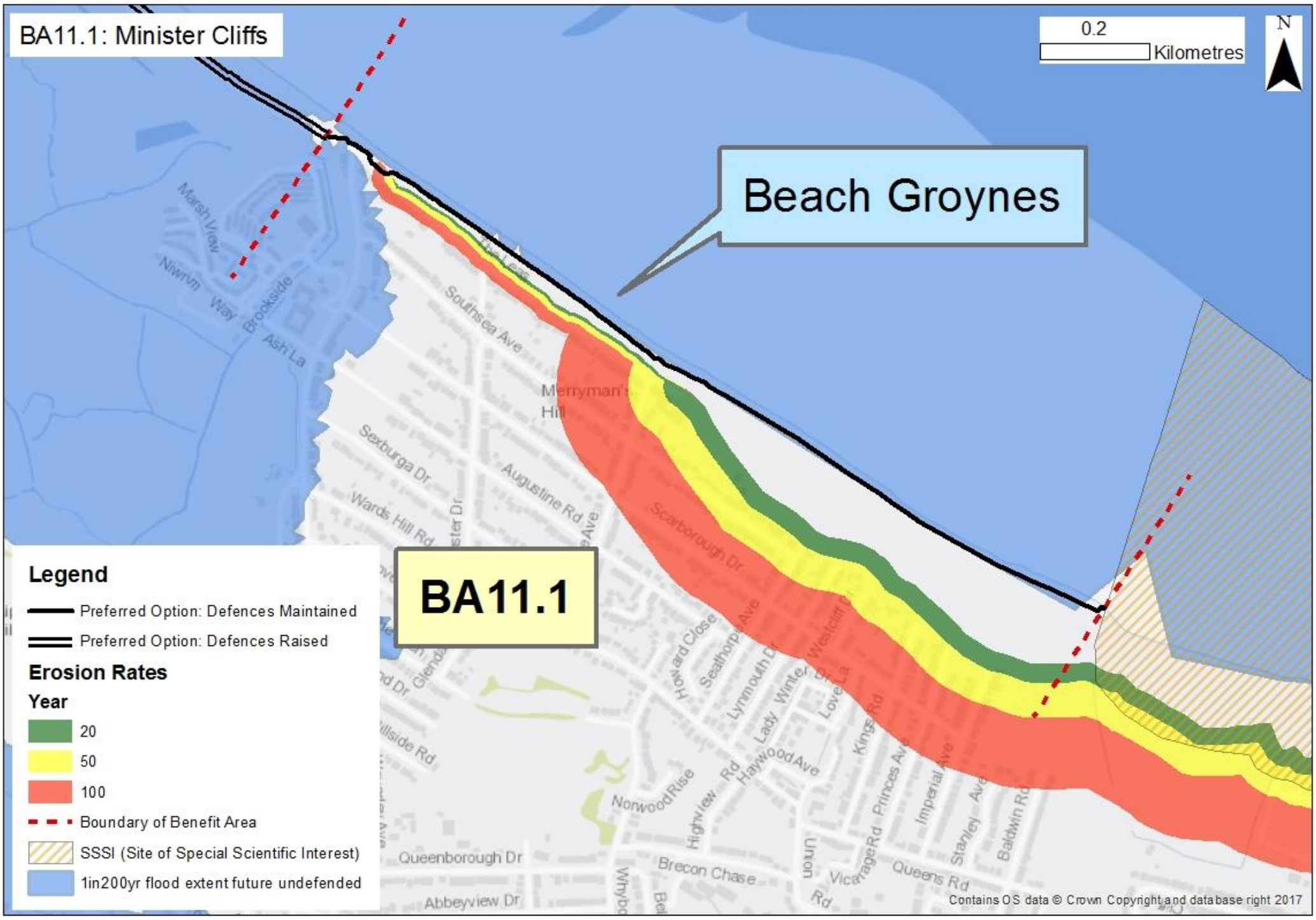
Benefit Area Name	11 - Sheerness
Benefit Unit Name	11.1 - Minster Town to Royal Oak
Frontage Length	1.7 km
Defence Structure Type	Sea wall, beach groynes
Min Standard of Protection (AEP%)	5%
Residual Life (years)	20

	0-20 years	**20-50 years**	**50-100 years**
SMP Policy	NAI	NAI	NAI
Aiming to comply with policy	Yes		
Comment	HTL for all epochs due to significant assets at risk of erosion/flooding.		



Do Nothing Assets at Risk (Erosion)			
	Year 20 (undefended)	**Year 50 (undefended)**	**Year 100 (undefended)**
Residential	3	92	270
Commercial & Industrial	7	3	5
Agricultural (Ha)	0	0	0
Key Infrastructure	None	None	Scarborough Drive
Social and Environmental Considerations	None	None	None

Long List to Short List			
Potential Measures			
	Measures	**Selected**	**Reasoning**
Structural	Construct new embankment	N	Exclude - will not support the SMP policy and is unlikely to be eligible for FDGiA funding due to limited number of benefits
	Maintain embankment	N	Exclude- no embankments currently present
	Raise embankment (sustain)	N	Exclude- no embankments currently present
	Raise embankment (upgrade)	N	Exclude- no embankments currently present
	Construct new wall	Y	Exclude - will not support the SMP policy and is unlikely to be eligible for FDGiA funding due to limited number of benefits
	Maintain wall	Y	Exclude - no walls currently present
	Raise wall (sustain)	N	Exclude - no walls currently present
	Raise wall (upgrade)	N	Exclude - no walls currently present
	Maintain rock revetment	N	Exclude - no rock revetment currently present
	Construct rock revetment	N	Exclude - will not support the SMP policy and is unlikely to be eligible for FDGiA funding due to limited number of benefits
	Install demountable defences	N	Exclude - relatively costly option which is not the most efficient use of FDGiA funding compared to sustaining existing defences. It would require significant man resources to
	Install temporary defences	N	Take forward - can help deliver some short term erosion protection. Currently being applied for by Minster Parish Council.
	Beach recharge (sand or shingle)	Y	Exclude - the foreshore is mudflat/ saltmarsh and so technically unviable and potentially environmentally damaging in SPA habitat
	Construct rock groynes	Y	Exclude - the foreshore is mudflat/ saltmarsh and so technically unviable geotechnically and would not provide flood protection function
	Maintain rock groynes	N	Exclude - to rock groynes currently present
	Construct timber structures	Y	Exclude - the foreshore is mudflat/ saltmarsh. Introduction of timber structures could cause damaging impacts on the SPA habitat.
	Maintain timber structures	Y	Exclude - no timber structures currently present
	Construct a tidal barrier	N	Exclude - not appropriate for this location
Non-Structural	Implement monitoring	N	Take forwards - will support the SMP policy
	Implement flood warning system	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Land use planning	N	Take forwards - will support the SMP policy
	Adaptation measures	N	Take forwards - will support the SMP policy
	Development control	N	Take forwards - will support the SMP policy
	Emergency response plans	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Monitoring for health and safety only	N	Take forwards - will support the SMP policy

Long List of Options			
	a) Do nothing	**b) Ongoing maintenance of embankments, walls, flood gates, groynes and beach.**	**c) Maintain (capital) embankments, walls, flood gates, groynes and beach.**
To what extent does the option meet the objectives?			
1- Reduce Flood Risk	N	Y	Y
2 - Natura 2000 sites	N	N	N
3- Reduce maintenance	N	?	?
4 - WFD	N	Y	Y
5 - Local Plans	NA	-	-
Comment and decision on whether taken forward to shortlist	Y=baseline for economics.	Y= Taken forward as do minimum option.	Y = Residual life good. SBC are already undertaking works CC00252 NPAS reference - erosion works. Identified 2015 financial year.

Short List of Options
a) Do nothing
b) Ongoing maintenance of embankments, walls, flood gates, groynes and beach.
c) Maintain SOP embankments, walls, flood gates, groynes and beach.

Assessment of Short List			
Option	**a) Do nothing**	**b) Ongoing maintenance of embankments, walls, flood gates, groynes and beach**	**c) Maintain SOP embankments, walls, flood gates, groynes and beach.**
Description	Used as an economic baseline to compare the other options against.	Maintenance (patch and repair) of the current defences	Capital works are undertaken to maintain the current defences
Technical Issue	Defences have 20 years residual life. Risk from both flooding and erosion	Current defences have 20 years residual life. Risk from both flooding and erosion	Current defences have 20 years residual life. Risk from both flooding and erosion
Assumptions/ Uncertainties	Assumes that all management is ceased. Erosion will commence once the defences reach the end of their residual life	The crest height of the defences remains the same as currently in place i.e. is not increased. Over time this will lead to a reduction in the SOP as the sea level rises.	The crest height of the defences remains the same as currently in place i.e. is not increased. Over time this will lead to a reduction in the SOP as the sea level rises.
SOP Provided (% AEP)	>50%	5%	5%
Value of Economics			
PV Capital Costs	£ -	£ -	£ 510,675
PV Maintenance Costs	£ -	£ 526,528	£ 58,625
PV Other Costs	£ -	£ -	£ 53,595
Total Cost (including Optimism Bias) (PV)	£ -	£ 842,445	£ 996,631
Value of Benefits	£ -	£ 13,931,040	£ 13,931,040
Benefit Cost Ratio (BCR)	0.0	16.5	14.0
PF Score	0%	212%	179%
Further funding required to achieve 100% PF Score	£ -	£ -	£ -
Flood/ erosion impacts			
Number of Commercial properties at risk under 0.1% AEP (Flooding)	0	0	0
Number of Commercial properties at risk under 0.1% AEP (Flooding)	0	0	0
PV Value of Properties (Total including AAD, write-offs, vehicle damages and Emergency Services)	£ -	£ -	£ -
Erosion Damages	£ 14,440,423	£ -	£ -
Critical Infrastructure	No assets at risk	No assets at risk	No assets at risk
PV Value of Impacts on road and rail	-	-	-
PV Value of Tourism and Recreation Impacts	£496,133 Minster Beach	£1,005,516 Minster Beach	£1,005,516 Minster Beach
PV Value of Agriculture Impacts	-	-	-
Stakeholders Feedback			
Statutory Stakeholders/ SEG	No specific comments	No specific comments	No specific comments
Landowners	No specific comments	No specific comments	No specific comments
Technical Feasibility			
Site Specific	n/a	n/a	n/a
Strategy Wide	n/a	n/a	n/a
WFD (Water Framework Directive)			
Compliance assessment outcome	2 Gradually but incomplete return to natural processes	1 Heavily Modified Waterbody maintained	1 Heavily Modified Waterbody maintained
HRA (Habitats Regulation Assessment)			
Impact on SPA/ Ramsar qualifying features	3 These options are not likely to have significant effects on any Natura 2000 sites and their constituent qualifying features.	3 These options are not likely to have significant effects on any Natura 2000 sites and their constituent qualifying features.	3 These options are not likely to have significant effects on any Natura 2000 sites and their constituent qualifying features.
Impacts on freshwater habitats	3 n/a - no designated freshwater habitats in the BA	3 n/a - no designated freshwater habitats in the BA	3 n/a - no designated freshwater habitats in the BA

Impacts on intertidal habitats	3 n/a - no designated intertidal habitats in the BA	3 n/a - no designated intertidal habitats in the BA	3 n/a - no designated intertidal habitats in the BA
Habitat Connectivity	3 No impacts, either beneficial or adverse.	3 No impacts, either beneficial or adverse.	3 No impacts, either beneficial or adverse.
SEA (Strategic Environmental Assessment)			
Historic Environment	3 No observable historic assets at risk	3 No observable historic assets at risk	3 No observable historic assets at risk
Effects on population	1 Tourism infrastructure at risk of flooding. Following the failure of the defences in year 20 there will be a risk of erosion to the properties.	2 Potential for flooding of tourism infrastructure overtime with sea level rise.	4 This option offers a reduced risk from flooding/ erosion
Impact on plans/ programmes	1 Large development site within the benefit area that may be at risk from flooding	2 Large development site within the benefit area that may be at risk from flooding overtime	4 Large development site within the benefit area will be at reduced risk from flooding
Freshwater Biodiversity	3 No potential for habitat creation, site mainly consists of cliffs that are at risk from erosion.	3 No potential for habitat creation, site mainly consists of cliffs that are at risk from erosion.	3 No potential for habitat creation, site mainly consists of cliffs that are at risk from erosion.
Saline Biodiversity	3 n/a - cliffed frontage at risk of erosion, so limited saline habitats in the area.	3 n/a - cliffed frontage at risk of erosion, so limited saline habitats in the area.	3 n/a - cliffed frontage at risk of erosion, so limited saline habitats in the area.
Soil	3 No impacts predicted	3 No impacts predicted	3 No impacts predicted
Groundwater	3 No impacts predicted. Potential risk of release of contaminants from landfill site at risk of flooding but small area.	3 No impacts predicted. Potential risk of release of contaminants from landfill site at risk of flooding but small area.	3 No impacts predicted. Potential risk of release of contaminants from landfill site at risk of flooding but small area.
Landscape (visual impact)	4 Landscape change Positive/negative effects depending on view and visual receptors, reverting to natural processes -assumed a benefit	3 No impact may be occasional overtopping	3 No impact may be occasional overtopping
Carbon Storage	3 no loss or gain of carbon storage from erosion of the cliffs.	3 no loss or gain of carbon storage from erosion of the cliffs.	2 no loss or gain of carbon storage from erosion of the cliffs; but some carbon costs from construction

Ecosystem Services			
Qualitative Score from Ecosystem Services Assessment	-10	-8	-9
Comments	Degradation in many ES (e.g. water regulation, natural hazard regulation, erosion regulation, water purification and recreation and tourism) outweigh limited enhancement opportunities (e.g. conservation habitat and fishery habitat)	Degradation in some ES (e.g. water purification) and no opportunities for enhancement	Degradation in some ES (e.g. climate regulation and water purification) and no opportunities for enhancement
To what extent does the option meet the objectives?			
1- Reduce Flood Risk	N	Y	Y
2 - Natura 2000 sites	N	N	N
3- Reduce maintenance	Y	N	Y
4 - WFD	N	N	N
5 - Local Plans	Y	Y	Y

Environmental Scores			
100 = best option, 0 = worst option			
Option	**a) Do nothing**	**b) Monitoring only**	**c) Adaptation- roll back of property over time**
WFD (Water Framework Directive)			
Compliance assessment outcome	25	0	0
HRA (Habitats Regulation Assessment)			
Impact on SPA/ Ramsar qualifying features	50	50	50
Impacts on freshwater habitats	50	50	50
Impacts on intertidal habitats	50	50	50
Habitat Connectivity	50	50	50
SEA (Strategic Environmental Assessment)			
Historic Environment	50	50	50
Effects on population	0	25	75
Impact on plans/ programmes	0	25	75
Freshwater Biodiversity	50	50	50
Saline Biodiversity	50	50	50
Soil	50	50	50
Groundwater	50	50	50
Landscape (visual impact)	75	50	50
Carbon Storage	50	50	25
Total	**600**	**600**	**675**

Summary of Results			
Option	**a) Do nothing**	**b) Ongoing maintenance of embankments, walls, flood gates, groynes and beach (Do Minimum)**	**c) Maintain SOP embankments, walls, flood gates, groynes and beach.**
Costs	£ -	£ 842,445	£ 996,631
Benefits	£ -	£ 13,931,040	£ 13,931,040
NPV	£ -	£ 13,088,595	£ 12,934,409
BCR	0.0	16.5	14.0
Environmental Scoring	600	600	675

Preferred Option Decision Making		
DLO	**Leading Option at DLO Stage**	**Justification for Leading Option**
DLO1 - Economic Assessment	c) Maintain embankments, walls, flood gates, groynes and beach.	This option has a BCR greater than one and a high PF score. Option C was taken over Option B due to the wider environmental benefits.
DLO2 - Economic Sensitivities		
DLO3 - Review of Compensatory Intertidal Habitat Requirements		
DLO4 - Review of Compensatory Freshwater Habitat Requirements		
DLO5 - Modelling of Leading Options		
DLO6 - Consultation Phase		

Preferred Option Name

Maintain embankments, walls, flood gates, groynes and beach.

Preferred Option

Capital works will be undertaken on the current defences to ensure that they remain in place to protect the toe of the cliff and assets behind the shoreline from erosion.

Justification

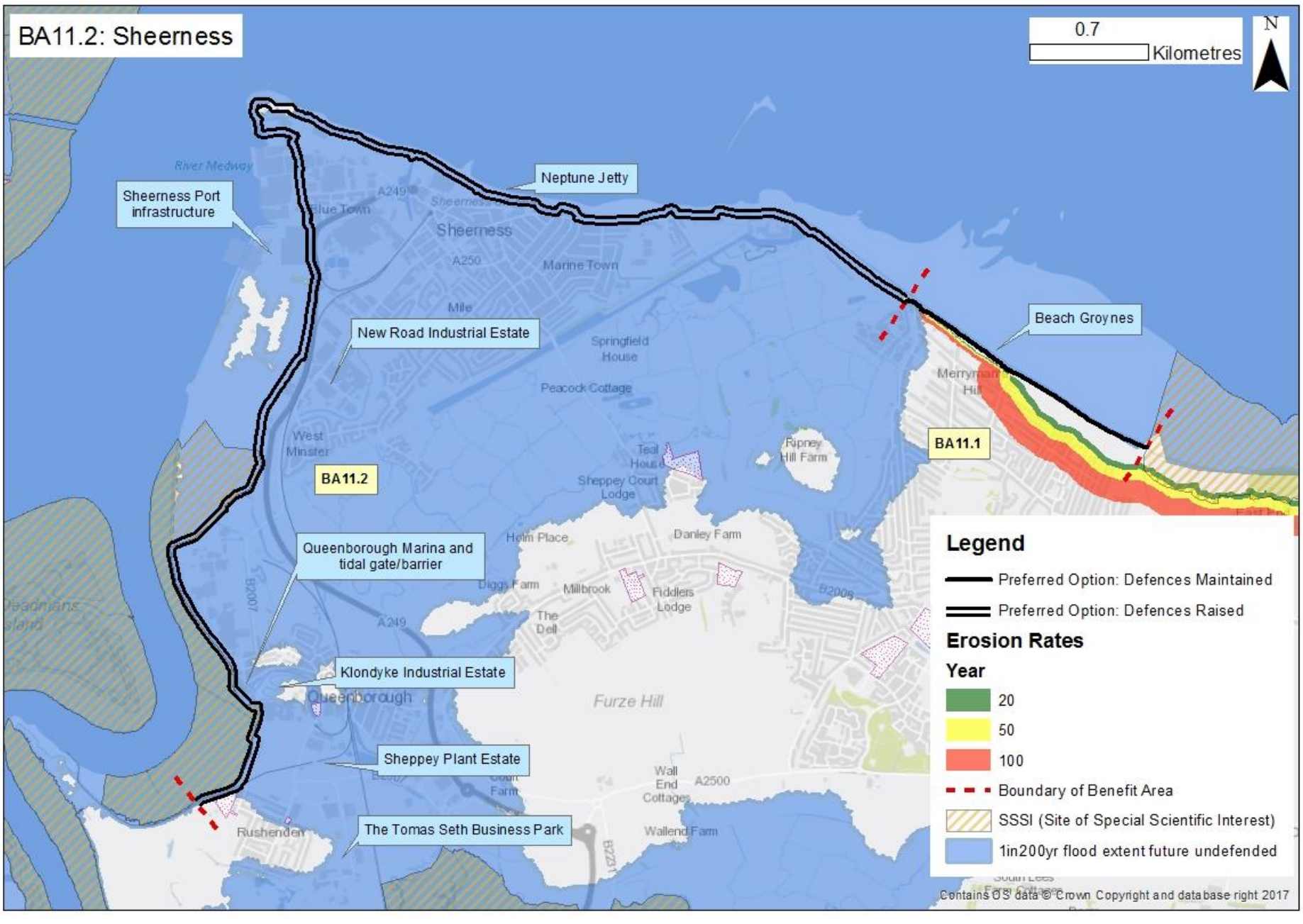
This option has the highest NPV and BCR. However, the option is ranked the lowest environmentally and mitigation will be required. As the risk is from erosion, the assessment of the increase in SoP provided by other options are not applicable because the main risk is from the erosion of the toe of the cliff and not from overtopping.

Preferred Option Costs

Cost	Benefits	BCR	PF Score
£ 1,408,969	**£ 13,931,040**	**9.89**	**115%**

Benefit Area Name	11 - Sheerness
Benefit Unit Name	11.2 - Sheerness to Minster and Rushenden to Sheerness
Frontage Length	9.5 km
Defence Structure Type	Wall, Embankment , High ground and Flood gate
Min Standard of Protection	6%
Residual Life (years)	20

	0-20 years	**20-50 years**	**50-100 years**
SMP Policy	HTL	HTL	HTL
Aiming to comply with	Yes		
Comment	HTL for all epochs due to significant assets at risk of erosion/flooding.		



Do Nothing Assets at Risk (Flooding)				
	50% AEP (undefended)		0.5% AEP (undefended)	
	Current Year	100 year	Current Year	100 Years
Residential	5447	6081	6226	6699
Commercial & Industrial	812	915	944	1037
Agricultural (Ha)	376.7	415.8	424.2	452
Key Infrastructure	New Road Industrial Estate, Sheppey Plant Estate, A250, A249, Sheerness-on-Sea Station, Scrapsgate Road Historic Landfill (inert), The Moat Historic Landfill (inert), Westminster Works Historic Landfill, Sheerness Canal Historic Landfill (inert), Westminster Historic Landfill (inert), Land East of Rushenden Road Historic Landfill (inert), Rushden Historic Landfill (inert)	New Road Industrial Estate, Sheppey Plant Estate, A250, A249, Sheerness-on-Sea Station, Queenborough Marina and tidal gate/barrier, The Tomas Seth Business Park, B2008, B2007, Queenborough Station Scrapsgate Road Historic Landfill (inert), The Moat Historic Landfill (inert), Westminster Works Historic Landfill, Sheerness Canal Historic Landfill (inert), Westminster Historic Landfill (inert), Land East of Rushenden Road Historic Landfill (inert), Rushden Historic Landfill (inert)	New Road Industrial Estate, Sheppey Plant Estate, A250, A249, Sheerness-on-Sea Station, Queenborough Marina and tidal gate/barrier, The Tomas Seth Business Park, B2008, B2007, Queenborough Station, Klondyke Industrial Estate Scrapsgate Road Historic Landfill (inert), The Moat Historic Landfill (inert), Westminster Works Historic Landfill, Sheerness Canal Historic Landfill (inert), Westminster Historic Landfill (inert), Land East of Rushenden Road Historic Landfill (inert), Rushden Historic Landfill (inert), Lappel Bank Historic Landfill (inert)	New Road Industrial Estate, Sheppey Plant Estate, A250, A249, Sheerness-on-Sea Station, Queenborough Marina and tidal gate/barrier, The Tomas Seth Business Park, B2008, B2007, Queenborough Station, Klondyke Industrial Estate, Scrapsgate Road Historic Landfill (inert), The Moat Historic Landfill (inert), Westminster Works Historic Landfill, Sheerness Canal Historic Landfill (inert), Westminster Historic Landfill (inert), Land East of Rushenden Road Historic Landfill (inert), Rushden Historic Landfill (inert), Lappel Bank Historic Landfill (inert)
Social and Environmental Considerations	Medway Estuary and Marshes SPA and SSSI (seaward and landward)	Medway Estuary and Marshes SPA and SSSI (seaward and landward)	Medway Estuary and Marshes SPA and SSSI (seaward and landward)	Medway Estuary and Marshes SPA and SSSI (seaward and landward)

Long List to Short List			
Potential Measures			
	Measures	**Selected**	**Reasoning**
Structural	Construct new embankment	Y	Take forward- embankments currently present
	Maintain embankment	Y	Take forward- embankments currently present
	Raise embankment (sustain)	Y	Take forward- embankments currently present
	Raise embankment (upgrade)	Y	Take forward- embankments currently present
	Construct new wall	Y	Take forward - walls currently present
	Maintain wall	Y	Take forward - walls currently present
	Raise wall (sustain)	Y	Take forward - walls currently present
	Raise wall (upgrade)	Y	Take forward - walls currently present
	Maintain rock revetment	N	Exclude - no rock revetment currently present
	Construct rock revetment	N	Exclude - limited benefits in constructing a revetment where embankments and walls are currently present and will not significantly reduce flood risk.
	Install demountable defences	Y	Take forward - public access and interaction with the river front is required. Demountable defences could support local regeneration plans. However potential increased cost compared to existing defences needs further consideration.
	Install temporary defences	N	Exclude - no significant assets at risk to warrant installation of temporary defences (significant resources to implement)
	Beach recharge (sand or shingle)	Y	Take forward - beach currently present
	Construct rock groynes	Y	Take forward - significant benefits to warrant the installation of rock defences.
	Maintain rock groynes	N	Exclude - no rock groynes currently present
	Construct timber structures	Y	Take forward - timber structures currently present
	Maintain timber structures	Y	Take forward - timber structures currently present
	Construct a tidal barrier	N	Exclude- likely to have significant environmental impacts, including on water quality (WFD), change in sedimentation in Estuary with wider impacts (environment, dredging, maintenance, navigation etc.). In addition likely to have significant costs. We recognise that a barrier is being proposed in Queenborough, but it does not provide flood protection to the whole of the BA. Further discussions will be required with asset owners at OBC stage.
Non-Structural	Implement monitoring	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Implement flood warning system	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Land use planning	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Adaptation measures	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Development control	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Emergency response plans	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Monitoring for health and safety only	N	Not suitable as a single measure to implement the SMP policy.

Long List of Options					
	a) Do nothing	b) Ongoing maintenance of embankments, walls, flood gates and beach.	c) Maintain SOP (capital) embankments, walls, flood gates, groynes and beach.	d) Raise (sustain SOP) embankments, walls, flood gates, groynes and beach.	e) Raise (upgrade SOP) embankments, walls, flood gates, groynes and beach.
To what extent does the option meet the objectives?					
1- Reduce Flood Risk	N	N	Y	Y	Y
2 - Natura 2000 sites	N	N	N	N	N
3- Reduce maintenan	N	N	N	N	N
4 - WFD	N	Y	Y	Y	Y
5 - Local Plans	N	N	Y	Y	Y
Comment and decision on whether taken forward to shortlist	Y=baseline for economics	Y - as baseline. Following 30 years a do nothing scenario would occur due to failure of the defences.	Y= SOP and residual life very low, therefore capital maintenance required to maintain defences (RL and SOP may be subject to change follow SPT review)	Y= existing SOP very low so could increase defence heights with sea level rise.	Y= existing SOP very low so could increase defence heights with sea level rise.

Short List of Options
a) Do nothing
b) Do minimum
c) Maintain (capital) embankments, walls, flood gates, groynes and beach.
d) Raise (sustain) embankments, walls, flood gates, groynes and beach.
e) Raise (upgrade) embankments, walls, flood gates, groynes and beach.

Assessment of Short List					
Option	**a) Do nothing**	**b) Do minimum**	**c) Maintain (capital) embankments, walls, flood gates, groynes and beach.**	**d) Raise (sustain) embankments, walls, flood gates, groynes and beach.**	**e) Raise (upgrade) embankments, walls, flood gates, groynes and beach.**
Description	Used as an economic baseline to compare the other options against.	Used as an economic baseline to compare the other options against.	Capital works are undertaken to maintain the current defences	Capital works are undertaken to improve the current defences	Capital works are undertaken to improve the current defences
Technical Issue	Defences have 20 years residual life. Scrapsgate Road Historic Landfill (inert), The Moat Historic Landfill (inert), Westminster Works Historic Landfill , Sheerness Canal Historic Landfill (inert), Westminster Historic Landfill (inert), Land East of Rushenden Road Historic Landfill (inert), Rushden Historic Landfill (inert) and Lappel Bank Historic Landfill (inert) potentially at risk.	Defences have 25 years residual life. Scrapsgate Road Historic Landfill (inert), The Moat Historic Landfill (inert), Westminster Works Historic Landfill , Sheerness Canal Historic Landfill (inert), Westminster Historic Landfill (inert), Land East of Rushenden Road Historic Landfill (inert), Rushden Historic Landfill (inert) and Lappel Bank Historic Landfill (inert) potentially at risk.	Current defences have 20 years residual life. Scrapsgate Road Historic Landfill (inert), The Moat Historic Landfill (inert), Westminster Works Historic Landfill , Sheerness Canal Historic Landfill (inert), Westminster Historic Landfill (inert), Land East of Rushenden Road Historic Landfill (inert), Rushden Historic Landfill (inert) and Lappel Bank Historic Landfill (inert) potentially at risk over time.	Current defences have 20 years residual life. Scrapsgate Road Historic Landfill (inert), The Moat Historic Landfill (inert), Westminster Works Historic Landfill , Sheerness Canal Historic Landfill (inert), Westminster Historic Landfill (inert), Land East of Rushenden Road Historic Landfill (inert), Rushden Historic Landfill (inert) and Lappel Bank Historic Landfill (inert) potentially at risk over time.	Current defences have 20 years residual life. Scrapsgate Road Historic Landfill (inert), The Moat Historic Landfill (inert), Westminster Works Historic Landfill , Sheerness Canal Historic Landfill (inert), Westminster Historic Landfill (inert), Land East of Rushenden Road Historic Landfill (inert), Rushden Historic Landfill (inert) and Lappel Bank Historic Landfill (inert) potentially at risk over time.
Assumptions/ Uncertainties	Assumes that all management is ceased.	Ongoing maintenance. Maintenance not sufficient to reduce risk of failure after year 25	The crest height of the defences remains the same as currently in place i.e. is not increased. Over time this will lead to a reduction in the SOP as the sea level rises.	The SOP provided by the defences is increased to the required standard over time. This option has a phased approach so the defences are raised in line with sea level rise at two phases i.e. capital works are undertaken in epoch 1 and again in year 50. This option will maintain the required SOP provided by the defences by keeping pace with sea level rise.	The crest height and SOP provided by the defences is increased. The crest heights will be raised to the level required to provide the SOP in 100 years time, i.e. the SOP will be greater than required during the first epoch, but this will decline over time with sea level rise but will still provide at least the SOP that the defence was upgraded to.
SOP Provided (% AEP)	>50%	>50%	6%	0.1%	0.1%
Value of Economics					
PV Capital Costs	£ -	£ -	£ 6,289,654	£ 9,954,329	£ 14,630,046
PV Maintenance Costs	£ -	£ 380,625	£ 577,885	£ 592,629	£ 712,673
PV Other Costs	£ -	£ -	£ 390,461	£ 753,613	£ 598,586
Total Cost (including Optimism Bias) (PV)	£ -	£ 609,000	£ 11,612,801	£ 18,080,913	£ 25,506,087
Value of Benefits	£ -	£ -	£ 601,960,469	£ 607,198,062	£ 607,177,157
Benefit Cost Ratio (BCR)	0.0	149.4	51.8	33.6	23.8
PF Score	0%	263%	1096%	705%	500%
Further funding required to achieve 100% PF Score	£ -	£ -	£ -	£ -	£ -
Flood/ erosion impacts					
Number of Residential Properties at risk under 0.1% AEP	7213	7213	5914	318	318
Number of Commercial properties at risk under 0.1% AEP	1089	1089	1005	121	121
PV Value of Properties (Total including AAD, write-offs, vehicle damages and Emergency Services)	£ 613,567,412	£ 522,793,607	£ 12,823,419	£ 7,715,652.55	£ 7,715,652.55

Critical Infrastructure	Sheerness Port, A250, A249, Sheerness-on-Sea Train Station, Queenborough Marina and tidal gate/barrier, B2008, B2007, Queenborough Train Station, at risk over time	Sheerness Port, A250, A249, Sheerness-on-Sea Train Station, Queenborough Marina and tidal gate/barrier, B2008, B2007, Queenborough Train Station, at risk over time	Sheerness Port, A250, A249, Sheerness-on-Sea Train Station, Queenborough Marina and tidal gate/barrier, B2008, B2007, Queenborough Train Station, at risk	No assets at risk	No assets at risk
PV Value of Impacts on road and rail	£904,877 A249/Isle of Sheppey rail line	£ 764,165	£39,616 A249Isle of Sheppey rail line	-	-
PV Value of Tourism and Recreation Impacts	£89,180 Sheerness Beach	£ 89,180	£89,180 Sheerness Beach	-	-
PV Value of Agriculture Impacts	£352,245 Worst case scenario 66ha Grade 3 agricultural land flooded and 399ha Grade 4 flooded.	£ 300,775	£1,029 Worst case scenario 42ha Grade 3 agricultural land flooded and 350ha Grade 4 flooded.	-	-
Stakeholders Feedback					
Statutory Stakeholders/ SEG	Key problem is erosion of the beach. Would prefer the beach to be built up with sand and the groynes replaced.	Key problem is erosion of the beach. Would prefer the beach to be built up with sand and the groynes replaced.	Key problem is erosion of the beach. Would prefer the beach to be built up with sand and the groynes replaced.	Key problem is erosion of the beach. Would prefer the beach to be built up with sand and the groynes replaced. Sheppey coastal partnership are applying or funding from the coastal communities' fund to put 10 new groynes along sheerness seafront. Potential to join up with Sheppey Proud coastal funding group	Key problem is erosion of the beach. Would prefer the beach to be built up with sand and the groynes replaced. Sheppey coastal partnership are applying or funding from the coastal communities' fund to put 10 new groynes along sheerness seafront. Potential to join up with Sheppey Proud coastal funding group
Landowners	No specific comments	No specific comments	No specific comments	No specific comments	No specific comments
Technical Feasibility					
Site Specific	n/a	n/a	n/a	n/a	n/a
Strategy Wide	n/a	n/a	n/a	n/a	n/a
WFD (Water Framework Directive)					
Compliance assessment outcome	2 Some reduction to HMWB but uncontrolled	3 Some reduction to HMWB but uncontrolled	1 Heavily Modified Water Body (HMWB) maintained	1 Heavily Modified Water Body (HMWB) maintained	1 Heavily Modified Water Body (HMWB) maintained
HRA (Habitats Regulation Assessment)					
Impact on SPA/ Ramsar qualifying features	2 There are potential adverse effects on the intertidal Medway Estuary and Marshes SPA and constituent qualifying features due to coastal squeeze in the south of the BA, however the defences are at risk of failure from year 20.	2 There are potential adverse effects on the intertidal Medway Estuary and Marshes SPA and constituent qualifying features due to coastal squeeze in the south of the BA, however the defences are at risk of failure from year 25.	2 There are potential adverse effects on the intertidal Medway Estuary and Marshes SPA and constituent qualifying features due to coastal squeeze in the south of the BA. Areas of mudflat around West Swale to the west of Queenborough and Rushenden, are likely to be reduced in size, impacting on the populations of waders and wildfowl that use this area for feeding etc.	2 There are potential adverse effects on the intertidal Medway Estuary and Marshes SPA and constituent qualifying features due to coastal squeeze in the south of the BA. Areas of mudflat around West Swale to the west of Queenborough and Rushenden, are likely to be reduced in size, impacting on the populations of waders and wildfowl that use this area for feeding etc.	2 There are potential adverse effects on the intertidal Medway Estuary and Marshes SPA and constituent qualifying features due to coastal squeeze in the south of the BA. Areas of mudflat around West Swale to the west of Queenborough and Rushenden, are likely to be reduced in size, impacting on the populations of waders and wildfowl that use this area for feeding etc.
Impacts on freshwater habitats	3 n/a - no designated freshwater habitats in the BA	3 n/a - no designated freshwater habitats in the BA	3 n/a - no designated freshwater habitats in the BA	3 n/a - no designated freshwater habitats in the BA	3 n/a - no designated freshwater habitats in the BA
Impacts on intertidal habitats	2 Yes although the defences are at risk of failure from year 20 so there may be the opportunity for the creation of new intertidal habitat around Queenborough	2 Yes although the defences are at risk of failure from year 25 so there may be the opportunity for the creation of new intertidal habitat around Queenborough	1 Yes risk of coastal squeeze, although overtime there may be some overtopping of the defences with sea level rise, which may allow new intertidal habitat to develop.	1 Yes maintenance of the defences will lead to the coastal squeeze of the intertidal habitat around Queenborough and Rushenden.	1 Yes maintenance of the defences will lead to the coastal squeeze of the intertidal habitat around Queenborough and Rushenden.

Habitat Connectivity	2 Slight adverse impacts as the development of new connecting mudflat habitat between the Swale and the Medway estuary areas is uncontrolled.	2 Slight adverse impacts as the development of new connecting mudflat habitat between the Swale and the Medway estuary areas is uncontrolled.	2 Slight adverse impacts as connecting mudflat habitat would be lost between the Swale and the Medway estuary areas with sea level rise	2 Slight adverse impacts as connecting mudflat habitat would be lost between the Swale and the Medway estuary areas with sea level rise	2 Slight adverse impacts as connecting mudflat habitat would be lost between the Swale and the Medway estuary areas with sea level rise
SEA (Strategic Environmental Assessment)					
Historic Environment	1 Two scheduled monuments and listed buildings at risk from flooding from year 20	1 Two scheduled monuments and listed buildings at risk from flooding from year 25	2 Two scheduled monuments and listed buildings at risk from flooding over time with sea level rise	4 Two scheduled monuments and listed buildings at reduced risk from flooding	5 Two scheduled monuments and listed buildings at reduced risk from flooding
Effects on population	1 Risk to population and commerce from flooding in the main urban area on the Isle of Sheppey, and nationally important Port once the defences fail in year 20.	1 Risk to population and commerce from flooding in the main urban area on the Isle of Sheppey, and nationally important Port once the defences fail in year 25.	2 Overtime, with sea level rise there will be a risk to population and commerce from flooding in the main urban area on the Isle of Sheppey, and nationally important Port.	4 Reduced risk to the population as the defences are improved	5 Reduced risk to the population as the defences are improved immediately
Impact on plans/ programmes	1 Proposed development site at risk from flooding following the failure of the defences in year 20	1 Proposed development site at risk from flooding following the failure of the defences in year 25	2 Proposed development site at risk from flooding over time with increased risk of overtopping due to sea level rise.	5 Proposed development site at reduced risk from flooding	5 Proposed development site at reduced risk from flooding
Freshwater Biodiversity	1 Risk to freshwater habitats once the defences fail in year 20. Water vole populations at risk.	1 Risk to freshwater habitats once the defences fail in year 25. Water vole populations at risk.	2 Gradual loss of freshwater habitats as the risk of overtopping increases with sea level rise. Increasing risk to water vole populations.	3 Freshwater habitats protected as the defences are improved	3 Freshwater habitats protected as the defences are improved
Saline Biodiversity	3 Small amount of saltwater coastal habitat loss from coastal squeeze. However the defences will fail in year 20 which may allow the uncontrolled development of new intertidal habitat, but the rate of this is unknown.	3 Small amount of saltwater coastal habitat loss from coastal squeeze. However the defences will fail in year 25 which may allow the uncontrolled development of new intertidal habitat, but the rate of this is unknown.	2 Small amount of habitat loss from coastal squeeze although not a significant amount	2 Small amount of habitat loss from coastal squeeze although not a significant amount	2 Small amount of habitat loss from coastal squeeze although not a significant amount
Soil	1 Loss of agricultural land once the defences fail.	1 Loss of agricultural land once the defences fail.	2 Gradual loss of agricultural land with sea level rise	5 Improvement to the defences so agricultural land protected.	5 Improvement to the defences so agricultural land protected.
Groundwater	3 No impacts predicted to aquifers. But there is a potential for the release of contaminants from the landfill sites once the defences fail.	3 No impacts predicted to aquifers. But there is a potential for the release of contaminants from the landfill sites once the defences fail.	3 No impacts predicted to aquifers. But there is a potential for the release of contaminants from the landfill sites.	4 No impacts predicted. Reduced risk of release of contaminants from landfill sites as the defences improved.	4 No impacts predicted. Reduced risk of release of contaminants from landfill sites as the defences improved.

Landscape (visual impact)	2 Potential changes from flooding following the failure of the defences as the environment is essentially townscape. Not considered a benefit overall	2 Potential changes from flooding following the failure of the defences as the environment is essentially townscape. Not considered a benefit overall	2 Potential gradual changes from flooding overtime as the environment is essentially townscape. Not considered a benefit overall	3 Defences improved so townscape character maintained	3 Defences improved so townscape character maintained
Carbon Storage	3 Negligible	3 Negligible	2 Some carbon cost due to maintenance	1 Carbon cost from construction	1 Carbon cost from construction
Ecosystem Services					
Qualitative Score from Ecosystem Services Assessment	-43	-43	-33	1	-1
Comments	Major degradation in many ES (e.g. natural hazard regulation, erosion regulation, cultural heritage and recreation and tourism) outweigh limited enhancement opportunities (e.g. aesthetic value and fishery habitat)	Major degradation in many ES (e.g. natural hazard regulation, erosion regulation, cultural heritage and recreation and tourism) outweigh limited enhancement opportunities (e.g. aesthetic value and fishery habitat)	Moderate gradual in many ES (e.g. natural hazard regulation, erosion regulation, cultural heritage and recreation and tourism) outweigh limited enhancement opportunities (e.g. aesthetic value and fishery habitat)	Balance of opportunities for enhancing some ES (e.g. natural hazard regulation and erosion regulation) with risks of degrading other ES (e.g. climate regulation and aesthetic value)	Balance of opportunities for enhancing some ES (e.g. natural hazard regulation and erosion regulation) with risks of degrading other ES (e.g. climate regulation and aesthetic value)
To what extent does the option meet the objectives?					
1- Reduce Flood Risk	N	N	Y	Y	Y
2 - Natura 2000 sites	N	N	N	N	N
3- Reduce maintenance	Y	Y	Y	Y	Y
4 - WFD	N	N	N	N	N
5 - Local Plans	Y	Y	Y	Y	Y

Environmental Scores

100 = best option, 0 = worst option

Option	a) Do nothing	b) Do minimum	c) Maintain (capital) embankments, walls, flood gates, groynes and beach.	d) Raise (sustain) embankments, walls, flood gates, groynes and beach.	e) Raise (upgrade) embankments, walls, flood gates, groynes and beach.
WFD (Water Framework Directive)					
Compliance assessment outcome	25	25	0	0	0
HRA (Habitats Regulation Assessment)					
Impact on SPA/ Ramsar qualifying features	25	25	25	25	25
Impacts on freshwater habitats	50	50	50	50	50
Impacts on intertidal habitats	25	25	0	0	0
Habitat Connectivity	25	25	25	25	25
SEA (Strategic Environmental Assessment)					
Historic Environment	0	0	25	75	100
Effects on population	0	0	25	75	100
Impact on plans/ programmes	0	0	25	100	100
Freshwater Biodiversity	0	0	25	50	50
Saline Biodiversity	50	50	25	25	25
Soil	0	0	25	100	100
Groundwater	50	50	50	75	75
Landscape (visual impact)	25	25	25	50	50
Carbon Storage	50	50	25	0	0
Total	**325**	**325**	**350**	**650**	**700**

Summary of Results

Option	a) Do nothing	b) Do minimum	c) Maintain (capital) embankments, walls, flood gates, groynes and beach.	d) Raise (sustain) embankments, walls, flood gates, groynes and beach.	e) Raise (upgrade) embankments, walls, flood gates, groynes and beach.
Costs	£ -	£ 609,000	£ 11,612,801	£ 18,080,913	£ 25,506,087
Benefits	£ -	£ 90,966,000	£ 599,083,757	£ 607,198,062	£ 607,177,157
NPV	£ -	£ 90,357,000	£ 587,470,957	£ 589,117,148	£ 581,671,070
BCR	0.0	149.4	51.6	33.6	23.8
Environmental Scoring	325	325	350	650	700

Preferred Option Decision Making

DLO	Leading Option at DLO Stage	Justification for Leading Option
DLO1 - Economic Assessment	Raise (sustain) embankments, walls, groynes and beach.	It provides the highest SOP and wider outcomes/benefits
DLO2 - Economic Sensitivities		
DLO3 - Review of Compensatory Intertidal Habitat Requirements		
DLO4 - Review of Compensatory Freshwater Habitat Requirements		
DLO5 - Modelling of Leading Options		
DLO6 - Consultation Phase		

Preferred Option Name

Raise (sustain) embankments, walls, flood gates, groynes and beach.

Preferred Option

This option involves improving the SoP provided by the defences to SoP of 0.1% AEP with sea level rise; in year 3 to 5.4m AOD and then in year 50 to 6.9m AOD to continue to provide protection in line with sea level rise.

Justification

Maintain (capital) option has the highest benefits following the Do Minimum and an incremental BCR greater than 1. However, the Sustain option protects over 5,000 additional properties and therefore much better meets the Strategy objectives. Furthermore, Sustain has the highest NPV value and better environmental scoring. Under local choices, the Sustain Option will be preferred and would require and additional £6.5m funding over 100 years.

Preferred Option Costs

Cost	Benefits	BCR	PF Score
£ 36,059,576	**£ 607,198,062**	**16.8**	**349%**