Appendix F
Long-list Option Appraisal Tables

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Frontage A

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage A: Jacob's Ladder Beach and Connaught Gardens (Chit Rocks)											
Option ID	**A.0**			**A.1**			**A.2**			**A.3**		
Overview/Description	Do Nothing			Maintenance of Jacob's Ladder seawall and promenade (including repairs where reinforcement is exposed) and rock revetment for as long as economically viable to maximise assessed residual life, then withdraw maintenance once it is uneconomical to continue this practice. Undertake in combination with Option #A.5.			Maintenance of Jacob's Ladder Wall and Promenade (including repairs where reinforcement is exposed) for as long as economically viable to maximise assessed residual life, then replace structure with new structure along same alignments once it is uneconomical to continue to maintain the existing structure. Maintenance of the remaining length (i.e. rock revetment) for the whole of the scheme life (i.e. to year 100). Undertake in combination with Option #A.5.			Maintenance of rock revetment around Chit Rocks, including re-packing of rock at western end where it adjoins Jacob's Ladder Beach. Maintenance of Jacob's Ladder seawall and promenade for the whole of the scheme life (i.e. to year 100). Undertake in combination with Option #A.5.		
Technical Issues	No works undertaken. Does not comply with SMP policy of hold-the-line.			Defence failure prevented through ongoing maintenance for 10 – 15 years until unviable and economic to continue. Complies with SMP policy to hold-the-line in short to medium term only.			Defence failure prevented through ongoing maintenance, and then through new replacement structure. Complies with SMP policy to hold-the-line.			Existing rock revetment removed and re-packed on existing line as necessary. Complies with SMP policy to hold-the-line.		
Assumptions and uncertainties	No intervention leading to failure of defence. For the access ramp section of the seawall which is not fronted by a revetment, the best estimate for complete performance failure is 25-30 years. For the seawall fronted by the revetment, the best estimate for complete performance failure is 45-50 years.			The best estimate for a significant reduction in the performance of the asset and defects that would render the structure (access ramp seawall) beyond economic structural repair is 10-15 years, and for the seawall fronted by the revetment, 25-30 years. Maintenance of entire section until year 15 then revert to do nothing.			Refer to assumptions and uncertainties for Option #A.1. Assume new replacement structures constructed in year 15.			Assumes no additional rock imported. Existing rock is removed and re-packed as necessary.		
Approaches to adaptation	None											
Costs and initial Benefit:Cost assessment and Partnership Funding Scores	Cost - £0 Benefit Cost Ratio – N/A PS Score = N/A			For Options A.1 & A.5: Cost - £674k (inc. 60% Optimism Bias) Benefit Cost Ratio – N/A (no benefits) PS Score = N/A (contribution required £674k) 100% funding required from non-GiA sources			For Options A.2 & A.5: Cost - £2,627k (inc. 60% Optimism Bias) Benefit Cost Ratio – N/A (no benefits) PS Score = N/A (contribution required £2,627k) 100% funding required from non-GiA sources			Cost - £737k (inc. 60% Optimism Bias) Benefit Cost Ratio – N/A (no benefits) PS Score = N/A (contribution required £737k) 100% funding required from non-GiA sources		
Category	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**
Economic Impacts												
Properties	No residential or commercial properties at risk of erosion within 100 yrs	-	-	Hinterland would be protected in short term only. No	-	-	Hinterland would be protected. No residential or commercial	-	-	Hinterland would be protected. No residential or commercial	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage A: Jacob's Ladder Beach and Connaught Gardens (Chit Rocks)											
Option ID	**A.0**			**A.1**			**A.2**			**A.3**		
				residential or commercial properties would be lost to erosion within 100 yrs			properties would be lost to erosion within 100 yrs			properties would be lost to erosion within 100 yrs		
Infrastructure	Amenity loss of SW Coast Path National Trail and impacts on amenity and tourism at Connaught Gardens and beach huts at Jacob's Ladder Beach. No other infrastructure would be lost.	Impacts not valued.	-	Option protects SW Coast Path National Trail, beach huts and Connaught Gardens in short term only. Impacts on amenity and tourism longer term as per Option #A.0. No other infrastructure would be lost.	Impacts not valued.	-	Option protects SW Coast Path National Trail, beach huts and Connaught Gardens from erosion. No infrastructure would be lost.	-	-	Option protects SW Coast Path National Trail, beach huts and Connaught Gardens from erosion. No infrastructure would be lost.	-	-
Transport	No transport links would be lost.	-	-	No transport links would be lost.	-	-	No transport links would be lost.	-	-	No transport links would be lost.	-	-
Development	There is not likely to be any impact on development opportunities.	-	-	-	-	-		-	-		-	-
Coastal Process Impacts												
Coastal processes	Coastal processes would continue as present until defences fail. The cliffs between Jacobs Ladder Beach and the west face of Chit Rocks	-	No significant change in prevailing conditions.	No change from present until defences fail. Once failure occurs, as per Option #A.0. The extent of erosion may be slightly greater than under 'Do	-	No significant change in prevailing conditions.	Coastal processes continue as existing.	-	Assume that the new structure is similar to existing. No significant change in prevailing conditions.	Coastal processes continue as existing.	-	Structure will remain similar to existing. No significant change in prevailing conditions.

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Frontage description	Frontage A: Jacob's Ladder Beach and Connaught Gardens (Chit Rocks)											
Option ID	**A.0**			**A.1**			**A.2**			**A.3**		
	would eventually become exposed and erode, with initially more rapid cut back so that the cliffs align with the cliffs to the west. Jacobs Ladder Beach would continue to be a shingle beach. In the long term, the headland of Chit Rocks would start to retreat once it becomes undefended, although this would be unlikely to lead to a continuous beach between Jacob's Ladder Beach and Sidmouth Beach (i.e. around Chit Rocks). The Chit Rocks shore platform diffracts wave energy so this section of coast will remain as a small headland, until			Nothing' (Option #A.0) as the coastline position will have been held for longer.								

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Frontage description	Frontage A: Jacob's Ladder Beach and Connaught Gardens (Chit Rocks)											
Option ID	**A.0**			**A.1**			**A.2**			**A.3**		
	possible submergence as a result of sea level rise. There could be wider scale impacts of the retreat of Chit Rocks, as historically this has provided some protection from south-westerly waves to the Sidmouth frontage. Impacts would depend upon the management of Sidmouth beach.											
Environmental Impacts												
Geology Geomorphology	Positive impact on UNESCO World Heritage Site and nationally designated geological sites by allowing natural processes of erosion to enhance features	-	-	Baseline conditions will remain the same until defence failure when conditions will become that of Option #A.0, allowing a naturally functioning coastline. This would be a positive impact to UNESCO World Heritage Site and nationally designated geological sites	-	-	Possible construction impacts to UNESCO World Heritage Site and nationally designated geological sites. Baseline conditions likely to remain at same level subject to external driving forces as replacement structure along same	-	-	Possible construction impacts to UNESCO World Heritage Site and nationally designated geological sites. Baseline conditions likely to remain at same level subject to external driving forces.	-	-

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Frontage description	Frontage A: Jacob's Ladder Beach and Connaught Gardens (Chit Rocks)											
Option ID	**A.0**			**A.1**			**A.2**			**A.3**		
							alignment as existing.					
Water quality	Potential water quality issues from infrastructure erosion debris.	-	-	With correct application of construction pollution prevention measures no likely impact (subject to external driving forces) until eventual defence failure. Conditions will then become those of no option with potential water quality issues.	-	-	With correct construction pollution prevention measures – no change to baseline envisaged (subject to external driving forces).	-	-	With correct construction pollution prevention measures – no change to baseline envisaged (subject to external driving forces).	-	-
Ecology	Impact from infrastructure erosion debris causing possible damage/ smothering of BAP habitat/reef habitat and inshore nursery and fish spawning grounds. Erosion debris would be at the detriment of loss of habitat for benthic species, however this may be	-	-	Possible Short term construction impacts. Baseline conditions will remain the same until defence failure (subject to external driving forces) when conditions will become that of Option #A.0.	-	-	No likely construction impacts to BAP habitats assuming material placed above MHWS.	-	-	Possible construction impacts to BAP habitats.	-	-

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Frontage description	Frontage A: Jacob's Ladder Beach and Connaught Gardens (Chit Rocks)											
Option ID	**A.0**			**A.1**			**A.2**			**A.3**		
	beneficial to epibenthos and reef associated communities such as those present at Chit rock.											
Fisheries	Possible impact to commercial fisheries and recreational fishers from property erosion debris causing damage/ smothering to inshore fishing grounds; potential to damage certain types of fishing gear. Possible Inshore navigational/ beach launch access hazards to commercial and recreational boats. Impact to beach access for recreational fishing.	-	-	Possible temporary impact to launch/landing access for recreational beach fishing during construction. Baseline conditions will remain the same until defence failure when conditions will become that of no option (subject to external driving forces) impacting on fishing ground/navigation/boat launch/beach access for commercial and recreational fishing.	-	-	Possible temporary impact to launch/landing access for recreational beach fishing during construction. No likely impact long term.	-	-	Possible temporary impact to launch access for commercial fishing boats and recreational beach fishing during construction. No likely impact long term.	-	-
Navigation	Increased navigational hazard around Chit Rocks. Impact for launch/landing	-	-	Baseline conditions will remain the same (subject to external driving forces)	-	-	Possible temporary landing/launch impact during construction for Sidmouth	-	-	Possible temporary landing/launch impact during construction for Sidmouth	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage A: Jacob's Ladder Beach and Connaught Gardens (Chit Rocks)											
Option ID	**A.0**			**A.1**			**A.2**			**A.3**		
	access for Sidmouth lifeboat and recreational boats.			until defence failure when conditions will become that of no option and cause navigational hazards inshore and increased hazards around Chit Rocks.			lifeboat and recreational boats.			lifeboat and recreational boats.		
Landscape	Changes will be seen to the landscape and there will be visual/direct impact to designated features including AONB and setting of the WHS.	-	-	No changes will be seen to the landscape or visual impact until defence failure when impacts for 'no option' will ensue (subject to external driving forces).	-	-	Short term visual impacts during construction. No changes to landscape envisaged if new structure is replaced like for like.	-	-	Short term impact during construction. No changes to landscape or visual impact envisaged if new structure is replaced like for like.	-	-
Archaeology and Cultural Heritage	Erosion will likely unearth and cause disturbance designated and non-designated Archaeology and Cultural Heritage features. Likely permanent direct impacts, and on setting of designated non-designated Archaeology and Cultural	-	-	Baseline designated and non-designated Archaeology and Cultural Heritage features will be protected until defence failure when impacts as for 'no option' conditions (subject to external driving forces) will ensue.	-	-	Construction may unearth/ cause disturbance to designated and non-designated Archaeology and Cultural Heritage features. Short term impacts on setting of designated and non-designated Archaeology and Cultural Heritage	-	-	Construction may unearth/ cause disturbance designated and non-designated Archaeology and Cultural Heritage features. Short term impacts on setting of designated and non-designated Archaeology and Cultural Heritage	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage A: Jacob's Ladder Beach and Connaught Gardens (Chit Rocks)											
Option ID	**A.0**			**A.1**			**A.2**			**A.3**		
	Heritage features.						features during construction.			features during construction.		
Air quality	N/A	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-
Noise	N/A	-	-	Noise and vibration impacts resulting from construction work can be successfully managed through good site management measures; minimising the construction period, working during fixed day time hour's etc.	-	-	Noise and vibration impacts resulting from construction work can be successfully managed through good site management measures; minimising the construction period, working during fixed day time hour's etc.	-	-	Noise and vibration impacts resulting from construction work can be successfully managed through good site management measures; minimising the construction period, working during fixed day time hour's etc.	-	-
Amenity value	Loss of access and beach amenities from erosion debris when defences start to fail. Health and safety concerns will likely prevent	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during maintenance activities.	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during maintenance and	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during maintenance activities.	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage A: Jacob's Ladder Beach and Connaught Gardens (Chit Rocks)											
Option ID	**A.0**			**A.1**			**A.2**			**A.3**		
	access prior to asset failure. Impact to SW Coast Path National Trail and National Cycle Network.			Baseline conditions will remain the same in the shorter term protecting amenities until defence failure when conditions will become that of no option (subject to external driving forces).			construction activities.					

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage A: Jacob's Ladder Beach and Connaught Gardens (Chit Rocks)											
Option	**A.4**			**A.5**								
Overview/Description	Maintenance of rock revetment around Chit Rocks, including re-packing of rock at western end where it adjoins Jacob's Ladder Beach and extension of rock armour along toe of Jacob's Ladder Seawall (approx. 10-20m extension envisaged) in support of Option #A.1/A.2 by contributing to efforts to extend the residual life of that wall. Maintenance of Jacob's Ladder seawall and promenade for the whole of the scheme life (i.e. to year 100). Undertake in combination with Option #A.5.			Periodic removal of shingle from Jacob's Ladder Beach promenade area, with sediment placed to the west of the wall within this sediment cell (not to be removed to east of Chit Rocks or elsewhere under any circumstances). Undertake in combination with Option #A.1/A.2/A.3/A.4. Maintenance of Jacob's Ladder seawall and promenade for the whole of the scheme life (i.e. to year 100).								
Technical Issues	Existing rock revetment removed and re-packed on existing line as necessary; and revetment extended eastwards using imported rock. No change in Standard of Protection to Sidmouth for duration of residual life of wall. Complies with SMP policy of hold-the-line.			General clearance of shingle off promenade area. Supports SMP policy.								
Assumptions and uncertainties	Existing rock is removed and re-packed as necessary.			All shingle to be kept within sediment cell. No shingle to be moved elsewhere.								
Approaches to adaptation	Existing rock can be reused when structure is rebuilt in Option #A.2.			None								
Costs and initial Benefit:Cost assessment and Partnership Funding Scores	Cost - £2,215k (inc. 60% Optimism Bias) Benefit Cost Ratio – N/A (no benefits) PS Score = N/A (contribution required £2,215k) 100% funding required from non-GiA sources			See Options A.1 and A.2.								
Category	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**
Economic Impacts												
Properties	Hinterland would be protected. No residential or commercial properties would be lost	-	-	Impacts of option to be considered together with those of option #A.1/A.2.	-	-						

	to erosion within 100 yrs.												
Infrastructure	Option protects SW coast path, beach huts and Connaught Gardens from erosion. No infrastructure would be lost.	-	-	Impacts of option to be considered together with those of option #A.1/A.2.	-	-							
Transport	No transport links would be lost.	-	-	Impacts of option to be considered together with those of option #A.1/A.2.	-	-							
Development	-	-	-	-	-	-							
Coastal Processes Impacts													
Coastal processes	Extending the rock revetment to the west would involving construction over the existing shingle beach, but the footprint of the new rock would be small and therefore little change in terms of coastal processes is anticipated. Coastal processes continue as at present.	-	-	Redistribution of sediment will only cause a local and short-term change; the beach will adjust to incident wave conditions over time. Otherwise, the coast is likely to respond as in Option #A.1/A.2.	-	Material should be placed to ensure it is redistributed by natural processes as soon as possible to reach an equilibrium profile.							
Environmental Impacts													
Geology Geomorphology	Possible construction impacts to UNESCO World	-	-	Unlikely to impact on UNESCO World Heritage Site	-	-							

	Heritage Site and nationally designated geological sites. Construction of a new structure impacts will not allow naturally functioning coastal processes long term.			and nationally designated geological sites.									
Water quality	With correct construction pollution prevention measures – no change to baseline envisaged (subject to external driving forces).	-	-	With correct construction pollution prevention measures – no change to baseline envisaged (subject to external driving forces).	-	-							
Ecology	No possible construction impacts to BAP habitats assuming material placed above MHWS.	-	-	No possible construction impacts to BAP habitats assuming material placed above MHWS.	-	-							
Fisheries	Temporary impact to launch access for commercial fishing boats and recreational beach fishing during construction. No likely impact long term.	-	-	Temporary impact to recreational fishing through limited access during construction. No likely impact long term.	-	-							
Navigation	May increase navigational	-	-	No impacts envisaged.	-	-							

	hazard around Chit Rocks long term.												
Landscape	Short term impact during construction. Changes in landscape character and there will be impact to the setting of the designated features including AONB and WHS, depending on scale of rock armour extension.	-	-	No changes to landscape or visual impact envisaged.	-	-							
Archaeology and Cultural Heritage	Impact to setting of designated/non-designated features Archaeology and Cultural Heritage features.	-	-	Impact to setting of designated/non-designated features Archaeology and Cultural Heritage features.	-	-							
Air quality	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-							
Noise	Noise and vibration impacts	-	-	Noise and vibration impacts	-	-							

	resulting from construction work can be successfully managed through good site management measures; minimising the construction period, working during fixed day time hour's etc.			resulting from construction work can be successfully managed through good site management measures; minimising the construction period, working during fixed day time hour's etc.									
Amenity value	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction activities.	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during shingle relocation activities.	-	-							

Frontage B

Project name	Sidmouth and East Beach Management Plan (BMP)			
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)			
Option	**B.0**	**B.1a**	**B1.b**	**B.2a**
Overview/Description	Do Nothing	Retain existing defence configuration and design (i.e. seawall, offshore reefs, 3 rock groynes). Repair/replace training wall along same alignment. Undertake periodic beach recycling, only using sediment within the frontage. Raise height of seawall along front (seaward) edge of promenade to reduce wave overtopping, at some point in the future.	Maintain existing defence configuration and design (i.e. seawall, offshore reefs, 3 rock groynes). Repair/replace training wall along same alignment. Undertake periodic beach recycling only using sediment within the frontage. Raise height of seawall along back (landward) edge of promenade to reduce risk of propagation of wave overtopping at some point in the future (i.e. replace existing low-level flood barrier/flood gate system with a higher, more robust structure and flood gate system).	Maintain existing defence configuration and design (i.e. seawall, offshore reefs, 3 rock groynes). Repair/replace training wall along same alignment. Undertake periodic beach recharge to maintain volume to level of design beach, supported by ongoing beach recycling.
Technical Issues	No works undertaken. Standard of protection to town from defence failure/erosion and overtopping reduces over time. For the river training wall, performance failure is estimated to occur in 15 years or less. The remaining seawalls performance failure is anticipated from 40 years onwards. Does not comply with SMP policy of hold-the-line.	New upstand floodwall constructed along seaward edge of sea defence/promenade assuming existing structure is suitable. New access gates/barriers will be required to gain access to foreshore (via the existing access steps and ramps). Training wall to be designed/upgraded to address scour at toe, risk of instability and measures to reduce wave reflection off sides of wall. Safety barriers to be upgraded/provided. Standard of protection from flooding/overtopping improved from existing but is dependent on new wall height. Wall details to be developed to minimize amenity impact along frontage. Wall on seaward edge provides better pedestrian safety from overtopping than Option # B.1b. Complies with SMP policy of hold-the-line.	New upstand floodwall constructed to reduce overtopping. Training wall to be designed/upgraded to address scour at toe, risk of instability and measures to reduce wave reflection off sides of wall. Safety barriers to be upgraded/provided. Standard of protection from flooding/overtopping improved from existing but is dependent on new wall height. Wall details to be developed to minimize amenity impact along frontage. Complies with SMP policy of hold-the-line.	Training wall to be designed/upgraded to address scour at toe, risk of instability and measures to reduce wave reflection off sides of wall. Safety barriers to be upgraded/provided. Standard of protection from overtopping and defence erosion/failure improved to original design level as currently no beach re-charge undertaken. Complies with SMP policy of hold-the-line.
Assumptions and uncertainties	The offshore reefs and 3 rock groynes are likely to remain and have an influence on the beach, but their integrity could be affected if beach levels at the toe drop, resulting in rocks becoming displaced. In a severe case, this could ultimately cause exposure of the structure core and further damage to the structure, resulting in crest level reduction and increased overtopping and wave transmission through the structure. This is likely to occur at a local level. Another risk is seawall failure, which could occur should beach levels drop within the groynes bays. This is a particular risk if prevailing conditions drive sediment transport in a single direction over prolonged periods, resulting in material becoming stripped from one end of the groyne bay. There is also a risk that outflanking occurs between the	Space requirements for flood barriers/gates to be investigated at short list stage.	Existing landward low-level flood barrier/wall replaced along existing route.	Source of beach re-charge material not known (local or imported) and whether sufficient material exists for 100 year appraisal period.

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.0**			**B.1a**			**B1.b**			**B.2a**		
	root of the groyne and the seawall. Should beach levels drop to a critical level, the seawall could become undermined, resulting in failure and a breach forming. Should beach levels drop the seawall structure could become undermined and fail; with a risk of breach and subsequent flooding of the low-lying hinterland. This is likely to be mitigated for a period by the rock armour along the toe, though over time even this will likely be subject to degradation and will therefore only delay the risk. As a result of sea level rise alone, even if the structures remain unchanged they are likely to become less effective in the long term, and overtopping of the seawall is anticipated to increase with time as wave and water levels increase.											
Approaches to adaptation	None			Wall could be built with additional freeboard allowance or ability to be raised in future			Wall could be built with additional freeboard allowance or ability to be raised in future			Increased quantities of beach material required to maintain standard of protection as sea levels rise.		
Costs and initial Benefit:Cost assessment and Partnership Funding Scores	For Frontages B and D combined: Cost - £0 Benefit Cost Ratio – N/A PS Score = N/A			For Options B.1a & B.6 & D.1: Cost - £5,663k (inc. 60% Optimism Bias) Benefit Cost Ratio – 11.7 PS Score = 69% (contribution required = £1,758k)			For Options B.1b & B.6 & D.1: Cost - £6,818k (inc. 60% Optimism Bias) Benefit Cost Ratio – 9.7 PS Score = 57% (contribution required = £2,913k)			For Options B.2 & B.6 & D.1: Cost - £9,876k (inc. 60% Optimism Bias) Benefit Cost Ratio – 6.7 PS Score = 40% (contribution required = £5,970k)		
Category	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**
Economic Impacts												
Properties	Residential properties at flood risk (Total for B.0 and D.0 linked flood risk area) – **Year 2014:** 19 at 100% (1 in 1) 36 at 20% (1 in 5)	PV Damages (Total for B.0 and D.0 linked flood risk area): £85,383k	-	Residential and commercial properties at flood risk (Total for B.0 and D.0 linked flood risk area) - Improve 0.5% (1 in 200)	PV Damages: £0k	-	Residential and commercial properties at flood risk (Total for B.0 and D.0 linked flood risk area) - Improve 0.5% (1 in 200)	PV Damages: £0k	-	Residential and commercial properties at flood risk (Total for B.0 and D.0 linked flood risk area) - Improve 0.5% (1 in 200)	PV Damages: £0k	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.0**			**B.1a**			**B1.b**			**B.2a**		
	64 at 2% (1 in 50) 69 at 1% (1 in 100) 86 at 0.5% (1 in 200) **Year 2065:** 41 at 100% (1 in 1) 63 at 20% (1 in 5) 90 at 2% (1 in 50) 95 at 1% (1 in 100) 98 at 0.5% (1 in 200) **Year 2115:** 71 at 100% (1 in 1) 91 at 20% (1 in 5) 99 at 2% (1 in 50) 103 at 1% (1 in 100) 108 at 0.5% (1 in 200) <u>Commercial properties at risk of flooding</u> (Total for B.0 and D.0 linked flood risk area) – **Year 2014:**			**Year 2014:** no properties at risk **Year 2065:** no properties at risk **Year 2115:** no properties at risk.			**Year 2014:** no properties at risk **Year 2065:** no properties at risk **Year 2115:** no properties at risk.			**Year 2014:** no properties at risk **Year 2065:** no properties at risk **Year 2115:** no properties at risk.		

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.0**			**B.1a**			**B1.b**			**B.2a**		
	9 at 100% (1 in 1) 19 at 20% (1 in 5) 49 at 2% (1 in 50) 52 at 1% (1 in 100) 57 at 0.5% (1 in 200) **Year 2065:** 22 at 100% (1 in 1) 45 at 20% (1 in 5) 59 at 2% (1 in 50) 59 at 1% (1 in 100) 63 at 0.5% (1 in 200) **Year 2115:** 52 at 100% (1 in 1) 59 at 20% (1 in 5) 68 at 2% (1 in 50) 68 at 1% (1 in 100) 80 at 0.5% (1 in 200).											
Infrastructure	Losses from tourism due to failure of defences and increased flooding. Disruption to	PV Damages (Total for B.0 and D.0 linked flood risk area): £46,612k	Damage to businesses included under commercial properties. Flood damage to utilities	Option protects tourism and amenity interests.	-	-	Option protects tourism and amenity interests.	-	-	Option protects tourism and amenity interests.	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.0**			**B.1a**			**B1.b**			**B.2a**		
	the tourism industry.		infrastructure has not been valued.									
Transport	Flooding of the seafront road – The Esplanade – and Fore Street occurs annually. Increasing with frequency with sea level rise.	Flood damage to road not valued separately.	-	Option protects transport links.	-	-	Option protects transport links.	-	-	Option protects transport links.	-	-
Development	This option would reduce the likelihood of further development / regeneration activities with knock-on effects for local economy.	Impacts not valued	-	Increased standard of flood risk protection increases potential for future development although diminishes over time due to coastal processes	-	-	Increased standard of flood risk protection increases potential for future development although diminishes over time due to coastal processes.	-	-	Increased standard of flood risk protection increases potential for future development.	-	-
Coastal Process Impacts												
Coastal processes	Initially, coastal processes would continue as present as the structures are likely to remain for some time. Should a severe storm or series of storms occur, there is a risk that the performance	-	Sediment supply is assumed to remain the same as present. The risk depends upon prevailing conditions, including predominate wave direction and the frequency, duration and	Coastal processes would continue as present, with the current structures continuing to influence nearshore transport. The risk of overtopping and flooding would be reduced along	-	Sediment supply is assumed to remain the same as present. The risk depends upon prevailing conditions, including predominate wave direction and the frequency, duration and	Impacts would be as for Option #B.1a.	-	Sediment supply is assumed to remain the same as present. The risk depends upon prevailing conditions, including predominate wave direction and the frequency, duration and	Coastal processes would continue as present. Beach recharge would result in a more stable beach, with diminishing volume prevented by addition of new material. Aided by improved	-	Sediment supply is assumed to remain the same as present. The risk depends upon prevailing conditions, including predominate wave direction and the frequency, duration and

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.0**			**B.1a**			**B1.b**			**B.2a**		
	of the reefs could be affected should beach levels at the toe reach a critical level. A more imminent threat would result from prolonged sediment transport in a single direction, potentially resulting in beach levels falling to critical levels along the frontage, putting the integrity of the seawall at risk. A narrower beach would result in increased overtopping and would put increased pressure on the seawall, which could then lead to a breach and flooding of the town. Once a breach forms, failure of subsequent sections may occur.		intensity of storms.	the length of this frontage. However, there is a risk that with sea level rise there could be increased scour along the seawall and as recycling is only due to take place within the frontage, the volume of beach will diminish over time. This will increase the vulnerability of the seawall to undermining at some locations (dependent upon prevailing conditions and residual condition of rock armour along the toe of the seawall). In the long term, as for do nothing (Option #B.0), sea level rise alone will result in a reduction in the structure performance due to the		intensity of storms.			intensity of storms.	beach condition, the risk of overtopping and flooding would reduce along the length of this frontage. In the long term, as for do nothing, sea level rise alone will result in a reduction in the structure performance due to the increase in water level relative to the crest level. This may affect mobility of sediment along the coastline and affect the recycling/ recharge regime volumes. Beaches at the western end may also become more vulnerable to beach draw down and sediment loss.		intensity of storms. Also assumed that recharge material would be of similar size and grading.

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.0**			**B.1a**			**B1.b**			**B.2a**		
	In the long term performance of the reefs could be diminished by rising sea levels, as water levels exceed those used in the design of the structure crest level. Any increase in sea level may also result in increased scour within the groyne bays and increased loss of sediment during storm events, as the beaches are subject to greater wave energies. The western end of the beach could become more mobile and esplanade become more vulnerable to overtopping. Should prevailing conditions result in movement of sediment away from this section, beach			increase in water level relative to the crest level. This may affect mobility of sediment along the coastline and affect the recycling regime. Beaches at the western end may also become more vulnerable to beach draw down and sediment loss.								

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.0**			**B.1a**			**B1.b**			**B.2a**		
	levels could reach critical levels, increasing the risk of both overtopping and seawall failure. The training wall along the River Sid may become undermined, and a breach could form allowing increased sediment transport across the mouth of the River Sid. This could increase the vulnerability of the seawall at the eastern end of the Sidmouth frontage. There could also be consequences for the outflow of the River Sid and subsequent issues upstream.											
Environmental Impacts												
Geology Geomorphology	Positive likely impact on UNESCO World Heritage Site and nationally designated	-	-	Possible construction impacts to UNESCO World Heritage Site and nationally	-	-	Possible construction impacts to UNESCO World Heritage Site and nationally	-	-	Possible construction impacts to UNESCO World Heritage Site and nationally	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.0**			**B.1a**			**B1.b**			**B.2a**		
	geological sites. Coast allowed to function naturally.			designated geological sites east of training wall/Chit Rocks.			designated geological sites east of training wall/Chit Rocks.			designated geological sites east of training wall.		
Water quality	Potential water quality issues from infrastructure erosion debris.	-	-	With correct construction pollution prevention measures – no change to baseline envisaged (subject to external driving forces).	-	-	With correct construction pollution prevention measures – no change to baseline envisaged (subject to external driving forces).	-	-	With correct construction pollution prevention measures – no change to baseline envisaged (subject to external driving forces).	-	-
Ecology	Impact from infrastructure erosion debris causing possible damage/ smothering of BAP habitat/reef habitat and inshore fish nursery and spawning grounds. Long term, erosion debris present would be at the detriment of loss of habitat for benthic species, however this may be beneficial and increase habitat to epibenthos/	-	-	Possible construction impacts to BAP habitats and to species associated with the existing structure during construction/ modification of seaward seawall/ training wall/beach recycling	-	-	Possible construction impacts to BAP habitats and to benthic ecology associated with the existing structure during construction of training wall and impacts from beach recycling	-	-	Possible construction impacts to BAP habitats and to benthic ecology associated with the existing structure during construction of training wall and impacts from beach recharge/ recycling impacts to BAP habitats	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.0**			**B.1a**			**B1.b**			**B.2a**		
	reef associated communities											
Fisheries	Possible impact to commercial fisheries and recreational fishers from property erosion debris causing damage/ smothering to inshore fishing grounds; potential damage to certain types of fishing gear. Possible Inshore navigational/ beach launch access hazards to commercial and recreational boats. Impact to beach access for recreational fishing.	-	-	Possible temporary impact to launch access for commercial fishing boats and recreational beach fishing during construction. No likely impact long term.	-	-	Possible temporary impact to launch access for commercial fishing boats and recreational beach fishing during construction. No likely impact long term.	-	-	Possible temporary impact to launch access for commercial fishing boats and recreational beach fishing during construction. No likely impact long term. Possible impacts to fish ecology (habitat/ spawning/nursery grounds) from increased sediment loads.	-	-
Navigation	Possible navigational hazards inshore. Increased navigational hazard around Chit Rocks.	-	-	Possible short term impact during construction/ beach recycling activities for beach boat landing/launch.	-	-	Possible short term impact during construction/ beach recycling activities for beach boat landing/launch.	-	-	Possible short term impact during construction/ beach recharge/ recycling activities for beach boat landing/launch.	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.0**			**B.1a**			**B1.b**			**B.2a**		
Landscape	Changes in landscape character and there will be impact to the setting of the designated features including AONB and setting of the WHS.	-	-	Changes in landscape character and there will be impact to the setting of the designated features including AONB and setting of the WHS as a result of heightening the training wall/seawall.	-	-	Changes in landscape character and there will be impact to the setting of the designated features including AONB and setting of the WHS as a result of heightening the training wall/seawall.	-	-	Short term impact during construction. No changes to landscape or visual impact envisaged if new training wall is replaced like for like.	-	-
Archaeology and Cultural Heritage	Permanent impacts to, and on setting of designated and non-designated Archaeology and Cultural Heritage features.	-	-	Construction may unearth/ cause disturbance to designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and non-designated features long term.	-	-	Construction may unearth/ cause disturbance to designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and non-designated features long term.	-	-	Construction may unearth/ cause disturbance to designated and non-designated Archaeology and Cultural Heritage features. Possible short term impact on setting of designated and non-designated features during construction.	-	-
Air quality	N/A	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.0**			**B.1a**			**B1.b**			**B.2a**		
				for long-term, permanent significant environmental effects.			for long-term, permanent significant environmental effects.			for long-term, permanent significant environmental effects.		
Noise	N/A	-	-	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.	-	-	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.	-	-	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.	-	-
Amenity value	Impact to access/and on beach amenities from erosion debris when defences start to fail including lifeboat access and SW Coast Path National Trail and National Cycle Network in this section.	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction/ maintenance activities.	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction/ maintenance activities.	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during maintenance/ beach recharge/ recycling activities.	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)			
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)			
Option	**B.2b**	**B.3a**	**B.3b**	**B.4a**
Overview/Description	As option B.2a except repair and shorten length of both the current freestanding section of training wall and East Pier.	Remove breakwaters and groynes and training wall, replace with large-scale rock revetment along frontage. Raise height of seawall along back (landward) edge of promenade to reduce risk of propagation of wave overtopping at some point in the future. At the eastern end of the seawall, replace existing low-level flood barrier/flood gate system with a higher, more robust structure and flood gate system. Also consider in combination with Option C.1.	As option B.3a but replace with large-scale concrete stepped revetment along frontage and raise height of seawall along back (landward) edge of promenade to reduce risk of propagation of wave overtopping at some point in the future.	Modify existing Bedford Steps, York Steps and East Pier rock groynes (from existing length) to make 'T-head' type groynes to retain sediment in small stable bays between each groyne bay. Support with periodic beach recycling and/or recharge to retain volume to give required design beach. Repair/replace training wall along same alignment.
Technical Issues	Training wall to be designed/upgraded to address scour at toe, risk of instability and measures to reduce wave reflection off sides of wall. Safety barriers to be upgraded/provided. Standard of protection from overtopping and defence erosion/failure improved to original design level as currently no beach re-charge undertaken. Complies with SMP policy of hold-the-line. Allows for a more gradual transition in shoreline orientation between hold-the-line in Frontage #B to managed realignment frontage in #C compared to Option #B.2a.	Existing rock groynes and revetments and training wall removed and replaced with large-scale revetment along frontage. Access points (steps and ramps) to be provided through revetment. Safety barriers to be provided to prevent falls from height onto rock revetment. Beach likely to be lost over time. Standard of protection from overtopping potentially improved together with improved SOP from defence erosion/failure. Complies with SMP policy as continues to hold-the-line along this frontage.	New stepped revetment with toe built along frontage. Access points (steps and ramps) to be provided through revetment. Toe structure to be located below predicted beach levels to prevent/minimize toe scour. Safety barriers to be provided to prevent falls from height onto stepped revetment. Beach likely to be lost over time. Standard of protection from overtopping potentially improved together with improved SOP from defence erosion/failure. Complies with SMP policy as continues to hold-the-line along this frontage.	Additional rock to be imported as necessary to create T-head groynes. Training wall to be designed/upgraded to address scour at toe, risk of instability and measures to reduce wave reflection off sides of wall. Safety barriers to be provided/upgraded. Standard of protection improved to original design level due to improved beach levels providing reduced overtopping and protection from scour/erosion. Complies with SMP policy as continues to hold-the-line along this frontage with river training wall forming boundary to hold the line frontage.
Assumptions and uncertainties	Source of beach re-charge material not known (local or imported) and whether sufficient material exists for 100 year appraisal period. Impact on SWW outfall to be considered – additional protection may be required to structure.	Assume no beach is retained along frontage in long term. Impact on SWW outfall to be considered – additional protection may be required to structure.	As Option #B.3a	Source of beach re-charge material not known (local or imported) and whether sufficient material exists for 100 year appraisal period.
Approaches to adaptation	Increased quantities of beach material required to maintain standard of protection as sea levels rise.	Low level wall could be built with additional freeboard allowance or ability to be raised in future. Existing rock could be incorporated and re-used within new works. New rock toe can 'drop' to suit any lowering of foreshore.	Low-level wall could be built with additional freeboard allowance or ability to be raised in future.	Increased quantities of beach material required to maintain standard of protection as sea levels rise.
Costs and initial Benefit:Cost assessment and	For Options B.2b & B.6 & D.1: Cost - £9,270k (inc. 60% Optimism Bias) Benefit Cost Ratio – 7.1	For Options B.3a & B.6 & D.1: Cost - £20,749k (inc. 60% Optimism Bias) Benefit Cost Ratio – 3.2	For Options B.3b & B.6 & D.1: Cost - £20,611k (inc. 60% Optimism Bias) Benefit Cost Ratio – 3.2	For Options B.4a & B.6 & D.1: Cost - £17,422k (inc. 60% Optimism Bias) Benefit Cost Ratio – 3.8

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	B.2b			B.3a			B.3b			B.4a		
Partnership Funding Scores	PS Score = 42% (contribution required = £5,365k)			PS Score = 19% (contribution required = £16,844k)			PS Score = 19% (contribution required = £16,706k)			PS Score = 22% (contribution required = £13,517k)		
Category	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**
Economic Impacts												
Properties	Residential and commercial properties at flood risk (Total for B.0 and D.0 linked flood risk area) - Improve 0.5% (1 in 200) **Year 2014:** no properties at risk **Year 2065:** no properties at risk **Year 2115:** no properties at risk.	PV Damages: £0k	-	Residential and commercial properties at flood risk (Total for B.0 and D.0 linked flood risk area) - Improve 0.5% (1 in 200) **Year 2014:** no properties at risk **Year 2065:** no properties at risk **Year 2115:** no properties at risk.	PV Damages: £0k	-	Residential and commercial properties at flood risk (Total for B.0 and D.0 linked flood risk area) - Improve 0.5% (1 in 200) **Year 2014:** no properties at risk **Year 2065:** no properties at risk **Year 2115:** no properties at risk.	PV Damages: £0k	-	Residential and commercial properties at flood risk (Total for B.0 and D.0 linked flood risk area) - Improve 0.5% (1 in 200) **Year 2014:** no properties at risk **Year 2065:** no properties at risk **Year 2115:** no properties at risk.	PV Damages: £0k	-
Infrastructure	Option protects tourism and amenity interests.			Option protects tourism and amenity interests.	-	-	Option protects tourism and amenity interests.	-	-	Option protects tourism and amenity interests.	-	-
Transport	Option protects transport links.			Option protects transport links.	-	-	Option protects transport links.	-	-	Option protects transport links.	-	-
Development	Increased standard of flood risk protection increases potential for future			Increased standard of flood risk protection increases potential for future	-	-	Increased standard of flood risk protection increases potential for future	-	-	Increased standard of flood risk protection increases potential for	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.2b**			**B.3a**			**B.3b**			**B.4a**		
	development although predicted long term loss of beach may influence development types.			development although predicted long term loss of beach may influence development types.			development although predicted long term loss of beach may influence development types.			future development.		
Coastal Process Impacts												
Coastal processes	As for B2a, beach recharge would result in a more stable beach, with diminishing volume prevented by addition of new material. Aided by improved beach condition, the risk of overtopping and flooding would reduce along the length of this frontage. The shorter structures should result in greater sediment transfer between frontage B and C – direction of transport and volumes will obviously depend upon prevailing		Sediment supply is assumed to remain the same as present. The risk depends upon prevailing conditions, including predominate wave direction and the frequency, duration and intensity of storms. It is also assumed that recharge material would be of similar size and grading to current beaches.	The rock revetment will be built over the existing shingle beach. With removal of the groynes and reefs, the beach would initially change to a more linear form, with a shingle upper beach and sandy lower beach remaining. Given that the beach is very dynamic and has historically been subject to longshore drift and draw-down, without stabilising structures, it is likely that the beach will become more mobile and volatile, with periodically periods of higher beach levels and lower beach	-	Sediment supply is assumed to remain the same as present. The risk depends upon prevailing conditions, including predominate wave direction and the frequency, duration and intensity of storms.	Impacts would be as for Option #B.3a, although wave reflection may differ slightly, depending upon the design.	-	Sediment supply is assumed to remain the same as present. The risk depends upon prevailing conditions, including predominate wave direction and the frequency, duration and intensity of storms.	Given that the current groynes extend down to a lower sandy beach, the T-head extensions may reduce current-induced scour around the toe of the structure and thereby improve stability of the structure. They may also result in additional accretion due to reduction of wave energy at the nearshore due to diffraction, and help to reduce the amount of draw-down from the beach during storms/ winter periods. This may improve stability of the	-	The impact of the T-head groynes on beach behaviour and coastal processes will depend upon their design. The optimum shape of the T-head groyne will affect the influence of the incident waves on sediment movement and therefore the shape that the beach conforms to.

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.2b**			**B.3a**			**B.3b**			**B.4a**		
	conditions. Although this may have benefits with respect to frontage C, it may result in more volatile beaches at the eastern end of the Sidmouth frontage, which will need to be addressed through beach recycling/ recharge. It is possible, therefore that maintaining the standard of protection will require additional material compared to B2b, depending upon the prevailing conditions in the future. Recycling requirements will be informed by monitoring which will need to consider the potential for increased risk along this frontage.			levels. There is a risk that over time the shingle beach will become eroded, with losses due to draw down and longshore transport. Unless sediment is input from updrift (which is unlikely), the beach will diminish significantly in volume and may disappear altogether or remain as a narrow strip along the toe of the rock revetment. Without the training wall, the eastern end of the beach will be more dynamic, with sediment transport determined by coastal and fluvial processes. This will affect the outflow of the River Sid, with potential consequences upstream.						beach and thereby reduce the risk of beach levels reaching critical levels at one end of the bay under periods of prolonged uni-directional transport. To the west and east, coastal processes will continue as existing.		

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.2b**			**B.3a**			**B.3b**			**B.4a**		
	In the long term, there will be a similar response to B2a, but with potential for increased sediment transfer between frontages B and C, which may affect the recycling/ recharge volumes.											
Environmental Impacts												
Geology Geomorphology	Shortening the training wall/east pier groyne may have a possible positive impact on UNESCO World Heritage Site and nationally designated geological sites by increasing natural processes.			Positive impact on UNESCO World Heritage Site and nationally designated geological sites by allowing natural processes of erosion by removal of breakwater. Loss of beach protection may accelerate erosion. However this would be limited by the construction of the new revetment. Possible construction impacts at Chit Rocks.	-	-	Positive impact on UNESCO World Heritage Site and nationally designated geological sites by allowing natural processes of erosion by removal of breakwater. Loss of beach protection may accelerate erosion. However this would be limited by the construction of the new revetment.	-	-	Possible impact on UNESCO World Heritage Site and nationally designated geological sites not allowing natural processes.	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.2b**			**B.3a**			**B.3b**			**B.4a**		
Water quality	Shortening of the training Wall and East Pier Groyne may release sediment into the water column and impact water quality temporarily. Chemical composition unknown.			Removal of structures may result in the increase in sediments to the water column and impact water quality temporarily. Chemical composition unknown. Long term lack of beach conflicts with designation as a bathing beach.	-	-	Removal of structures may result in the increase in sediments to the water column and impact water quality temporarily. Chemical composition unknown. Long term lack of beach conflicts with designation as a bathing beach.	-	-	Removal of structure may result in the increase in sediments to the water column and impact water quality temporarily. Chemical composition unknown.	-	-
Ecology	Possible construction impacts to BAP habitats and species associated with the structures modified. Possible construction impacts to BAP habitats/fish nursery and spawning grounds by removal/ disturbance of sediment during modification/shortening of training wall and East Groyne			Possible long term impacts (loss of beach protection) may promote Internationally and Nationally designated features. Possible construction and long term impacts to BAP habitats and species associated with the structure being removed. Possible construction impacts to fish habitat/nursery and spawning grounds by	-	-	Possible long term impacts (loss of beach protection) may promote Internationally and Nationally designated features. Possible construction and long term impacts to BAP habitats and species associated with the structure being removed. Possible construction impacts to fish habitat/fish nursery and spawning grounds by	-	-	Possible construction and long term impacts to BAP habitats and species associated with the structure being modified. Possible construction impacts to BAP habitat/fish nursery and spawning grounds by removal/ disturbance of sediment. Possible construction impacts to BAP habitats during construction of training wall/	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.2b**			**B.3a**			**B.3b**			**B.4a**		
	Possible impacts to BAP habitat from beach recharge/ recycling			removal/ disturbance of sediment. Possible impact to designated features and BAP habitat from a reduction in beach width due to coastal squeeze (annual vegetation drift lines).			removal/ disturbance of sediment. Possible long term permanent changes due to loss of beach sediment inshore. Possible impact to designated features and BAP habitat from a reduction in beach width due to coastal squeeze (annual vegetation drift lines).			modification of groynes and impacts from beach recharge/ recycling.		
Fisheries	Temporary impact during construction to launch access for commercial fishing boats and recreational beach fishing.			Temporary impact during construction and possible long term impact to launch access for commercial fishing boats and recreational beach fishing. Loss of recreational/ commercial fishing areas around breakwaters/ groynes.	-	-	Temporary impact during construction and possible long term impact to launch access for commercial fishing boats and recreational beach fishing. Loss of recreational/ commercial fishing areas around breakwaters/ groynes.	-	-	Temporary impact to launch access for commercial fishing boats and recreational beach fishing during construction.	-	-
Navigation	Short term impact during construction/b			Short term impact during construction/b	-	-	Short term impact during construction/b	-	-	Short term impact during construction/b	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.2b**			**B.3a**			**B.3b**			**B.4a**		
	each recycling activities for beach boat landing/launch			each recycling activities for beach boat landing/launch. Navigation may be improved long term with the removal of offshore structure and associated hazard to vessels.			each recycling activities for beach boat landing/launch. Navigation may be improved long term with the removal of offshore structure and associated hazard to vessels.			each recycling activities for beach boat landing/launch. Assuming access is incorporated into the design of any new structures.		
Landscape	Short term impact during construction. Shortening the training wall/East pier Groyne will see changes in the landscape long term. Maybe a positive/negative visual impact to designated features.			Changes will be seen to the landscape and there will be visual/direct impact to designated features including AONB and setting of the WHS.	-	-	Changes will be seen to the landscape and there will be visual/direct impact to designated features including AONB and setting of the WHS.	-	-	Changes will be seen to the landscape and there will be visual/direct impact to designated features including AONB and setting of the WHS.	-	-
Archaeology and Cultural Heritage	Construction may unearth/ cause disturbance to designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and			Construction may unearth/ cause disturbance to designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and	-	-	Construction may unearth/ cause disturbance to designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and	-	-	Construction may unearth/ cause disturbance to designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.2b**			**B.3a**			**B.3b**			**B.4a**		
	non-designated features long term.			non-designated features long term.			non-designated features long term.			non-designated features long term.		
Air quality	Impact to air considered negligible and not believed to have potential for long-term, permanent significant environmental effects.			Impact to air considered negligible and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air considered negligible and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air considered negligible and not believed to have potential for long-term, permanent significant environmental effects.	-	-
Noise	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.			Possible noise and vibration impacts to fish ecology/ nursery and spawning grounds from ground/ breakwater removal Land based Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.	-	-	Possible noise and vibration impacts to fish ecology/ nursery and spawning grounds from ground/ breakwater removal Land based Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.	-	-	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.	-	-
Amenity value	Temporary impact to SW			Temporary impact to SW	-	-	Temporary impact to SW	-	-	Temporary impact to SW	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.2b**			**B.3a**			**B.3b**			**B.4a**		
	Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction.			Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction. Long term loss of beach will result in loss of beach amenities/ beach users.			Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction. Long term loss of beach will result in possible loss of beach amenities/ beach users.			Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction.		

Project name	Sidmouth and East Beach Management Plan (BMP)			
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)			
Option	**B.4b**	**B.4c**	**B.4d**	**B.5a**
Overview/Description	As option B.4a except involves shortening East Pier groyne in the process. Repair/replace training wall and shorten length of the current freestanding section.	Modify existing Bedford Steps, York Steps and East Pier rock groynes to make 'T-head' type groynes to retain sediment in small stable bays between each groyne bay. Support with periodic beach recycling and/or recharge to retain volume to give required design beach. Remove training wall and place rock-armour around seawall where it curves into the River Sid. Also consider in combination with Option C.1.	As option B.4c except, remove East Pier rock groyne and training wall and place rock-armour around seawall where it curves into the River Sid. Also consider in combination with Option C.1.	Remove the three rock groynes and training wall. Construct additional offshore rock breakwaters (number to be determined at later date) to implement broadly the technically preferred solution identified by HR Wallingford in the 1990s. Reefs would be structures of similar size/scale as the two existing breakwaters, tapering in (and so being gradually smaller potentially) to minimise diffraction impacts on down-drift coast. Support with periodic beach recharge and recycling. Note 1, option has potential to be extended along East Beach – see Option C.7a – so also consider in-combination with that option. Note 2, reefs could incorporate biological units to encourage flora and fauna development.
Technical Issues	Allows for more gradual transition in shoreline orientation between hold-the line frontage in #B to managed realignment frontage in #C compared to Option #B.4a. Additional rock to be imported as necessary to create T-head groynes. Training wall to be designed/upgraded to address scour at toe, risk of instability and measures to reduce wave reflection off sides of wall. Safety barriers to be provided/upgraded. Standard of protection improved to original design level due to improved beach levels providing reduced overtopping and protection from scour/erosion. Complies with SMP policy as continues to hold-the-line along this frontage with river training wall forming boundary to hold the line frontage.	Allows for transition in shoreline orientation between hold-the line frontage in #B to managed realignment frontage in #C. Additional rock to be imported as necessary to create T-head groynes. Training wall removal and replacement by rock armour protection helps to dissipate wave energy at River Sid entrance and reduces wave reflection onto promenade. Impact on SWW outfall to be considered – additional protection may be required to structure. Standard of protection improved to original design level due to improved beach levels providing reduced overtopping and protection from scour/erosion. Complies with SMP policy of hold-the-line.	Allows for more gradual transition in shoreline orientation between hold-the line frontage in #B to managed realignment frontage in #C when compared to Option #B4.c. Additional rock to be imported as necessary to create T-head groynes. Training wall removal and replacement by rock armour protection helps to dissipate wave energy at River Sid entrance and reduces wave reflection onto promenade. Impact on SWW outfall to be considered – additional protection may be required to structure. Standard of protection improved to original design level due to improved beach levels providing reduced overtopping and protection from scour/erosion. Complies with SMP policy of hold-the-line.	Offshore reefs will create salient/tombolos providing a beach in front of the existing structures. Allows for transition in shoreline orientation between hold-the line frontage in #B to managed realignment frontage in #C. Standard of protection likely to be improved from existing levels to original design levels due to improved beach levels providing reduced overtopping and protection from scour/erosion. Complies with SMP policy of hold-the-line.
Assumptions and uncertainties	Source of beach re-charge material not known (local or imported) and whether sufficient material exists for 100 year appraisal period. Additional protection measures may be required to SWW outfall if exposed due to transition in beach from hold the line to do nothing.	Source of beach re-charge material not known (local or imported) and whether sufficient material exists for 100 year appraisal period. Option may compromise amenity value and economy (including future regeneration options) of the eastern end of Sidmouth frontage.	Source of beach re-charge material not known (local or imported) and whether sufficient material exists for 100 year appraisal period. Option may compromise amenity value and economy (including future regeneration options) of the eastern end of Sidmouth frontage.	Source of beach re-charge material not known (local or imported) and whether sufficient material exists for 100 year appraisal period. Existing rock may be able to be reused within new offshore breakwaters. Existing outfall discharge plume may be affected by offshore reefs. Additional protection measures may be required to SWW outfall if exposed.

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.4b**			**B.4c**			**B.4d**			**B.5a**		
	Option may compromise amenity value and economy (including future regeneration options) of the eastern end of Sidmouth frontage.									**Size, location etc of offshore reefs would need to be modelled to ensure effectiveness including effectiveness during south easterlies.** Wave induced currents may develop – to be investigated at next stage of works.		
Approaches to adaptation	Increased quantities of beach material required to maintain standard of protection as sea levels rise.			Increased quantities of beach material required as sea levels rise to maintain standard of protection.			Increased quantities of beach material required as sea levels rise to maintain standard of protection.			Increased quantities of beach material required as sea levels rise to maintain standard of protection.		
Costs and initial Benefit:Cost assessment and Partnership Funding Scores	For Options B.4b & B.6 & D.1: Cost - £15,855k (inc. 60% Optimism Bias) Benefit Cost Ratio – 4.2 PS Score = 25% (contribution required = £11,950k)			For Options B.4c & B.6 & D.1: Cost - £16,190k (inc. 60% Optimism Bias) Benefit Cost Ratio – 4.1 PS Score = 24% (contribution required = £12,285k)			For Options B.4d & B.6 & D.1: Cost - £14,264k (inc. 60% Optimism Bias) Benefit Cost Ratio – 4.6 PS Score = 27% (contribution required = £10,359k)			For Options B.5a & B.6 & D.1: Cost - £10,193k (inc. 60% Optimism Bias) Benefit Cost Ratio – 6.5 PS Score = 38% (contribution required = £6,288k)		
Category	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**
Economic Impacts												
Properties	Residential and commercial properties at flood risk (Total for B.0 and D.0 linked flood risk area) - Improve 0.5% (1 in 200) **Year 2014:** no properties at risk **Year 2065:** no properties at risk **Year 2115:** no properties at risk.	PV Damages: £0k	-	Residential and commercial properties at flood risk (Total for B.0 and D.0 linked flood risk area) - Improve 0.5% (1 in 200) Year 2014: no properties at risk Year 2065: no properties at risk Year 2115: no properties at risk.	PV Damages: £0k	-	Residential and commercial properties at flood risk (Total for B.0 and D.0 linked flood risk area) - Improve 0.5% (1 in 200) Year 2014: no properties at risk Year 2065: no properties at risk Year 2115: no properties at risk.	PV Damages: £0k	-	Residential and commercial properties at flood risk (Total for B.0 and D.0 linked flood risk area) - Improve 0.5% (1 in 200) Year 2014: no properties at risk Year 2065: no properties at risk Year 2115: no properties at risk.	PV Damages: £0k	-
Infrastructure	Option protects tourism and	-	-	Option protects tourism and	-	-	Option protects tourism and	-	-	Option protects tourism and	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.4b**			**B.4c**			**B.4d**			**B.5a**		
	amenity interests.			amenity interests.			amenity interests.			amenity interests.		
Transport	Option protects transport links.	-	-	Option protects transport links.	-	-	Option protects transport links.	-	-	Option protects transport links.	-	-
Development	Increased standard of flood risk protection increases potential for future development.	-	-	Increased standard of flood risk protection increases potential for future development.	-	-	Increased standard of flood risk protection increases potential for future development.	-	-	Increased standard of flood risk protection increases potential for future development.	-	-
Coastal Process Impacts												
Coastal processes	The impacts would be the same as for Option #B.4a for much of the frontage; the difference would be along the beach to the east between East Pier Groyne and the training wall. Shorter lengths may mean that sediment bypassing would increase thereby creating a more mobile beach with greater interaction with East Beach. This may mean that greater frequency of	-	There remains a degree of uncertainty relating to potential sediment transport linkages between the eastern end of Sidmouth and East Beach across the mouth of River Sid. Without this knowledge it Is difficult to be certain on what the benefits of a shorter T-head groyne at East Pier and a shorter training wall will be.	The impacts along much of the frontage would be the same as for Option #B.4a, the difference would be along the beach to the east. Without the training wall the beach would be more dynamic. It would not be stabilised and so likely to fluctuate in size in response to incident wave/storm conditions. There would be greater interaction between the beach at the eastern end of	-	There is a large degree of uncertainty relating potential sediment transport linkages between the beach at the eastern end of Sidmouth and East Beach across the mouth of River Sid. Without this knowledge it Is difficult to be certain on what the benefits of a shorter T-head groyne at East Pier and a shorter training wall will be. Upstream implications within the River Sid need	To the west of York Steps Groyne, the impacts would be similar to Option #B.4a. The key difference would be along the beach to the east between York Groyne and the River Sid. Here the influence of the T-head extension at York Steps groyne would only have a limited influence, and therefore the shape of the beach would change significantly. Without stabilizing	-	There is a large degree of uncertainty relating potential sediment transport linkages between the beach at the eastern end of Sidmouth and East Beach across the mouth of River Sid. Without this knowledge it Is difficult to be certain on what the benefits of a shorter T-head groyne at East Pier and a shorter training wall will be. Upstream implications within the River Sid need	The morphology of the beach would change significantly, although the reefs would have a similar net affect in terms of reducing the alongshore sediment transport, albeit it through a totally different mechanism. Instead of physically retaining sediment, the reefs would reduce movement through altering the direction and size of incident waves. The	-	The size, spacing and orientation of the rock reefs, along with the rate of sediment supply and movement along the coast will determine how successful the reefs would be at retaining sediment. The degree to which the coastline is exposed to more wave penetration and therefore the energy reaching the shoreline will also be determined by these factors. Any redistribution

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.4b**			**B.4c**			**B.4d**			**B.5a**		
	beach recharge is needed to maintain volumes. This could also affect the outflow of the River Sid, with upstream consequences.			Sidmouth and East Beach. There is a risk that the exit of the River Sid would become temporarily blocked with sediment, which could potentially increase fluvial flood risk in the town and/or require more frequent maintenance dredging.		to be considered further.	structures, the beach would move to a more linear form, with a shingle upper beach and sandy lower beach. With no structure at the end of the frontage, and limited interaction with the beaches to the west of York Steps, there is a risk that the beach could disappear altogether, either periodically or permanently. Without the training wall, the river mouth will be more dynamic with greater sediment interaction between the beach at the eastern end of Sidmouth and East Beach. There is a risk that the exit of the River Sid would become temporarily blocked with sediment, which could		to be considered further.	beach is likely to widen behind the reefs with the formation of a series of tombolos in the lee of each breakwater. It is possible that a narrower beach would develop towards the east as the size of the rock reefs taper. It is likely that recharge would initially be required to ensure that adequate beach levels are maintained between the tombolos. Without the training wall, the river mouth will be more dynamic with greater interaction between the beach at the eastern end of Sidmouth and East Beach. As noted above, size, height etc. of breakwater will need to be modeled to		and build up at certain points along the beach in relation to the incident wave conditions would need to be addressed through recycling.

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.4b**			**B.4c**			**B.4d**			**B.5a**		
							potentially increase fluvial flood risk in the town and/or require more frequent maintenance dredging.			ensure effectiveness.		
Environmental Impacts												
Geology Geomorphology	Possible impact on UNESCO World Heritage Site and nationally designated geological sites not allowing natural processes.	-	-	Possible impact on UNESCO World Heritage Site and nationally designated geological sites not allowing natural processes.	-	-	Possible impact on UNESCO World Heritage Site and nationally designated geological sites not allowing natural processes of erosion.	-	-	Possible impact on UNESCO World Heritage Site and nationally designated geological sites not allowing natural processes of erosion.	-	-
Water quality	Shortening of East Pier groyne may release sediment into the water column and impact water quality temporarily. Chemical composition unknown.	-	-	Removal of structure may result in the increase in sediments to the water column and impact water quality temporarily. Chemical composition unknown.	-	-	Removal of structures may result in the increase in sediments to the water column and impact water quality temporarily. Chemical composition unknown.	-	-	Removal of structures and construction of breakwaters may result in the increase in sediments to the water column and impact water quality temporarily. Chemical composition unknown.	-	-
Ecology	Possible construction and long term impacts to BAP habitats and species associated with the	-	-	Possible long term changes to designated features from changes in erosion rates. Possible construction and long term	-	-	Possible long term changes to designated features from changes in erosion rates. Possible construction impacts and	-	-	Possible long term changes to designated features from changes in erosion rates. Possible construction and long term	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.4b**			**B.4c**			**B.4d**			**B.5a**		
	structure being removed. Possible construction impacts to BAP habitats/fish nursery and spawning grounds by removal/ disturbance of sediment during construction of training wall/ modification of groynes. Possible impacts to BAP habitat from beach recharge/ recycling.			impacts to BAP habitats and species associated with the structure being removed. Possible construction impacts to BAP habitat/fish nursery and spawning grounds by removal/ disturbance of sediment. Possible construction impacts to BAP habitat/fish nursery and spawning grounds during construction of structures.			long term impacts to BAP habitats and species associated with the structure being removed. Possible construction impacts to BAP habitat/fish nursery and spawning grounds by removal/ disturbance of sediment. Possible construction impacts to BAP habitat/fish nursery and spawning grounds during construction of structures.			impacts to BAP habitats and species associated with the structure being removed. Possible construction impacts to BAP habitat/fish nursery and spawning grounds by removal/ disturbance of sediment. Possible construction impacts to BAP habitat/fish nursery and spawning grounds during construction of structures. Long term altered changes to ecology. Breakwater construction would be at the detriment of loss of habitat to benthic species associated with soft sediment however construction could be of benefit to epibenthos		

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.4b**			**B.4c**			**B.4d**			**B.5a**		
										species including BAP and species associated with rocky reef substrate.		
Fisheries	Temporary impact to launch access for commercial fishing boats and recreational beach fishing during construction.	-	-	Temporary impact to launch access for commercial fishing boats and recreational beach fishing during construction.	-	-	Temporary impact to launch access for commercial fishing boats and recreational beach fishing during construction.	-	-	Temporary impact to launch access for commercial fishing boats and recreational beach fishing during construction. Possible long term changes in type of fishing gear used in the inshore area where breakwater is proposed.	-	-
Navigation	Short term impact during construction/beach recycling activities for beach boat landing/launch. Assuming access is incorporated into the design of any new structures.	-	-	Short term impact during construction/beach recycling activities for beach boat landing/launch. Assuming access is incorporated into the design of any new structures.	-	-	Short term impact during construction/beach recycling activities for beach boat landing/launch. Assuming access is incorporated into the design of any new structures.	-	-	Long term navigational impacts although these will be charted.	-	-
Landscape	Changes will be seen to the landscape and there will be visual/direct impact to designated	-	-	Changes will be seen to the landscape and there will be visual/direct impact to designated	-	-	Changes will be seen to the landscape and there will be visual/direct impact to designated	-	-	Changes will be seen to the landscape and there will be visual/direct impact to designated	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.4b**			**B.4c**			**B.4d**			**B.5a**		
	features including AONB and setting of the WHS.			features including AONB and setting of the WHS.			features including AONB and setting of the WHS.			features including AONB and setting of the WHS.		
Archaeology and Cultural Heritage	Construction may unearth/ cause disturbance to designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and non-designated features long term.	-	-	Construction may unearth/ cause disturbance to designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and non-designated features long term.	-	-	Construction may unearth/ cause disturbance to designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and non-designated features long term.	-	-	Construction may unearth/ cause disturbance to designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and non-designated features long term.	-	-
Air quality	Impact to air considered negligible and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-
Noise	Noise and vibration impacts resulting from construction	-	-	Noise and vibration impacts resulting from construction	-	-	Noise and vibration impacts resulting from construction	-	-	Noise and vibration impacts resulting from construction	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.4b**			**B.4c**			**B.4d**			**B.5a**		
	may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.			may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.			may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.			may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.		
Amenity value	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction.	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction.	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction.	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction.	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)			
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)			
Option	**B.5b**	**B.6**		
Overview/Description	As option B.5a except that reefs would be structures of lower-height (so more inter-tidal; not exposed above sea level all the time) compared the two existing breakwaters, tapering in to minimise diffraction impacts on down-drift coast. Note 1, option has potential to be extended along East Beach – see Option C.7b – so also consider in-combination with that option. Note 2, reefs could incorporate biological units to encourage flora and fauna development.	Maintain/repair training wall to reduce imminent risk of failure in short term in advance of undertaking any of the Options B.1 to B.5 above.		
Technical Issues	Offshore reefs will create salient/tombolos providing a beach in front of the existing structures. Allows for transition in shoreline orientation between hold-the line frontage in #B to managed realignment frontage in #C. Standard of protection likely to be improved from existing levels to original design levels due to improved beach levels providing reduced overtopping and protection from scour/erosion. Complies with SMP policy of hold-the-line.	Short term maintenance/repair until longer term scheme implemented. Standard of protection maintained until long term scheme implemented. Supports SMP policies in this area.		
Assumptions and uncertainties	Source of beach re-charge material not known (local or imported) and whether sufficient material exists for 100 year appraisal period. Existing rock may be able to be reused within new offshore breakwaters. Existing outfall discharge plume may be affected by offshore reefs. Additional protection measures may be required to SWW outfall if exposed. **Size, location etc of offshore reefs would need to be modelled to ensure effectiveness including effectiveness during south easterlies.** Wave induced currents may develop – to be investigated at next stage of works.	Assume rock armour protection to toe of training wall to provide additional support, protection from scour, and reduce wave impact. Safety barriers to be provided/upgraded. Footprint of rock however may encroach/impact on river and adjacent surface water outfall.		
Approaches to adaptation	Increased quantities of beach material required as sea levels rise to maintain standard of protection.	Rock could be reused in options # B.1 to B.5 depending on final option.		
Costs and initial Benefit:Cost assessment and Partnership Funding Scores	For Options B.5b & B.6 & D.1: Cost - £9,708k (inc. 60% Optimism Bias) Benefit Cost Ratio – 6.8 PS Score = 40% (contribution required = £5,803k)	See Options B.1, B.2, B.3, B.4 & B.5.		

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.5b**			**B.6**								
Category	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**
Economic Impacts												
Properties	Residential and commercial properties at flood risk (Total for B.0 and D.0 linked flood risk area) Improve 0.5% (1 in 200) Year 2014: no properties at risk Year 2065: no properties at risk Year 2115: no properties at risk.	PV Damages: £0k	-	Residential and commercial properties at flood risk (Total for B.0 and D.0 linked flood risk area) - Improve 0.5% (1 in 200) **Year 2014:** no properties at risk **Year 2065:** no properties at risk **Year 2115:** no properties at risk.	PV Damages: £0k	-						
Infrastructure	Option protects tourism and amenity interests.	-	-	Option protects tourism and amenity interests.	-	-						
Transport	Option protects transport links.	-	-	Option protects transport links.	-	-						
Development	Increased standard of flood risk protection increases potential for future development.	-	-	Increased standard of flood risk protection increases potential for future development.	-	-						
Coastal Process Impacts												

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.5b**			**B.6**								
Coastal processes	As Option #B.5a, but the effectiveness of the reefs would be reduced, particularly during storm events, when the beaches could become more mobile. As noted above, size, height etc of breakwater will need to be modeled to ensure effectiveness.	As Option #B.5a.	As Option #B.5a.	Coastal processes would continue as existing, with the training wall continuing to affect the longshore transport of shingle.	-	No significant change in prevailing conditions.						
Environmental Impacts												
Geology Geomorphology	Possible impact on UNESCO World Heritage Site and nationally designated geological sites not allowing natural processes of erosion.	-	-	Baseline conditions will remain the same. No impact to UNESCO World Heritage Site and nationally designated geological sites.	-	-						
Water quality	Removal of structures and construction of breakwaters may result in the increase in sediments to the water column and impact water quality temporarily. Chemical	-	-	No likely impacts.	-	-						

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.5b**			**B.6**								
	composition unknown.											
Ecology	Possible long term changes to designated features from changes in erosion rates. Possible construction and long term impacts to BAP habitats and species associated with the structure being removed. Possible construction impacts to BAP habitat/fish nursery and spawning grounds by removal/ disturbance of sediment. Possible construction impacts to BAP habitat/fish nursery and spawning grounds during construction of structures. Long term altered changes to ecology. Breakwater construction would be at the detriment	-	-	Possible maintenance/ construction impacts to BAP habitats.	-	-						

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.5b**			**B.6**								
	of loss of habitat to benthic species associated with soft sediment however construction could be of benefit to epibenthos species including BAP and species associated with rocky reef substrate.											
Fisheries	Temporary impact to launch access for commercial fishing boats and recreational beach fishing during construction. Possible long term changes in type of fishing gear used in the inshore area where breakwater is proposed.	-	-	Possible temporary impact to launch access for commercial fishing boats and recreational beach fishing during maintenance	-	-						
Navigation	Possible navigational hazard since potential breakwater will only be seen at low tide although	-	-	Possible short term impact during maintenance for beach boat landing/launch .	-	-						

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.5b**			**B.6**								
	these will be charted.											
Landscape	Changes will be seen to the landscape and there will be visual/direct impact to designated features including AONB and setting of the WHS.	-	-	Short term impact during maintenance works. No changes to landscape or visual impact envisaged.	-	-						
Archaeology and Cultural Heritage	Construction may unearth/ cause disturbance to designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and non-designated features long term.	-	-	No impacts likely.	-	-						
Air quality	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term,	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term,	-	-						

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage B: Sidmouth Town (Chit Rocks to the River Sid, including the training wall seawards of Alma Bridge)											
Option	**B.5b**			**B.6**								
	permanent significant environmental effects.			permanent significant environmental effects.								
Noise	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.	-	-	Noise and vibration impacts resulting from construction work can be successfully managed through good site management measures; minimising the construction period, working during fixed day time hour's etc.	-	-						
Amenity value	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction.	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during maintenance activities.	-	-						

Frontage C

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.0**			**C.1a**			**C.1b**			**C.2a**		
Overview/Description	Do Nothing			For options where training wall shortening or removal is considered (Options B.2b, B.3a, B.3b, B.4c and B.4d), construct one or two short/low-level rock groynes about 150-200m east of the River Sid to aid beach levels control as scheme transitions eastwards from hold the line at Sidmouth to no active intervention to the east.			For options where training wall removal is considered (Options B.3a, B.3b, B.4c and B.4d), construct one or two short/low-level rock groynes about 150-200m east of the River Sid to aid beach levels control as it transitions eastwards, supported by periodic beach recycling.			Construct 210m rock revetment along base of cliff. *i.e. previously proposed 2004 option IV A*		
Technical Issues	No works undertaken. Does not comply with SMP policy as does not control rate of coastal change, which is the definition of managed realignment.			Small scale rock groynes to retain any available beach material along toe of cliffs, helping to reduce erosion rates (dependent on beach) of cliff toe. May help to provide transition between the hold the line along Sidmouth frontage and the managed realignment policy along East Beach. Safety of construction works to be considered especially due to landslides which cannot be controlled/foreseen. Groynes may not be considered as 'managed realignment' as part of the 2011 SMP Policy for cell 6a35 - River Sid and Sidmouth (East).			Creation of beach along toe of cliff aided by rock groynes and beach recycling reducing rates of cliff toe erosion. May help to provide transition between the hold the line along Sidmouth frontage and the managed realignment policy along East Beach. Safety of construction works to be considered especially due to landslides which cannot be controlled/foreseen. Groynes and beach recycling may not be considered as 'managed realignment' as part of the 2011 SMP Policy for cell 6a35 - River Sid and Sidmouth (East).			Reduced wave impact and hence erosion to toe of cliffs. Safety of construction works to be considered especially due to landslides which cannot be controlled/foreseen. Revetment may not be considered as 'managed realignment' as part of the 2011 SMP Policy for cell 6a35 - River Sid and Sidmouth (East).		
Assumptions and uncertainties	Wave and water levels increase, and erosion of East Beach continues exposing River Sid to increased coastal conditions.			Assumes that sufficient beach material exists in cell to allow groynes to function effectively.			Assumes that sufficient beach material exists in cell to allow re-cycling of material and groynes to function effectively. Beach recycling occurs within Frontage B, and removal of the training wall will allow beach material to transport into Frontage C.			Unlikely to fully stop cliff recession as does not address cliff top drainage issues.		
Approaches to adaptation	None			Rock can be reused in future works.			Rock can be reused in future works.			Rock can be reused in future works.		
Costs and initial Benefit:Cost assessment and Partnership Funding Scores	Cost - £0 Benefit Cost Ratio – N/A PS Score = N/A			Cost - £846k (inc. 60% Optimism Bias) Benefit Cost Ratio – 0.01 PS Score = 4% (contribution required = £811k)			Cost - £1,105k (inc. 60% Optimism Bias) Benefit Cost Ratio – 0.01 PS Score = 3% (contribution required = £1,070k)			Cost - £4,401k (inc. 60% Optimism Bias) Benefit Cost Ratio – 0.00 PS Score = 1% (contribution required = £4,366k)		
Category	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**
Economic Impacts												
Properties	By 2115, up to 5 residential properties predicted to	PV Damages: £9k	Assumes total cliff recession	Residential property would be	PV Damages - £0k	-	Residential property would be	PV Damages - £0k	-	Residential property would be	PV Damages - £0k	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.0**			**C.1a**			**C.1b**			**C.2a**		
	be lost to erosion. No commercial properties are at risk of erosion.		over 100yrs of 42.4m.	protected from erosion.			protected from erosion.			protected from erosion.		
Infrastructure	Erosion will lead to loss of Alma Bridge and expose River Sid western wall to full coastal conditions, increasing risk of flooding to the adjacent Sidmouth Town frontage.	-	-	May help reduce impact on Alma Bridge and River Sid western wall	-	-	May help reduce impact on Alma Bridge and River Sid western wall	-	-	-	-	-
Transport	No transport links are at risk of erosion.	-	-	-	-	-	-	-	-	-	-	-
Development	There is not likely to be any impact on development opportunities.	-	-	-	-	-	-	-	-	-	-	-
Coastal Process Impacts												
Coastal processes	The cliffs will continue to erode. All other coastal processes will continue as present. Even assuming Do Nothing along the Sidmouth frontage (Option #B.0), the existing structures there are likely	-	Assumed in combination with Do Nothing elsewhere. No significant change in prevailing conditions.	The groynes may help to stabilise the upper beach, but the natural movement of beach material along this section of coast would be significantly affected. Beaches further east are generally healthy at	-	-	Much as per Option #C.1a, except any redistribution of material within the groynes bays, in response to the incident wave conditions would be controlled through recycling, thereby	-	-	A rock revetment will reduce the wave action at the cliff toe, however, it will have no impact on failures of the cliff top that are driven by saturation of weak material by water. While the revetment will	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.0**			**C.1a**			**C.1b**			**C.2a**		
	to remain and continue to affect alongshore transport for some time to come. Failure of the training wall at the River Sid could improve sediment linkages but East Pier Groyne would limit the volume of sediment available.			present, therefore the groynes are not anticipated to have a significant impact on adjacent frontages. However, the groynes would limit any sediment entering the frontage from further east, during periods of southeasterly waves. Material would be redistributed within the bays in response to the incident wave conditions. As experienced along the Sidmouth frontage, due to the bimodal wave climate along this frontage, the beaches within the bays would be expected to remain dynamic, characterised by fluctuating areas of erosion/ accretion and			ensuring beach levels do not reach critical levels at any location along the frontage.			act as a barrier to the natural sediment exchange between the cliffs and beach, the net impact on beaches will be minimal as the material supplied by the cliffs is generally fine grained and does not persist on the beach. This coastline is designated as WHS and SSSI due to its geology and geomorphology and the engineering would obscure outcrops at the base of the cliff that are features of designation.		

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.0**			**C.1a**			**C.1b**			**C.2a**		
				periods of high/low beach levels. Without management intervention (i.e. recycling – see Option#C.1b), there is a risk that prolonged periods of unidirection waves could result in loss of material from one end of the bays and beach lowering. Such measures will not reduce the risk of cliff top failure, which are driven by saturation of weak material by water.								
Environmental Impacts												
Geology Geomorphology	Positive impact on the UNESCO World Heritage Site and nationally designated geological sites by allowing natural processes of erosion to enhance features.	-	-	Acts to constrain natural processes Construction and possible long term impacts to UNESCO World Heritage Site and nationally designated geological sites (features on beach).	-	-	Acts to constrain natural processes Construction and possible long term impacts to UNESCO World Heritage Site and nationally designated geological sites (features on beach).	-	-	Acts to constrain natural processes Construction and possible long term impacts to UNESCO World Heritage Site and nationally designated geological sites (features on beach).	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.0**			**C.1a**			**C.1b**			**C.2a**		
Water quality	Potential water quality issues from property erosion debris.	-	-	With the application of best construction pollution prevention measures- no impact is likely.	-	-	With the application of best construction pollution prevention measures- no impact is likely.	-	-	With the application of best construction pollution prevention measures- no impact is likely.	-	-
Ecology	Possible impact from infrastructure erosion debris causing possible damage/ smothering to internationally and nationally designated features, BAP habitat and inshore nursery and fish spawning grounds. Long term, erosion debris present would be at the detriment of loss of habitat for benthic species, however this may be beneficial and increase habitat to epibenthos/ reef associated communities	-	-	Possible long term changes to designated features from changes in erosion rates on the cliff. Possible construction impacts to designated features and BAP habitats associated with the beach and below MHW during construction of structures.	-	-	Possible long term changes to designated features from changes in erosion rates on the cliff. Possible construction impacts to designated features and BAP habitats associated with the beach and below MHW during construction of structures.	-	-	Possible long term changes to designated features from changes in erosion rates on the cliff. Possible construction impacts to designated features and BAP habitats associated with the beach and below MHW during construction of structures. Possible impact to designated features and BAP habitat from a reduction in beach width due to coastal squeeze (annual vegetation drift lines).	-	-
Fisheries	Possible impact to commercial fisheries and recreational	-	-	Possible impact to launch/ landing access for commercial	-	-	Possible impact to launch /landing access for commercial	-	-	Possible impact to launch/ landing access for commercial	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.0**			**C.1a**			**C.1b**			**C.2a**		
	fishers from property erosion debris causing damage/ smothering to inshore fishing grounds; potential to cause damage to certain types of fishing gear. Possible Inshore navigational/ beach launch access hazards to commercial and recreational boats. Impact to beach access for recreational fishing.			fishing boats and recreational beach fishing for plant access during construction.			fishing boats and recreational beach fishing for plant access during construction.			fishing boats and recreational beach fishing for plant access during construction.		
Navigation	Impact for launch/landing access for recreational boats.	-	-	Short term impact during construction for beach boat landing/launch. Assuming access is incorporated into the design of any new structures.	-	-	Short term impact during construction/beach recycling activities for beach boat landing/launch. Assuming access is incorporated into the design of any new structures.	-	-	Possible temporary impact during construction for beach boat landing/launch.	-	-
Landscape	Changes in landscape character and there will be impact to the	-	-	Changes in landscape character and there will be impact to the	-	-	Changes in landscape character and there will be impact to the	-	-	Changes in landscape character and there will be impact to the	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.0**			**C.1a**			**C.1b**			**C.2a**		
	setting of the designated features including AONB and setting of the WHS.			setting of the designated features including AONB and setting of the WHS.			setting of the designated features including AONB and setting of the WHS.			setting of the designated features including AONB and setting of the WHS.		
Archaeology and Cultural Heritage	Likely permanent direct impacts, and on setting of designated and non-designated Archaeology and Cultural Heritage features.			Construction may unearth/ cause disturbance designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and non-designated features long term.			Construction may unearth/ cause disturbance designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and non-designated features long term.			Construction may unearth/ cause disturbance designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and non-designated features long term.		
Air quality	N/A	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-
Noise	N/A	-	-	Noise and vibration impacts	-	-	Noise and vibration impacts	-	-	Noise and vibration impacts	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.0**			**C.1a**			**C.1b**			**C.2a**		
				resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.			resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.			resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.		
Amenity value	Total impact to access/and on beach amenities from property erosion debris including access and SW Coast Path National Trail and National Cycle Network.	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction activities.	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction /beach recycling activities.	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction activities.	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.2b**			**C.3a**			**C.3b**			**C.4a**		
Overview/Description	Construct 210m rock revetment along base of cliff, supported by cliff top drainage measures (to be determined following investigation of groundwater flows) and/or cliff top slope re-grading and pinning (e.g. soil nailing and netting).			Construct 210m rock revetment along frontage, offset 5-10m from the base of cliff.			Construct 210m rock revetment along frontage, offset 5-10m from the base of cliff, supported by cliff top drainage measures (to be determined following investigation of groundwater flows) and/or cliff top slope regrading and pinning (e.g. soil nailing and netting).			Construct 3 low-level rock groynes along base of cliff over a length of approximately 210m east of the River Sid. *i.e. previously proposed 2004 option IV C*		
Technical Issues	Reduced wave impact and hence erosion to toe of cliffs together with improved cliff top slope stability. Safety of construction works to be considered especially due to landslides which cannot be controlled/foreseen. Revetment may not be considered as 'managed realignment' as part of the 2011 SMP Policy for cell 6a35 - River Sid and Sidmouth (East).			Reduced wave impact and hence erosion to toe of cliffs. Safety of construction works to be considered especially due to landslides which cannot be controlled/foreseen. Revetment may not be considered as 'managed realignment' as part of the 2011 SMP Policy for cell 6a35 - River Sid and Sidmouth (East).			Reduced wave impact and hence erosion to toe of cliffs together with improved cliff top slope stability. Safety of construction works to be considered especially due to landslides which cannot be controlled/foreseen. Revetment may not be considered as 'managed realignment' as part of the 2011 SMP Policy for cell 6a35 - River Sid and Sidmouth (East).			Rock groynes to retain any available beach material along toe of cliffs reducing rate of erosion. Safety of construction works to be considered especially due to landslides which cannot be controlled/foreseen. Groynes may not be considered as 'managed realignment' as part of the 2011 SMP Policy for cell 6a35 - River Sid and Sidmouth (East).		
Assumptions and uncertainties	Cliff top drainage would be maintained by landowner. Suitability of cliff top regrading and netting and nailing would need to be determined if option taken forward.			Unlikely to fully stop cliff recession as does not address cliff top drainage issues.			Cliff top drainage would be maintained by landowner. Suitability of cliff top regrading and netting and nailing would need to be determined if option taken forward			Assumes that sufficient beach material exists in cell to allow groynes to function effectively. Unlikely to fully stop cliff recession as does not address cliff top drainage issues.		
Approaches to adaptation	Rock can be reused in future works.			Rock can be reused in future works.			Rock can be reused in future works.			Rock can be reused in future works.		
Costs and initial Benefit:Cost assessment and Partnership Funding Scores	Cost - £5,179k (inc. 60% Optimism Bias) Benefit Cost Ratio – 0.00 PS Score = 1% (contribution required = £5,144k)			Cost - £4,810k (inc. 60% Optimism Bias) Benefit Cost Ratio – 0.00 PS Score = 1% (contribution required = £4,774k)			Cost - £5,588k (inc. 60% Optimism Bias) Benefit Cost Ratio – 0.00 PS Score = 1% (contribution required = £5,552k)			Cost - £1,270k (inc. 60% Optimism Bias) Benefit Cost Ratio – 0.01 PS Score = 3% (contribution required = £1,234k)		
Category	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**
Economic Impacts												
Properties	Residential property would be protected from erosion.	PV Damages - £0k	-	Residential property would be protected from erosion.	PV Damages - £0k	-	Residential property would be protected from erosion.	PV Damages - £0k	-	Residential property would be protected from erosion.	PV Damages - £0k	-
Infrastructure	-	-	-	-	-	-	-	-	-	May help to reduce impact on Alma Bridge	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.2b**			**C.3a**			**C.3b**			**C.4a**		
										and River Sid western wall.		
Transport	-	-	-	-	-	-	-	-	-	-	-	-
Development	-	-	-	-	-	-	-	-	-	-	-	-
Coastal Process Impacts												
Coastal processes	Refer to Option #C.2a for appraisal of rock revetment. Drainage measures may comprise shallow schemes on the cliff top designed to intercept surface water flow, or deeper drainage of the cliffs to control groundwater. Deep measures may comprise inclined gravity drains drilled at the base of the cliff or pump drainage methods. This coastline is designated as WHS and SSSI due to its geology and geomorphology and the engineering would obscure outcrops at the base of the	-	None.	The detached breakwater will limit wave erosion of the cliff, while permitting access to the SSSI/WHS notified cliffs for geological study. By limiting rather than preventing toe erosion, the geological features should remain exposed. However there is a risk that the area between the cliff toe and revetment will become filled with debris and flotsam and so exposures may still become obscured. Without additional drainage measures, such a scheme would have no impact on cliff top stability.	-	None.	As per Option C.3a regarding detached breakwater. Soil nailing and regrading of the upper cliff will remove weak materials and bring the cliff top to a more stable angle. In combination with drainage measures, netting and nailing will help to stabilise the cliff face. While this will reduce the sediment supply from cliff failures, this material is generally fine grained and does not contribute to the beach. Refer to Option #C.2a for appraisal of impact on the beach. The position of the revetment	-	None.	As per Option #C.1a.	-	None.

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.2b**			**C.3a**			**C.3b**			**C.4a**		
	cliff that are features of designation.			Consequently, unless a small amount of wave erosion is allowed in the design, the area between the breakwater and cliff toe will progressively fill with cliff fall debris. Refer to Option #C.2a for appraisal of impact on the beach.			away from the cliff may have an increased impact on sediment transport compared to Option #C.2a. There is also a risk that during storm conditions the structure could become outflanked and beach material washed out from between the structure and the cliffs. This coastline is designated as WHS and SSSI due to its geology and geomorpholog y and the engineering would obscure outcrops at the base of the cliff that are features of designation.					
Environmental Impacts												
Geology Geomorphology	Does not allow natural processes of erosion. Construction and possible long term impacts to UNESCO World Heritage Site	-	-	Does not allow natural processes of erosion. Construction and possible long term impacts to UNESCO World Heritage Site	-	-	Does not allow natural processes of erosion. Construction and possible long term impacts to UNESCO World Heritage Site	-	-	Does not allow natural processes of erosion. Construction and possible long term impacts to UNESCO World Heritage Site	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.2b**			**C.3a**			**C.3b**			**C.4a**		
	and nationally designated geological sites (features on beach). Issues of coastal squeeze against the hard defence structure.			and nationally designated geological sites (features on beach). Issues of coastal squeeze against the hard defence structure.			and nationally designated geological sites (features on beach). Issues of coastal squeeze against the hard defence structure.			and nationally designated geological sites (features on beach). Issues of coastal squeeze against the hard defence structure.		
Water quality	With the application of best construction pollution prevention measures- no impact is likely.	-	-	With the application of best construction pollution prevention measures- no impact is likely.	-	-	With the application of best construction pollution prevention measures- no impact is likely.	-	-	With the application of best construction pollution prevention measures- no impact is likely.	-	-
Ecology	Possible long term changes to designated features from changes in erosion rates. Impact to designated features and BAP habitat from a reduction in beach width due to coastal squeeze (annual vegetation drift lines). Possible construction and long term impacts to designated features and BAP habitat (annual	-	-	Possible long term changes to designated features from changes in erosion rates. Impact to designated features and BAP habitat from a reduction in beach width due to coastal squeeze (annual vegetation drift lines). Possible construction and long term impacts to designated features and BAP habitat (annual	-	-	Possible long term changes to designated features from changes in erosion rates. Impact to designated features and BAP habitat from a reduction in beach width due to coastal squeeze (annual vegetation drift lines). Possible construction and long term impacts to BAP habitats (annual vegetation drift lines).	-	-	Possible long term changes to designated features from changes in erosion rates. Impact to designated features and BAP habitat from a reduction in beach width due to coastal squeeze (annual vegetation drift lines). Possible construction impacts to BAP habitats during construction of structures (annual vegetation drift lines).	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.2b**			**C.3a**			**C.3b**			**C.4a**		
	vegetation drift lines).			vegetation drift lines).								
Fisheries	Possible impact to launch/ landing access for commercial fishing boats and recreational beach fishing for plant access during construction.	-	-	Possible impact to launch/ landing access for commercial fishing boats and recreational beach fishing for plant access during construction.	-	-	Possible impact to launch/ landing access for commercial fishing boats and recreational beach fishing for plant access during construction.	-	-	Possible impact to launch/ landing access for commercial fishing boats and recreational beach fishing for plant access during construction.	-	-
Navigation	Short term impact during construction for beach boat landing/launch .	-	-	Short term impact during construction for beach boat landing/launch .	-	-	Short term impact during construction for beach boat landing/launch .	-	-	Short term impact during construction for beach boat landing/launch . Assuming access is incorporated into the design of any new structures.	-	-
Landscape	Changes in landscape character and there will be impact to the setting of the designated features including AONB and setting of the WHS.	-	-	Changes in landscape character and there will be impact to the setting of the designated features including AONB and setting of the WHS.	-	-	Changes in landscape character and there will be impact to the setting of the designated features including AONB and setting of the WHS.	-	-	Changes in landscape character and there will be impact to the setting of the designated features including AONB and setting of the WHS.	-	-
Archaeology and Cultural Heritage	Construction may unearth/ cause disturbance designated and non-designated	-	-	Construction may unearth/ cause disturbance designated and non-designated	-	-	Construction may unearth/ cause disturbance designated and non-designated	-	-	Construction may unearth/ cause disturbance designated and non-designated	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.2b**			**C.3a**			**C.3b**			**C.4a**		
	Archaeology and Cultural Heritage features Possible impact on setting of designated and non-designated features long term			Archaeology and Cultural Heritage features Possible impact on setting of designated and non-designated features long term			Archaeology and Cultural Heritage features Possible impact on setting of designated and non-designated features long term			Archaeology and Cultural Heritage features Possible impact on setting of designated and non-designated features long term		
Air quality	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-
Noise	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers,	-	-	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers,	-	-	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers,	-	-	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers,	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.2b**			**C.3a**			**C.3b**			**C.4a**		
	monitoring etc.			monitoring etc.			monitoring etc.			monitoring etc.		
Amenity value	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction. Reduction in beach width due to coastal squeeze limiting recreational opportunities.	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction. Reduction in beach width due to coastal squeeze limiting recreational opportunities.	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction. Reduction in beach width due to coastal squeeze limiting recreational opportunities.	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction. Reduction in beach width due to coastal squeeze limiting recreational opportunities.	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)			
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)			
Option	**C.4b**	**C.5a**	**C.5b**	**C.6a**
Overview/Description	Construct 3 low-level rock groynes along base of cliff over a length of approximately 210m east of the River Sid, supported by cliff top drainage measures (to be determined following investigation of groundwater flows) and/or cliff top slope regrading and pinning (e.g. soil nailing and netting).	Construct 50m rock revetment along base of cliff immediately east of the River Sid (i.e. around Pennington Point). *i.e. previously proposed 2004 option III*	Construct 50m rock revetment along base of cliff immediately east of the River Sid (i.e. around Pennington Point), supported by cliff top drainage measures (to be determined following investigation of groundwater flows) and/or cliff top slope regrading and pinning (e.g. soil nailing and netting).	Construct a 35m 'T-head' type rock groyne along base of cliff immediately east of the River Sid (i.e. around Pennington Point). *i.e. previously proposed 2004 option II*
Technical Issues	Rock groynes to retain any available beach material along toe of cliffs helping to reduce wave impact and hence erosion to toe of cliffs together with improved cliff top slope stability. Safety of construction works to be considered especially due to landslides which cannot be controlled/foreseen. Groynes may not be considered as 'managed realignment' as part of the 2011 SMP Policy for cell 6a35 - River Sid and Sidmouth (East)	Reduced wave impact and hence erosion to toe of cliffs. Revetment may /may not provide additional support/foundation to realigned Alma Bridge, and also reduce wave reflection from the River Sid river wall. Revetment may not be considered as 'managed realignment' as part of the 2011 SMP Policy for cell 6a35 - River Sid and Sidmouth (East).	Reduced wave impact and hence erosion to toe of cliffs together with improved cliff top slope stability. Revetment may /may not provide additional support/foundation to realigned Alma Bridge, and also reduce wave reflection from the River Sid river wall. Revetment may not be considered as 'managed realignment' as part of the 2011 SMP Policy for cell 6a35 - River Sid and Sidmouth (East).	Rock groyne to retain any available beach material along toe of cliffs helping to reduce wave impact and hence erosion to toe of cliffs. Safety of construction works to be considered especially due to landslides which cannot be controlled/foreseen. Groyne may not be considered as 'managed realignment' as part of the 2011 SMP Policy for cell 6a35 - River Sid and Sidmouth (East).

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.4b**			**C.5a**			**C.5b**			**C.6a**		
Assumptions and uncertainties	Assumes that sufficient beach material exists in cell to allow groynes to function effectively. Cliff top drainage would be maintained by landowner. Suitability of cliff top regrading and netting and nailing would need to be determined if option taken forward			Unlikely to fully stop cliff recession as does not address cliff top drainage issues.			Cliff top drainage would be maintained by landowner. Suitability of cliff top regrading and netting and nailing would need to be determined if option taken forward			Assumes that sufficient beach material exists in cell to allow groyne to function effectively. Position/usefulness of single groyne to be assessed at later stage. Unlikely to fully stop cliff recession as does not address cliff top drainage issues.		
Approaches to adaptation	Rock can be reused in future works.			Rock can be reused in future works.			Rock can be reused in future works.			Rock can be reused in future works.		
Costs and initial Benefit:Cost assessment and Partnership Funding Scores	Cost - £2,048k (inc. 60% Optimism Bias) Benefit Cost Ratio – 0.00 PS Score = 2% (contribution required = £2,012k)			Cost - £1,097k (inc. 60% Optimism Bias) Benefit Cost Ratio – 0.01 PS Score = 3% (contribution required = £1,062k)			Cost - £1,876k (inc. 60% Optimism Bias) Benefit Cost Ratio – 0.00 PS Score = 2% (contribution required = £1,840k)			Cost - £3,056k (inc. 60% Optimism Bias) Benefit Cost Ratio – 0.00 PS Score = 1% (contribution required = £3,020k)		
Category	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**
Economic Impacts												
Properties	Residential property would be protected from erosion.	PV Damages - £0k	-	Residential property would be protected from erosion.	PV Damages - £0k	-	Residential property would be protected from erosion.	PV Damages - £0k	-	Residential property would be protected from erosion.	PV Damages - £0k	-
Infrastructure	May help to reduce impact on Alma Bridge and River Sid western wall.	-	-	-	-	-	-	-	-	May help to reduce impact on Alma Bridge and River Sid western wall.	-	-
Transport	-	-	-	-	-	-	-	-	-	-	-	-
Development	-	-	-	-	-	-	-	-	-	-	-	-
Coastal Process Impacts												
Coastal processes	As per Option# C.1a regarding groynes. As per Option# C.2b regarding drainage measures.	-	None.	This structure will have limited impact on the majority of East Cliff and will only reduce the risk	-	None.	Much as for Option #C.5a, except this option will reduce both the risk of cliff top and cliff toe erosion.	-	None.	The groyne may help to stabilise the upper beach through reducing the natural movement of	-	None.

Project name	Sidmouth and East Beach Management Plan (BMP)													
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)													
Option	**C.4b**			**C.5a**			**C.5b**			**C.6a**				
				of cliff toe erosion, not cliff top. Consideration will need to be given to outflanking of eastern part of structure that could lead to accelerated erosion of parts of East Cliff. The revetment will affect natural sediment exchange between the cliffs and beach; however this is primarily fine grained and therefore not a contributor to beach building. The small footprint of this structure means that it is unlikely to significantly affect sediment transport. It would also have a reduced impact in terms of the WHS and SSSI status, though would still obscure outcrops at the			However, as for Option #C5a, the effect will only be very limited. Consideration will need to be given to outflanking of eastern part of structure that could lead to accelerated erosion of parts of East Cliff. Should this occur and the structure start to form a promontory there is a possibility that this could start to interrupt sediment movement in the longer term.			beach material along this section of coast. Material would be redistributed within the bays in response to the incident wave conditions. During easterlies material may build up on the eastern side of the groyne, thereby reducing toe erosion of the cliffs along the adjacent frontage. However this option would not affect the risk of cliff top erosion, which is related to saturation of weak material by water. During these conditions, there may however, be loss of material from the western side of the groyne – but		

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.4b**			**C.5a**			**C.5b**			**C.6a**		
				base of the cliff that are features of designation.						the extent of this issue would depend upon options in place for the Sidmouth frontage. Conversely, during westerlies, there may be an issue of low beach levels on eastern side of the groyne, increasing the risk of cliff toe erosion. There is a risk that the toe of the structure could suffer scour as a result of the river channel, which has historically been periodically diverted to cross the beach at this location. This issue will be affected by options adopted for the training wall. This coastline is designated as WHS and SSSI due to its		

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.4b**			**C.5a**			**C.5b**			**C.6a**		
										geology and geomorphology and the engineering would obscure outcrops at the base of the cliff that are features of designation.		
Environmental Impacts												
Geology Geomorphology	Does not allow natural processes of erosion. Possible impacts to UNESCO World Heritage Site and nationally designated geological sites (features on beach). Issues of coastal squeeze against the hard defence structure.	-	-	Does not allow natural processes of erosion. Possible impacts to UNESCO World Heritage Site and nationally designated geological sites (features on beach). Issues of coastal squeeze against the hard defence structure.	-	-	Does not allow natural processes of erosion. Possible impacts to UNESCO World Heritage Site and nationally designated geological sites (features on beach). Issues of coastal squeeze against the hard defence structure.	-	-	Does not allow natural processes of erosion. Possible impacts to UNESCO World Heritage Site and nationally designated geological sites (features on beach). Issues of coastal squeeze against the hard defence structure.	-	-
Water quality	With the application of best construction pollution prevention measures- no impact is likely.	-	-	With the application of best construction pollution prevention measures- no impact is likely.	-	-	With the application of best construction pollution prevention measures- no impact is likely.	-	-	With the application of best construction pollution prevention measures- no impact is likely.	-	-
Ecology	Possible long term changes to designated	-	-	Possible long term changes to designated	-	-	Possible long term changes to designated	-	-	Possible long term changes to designated	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.4b**			**C.5a**			**C.5b**			**C.6a**		
	features from changes in erosion rates. Impact to designated features and BAP habitat from a reduction in beach width due to coastal squeeze (annual vegetation drift lines). Possible construction impacts to designated features BAP habitat during construction of structures.			features from changes in erosion rates. Impact to designated features and BAP habitat from a reduction in beach width due to coastal squeeze (annual vegetation drift lines). Possible construction impacts to designated features BAP habitat during construction of structures.			features from changes in erosion rates. Impact to designated features and BAP habitat from a reduction in beach width due to coastal squeeze (annual vegetation drift lines). Possible construction impacts to designated features BAP habitat during construction of structures.			features from changes in erosion rates. Impact to designated features and BAP habitat from a reduction in beach width due to coastal squeeze (annual vegetation drift lines). Possible construction impacts to designated features BAP habitat during construction of structures. Possible construction impacts to BAP habitat/fish nursery and spawning grounds by removal/disturbance of sediment. Below MHW.		
Fisheries	Possible impact to launch/ landing access for commercial fishing boats and recreational beach fishing for plant	-	-	Possible impact to launch/ landing access for commercial fishing boats and recreational beach fishing for plant	-	-	Possible impact to launch/ landing access for commercial fishing boats and recreational beach fishing for plant	-	-	Possible impact to launch/ landing access for commercial fishing boats and recreational beach fishing	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.4b**			**C.5a**			**C.5b**			**C.6a**		
	access during construction.			access during construction.			access during construction.			for plant access		
Navigation	Short term impact during construction for beach boat landing/launch. Assuming access is incorporated into the design of any new structures.	-	-	Short term impact during construction for beach boat landing/launch.	-	-	Short term impact during construction for beach boat landing/launch.	-	-	Short term impact during construction for beach boat landing/launch. Assuming access is incorporated into the design of any new structures.	-	-
Landscape	Changes in landscape character and there will be impact to the setting of the designated features including AONB and setting of the WHS.	-	-	Changes in landscape character and there will be impact to the setting of the designated features including AONB and setting of the WHS.	-	-	Changes in landscape character and there will be impact to the setting of the designated features including AONB and setting of the WHS.	-	-	Changes in landscape character and there will be impact to the setting of the designated features including AONB and setting of the WHS.	-	-
Archaeology and Cultural Heritage	Construction may unearth/ cause disturbance designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and non-designated	-	-	Construction may unearth/ cause disturbance designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and non-designated	-	-	Construction may unearth/ cause disturbance designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and non-designated	-	-	Construction may unearth/ cause disturbance designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and non-designated	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.4b**			**C.5a**			**C.5b**			**C.6a**		
	features long term.			features long term.			features long term.			features long term.		
Air quality	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-
Noise	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.	-	-	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.	-	-	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.	-	-	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.	-	-
Amenity value	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and	-	-

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.4b**			**C.5a**			**C.5b**			**C.6a**		
	to/on beach amenities during construction. Reduction in beach width due to coastal squeeze limiting recreational opportunities.			to/on beach amenities during construction. Reduction in beach width due to coastal squeeze limiting recreational opportunities.			to/on beach amenities during construction. Reduction in beach width due to coastal squeeze limiting recreational opportunities.			access to/on beach amenities during construction. Reduction in beach width due to coastal squeeze limiting recreational opportunities.		

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.6b**			**C.7a**			**C.7b**					
Overview/Description	Construct a 35m 'T-head' type rock groyne along base of cliff immediately east of the River Sid (i.e. around Pennington Point), supported by cliff top drainage measures (to be determined following investigation of groundwater flows) and/or cliff top slope regrading and pinning (e.g. soil nailing and netting).			Extend Option B.5a further east, with offshore breakwaters (at similar height to existing two Sidmouth breakwaters) tapering towards the eastern end of the BMP area. Beach recharge would not occur along East Beach, only along Sidmouth Town frontage, but removal of groynes/training wall would enable transport along the shoreline of the recharge material placed along Sidmouth Town frontage.			Extend Option B.5b further east, with offshore breakwaters/reefs (at lower height than the two existing Sidmouth breakwaters) tapering towards the eastern end of the BMP area. Beach recharge would not occur along East Beach, only along Sidmouth Town frontage, but removal of groynes/training wall would enable transport along the shoreline.					
Technical Issues	Rock groynes to retain any available beach material along toe of cliffs helping to reduce wave impact and hence erosion to toe of cliffs together with improved cliff top slope stability. Safety of construction works to be considered especially due to landslides which cannot be controlled/foreseen. Groyne may not be considered as 'managed realignment' as part of the 2011 SMP Policy for cell 6a35 - River Sid and Sidmouth (East).			Offshore reefs will create salient/tombolos providing a beach in front of the existing cliffs which will reduce cliff toe erosion rates. Allows for gradual transition from hold-the line to managed realignment across the two coastal units and aligns well with SMP policy.			Offshore reefs will create salient/tombolos providing a beach in front of the existing cliffs which will reduce cliff toe erosion rates. Allows for gradual transition from hold-the line to managed realignment across the two coastal units and aligns well with SMP policy.					
Assumptions and uncertainties	Assumes that sufficient beach material exists in cell to allow groyne to function effectively. Position/usefulness of single groyne to be assessed at later stage. Cliff top drainage would be maintained by landowner.			Size, location etc. of offshore reefs would need to be modelled to ensure effectiveness. Impact on SWW outfall to be considered including discharge plume. Wave induced currents may develop – would need to consider at next stage.			Size, location etc. of offshore reefs would need to be modelled to ensure effectiveness. Impact on SWW outfall to be considered including discharge plume. Wave induced currents may develop – would need to consider at next stage.					
Approaches to adaptation	Rock can be reused in future works.			Rock can be reused in future works.			Rock can be reused in future works.					
Costs and initial Benefit:Cost assessment and Partnership Funding Scores	Cost - £3,834k (inc. 60% Optimism Bias) Benefit Cost Ratio – 0.00 PS Score = 1% (contribution required = £3,799k)			Cost - £3,453k (inc. 60% Optimism Bias) Benefit Cost Ratio – 0.00 PS Score = 1% (contribution required = £3,418k)			Cost - £2,968k (inc. 60% Optimism Bias) Benefit Cost Ratio – 0.00 PS Score = 1% (contribution required = £2,933k)					
Category	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**
Economic Impacts												
Properties	Residential property would be	PV Damages - £0k	-	Residential property would be	PV Damages - £0k	-	Residential property would be	PV Damages - £0k	-			

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.6b**			**C.7a**			**C.7b**					
	protected from erosion.			protected from erosion.			protected from erosion.					
Infrastructure	May help to reduce impact on Alma Bridge and River Sid western wall	-	-	-	-	-	-	-	-			
Transport	-	-	-	-	-	-	-	-	-			
Development	-	-	-	-	-	-	-	-	-			
Coastal Process Impacts												
Coastal processes	In terms of impacts on coastal processes, see Option #C.6a. The additional works will also reduce the risk of cliff top erosion. This coastline is designated as WHS and SSSI due to its geology and geomorphology and the engineering would obscure outcrops at the base of the cliff that are features of designation.	-	None.	The morphology of the beach would change significantly, although the reefs would have a similar net affect in terms of reducing the alongshore sediment transport, albeit it through a totally different mechanism. Instead of physically retaining sediment, the reefs would reduce movement through altering the direction and size of incident waves. The beach is likely to widen behind the reefs with the	-	The size, spacing and orientation of the rock reefs, along with the rate of sediment supply and movement along the coast will determine how successful the reefs would be at retaining sediment.	As Option #C.7a, but the effectiveness of the reefs would be reduced, particularly during storm events, when the beaches could become more mobile.	As Option #C.7a.	As Option #C.7a.			

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.6b**			**C.7a**			**C.7b**					
				formation of a series of tombolos in the lee of each breakwater. It is possible that a narrower beach would develop towards the east as the size of the rock reefs taper. Without the training wall, the river mouth will be more dynamic with greater interaction between the beach at the eastern end of Sidmouth and East Beach. There could be a terminal affect at the end of the scheme, with a risk of increased cliff erosion at this location. The course of the river relative to the structures will also need to be considered, otherwise there could be a risk of scour.								
Environmental Impacts												

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.6b**			**C.7a**			**C.7b**					
Geology Geomorphology	Does not allow natural processes of erosion. Construction and possible long term impacts to UNESCO World Heritage Site and nationally designated geological sites (features on beach). Issues of coastal squeeze against the hard defence structure.	-	-	Acts to constrain natural processes but to lesser extent than Options #C.1 to #C.6. Possible long term impacts to UNESCO World Heritage Site and nationally designated geological sites.	-	-	Acts to constrain natural processes but to even lesser extent than Option #C.7a. Possible long term impacts to UNESCO World Heritage Site and nationally designated geological sites.	-	-			
Water quality	With correct construction pollution prevention measures – no change to baseline envisaged (subject to external driving forces).	-	-	Removal of structure may result in the increase in sediments to the water column and impact water quality temporarily. Chemical composition unknown.	-	-	Removal of structure may result in the increase in sediments to the water column and impact water quality temporarily. Chemical composition unknown.	-	-			
Ecology	Possible long term changes to designated features from changes in erosion rates. Impact to designated features and BAP habitat from a reduction in	-	-	Possible long term changes to designated features from changes in erosion rates. Possible construction and long term impacts to BAP habitats and species	-	-	Possible long term changes to designated features from changes in erosion rates. Possible construction and long term impacts to BAP habitats and species	-	-			

Project name	Sidmouth and East Beach Management Plan (BMP)												
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)												
Option	**C.6b**			**C.7a**			**C.7b**						
	beach width due to coastal squeeze (annual vegetation drift lines). Possible construction impacts to designated features and BAP habitat during construction of structures (annual vegetation drift lines). Possible construction impacts to BAP habitat/fish nursery and spawning grounds by removal/disturbance of sediment. Below MHW.			associated with the structure being removed. Possible impacts to designated features/BAP habitat from beach recharge (annual vegetation drift lines). Possible construction impacts to BAP habitat/fish nursery and spawning grounds/benthic habitat by removal/disturbance of sediment. Possible construction impacts to BAP habitat/fish nursery and spawning grounds/benthic habitat during construction of structures. Long term altered changes to ecology. Breakwater construction would be at the detriment of loss of			associated with the structure being removed. Possible impacts to designated features/BAP habitat from beach recharge (annual vegetation drift lines). Possible construction impacts to BAP habitat/fish nursery and spawning grounds/benthic habitat by removal/disturbance of sediment. Possible construction impacts to BAP habitat/fish nursery and spawning grounds/benthic habitat during construction of structures. Long term altered changes to ecology. Breakwater construction would be at the detriment of loss of					

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.6b**			**C.7a**			**C.7b**					
				habitat to benthic species associated with soft sediment, however construction could be of benefit to epibenthos species including BAP and species associated with rocky reef substrate.			habitat to benthic species associated with soft sediment, however construction could be of benefit to epibenthos species including BAP and species associated with rocky reef substrate.					
Fisheries	Possible impact to launch/ landing access for commercial fishing boats and recreational beach fishing for plant access.	-	-	Temporary impact to launch access for commercial fishing boats and recreational beach fishing during construction. Possible long term changes to inshore fisheries. May provide increased fishing ground (reef) for pelagic species, however breakwater construction may impact benthic species (loss of sediment habitat).	-	-	Temporary impact to launch access for commercial fishing boats and recreational beach fishing during construction. Possible long term changes to inshore fisheries. May provide increased fishing ground (reef) for pelagic species, however breakwater construction may impact benthic species (loss of sediment habitat).	-	-			

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.6b**			**C.7a**			**C.7b**					
				May impact use of fishing gear usage in this area and therefore target species.			May impact use of fish gear usage in this area and therefore target species.					
Navigation	Short term impact during construction for beach boat landing/launch Assuming access is incorporated into the design of any new structures.	-	-	Long term impacts/ navigational changes although these will be charted.	-	-	Long term impacts/ navigational changes particularly since breakwater will only be seen at low tide although these will be charted.	-	-			
Landscape	Changes in landscape character and there will be impact to the setting of the designated features including AONB and setting of the WHS.	-	-	Changes in landscape character and there will be impact to the setting of the designated features including AONB and setting of the WHS.	-	-	Changes in landscape character and there will be impact to the setting of the designated features including AONB and setting of the WHS.	-	-			
Archaeology and Cultural Heritage	Construction may unearth/ cause disturbance designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and	-	-	Construction may unearth/ cause disturbance designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and	-	-	Construction may unearth/ cause disturbance designated and non-designated Archaeology and Cultural Heritage features. Possible impact on setting of designated and	-	-			

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.6b**			**C.7a**			**C.7b**					
	non-designated features long term.			non-designated features long term.			non-designated features long term.					
Air quality	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-	Impact to air quality through construction considered negligible due to small scale construction and not believed to have potential for long-term, permanent significant environmental effects.	-	-			
Noise	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.	-	-	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.	-	-	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.	-	-			
Amenity value	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access	-	-			

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage C: East Beach (River Sid eastwards to BMP boundary)											
Option	**C.6b**			**C.7a**			**C.7b**					
	to/on beach amenities during construction. Reduction in beach width due to coastal squeeze limiting recreational opportunities.			to/on beach amenities during construction.			to/on beach amenities during construction.					

Frontage D

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage D: River Sid Western Wall (upstream of the training wall / Alma Bridge)											
Option	**D.0**			**D.1**								
Overview/Description	Do Nothing			Maintenance of existing western wall, which is in fair condition, to maximise its residual life for as long as possible. Repair scour in immediate future to support this. As and when wall becomes exposed to full coastal conditions (if/when cliff to the east retreats sufficiently far to cause this), replace wall with a coastal-standard vertical seawall. NB: need for this (and timing) depends on Options for East Beach, so consider this option in combination with each of Options C.1 to C.7.								
Technical Issues	No works undertaken. For the River Sid wall the best estimate for complete performance failure is 15-30 years. Does not comply with SMP policy of hold-the-line.			Defence failure prevented through ongoing maintenance extending lifespan of wall beyond its residual life of 15 – 30 years until unviable and economic to continue, or when cliffs erode such that the wall becomes exposed to full coastal conditions and a new coastal standard wall is constructed. Complies with SMP policy of hold-the-line.								
Assumptions and uncertainties	No intervention leading to failure of defence.			Form of construction of existing wall is unknown and hence extent/form of repairs that can be undertaken are uncertain. Prevention/reduction of undermining and scour to toe of structure are required as priority. Assumed that the upstream Ham Weir is sufficient and no additional works/improvements are required.								
Approaches to adaptation	None			Wall height could be raised in one go or in stages in response to actual sea level rise observed.								
Costs and initial Benefit:Cost assessment and Partnership Funding Scores	Cost - £0 Benefit Cost Ratio – N/A PS Score = N/A			See Options B.1, B.2, B.3, B.4 & B.5.								
Category	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**	**Description and quantification of impacts**	**Values of impacts**	**Assumptions and uncertainties**
Economic Impacts												
Properties	Impacts of option to be considered together with	PV Damages (Total for B.0 and D.0 linked	-	Impacts of option to be considered together with those of	-	-						

Project name	Sidmouth and East Beach Management Plan (BMP)											
Frontage description	Frontage D: River Sid Western Wall (upstream of the training wall / Alma Bridge)											
Option	**D.0**			**D.1**								
	those of option #B.0.	flood risk area): £85,383k		Options #C.1 to C.7.								
Infrastructure	Impacts of option to be considered together with those of option #B.0 and #C.0. Loss of wall would result in increased flood risk to, or even loss of, critical infrastructure including the SWW pumping station.	PV Damages (Total for B.0 and D.0 linked flood risk area): £46,612k	-	Impacts of option to be considered together with those of Options #C.1 to C.7.	-	-						
Transport	Impacts of option to be considered together with those of option #B.0.	-	-	Impacts of option to be considered together with those of Options #C.1 to C.7.	-	-						
Development	Impacts of option to be considered together with those of option #B.0.	-	-	Impacts of option to be considered together with those of Options #C.1 to C.7.	-	-						
Coastal Process Impacts												
Coastal processes	Coastal processes would continue as present until defence fails. Upon failure, erosion of the western river	-	Rate of failure of wall will be influenced by degree of exposure of the western wall to coastal conditions that will occur as East Cliff	Coastal processes along the open coast would continue as existing (or altered depending on preferred option for	-	-						

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Option	**D.0**			**D.1**									
	bank, causing instability and potential breach leading to flooding at the eastern end of Sidmouth. Without constraint the river may attempt to meander, which could affect its course, which could impact on the eastern bank. A change in river flow at the mouth could impact on the sediment movement there and the linkages between the beach at the eastern end of Sidmouth and East Beach.		continues to erode.	future management along the open coast).									
Environmental Impacts													
Geology Geomorphology	No likely impact to UNESCO World Heritage Site and nationally designated geological sites.	-	-	No likely impact UNESCO World Heritage Site and nationally designated geological sites.	-	-							
Water quality	Potential water quality issues from	-	-	Replacement of wall may result in the	-	-							

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Option	**D.0**			**D.1**								
	damaged infrastructure/ sewage outfall and pumping station including erosion debris.			increase in sediments to the water column and impact water quality temporarily. Chemical composition unknown.								
Ecology	No likely impact to internationally and nationally designated features or BAP habitat.	-	-	No likely impact to internationally and nationally designated features or BAP habitat.	-	-						
Fisheries	Impact to commercial fisheries and recreational fishers from infrastructure erosion debris for boat launch/landing access, and from pollution of inshore waters from sewage pumping station damage	-	-	Possible temporary impact to launch access for commercial fishing boats and recreational fishing during construction.	-	-						
Navigation	Impact for launch/landing access from erosion/ infrastructure debris for commercial and recreational boats.	-	-	Possible short term impact during construction for beach boat landing/launch .	-	-						

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Frontage description	Frontage D: River Sid Western Wall (upstream of the training wall / Alma Bridge)											
Option	**D.0**			**D.1**								
Landscape	Changes in landscape character and there will be impact to the setting of the designated features including AONB and setting of the WHS.	-	-	Changes will be seen to the landscape and there will be visual/direct impact to designated features including AONB and setting of the WHS. Short term changes during maintenance/ construction and long term if new wall is not replaced like for like.	-	-						
Archaeology and Cultural Heritage	Impact to designated and non-designated Archaeology and Cultural Heritage features; and on setting.	-	-	Construction may unearth/ cause disturbance designated and non-designated Archaeology and Cultural Heritage features Possible impact on setting of designated and non-designated features long term.	-	-						
Air quality	N/A	-	-	Impact to air quality through construction considered negligible due to small scale	-	-						

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Option	**D.0**			**D.1**								
				construction and not believed to have potential for long-term, permanent significant environmental effects.								
Noise	N/A	-	-	Noise and vibration impacts resulting from construction may be significant due to close proximity of occupied buildings. May require the application of mitigation – acoustic barriers, monitoring etc.	-	-						
Amenity value	Loss of access/and on beach amenities at this section including link between east Sidmouth and Sidmouth Town/ SW Coast Path National Trail and National Cycle Network from erosion debris and likely damage to Alma Bridge.	-	-	Temporary impact to SW Coast Path National Trail and National Cycle Network, and access to/on beach amenities during construction/ maintenance activities.	-	-						

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Frontage description	Frontage D: River Sid Western Wall (upstream of the training wall / Alma Bridge)											
Option	**D.0**			**D.1**								
	Health and safety concerns will likely prevent access prior to asset failure.											