061	20,777	20,693	20,528	19,798	8,165
Average benefit/cost ratio		0.90	0.19	2.57	2.27	2.27	2.23	2.19	2.08	1.52
Incremental benefit/cost ratio			0.16	7.88	0.67	2.48	0.83	0.66	0.25	0.56

## Flood Cell 7 – HM Naval Base

2.7.12 The benefit cost summary table for Flood Cell 7 is shown below. The preferred option is to sustain the current standard of protection (0.5% AEP) against predicted levels of sea level rise.

**Table 17 - Benefit Cost Summary Table for Flood Cell 7**

	Costs and benefits £k						
	Option 1 (do nothing)	Option 2 Do Minimum	Option 3 Maintain (2% AEP falling to >100% AEP)	Option 4 Sustain (at 0.5% AEP)	Option 5 Improve 0.3% AEP	Option 6 Improve 0.2% AEP	Option 7 Improve 0.1% AEP
PV costs PVc	-	944	9,650	10,737	11,033	11,328	11,918
PV damage PVd	26,416	26,415	9,073	147	98	59	29
PV damage avoided		0	17,342	26,268	26,317	26,357	26,386
PV assets Pva	-	-	-	-	-	-	-
PV asset protection benefits (HRIB)		-	-	-	-	-	-
Total PV benefits PVb		0	17,342	26,268	26,317	26,357	26,386
Net Present Value NPV		- 944	7,693	15,531	15,285	15,029	14,468
Average benefit/cost ratio		0.00	1.80	2.45	2.39	2.33	2.21
Incremental benefit/cost ratio			1.99	8.21	0.17	0.13	0.05

## Outcome Measure Scores

2.7.13 The outcome measure scores for each of the seven flood cells is summarised below. A full break down of the scores is included in the Economics Report – Appendix I

**Table 18 – Summary of Outcome Measure scores**

Flood Cell	Preferred Option	PV Benefit £k	PV Cost £k	WL Cost £k (inc. OB)	Outcome Measure (2009)					
					1 - BC Ratio	2a – H total	2b – H sig.	3 – H dep.	5 – * net BAP (ha)	Total OM Score
1	Improve to 0.5% AEP and sustain	585,753	57,447	136,469	10.2	2,311	2,298	-	-	<b>3.87</b>
2	Improve to 0.5% AEP and sustain	15,062	16,367	40,247	0.9	198	198	-	-	<b>0.59</b>
3	Sustain 0.5% AEP	11,792	4,719	9,438	2.5	-	-	-	-	<b>0.68</b>
4	Sustain 0.5% AEP	568,529	46,419	95,622	12.2	1,414	1,405	-	-	<b>4.15</b>
5	Maintain	7,593	5,324	11,997	1.4	-	-	-	-	<b>n/a (0.4)</b>
6	Sustain 1.3% AEP	34,217	13,332	43,439	2.6	-	-	-	-	<b>0.69</b>
7	Sustain 0.5% AEP	26,268	10,737	34,361	2.4	-	-	-	-	<b>0.66</b>
<b>Overall Strategy</b>	<b>Mixed</b>	<b>1,249,214</b>	<b>154,345</b>	<b>371,574</b>	<b>8.1</b>	<b>3,924</b>	<b>3,901</b>	<b>-</b>	<b>-</b>	<b>2.89</b>

## Allowance for sea level rise

2.7.14 Capital costs include allowance to raise the defences to the target standard of protection accounting for a design life of 50 years, incorporating an allowance for 50 years of sea level rise. Additional costs are included to raise the defences or replace with new higher defences for a further 50 year design life at the end of the original 50 year design life. Mean sea level rise allowances have been calculated in accordance with the guidance issues by Defra in October 2006.

## Sensitivity testing

2.7.15 Sensitivity testing demonstrates that the option choice is sound and the business justification remains strong even if significant changes such as costs and timings occur. Sensitivity testing looked at the validity of option selection due to changes in the cost of proposed engineering works, an assessment of the effects of increasing potential for more stormy conditions and an assessment of the effects of changing the approach for calculating over design flood damages. These tests are detailed in the Economics Report and summarised in Key Plan 3c and d.

## Consequence of above design event

2.7.16 An above design event would lead to overtopping of structures. Hard defences have generally been proposed in areas where land levels on the dry side of the new defences are lower than the crest level of the proposed new defence. Where this is the case it is envisaged that the hard defence will be provided adequate strength such that in the event of the defence overtopping the structure will remain in place slowing the rate of overtopping and providing a continued level of protection.

2.7.17 In certain localised areas an overdesign event may result in the loss of beach material and partial undermining of the defence. Where this is considered a risk, allowance has been made to provide improved protection against undermining to ensure that the defences remain stable during storm conditions.

### **Compliance with SMP**

2.7.18 The recommendations of the current SMP have been followed with a hold the line option being promoted for the full shoreline.

### **Implementation and residual risks**

2.7.19 The key risks to the implementation of the Strategy are presented below along with the mitigation proposed.

2.7.20 Appropriate Assessment – Secretary of State Approval is expected to be required before a formal approval for the strategy can be obtained.

2.7.21 Ministry of Defence – As a key benefactor in the adoption of this strategy it is appropriate that the MoD will contribute towards the required defence improvements. The level and method of contribution will require agreement prior to implementation of any capital scheme where joint funding would be appropriate.

2.7.22 Public Liaison – Development of scheme options will impact directly on local inhabitant causing temporary disturbance due to increase traffic volumes and reduced access to length of the frontage during works. Future works will require continued liaison with the public to ensure continued acceptance and support for the strategy

2.7.23 Compensatory Habitat – Implementation of the strategy recommendations will require compensatory habitat. Close liaison with Natural England will be undertaken throughout the scheme appraisal period in order to develop and agree compensatory measures to ensure the coherence of the Natura 2000 site. Prior to the commencement of a scheme PAR, this will be taken forward by the Region Habitat Creation Programme.

2.7.24 Contingency Planning - Portsmouth City Council recognise the importance of non-structural solutions to flood risk management and through the council's Civil Contingency team already operate Emergency Response Plans (ERP) and the Portsmouth Flood Plan (PFP) which considers planning for and responding to all types of flooding.

### **Contributions and funding**

2.7.25 The Outcome Measure scores for flood cells 1 (3.4) and 4 (4.7) compare favourably with the current funding for Flood Defence Capital Grant funding via the Environment Agency's Medium Term Plan (MTP), and are likely to receive funding.

2.7.26 The Outcome Measure score of 0.7 for Flood Cell 7 may not secure Capital Grant funding - although the Sustain works required would be primarily funded by the Ministry of Defence (see Letter of Support C – attached to end of document).

2.7.27 The Outcome Measure score of 0.5 for Flood Cell 2 may not secure funding – The primary frontage where works are required in this flood cell protects Fraser Battery (a site privately owned). The landowner has plans in place to redevelop the site into residential properties. Works required to implement the preferred option for this frontage will therefore be primarily funded by the landowner and the developer. The economic assessment for this flood cell includes additional costs for providing protection against outflanking of the other flood defences in the event of private funding not being secured. See the Economics Addendum Section 5.

2.7.28 The Outcome Measure score of 1.1 for Flood Cell 3 may not secure Capital Grant funding – However, the condition of the existing defences introduces a risk of failure/damage to the existing defences should no work be undertaken to strengthen or improve the

condition. The defences for this flood cell are located within a sheltered reach of Portsea Island and therefore undermining of the existing defences is not expected to occur rapidly. The ground behind the existing defences is high and should the defences fail, an immediate breach would not occur or risk leeching of contaminants. Therefore it is considered that by carefully monitoring the condition of the existing defences and continuing general/intensive maintenance activities the risk of a breach occurring can be controlled. Adopting this approach will ensure that the risk of a breach occurring can be managed until the required scheme can justify support for Capital Grant funding.

2.7.29 Flood Cell 5 is a strategic development site for Portsmouth City Council and is earmarked for regeneration. Preliminary work has already been carried out to begin work on a new interchange with the intention of encouraging developers to invest in the area for a new mixed use site including residences. The sea defences standard of protection under a maintain option will have a standard of service that reduces over time with sea level rise. In order to provide a safe standard the developer will be required to invest in improving the defences either directly or through government backed infrastructure grants. Whilst this site currently does not justify public expenditure through Capital Grant funding the delivery of sea defences may have to be brought forward to accommodate the cities growth.

2.7.30 The Outcome measure score of 0.7 for flood cell 6 may not secure Capital Grant funding. It is envisaged that a joint funding scheme will be implemented between port operatives and Portsmouth City council to ensure that the site remains operational

## **Recommendation**

2.7.31 It is recommended that the Portsea Island Coastal Strategy Study is approved, thus reducing flood risk for the 9,335 residential properties at risk. This includes work to improve the defences in Flood Cells 1 and 2, sustain the standard of protection for flood cells 3, 4, 6 and 7, and maintain the defences in flood cell 5.

2.7.32 The Whole Life Cost (including contingency) is £372,000k. This cost will be met by the Operating Authorities (Portsmouth City Council and Environment Agency) with contributions from MoD and other sources.

## **2.8 Other Considerations**

### **Political issues**

2.8.1 A three month period of public consultation ended in July 2008. There is widespread support and acceptance for the strategy proposals. A summary of the consultation responses is provided in the post adoption statement.

2.8.2 Prior to submission of this strategy study to the Environment Agency National Review Group, approval has been given by Portsmouth City Council Board.

2.8.3 The exclusion of Whale Island from the strategy study means there are no formalised recommendations for this separate island. The MoD have been made aware of this decision. Removing Whale Island from the strategy study does not affect the recommendations for any of the other frontages.

### **Future Development Control**

2.8.4 The Environment Agency is a statutory consultee on all applications for development in flood risk areas.

2.8.5 A strategic Flood Risk Assessment has been completed for Portsea Island. This study will influence the Local Development Documents and provide the basis for assessing future planning applications.

### **Sustainable Construction**

2.8.6 Options have been carefully assessed with regard to delivery of sustainable

construction objectives. Designs will be pursued which achieve low impact solutions, minimise waste, allow for re-use of existing materials, limit use of non-sustainable construction products, and retain repairable structures and features where appropriate. Careful consideration will also be given to the design, specification, and detailing of all structures including associated fencing, railings, lighting, pavements and signage. Existing features, particularly street furniture of historic or townscape value will be identified, conserved and re-used where appropriate.

### 3 Strategy Plan

#### Implementation

3.1.1 The results of the strategy study identify that construction works for two of the seven flood cells (flood cells 1 and 4) have a high priority. Additional works should also be carried out in Flood Cell 5 as a priority to secure the environmental interests of Portsmouth Harbour against possible leaching of contamination that may result should the flood defences within this flood cell breach or collapse. Works are also required to 3 of the remaining 4 flood cells but the schemes have a lower outcome measure score and consequently are less likely to secure Capital Grant funding in the near term. The programme for implementation of these schemes is included as Key Plan 2.

3.1.2 The strategy proposes a programme of capital works to reduce the risks of flooding from the sea. Implementation of the strategy will depend upon Portsmouth City Council working together with partners, operating authorities, defence and land owners. Due to the uncertainties associated with climate change and any future changes to sea level rise guidance it is important that adaptability is designed as an integral part of any flood and coastal erosion risk management solution. This will be developed for each preferred option during the scheme development stage. A summary of the programme is included in Tables 19 and 20. Additional detail relating to the options considered is included in the Portsea Island Coastal Strategy Study Coastal Defences Report, Halcrow 2009, Appendix C and the Technical Addendum to the Coastal Defences Report, Halcrow 2010 Section 2.

**Table 19 – Outline Implementation programme**

Flood Cell	Description	Responsible Authority
<b>Short Term Year 1 – 10</b>		
1a	Old Portsmouth – No works planned – defences recently improved to provide 0.5% AEP to discreet flood risk zone	N/A
1b	Raising seawalls (1.54km improvements) where possible along landward edge of promenade to reduce disturbances to sea views, strengthening of foreshore in areas that rapidly lose beach material during storms and result in damage to promenade (Clarence Esplanade additional rock toe protection). Target standard of protection 0.5%AEP. Predicted route of funding via Environment Agency Flood Risk Management Capital Grant. The original preferred option for this frontage included a length of demountable defences fronting Clarence Pier. A review of this option was undertaken and the preferred option changed to a permanent defence. See the Portsea Island Coastal Strategy Study, Addendum to the Economics Report, Halcrow 2010 for more details	PCC/ FDGiA
1c	1.21km long new flood wall on landward side of promenade to provide target standard of protection 0.5% AEP and reduce disturbances to seaward views (Southsea Esplanade)	PCC/FDGiA
1d	0.9km long new flood wall on landward side of promenade to provide target standard of protection 0.5% AEP and reduce disturbances to seaward views (Southsea Esplanade)	PCC/FDGiA
2e	Raise walls (0.54 km) and replace/improve foundations to strengthen existing defences and provide a target 0.5% AEP standard of protection. Identified improvement works to private property to be funded by the landowner or externally e.g. by a developer	Landowner/ Developers
2f	Replace structure fronting Eastney outfall at risk of failure with a new revetment and seawall. Works to be funded by local developers and landowners	Landowner/ Developers
2g	No capital works required in first 10 years	N/A
3h	Maintain and monitor defences. Funding to be provided by the landowner but will be monitored through Portsmouth City Council's revenue budget.	Landowner/PCC
4i	Replace existing seawall at Tangier Road (0.36km) with higher wall, and raise existing embankment at Milton Bund (1.03km) with associated shoreline protection, with the aim of sustaining the existing standard of flood protection against predicted increased sea levels. Predicted route of funding via Environment Agency Flood Risk Management Capital Grant.	PCC/ FDGiA
4j	Where possible strengthen existing walls and raise defence levels to provide a sustained standard of flood protection of 0.5% AEP against predicted increased sea levels. Where existing walls not sufficiently strong replace with new higher	PCC/ FDGiA



Flood Cell	Description	Responsible Authority
<b>Short Term Year 1 – 10</b>		
	walls. (2.43 km improvement works). Predicted route of funding via Environment Agency Flood Risk Management Capital Grant.	
4k	Raise level of existing flood embankment with crest footpath and maintain existing walls and revetments (2.18km improvement works). Predicted route of funding via Environment Agency Capital Grant.	PCC/FDGiA
4l	Replace existing structures with higher levels to provide a sustained standard of flood protection of 0.5% AEP against predicted increased sea levels. (1.75 km improvement works). Predicted route of funding via Environment Agency Capital Grant.	PCC/FDGiA
5m	Repair existing seawall and re-profile flood embankment flood embankment to secure contaminated land (0.85km improvements Tipner Lake). Predicted route of funding via MoD and landowners. This site has regeneration potential, external funding for improvements will be sought from developer contributions and infrastructure initiatives	MoD/Developers
6n – 6p	No capital works planned for first 10 years. Maintain and monitor defences. Funding to be provided by the landowner but will be monitored through Portsmouth City Council's revenue budget.	Landowner/PCC
7q	Partially repair and partially replace seawalls as required to a higher level so that the existing standard of flood protection is sustained against predicted increased sea levels (0.18km improvements required at The Hard) Alternative sources of funding may be required to secure the money required to implement these works. Contributions to be sought from MoD	MoD
<b>Medium Term Year 11 – 50</b>		
1	Raise other defences not previously incorporated into short term scheme to provide 0.5% AEP	PCC/FDGiA
2	Raise other defences not previously incorporated into short term scheme to provide 0.5% AEP	PCC/FDGiA
3	Raise defences as necessary to sustain existing standard of protection at 0.5% AEP	PCC/FDGiA
4	Raise defences not included in short term scheme as necessary to sustain existing standard of protection at 0.5% AEP	PCC/FDGiA
5	Replace and maintain existing defences to secure protection against contamination	MoD
6	Raise defences as necessary to sustain existing standard of protection at 1.3% AEP	PCC/FDGiA
7	Raise defences not included in short term scheme as necessary to sustain existing standard of protection at 0.5% AEP	MoD
<b>Long Term Year 51 – 99</b>		
1	Replace defences at end of design life to provide continued improved SoP at 0.5% AEP accounting for future predictions of sea level rise	PCC/FDGiA
2	Replace defences at end of design life to provide continued improved SoP at 0.5% AEP accounting for future predictions of sea level rise	PCC/FDGiA
3	Replace defences at end of design life to provide sustain SoP at 0.5% AEP accounting for future predictions of sea level rise	PCC/FDGiA
4	Replace defences at end of design life to provide sustain SoP at 0.5% AEP accounting for future predictions of sea level rise	PCC/FDGiA
5	Replace and maintain existing defences to secure protection against contamination	MoD
6	Replace defences at end of design life to provide sustain SoP at 1.3% AEP accounting for future predictions of sea level rise	PCC/FDGiA
7	Replace defences at end of design life to provide sustain SoP at 0.5% AEP accounting for future predictions of sea level rise	MoD

**Table 20 - Spend Profile Summary**

Element	Responsible Authority	Total cost (£k)	Year 1 2010/11	Year 2 2011/12	Year 3 2012/13	Year 4 2013/14	Year 5 - 2014/15	Year 6-10 - 2015/20
1	PCC/ FDGiA	47,850	396	396	9,230	0	14,834	22,993
2	Landowner/ Developers	9,799	0	0	0	0	0	9,799
3	Landowner/ PCC	0	0	0	0	0	0	0
4	PCC/ FDGiA	53,731	337	337	6,837	13,211	0	33,009
5	MoD/ Developers	3,462	0	0	0	0	0	3,462
6	Landowner/ PCC	0	0	0	0	0	0	0
7	MoD	9,445	0	0	0	0	0	9,445
<b>Total</b>		<b>124,287</b>	<b>733</b>	<b>733</b>	<b>16,067</b>	<b>13,211</b>	<b>14,834</b>	<b>78,708</b>

N.B. Costs shown in table above include inflation

## Risks

3.1.3 Table 21 summarises the key risks that could impact on the delivery of the strategy.

**Table 21 – Risks and Mitigation**

Risk	Key Mitigation
Public liaison inadequate or results in adverse reaction	Future schemes will need stakeholder engagement plans to build on the strategy liaison work and maintain the support of the public and other organisations
Provision of compensatory habitat delayed or not possible	Procurement of compensatory habitat will be taken forward by the SRHCP prior to the schemes being developed at PAR stage.
Agreement of level of MoD, Landowner and developer (flood cells 2, 5 & 7) contribution	Early liaison with MoD, Landowner and developer, and current approval of strategy recommendations. However no contributions envisaged for at least first five years of works.
Damage to the environment during the works	Continued assessment and mitigation at scheme level, including addressing the need for habitat creation
Reliance on regular capital funding	Maintain a rolling 5 year programme for approval by the Environment Agency

## Procurement

3.1.4 The Strategy has been produced by Halcrow, who were appointed by Portsmouth City Council following successful completion of a Scoping Study exercise in 2000.

3.1.5 Following approval of this StAR, separate approvals will be sought for the proposed schemes. Implementation of the strategy will be managed by Portsmouth City Council in partnership with the Environment Agency.

3.1.6 Portsmouth City Council have appointed through the European Union (EU) approved route, its own framework consultants and will, subject to timing and EU rules explore the use of Environment Agency's National Contractor Framework.

3.1.7 There are a number of work packaging opportunities within the strategy area,

resulting in reduced mobilisation costs and costs associated with familiarisation of local conditions. There are also opportunities to gain economies of scale on rock armour (Flood cell 1) fill material (Flood cell 4 and 5) and appropriate cladding materials (throughout). The programming of the priority schemes need to be aligned in order for this benefit to be maximised and this will be considered at PAR stage. Opportunities to package works identified by the Strategy will be pursued in discussion with the EA, during the scheme development and the procurement stage.

### **Health and Safety at construction stage**

3.1.8 A CDM Coordinator will be appointed to assist at scheme stage for all appraisals.

3.1.9 All schemes will be constructed in the coastal or tidal environment and often in close proximity to the public.

3.1.10 Construction of new defences through the flood cell 5 will be adjacent to MoD operational areas. It is recommended that advice is sought from the MoD on the level of risk and how it can be appropriately managed. If night working is necessary due to MoD imposed restrictions, this will present specific hazards that will need to be addressed at design stage.

### **Compensatory Habitat.**

3.1.11 Portsmouth City Council will further develop the compensatory habitat package working in partnership with the Environment Agency in delivering the Regional Habitat Creation Plan.

### **Strategy Revision**

3.1.12 Portsmouth City Council should review this strategy as and when required when all of the urgent schemes have been completed and the AA will need to be revisited in line with NE advice.

## **Letters of Support.**

A: Solent Regional Habitat Creation Programme

creating a better place

Environment  
Agency

Mr B Davies  
Development and Technical Services  
Havant Borough Council  
Civic Centre Road  
Havant  
PO9 2AX

Your ref:

Our ref:

Date: 6 November 2009



Dear Bret,

**Portsea Island Coastal Strategy – Habitat Provisions**

The aim of the Regional Habitat Creation Programme (RHCP) is to provide an overview and delivery mechanism of the habitat required to offset losses caused by flood and coastal risk management schemes, including those delivered by Local Authorities. This approach to meeting the requirements of strategies and schemes through the RHCP has been agreed with Defra.

The Southern RHCP has included the requirement of 47.4 hectares of inter tidal habitat to compensate for losses to Natura 2000 sites caused by the schemes identified in the Portsea Island Coastal Strategy Study (PICSS) within the overall requirements for approximately 600 hectares of inter-tidal habitat required across the Solent to compensate for coastal squeeze on Natura 2000 sites. The RHCP will identify habitat creation sites and maintain a balance sheet of habitat created and habitat required. Delivery of habitat creation sites will be carried out by the party best placed to do so, which could be the Environment Agency or the Local Authority.

The first inter-tidal habitat creation which will be suitable for compensation for the losses in PICSS will take place at Medmerry. Natural England have confirmed that Medmerry is a suitable site for compensation for losses in PICSS. This project is being delivered by the Environment Agency, with habitat creation expected to start in 2014. As coastal squeeze losses will occur gradually over time, only a portion of the habitat required for PICSS will be allocated at the beginning. The RHCP will deliver further areas of inter-tidal habitat over the next 100 years to keep pace with losses. This avoids excessive investment in habitat well in advance of need, or other schemes being delayed because habitat has been 'allocated' to a scheme where the losses have not all yet occurred. This approach has been agreed regionally with Natural England.

I enclose a copy of the RHCP Update 2009 which sets out the latest habitat requirements and programme for Southern Region.

Yours sincerely



**Ruth Jolley**  
Regional Habitat Creation Programme Manager

Environment Agency, Guildbourne House, Chatsworth Road, Worthing, West Sussex BN11 1LD  
Email: [ruth.jolley@environment-agency.gov.uk](mailto:ruth.jolley@environment-agency.gov.uk) DD: 01903 832113



INVESTOR IN PEOPLE

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B:     Natural England

Date: 18 March 2009  
Our ref: Portsea Island CDS  
Your ref:



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Havant and Portsmouth Coastal  
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Dear Bret

#### **PORTSEA ISLAND COASTAL STRATEGY STUDY**

Thank you for consulting Natural England on the Portsea Island Coastal Strategy Study, including the Strategic Environmental Assessment and Appropriate Assessment. We are pleased to support this Strategy Study.

Natural England concurs with the findings of the Appropriate Assessment, that an adverse effect on the integrity of the Natura 2000 sites cannot be avoided, and that there is no alternative to the Strategy options and imperative reasons of over-riding public interest (IROPI) exist. Hence the Strategy will require compensation habitat of 56.1ha to be found over the next 100 years. In accordance with agreed protocol this 'Strategy level' compensation habitat will be secured through the Environment Agency-led Regional Habitat Creation Programme (EA RHCP). Natural England is therefore pleased to agree that the Portsea Island Strategy is compliant with the Habitat Regulations.

Natural England particularly welcomes the rigorous assessment of habitat change presented by the Strategic Environmental Assessment (SEA), which went further than other similar studies. As a consequence the Strategy has been able to recognise a substantial habitat zonation change as a consequence of sea level rise. This will lead to the loss of 132ha of middle inter-tidal habitat which will be replaced by lower inter-tidal habitat. Such a substantial change of habitat will have a severe detrimental effect on the wintering birds of the Special Protection Area. As a consequence it has been agreed that this loss of habitat will also be offset by the EA RHCP. On this basis Natural England is pleased to concur with the findings of the SEA.

We would like to note, at this stage, that subsequent schemes will still need to be considered under the Habitat Regulations. The agreed appropriate assessment and SEA at Strategy level will, however, establish IROPI for the set of subsequent schemes and provide solutions to strategic

impacts such as coastal squeeze, leaving more detailed issues to be addressed at Scheme level. Similarly any other necessary consents, assents or permissions will still need to be sought for subsequent schemes.

Thank you for working with Natural England on this Coastal Strategy.

Yours sincerely



Dr Claire Lambert  
Coastal Advisor  
07795 121376

Portsea Island CDSS sign off letter 180909 CLL.doc



C: Ministry of Defence (MoD)



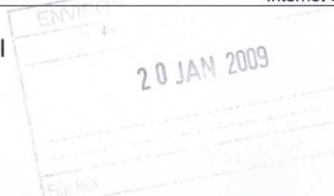
## Operations South

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Mr B Davies  
Portsmouth City Council  
Civic Offices  
Guildhall Square  
Portsmouth  
Hampshire  
PO1 2NE



Your Ref

Our Ref D/DE/SW/

Date 19<sup>th</sup> January 2009

Dear Brett

### The Portsea Island Coastal Defence Strategy and MoD Sites

Thank you for your original enquiry, I apologise for the length of time it has taken to respond to it.

I can confirm that the MOD are continuing to operate from the sites referred to in your original email, being Tipner Range, Fraser Battery, Whale Island and HMNB Portsmouth, and will manage the flood defence assets accordingly in order to maintain the required MOD operational capabilities of these facilities.

The MOD are generally supportive of Portsmouth City Council's Portsea Island Coastal Strategy.

Please feel free to contact me should you require further information and I will ensure that it is passed to the correct department for comment.

Yours sincerely



**Lara Storr MRICS**  
Estates Surveyor

D: Defra

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**Our ref NSSF62**

5 April 2011

Dear Mr Davies

**PORTSEA ISLAND COASTAL STRATEGY**

1. Thank you for supplying the Habitats Regulations Assessment and the completed Appendix 20 application for the Portsea Island Coastal Strategy.
2. I recognise that your Council has fulfilled its obligations under the Habitats Regulations and appropriately assessed the impacts of the proposed strategy on the European sites that may have been affected.
3. I am satisfied that you have carried out an appropriate evaluation of alternative solutions. I accept that there are no alternative solutions to the preferred options that would have a lesser effect on the integrity of the European sites.
4. Given that coastal flooding and erosion poses a risk to over 9,000 residential and commercial properties, key infrastructure and the HM Naval Base, I consider that you have made a strong case to justify the potential damage on grounds of imperative reasons of overriding public interest.
5. I am satisfied that you have taken appropriate steps to secure suitable compensatory habitat within the Southern Regional Habitat Creation Programme to ensure that the overall coherence of the Natura 2000 network is protected.
6. Consequently, I can confirm that, in respect of regulation 62 of the Conservation of Habitats and Species Regulations 2010, Defra has no objections to your Council's intention to approve this strategy.
7. I would be grateful if you could inform Craig Lee once the strategy is approved so that he can forward the details to the European Commission.



8. I am copying this letter to Paul Murby in Defra, Jenny Buffrey in the EA and Chris McMullon in Natural England.

Yours sincerely



Steve Lee-Bapty  
Head of Protected Areas  
Acting on behalf of the Secretary of State

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