Seaton Beach Management Plan
Long List Appraisal
Drafted 05.10.2017 - 13.02.2018

Location	Option Number	Option Description	FCERM Issue Addressed - Including Reference To Table - Issues, current management practices and actions									High Level Assessment Coastal Processes		High Level Assessment Defences		High Level Assessment Economics		High Level Assessment Environment		Show Stopper	Take Forward to Short-List Appraisal (Y/N)	Summary of Rationale for Discounting from Long-List / Taking Forward to Short-List	Consider in Combination With Other Options	Sensitivity Test - More funding
												Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages					
BMP Wide	1	Do Nothing (used as a baseline comparison, reported on in baseline studies)	Does not address FCERM issues									•As per baseline study.	•As per baseline study.	•As per baseline study.	•As per baseline study.	•As per baseline study.	•As per baseline study.	•As per baseline study.	•As per baseline study.	✓	N	This option does not directly reduce flooding or erosion. Considered to be a 'show stopper'.	n/a	-
BMP Wide	2	East Devon Marina - Feniton Park Ltd *to include a copy of the scheme in the main options report	2.2, 2.3	1	2							•Reduced wave energy at the coast	•Alter sediment dynamics in the wider area •Potentially modify tidal flows, which could have an implications for the wider area	•Provides necessary protection form flood and coastal erosion risk •Existing FCERM structures would require reduced maintenance	•May cause adjacent areas to experience issues due to wave reflection / refraction from the new structures •Will affect the nearshore bathymetry, affecting wave conditions experienced at adjacent areas	•Reduced requirement for capital works and maintenance of existing defences	•Significant cost for breakwater structures in potentially deep water, and potential for tidal working conditions •Potential for remedial works to adjacent structures to address changes to design conditions •Significant mitigation required due to impact of large flood defence footprint	•Reduce wave energy reaching the coastline, reducing risk of erosion and providing protection to some existing habitats •Provides a tourist attraction	•Significant visual impact •Could have a negative change on the landscape and seascape characteristics of the area •Adversely impacts the coastal process that underpins ecology of designated sites •Construction based impacts to benthic ecology and 'designated marine features' reefs etc.	✓	N	Considered to be a 'show stopper' for reasons of cost, impact on coastal l processes and the environment.	n/a	-
BMP Wide	3	Seaton Bay Plan - 'Vic Raskin' offshore breakwater *to include a copy of the scheme in the main options report	2.2, 2.3	1	2							•Reduced wave energy at the coast	•Alter sediment dynamics in the wider area •Potentially modify tidal flows, which could have an implications for the wider area	•May provide necessary protection form flood and coastal erosion risk •Existing FCERM structures would require reduced maintenance	•May cause adjacent areas to experience issues due to wave reflection / refraction from the new structures •Will affect the nearshore bathymetry, affecting wave conditions experienced at adjacent areas	•Reduced requirement for capital works and maintenance of existing defences	•Significant cost for breakwater structures in potentially deep water, and tidal working conditions •Potential for remedial works to adjacent structures to address changes to design conditions •Significant mitigation required due to impact of large flood defence footprint	•Reduce wave energy reaching the coastline, reducing risk of erosion and providing protection to some existing habitats •Provides a tourist attraction	•Significant visual impact •Could have a negative change on the landscape and seascape characteristics of the area •Adversely impacts the coastal process that underpins ecology of designated sites •Construction based impacts to benthic ecology and 'designated marine features' reefs etc.	✓	N	Considered to be a 'show stopper' for reasons of cost, impact on coastal l processes and the environment.	n/a	-
Beer	4	Reinstate Kings Eye Hole	2.2		2				7			•Potential increase of sediment throughput/bypassing to east	•Could reinstate cliff erosion at Kings Eye Hole and the adjacent cliffs around the Beer headland •May only result in temporary influx of sediment	•Allows long shore transport of material between Beer and Seaton, increasing the standard of protection afforded to the Seaton frontages •Reduces the frequency of maintenance and repair works by dissipating some incident wave energy before it reaches the existing defences	•Requires ongoing recycling to ensure that the increased sediment contributes to a profile that increases standard of protection •No beach control structure may allow transport of material across the entire Seaton frontage •May increase flood and coastal erosion risk at Beer	•Initial capital cost may be relatively low compared with other options •Uncertain, but potentially low, maintenance costs	•Uncertain maintenance costs are likely to increase over time due to climate change. •May require mitigation works at Beer	•Promotes a more naturally functioning coastline •May promote improved access for fishermen across the beach, preventing them from opting to use alternative locations •A reduction in beach slope at Beer (in response to reduced beach volume) may improve Beer's standing as a tourist location thereby increasing visitor numbers as beach access is simpler	•Construction activities may directly impact on biological and geological features of the designated sites •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations. •A reduction of beach material at Beer may alternatively result in reduced visitor numbers and have negative socio-economic impacts there •Increased rate of cliff erosion may have an associated negative socio-economic impacts, including reduced protection to homes, infrastructure and the community •Option will require detailed consideration /consultation with stakeholders		N	Although this option has the potential to increase sediment throughput eastwards to Seaton, it may only be temporary. There are significant risks associated with erosion being reinstated, which itself would require mitigation measures.	n/a	-
Beer	5	Shorten concrete groyne	2.2		2				7			•Short-term pulse of sediment will move eastwards, supplying beaches at Seaton with an influx of material •In the longer term, more sediment may be able to periodically bypass the groyne, feeding beach to the east at Seaton with a supply of material, potentially resulting in a net increase in beach level and volume	•Could reinstate cliff erosion at Kings Eye Hole and the adjacent cliffs around the Beer headland •Influx of material may only be temporary; it is not certain if the rate of transport will continue as it will depend on available supply from further west •Amount of material released may not be sufficient to substantially build the beaches at Seaton •Wider impact on Beer would need to be considered	•Short-term increase in beach levels providing some defence function •Reduces the frequency of maintenance and repair works by dissipating some incident wave energy before it reaches the existing defences	•Requires ongoing recycling to ensure that the increased sediment contributes to a profile that increases standard of protection •No beach control structure may allow transport of material across the entire Seaton frontage •May increase flood and coastal erosion risk at Beer •May have only temporary benefit	•Low whole life cost, comprising initial capital expense to reduce groyne length •Uncertain, but potentially low, maintenance costs	•Uncertain maintenance costs are likely to increase over time due to climate change. •May require mitigation works at Beer	•Promotes a more naturally functioning coastline •May promote improved access for fishermen across the beach, preventing them from opting to use alternative locations •A reduction in beach slope at Beer (in response to reduced beach volume) may improve Beer's standing as a tourist location thereby increasing visitor numbers as beach access is simpler	•Construction activities may directly impact on biological and geological features of the designated sites •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations. •A reduction of beach material at Beer may alternatively result in reduced visitor numbers and have negative socio-economic impacts there •Increased rate of cliff erosion may have an associated negative socio-economic impacts, including reduced protection to homes, infrastructure and the community •Option will require detailed consideration /consultation with stakeholders		Y	This option has the potential to provide an influx of material to Seaton, although it may only be temporary. Shortening the groyne, could allow more material to bypass on a day-to-day basis, but the beach could narrow by still provide amenity value. It is questioned if the material that does bypass would be of sufficient volume to increase the beach at Seaton to a sufficient level that provides a defence function. This option would need to be considered in combination with other solutions.	Y	-
Beer	6	Remove concrete groyne	2.2		2				7			•Short-term pulse of sediment will move eastwards, supplying beaches at Seaton with an influx of material •The volume of material released will be greater than if the groyne is shortened •In the longer term, more sediment may be able to naturally move around Beer headland, feeding beach to the east at Seaton with a supply of material, potentially resulting in a net increase in beach level and volume	•Could reinstate cliff erosion at Kings Eye Hole and the adjacent cliffs around the Beer headland •Influx of material may only be temporary; it is not certain if the rate of transport will continue as it will depend on available supply from further west •Amount of material moved around the headland may not substantially build the beaches at Seaton •Wider impact on Beer would need to be considered	•Short-term increase in beach levels providing some defence function •Reduces the frequency of maintenance and repair works by dissipating some incident wave energy before it reaches the existing defences	•Requires ongoing recycling to ensure that the increased sediment contributes to a profile that increases standard of protection •No beach control structure may allow transport of material across the entire Seaton frontage •May increase flood and coastal erosion risk at Beer •May have only temporary benefit	•Low whole life cost, comprising initial capital expense to remove groyne •Uncertain, but potentially low, maintenance costs	•Uncertain maintenance costs are likely to increase over time due to climate change. •May require mitigation works at Beer	•Promotes a more naturally functioning coastline •May promote improved access for fishermen across the beach, preventing them from opting to use alternative locations •A reduction in beach slope at Beer (in response to reduced beach volume) may improve Beer's standing as a tourist location thereby increasing visitor numbers as beach access is simpler	•Construction activities may directly impact on biological and geological features of the designated sites •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations. •A reduction of beach material at Beer may alternatively result in reduced visitor numbers and have negative socio-economic impacts there •Increased rate of cliff erosion may have an associated negative socio-economic impacts, including reduced protection to homes, infrastructure and the community •Option will require detailed consideration /consultation with stakeholders		N	Removal of the groyne could reinstate erosion at Beer and call for mitigation measures. There could be substantial impacts on the designated sites. Given the associated risks and potential impacts on the coastline, when compared to the fact that the sediment may only be a temporary influx of material, this option won't be taken forward to the short-list.	n/a	-
Beer / Seaton Hole	7	Recycle shingle from Beer to Seaton Hole / Old Beer Road	2.2		2				7			•Works with natural processes - i.e. replicates natural alongshore transport, but requires ongoing management (unlike option 6), potentially resulting in a net increase in beach level and volume along the beach to the east at Seaton •The addition of material to Seaton Hole would be controlled, rather than uncontrolled as under options 1, 4, 5 and 6, meaning works could be undertaken in response to critical conditions •Could be combined with improving beach usability for fishermen at Beer, through reducing beach width and steepness	•Impact on natural beach morphology at Beer •Impact on natural beach morphology at Seaton Hole	•Would improve the defence function of the beach at Seaton Hole / Old Beer Road •Sediment grade similar to Seaton, therefore no change to cross-shore profile	•Uncertainty in frequency of recycling activities required to provide standard of protection •Uncertainty whether sufficient volumes to provide required levels of protection •Diminishing standard of protection over time due to climate change	•Potentially low initial cost, based on volume required and method of transport. •Low mitigation costs required due to similarity in beach material	•Method of movement will determine cost. If possible to move along coast from Beer relatively low cost. If inland route, costs will be high. •Requirements will increase over time as a consequence of sea level rise	•Promotes a more naturally functioning coastline •May promote improved access for fishermen across the beach, preventing them from opting to use alternative locations •A reduction in beach slope at Beer (in response to reduced beach volume) may improve Beer's standing as a tourist location thereby increasing visitor numbers as beach access is simpler	•Construction activities may directly impact on biological and geological features of the designated sites •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations. •A reduction of beach material at Beer may alternatively result in reduced visitor numbers and have negative socio-economic impacts there •Increased rate of cliff erosion may have an associated negative socio-economic impacts, including reduced protection to homes, infrastructure and the community •Option will require detailed consideration /consultation with stakeholders		Y	This option replicates natural processes, can be controlled, and has the potential to overcome undesired beach width and steepness at Beer.	Y	-
• Seaton Hole	8	Maintain or replace existing outfall protection works (to address issues of undermining and outflanking). Consider works completed by Devon County Council to reduce flooding on Old Beer Road, possible Upstream Flood Management to be incorporated into option/adaptive measure/BMP recommendations.	2.2									•No substantial change to existing coastal processes	•No substantial change to existing coastal processes (assuming no change in outfall footprint)	•Will provide the required protection to the outfall structure •Straightforward construction, with short programme of works •Reduction in groundwater/drainage through the cliff at Old Beer Road will reduce likelihood of cliff saturation and failure	•Gabions have a short design-life and would require frequent maintenance and replacement •Without works to address the ongoing trend of erosion, it is likely that the existing issue of undermining and outflanking will continue •Tidal working may be required in a more isolated part of the study area	•Low cost option with good availability of materials •Low cost for anticipated mitigation works (if any)	•Requires frequent replacement, which may contribute to relatively high whole life cost	•Presents opportunities to improve discharge quality and the promotes the use of upland flood storage, which is assumed to have an associated flood reduction capacity •Contributes to the WFD objectives			Y	A relatively low cost option and easy to implement, will require ongoing maintenance however. The benefits achieved will need to provide protection to the cliffs from erosion, so this option does not provide Funding streams for this option need to be explored further, since maintenance funds may be available in addition to FCERM-GiA - if not, the option will need to be considered in combination with other options.	Y	-
Seaton Hole	9	Upgrade or replace outfall protection works with a new structure (e.g. use rock at toe, encase in concrete, or incorporate into adjacent revetment)	2.2									•No substantial change to existing coastal processes	•No substantial change to existing coastal processes (assuming no change in outfall footprint)	•Greater confidence in performance if forming part of a wider structure •Lower risk of undermining or outflanking •Improved H&S by requiring less frequent maintenance	•Accessibility for asset owner may be more complicated, requiring additional engagement during design •Tidal working would be required in a more isolated part of the study area	•Lower ongoing maintenance cost	•High initial capital costs •Higher design and capital costs to address localised issue	•Presents opportunities to improve discharge quality and contribution to the WFD objectives			N	Benefits gained from costs unlikely to be value for money, where compared to 'maintain option' so not carried forward to short-list.	n/a	-
Seaton Hole	10	Maintain concrete encased revetment and return to as-built design	2.2		2	3						•Continue to prevent marine erosion of the cliff toe, therefore slowing the rate of cliff retreat •Reduced input of sediment from cliffs, but this is mainly fines and as reported on in the Coastal Process Baseline report is unlikely to represent a substantial feed to the beaches	•The existing footprint of the structure extends across the beach, which could intercept longshore sediment transport - potential impact on downdrift beach levels, particularly to the east •Will continue to hold shoreline in a fixed position - over time this will become increasingly exposed to waves and tides •Risk of outflanking to the east may increase •Does not address beach volatility and has the potential to increase it	• The concrete encased revetment would continue to provide cliff toe protection from coastal erosion • Limited works in tidal conditions due to	• The concrete at present is not reinforced and therefore fails under wave loading. • There is a question over suitability and residual life of this defence type in this environment. • Toe scour and subsidence issues will continue.	•Low initial capital cost	•Higher ongoing maintenance costs than upgrading/replacing •Structure is failing as is, therefore likely need to replace in the near future	•Social-economic benefit of protecting cliffs from erosion provides protection to homes, infrastructure and ensures community cohesion	•Construction activities may directly impact on biological and geological features of the designated sites (although likely to be over a short time frame only and limited to the demolition of the existing structure and removal of intertidal and benthic ecology) •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations.		N	The structure is failing in its current form, so not providing a sufficient level of protection to the cliff toe.	n/a	-
Seaton Hole	11	Upgrade concrete encased revetment (tie into adjacent rock revetment) or replace with a new structure	2.2		2	3						•Continue to prevent marine erosion of the cliff toe for a longer period of time (due to increased robustness of the structure), therefore slowing the rate of cliff retreat •Reduced input of sediment from cliffs, but this is mainly fines and as reported on in the Coastal Process Baseline report is unlikely to represent a substantial feed to the beaches	•Could intercept longshore sediment transport - potentially resulting in a net increase in beach level and volume, particularly to the east •Will continue to hold shoreline in a fixed position - over time this will become increasingly exposed to waves and tides •Risk of outflanking to the east may increase •Does not address beach volatility and has the potential to increase it	• An upgrade of the revetment would provide a more robust cliff toe protecting against marine erosion. • A new structure can be designed to prevent toe scour and subsidence.	• The isolated location and narrow beach could mean that getting plant to site could be difficult and a barge may be required. • Narrow beach and full tidal cover at high tide also limits the working window.	•Redesigned structure will require less maintenance than existing structure	•More expensive than maintaining •Costs associated with sourcing and transporting rock are currently high, particularly larger material from outside the UK •Elevated cost due to work in an isolated part of the site with restricted access and tidal working	•Social-economic benefit of protecting cliffs from erosion provides protection to homes, infrastructure and ensures community cohesion	•Construction activities may directly impact on biological and geological features of the designated sites (although likely to be over a short time frame only and limited to the demolition of the existing structure and removal of intertidal and benthic ecology) •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations. •Potential to have visual and landscape impact - careful consideration and stakeholder engagement required		Y	Improving the integrity of the structure and possibly tying into the adjacent rock revetment would provide more robust toe protection against erosion in the short-term. Would follow a similar footprint to present, with minimal impact of existing views of the coastline (in respect of the designated sites). Since this option only address a section of the eroding cliff, it would need to be considered in combination with other options.	Y	-
Seaton Hole (CBU 1)	12	Cliff drainage scheme (shallow drainage measures, e.g. could comprise machine-excavated catch-drains of nominal 4m depth that intercept shallow groundwater before it reaches the coastline)	2.2		2							•Would draw-down ground water below a critical level would reduce the rate of degradation and clifftop retreat	•Cliff stabilisation may cause a reduction in sediment supply to beach	• Contributes to local cliff stability, but does not address erosion at toe of cliff • Relatively simple construction process, with short programme	•Requires ground investigation to support design • May be damaged if alternative cliff erosion processes cause losses •Would need to be completed alongside improvements to cliff toe protection •Would need to be considered in conjunction with cliff stabilisation • This option may align with the SMP2 policy of Managed Realignment in the medium and long term.	•Moderate initial capital cost •Negates costs associated with property demolition and relocating	•May lead to redesign and upgrade of local drainage to account for additional discharge with associated costs •In combination coats also associated with required cliff stabilisation measures •Costs are very approximate at this stage of options appraisal - it is difficult to price this option accurately as cost of GI, design and construction are unknown until the site is looked at it more detail/option details are refined	•Helps to reduce erosion rates and the associated socio-economic impact required.	•Works to the cliff inside the designated site or outside on a designated feature will require further detailed consideration to examine the effects. Complex approvals process and extensive consultation with stakeholder required. •Works may effect ecology of the designated site		Y	Cliff drainage will help to reduced cliff erosion via groundwater weathering, but should be considered alongside cliff stabilisation measures. Generally a cliff drainage scheme will have little if any impact on coastal processes; any material supplied to the beach would consist of fine grained material and is not reported to be a significant source of beach-building material. The success of cliff drainage will ultimately be dependent on the stability of the cliff toe, therefore this option would need to be considered in combination with marine toe protection. The option could potentially be affordable, but more refined costs would inform this. There is potential for this option to conflict with the SMP2 policy of managed retreat for the medium and long-term.	Y	-
Seaton Hole (CBU 1)	13	Cliff drainage scheme (deep drainage measures, e.g. could involve drilling vertical boreholes in an array and pumping the water away / gravity drainage)	2.2		2							•Would draw-down ground water below a critical level would reduce the rate of degradation and clifftop retreat	•Cliff stabilisation may cause a reduction in sediment supply to beach	• Contributes to local cliff stability, but does not address erosion at toe of cliff	•Requires ground investigation to support design • May be damaged if alternative cliff erosion processes cause losses •Would need to be considered in conjunction with cliff stabilisation • This option may not align with the SMP2 policy of Managed Realignment in the medium and long term.	•Negates costs associated with property demolition and relocating	•May lead to redesign and upgrade of local drainage to account for additional discharge with associated costs •Relatively high cost when compared to shallow drainage options and stabilisation measures •Costs are very approximate at this stage of options appraisal - it is difficult to price this option accurately as cost of GI, design and construction are unknown until the site is looked at it more detail/option details are refined	•Helps to reduce erosion rates and the associated socio-economic impact required.	•Works to the cliff inside the designated site or outside on a designated feature will require further detailed consideration to examine the effects. Complex approvals process and extensive consultation with stakeholder required. •Works may effect ecology of the designated site		Y	Cliff drainage will help to reduced cliff erosion via groundwater weathering, but should be considered alongside cliff stabilisation measures. Generally a cliff drainage scheme will have little if any impact on coastal processes; any material supplied to the beach would consist of fine grained material and is not reported to be a significant source of beach-building material. The success of cliff drainage will ultimately be dependent on the stability of the cliff toe, therefore this option would need to be considered in combination with marine toe protection. The option could potentially be affordable, but more refined costs would inform this. There is potential for this option to conflict with the SMP2 policy of managed retreat for the medium and long-term.	Y	Y
Seaton Hole (CBU 1)	14	Cliff face stabilisation at (e.g. netting to stop lose material falling to the beach and rock bolts to hold blocks of failed bedrock in place)	2.2		2							•Would increase material strength in upper cliff would hold weak, weathered mudstone and Head deposits in place and allow vegetation to develop and further stabilise the weak materials •May also allow large pre-failed blocks of mudstone on the cliff to be held in place	•Cliff stabilisation may cause a reduction in sediment supply to beach	• Contributes to local cliff stability, but does not address erosion at toe of cliff • Relatively simple construction process, with short programme	•Requires ground investigation to support design • May be damaged if alternative cliff erosion processes cause losses •Would need to be considered in conjunction with cliff drainage • This option may not align with the SMP2 policy of Managed Realignment in the medium and long term.	•Moderate initial capital cost •Negates costs associated with property demolition and relocating	•May lead to redesign and upgrade of local drainage to account for additional discharge with associated costs •Relatively high cost when compared to shallow drainage options and stabilisation •In combination coats also associated with required cliff drainage measures •Costs are very approximate at this stage of options appraisal - it is difficult to price this option accurately as cost of GI, design and construction are unknown until the site is looked at it more detail/option details are refined	•Helps to reduce erosion rates and the associated socio-economic impact required.	•Works to the cliff inside the designated site or outside on a designated feature will require further detailed consideration to examine the effects. Complex approvals process and extensive consultation with stakeholder required. •Works may effect ecology of the designated site		Y	Cliff stabilisation would work alongside cliff drainage. Generally a cliff stabilisation scheme will have little if any impact on coastal processes; any material supplied to the beach would consist of fine grained material and is not reported to be a significant source of beach-building material. The success of cliff stability measures will ultimately be dependent on the stability of the cliff toe, therefore this option would need to be considered in combination with marine toe protection. The option could potentially be affordable, but more refined costs would inform this. There is potential for this option to conflict with the SMP2 policy of managed retreat for the medium and long-term.	Y	-
Seaton Hole / Old Beer Road	15	Maintain 'old and new' revetment and re-profile to as-built design	2.2		2	3						•Continue to prevent marine erosion of the cliff toe, therefore slowing the rate of cliff retreat - reduced input of sediment from cliffs, but this is mainly fines and as reported on in the Coastal Process Baseline report is unlikely to represent a substantial feed to the beaches •Less reflection than a seawall, so potential for less beach draw-down •Would not prevent longshore transport eastwards to Seaton, therefore limited impact on downdrift beach level and volume anticipated •Potential to bury structure beneath beach and stabilise the shingle beach •Assumed for there to be little change to the footprint of the structure compared to upgraded revetment, therefore less impact on beach	•Beach draw-down would still continue due to a hard backshore and wave reflection (although less than a seawall) •Does not address beach volatility and has the potential to increase it	• Work to maintain the revetment could be limited to localised areas in poor condition (as identified by the Condition Assessment). • Straightforward construction would be at a smaller scale than replacement, and is likely to take less time than upgrading the defences	• This option does not improve the current standard of protection	• Relatively low cost as defence structure materials are already on site	• Increasing maintenance costs over time to address climate change • Large amount of beach excavation required to locate and reprofile rock structure	•Social-economic benefit of protecting cliffs from erosion provides protection to homes, infrastructure and help to promote community cohesion	•Construction activities may directly impact on biological and geological features of the designated sites •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations.		Y	The existing defence is understood to be working well, but in some locations requires maintenance. The structure allows longshore and cross-shore process to continue, so although the beach would remain volatile, it would have the ability to 'repair itself' after any storm damage. Since this option only address a section of the eroding cliff, it would need to be considered in combination with other options. Funding streams for this option need to be explored further, since maintenance funds may be available in addition to FCERM-GiA - if not, the option will need to be considered in combination with other options.	Y	-
Seaton Hole / Old Beer Road	16	Upgrade 'old and new' revetment (e.g. increase height and width)	2.2		2	3						•Continue to prevent marine erosion of the cliff toe, therefore slowing the rate of cliff retreat - reduced input of sediment from cliffs, but this is mainly fines and as reported on in the Coastal Process Baseline report is unlikely to represent a substantial feed to the beaches •Less reflection than a seawall, so potential for less beach draw-down •Would not prevent longshore transport eastwards to Seaton, therefore limited impact on downdrift beach level and volume anticipated •Potential to bury structure beneath beach and stabilise the shingle beach	•Beach draw-down would still continue due to a hard backshore and wave reflection (although less than a seawall) •Does not address beach volatility and has the potential to increase it •Increased footprint of structure compared to maintaining the existing revetment, resulting in reduced beach width with potentially no beach at higher states of the tide over the longer-term as SLR	• An upgrade of the existing revetment would improve the existing standard of protection	• A larger revetment structure will narrow the beach width • Might struggle to get rock of specified size if Norwegian rock is unavailable.	• Lower maintenance costs to maintain newly designed rock structure	• Costs associated with sourcing and transporting rock are currently high, particularly larger material from outside the UK • Difficulties in reconstructing revetment in narrow coastal area with tidal working conditions will increase cost	•Social-economic benefit of protecting cliffs from erosion provides protection to homes, infrastructure and help to promote community cohesion	•Construction activities may directly impact on biological and geological features of the designated sites (although likely to be over a short time frame only and limited to the demolition of the existing structure and removal of intertidal and benthic ecology) •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations. •Reduced beach width would mean reduced amenity value of the beach •Potential to have visual and landscape impact - careful consideration and stakeholder engagement required		N	This option would provide a more robust structure, but has been discounted on the basis of costs. It may be considered in the future should more funds become available.	n/a	Y
Old Beer Road (CBU 2 + 3 + 4)	17	Cliff drainage scheme (shallow drainage measures, e.g. could comprise machine-excavated catch-drains of nominal 4m depth that intercept shallow groundwater before it reaches the coastline)	2.2		2							•Would draw-down ground water below a critical level would reduce the rate of degradation and clifftop retreat	•Cliff stabilisation may cause a reduction in sediment supply to beach	• Contributes to local cliff stability, but does not address erosion at toe of cliff • Relatively simple construction process, with short programme	•Requires ground investigation to support design • May be damaged if alternative cliff erosion processes cause losses •Would need to be completed alongside improvements to cliff toe protection •Would need to be considered in conjunction with cliff stabilisation • This option may align with the SMP2 policy of Managed Realignment in the medium and long term.	•Moderate initial capital cost •Negates costs associated with property demolition and relocating	•May lead to redesign and upgrade of local drainage to account for additional discharge with associated costs •In combination coats also associated with required cliff stabilisation measures •Costs are very approximate at this stage of options appraisal - it is difficult to price this option accurately as cost of GI, design and construction are unknown until the site is looked at it more detail/option details are refined	•Helps to reduce erosion rates and the associated socio-economic impact required.	•Works to the cliff inside the designated site or outside on a designated feature will require further detailed consideration to examine the effects. Complex approvals process and extensive consultation with stakeholder required. •Works may effect ecology of the designated site		Y	Cliff drainage will help to reduced cliff erosion via groundwater weathering, but should be considered alongside cliff stabilisation measures. Generally a cliff drainage scheme will have little if any impact on coastal processes; any material supplied to the beach would consist of fine grained material and is not reported to be a significant source of beach-building material. The success of cliff drainage will ultimately be dependent on the stability of the cliff toe, therefore this option would need to be considered in combination with marine toe protection. The option could potentially be affordable, but more refined costs would inform this. There is potential for this option to conflict with the SMP2 policy of managed retreat for the medium and long-term.	Y	-
Old Beer Road (CBU 2 + 3 + 4)	18	Cliff drainage scheme (deep drainage measures, e.g. could involve drilling vertical boreholes in an array and pumping the water away / gravity drainage)	2.2		2							•Would draw-down ground water below a critical level would reduce the rate of degradation and clifftop retreat	•Cliff stabilisation may cause a reduction in sediment supply to beach	• Contributes to local cliff stability, but does not address erosion at toe of cliff • Relatively simple construction process, with short programme	•Requires ground investigation to support design • May be damaged if alternative cliff erosion processes cause losses •Would need to be considered in conjunction with cliff stabilisation • This option may not align with the SMP2 policy of Managed Realignment in the medium and long term.	•Negates costs associated with property demolition and relocating	•May lead to redesign and upgrade of local drainage to account for additional discharge with associated costs •Relatively high cost when compared to shallow drainage options and stabilisation •Technically challenging and potentially hazardous to undertaken this type of work near an active landslide •In combination coats also associated with required cliff stabilisation measures •Costs are very approximate at this stage of options appraisal - it is difficult to price this option accurately as cost of GI, design and construction are unknown until the site is looked at it more detail/option details are refined	•Helps to reduce erosion rates and the associated socio-economic impact required.	•Works to the cliff inside the designated site or outside on a designated feature will require further detailed consideration to examine the effects. Complex approvals process and extensive consultation with stakeholder required. •Works may effect ecology of the designated site		Y	Cliff drainage will help to reduced cliff erosion via groundwater weathering, but should be considered alongside cliff stabilisation measures. Generally a cliff drainage scheme will have little if any impact on coastal processes; any material supplied to the beach would consist of fine grained material and is not reported to be a significant source of beach-building material. The success of cliff drainage will ultimately be dependent on the stability of the cliff toe, therefore this option would need to be considered in combination with marine toe protection. The option could potentially be affordable, but more refined costs would inform this. There is potential for this option to conflict with the SMP2 policy of managed retreat for the medium and long-term.	Y	Y
Old Beer Road (CBU 2 + 3 + 4)	19	Cliff face stabilisation (e.g. netting to stop lose material falling to the beach and rock bolts to hold blocks of failed bedrock in place)	2.2		2							•Would increase material strength in upper cliff would hold weak, weathered mudstone and Head deposits in place and allow vegetation to develop and further stabilise the weak materials •May also allow large pre-failed blocks of mudstone on the cliff to be held in place	•Cliff stabilisation may cause a reduction in sediment supply to beach	• Contributes to local cliff stability, but does not address erosion at toe of cliff • Relatively simple construction process, with short programme	•Requires ground investigation to support design • May be damaged if alternative cliff erosion processes cause losses •Would need to be considered in conjunction with cliff drainage • This option may not align with the SMP2 policy of Managed Realignment in the medium and long term.	•Negates costs associated with property demolition and relocating	•May lead to redesign and upgrade of local drainage to account for additional discharge with associated costs •In combination coats also associated with required cliff drainage measures •Costs are very approximate at this stage of options appraisal - it is difficult to price this option accurately as cost of GI, design and construction are unknown until the site is looked at it more detail/option details are refined	•Helps to reduce erosion rates and the associated socio-economic impact required.	•Works to the cliff inside the designated site or outside on a designated feature will require further detailed consideration to examine the effects. Complex approvals process and extensive consultation with stakeholder required. •Works may effect ecology of the designated site		Y	Cliff stabilisation would work alongside cliff drainage. Generally a cliff stabilisation scheme will have little if any impact on coastal processes; any material supplied to the beach would consist of fine grained material and is not reported to be a significant source of beach-building material. The success of cliff stability measures will ultimately be dependent on the stability of the cliff toe, therefore this option would need to be considered in combination with marine toe protection. The option could potentially be affordable, but more refined costs would inform this. There is potential for this option to conflict with the SMP2 policy of managed retreat for the medium and long-term.	Y	-

										High Level Assessment Coastal Processes		High Level Assessment Defences		High Level Assessment Economics		High Level Assessment Environment						
Location	Option Number	Option Description	FCERM Issue Addressed - Including Reference To Table - Issues, current management practices and actions							Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages	Show Stopper	Take Forward to Short-List Appraisal (Y/N)	Summary of Rationale for Discounting from Long-List / Taking Forward to Short-List	Consider in Combination With Other Options	Sensitivity Test - More funding
Old Beer Road (CBU 2 + 3 + 4)	20	Piling to limit expansion of the active landslide	2.2		2					•Would limit expansion of the active landslide	•Cliff stabilisation may cause a reduction in sediment supply to beach	• Contributes to local cliff stability, but does not address erosion at toe of cliff		•Negates costs associated with property demolition and relocating	• Very high capital and maintenance costs • Ongoing maintenance of beach structures despite drainage works to protect from coastal erosion •Costs are very approximate at this stage of options appraisal - it is difficult to price this option accurately as cost of GI, design and construction are unknown until the site is looked at it more detail/option details are refined	•Helps to reduce erosion rates and the associated socio-economic impact	•Works to the cliff inside the designated site or outside on a designated feature will require further detailed consideration to examine the effects. Complex approvals process and extensive consultation with stakeholder required. •Works may effect ecology of the designated site		Y	Cliff stabilisation in the form of piling would work alongside other cliff stabilisation. Generally a cliff stabilisation scheme will have little if any impact on coastal processes; any material supplied to the beach would consist of fine grained material and is not reported to be a significant source of beach-building material. The success of cliff stability measures will ultimately be dependent on the stability of the cliff toe, therefore this option would need to be considered in combination with marine toe protection. The option could potentially be affordable, but more refined costs would inform this. There is potential for this option to conflict with the SMP2 policy of managed retreat for the medium and long-term.	Y	-
The Pillar	21	Reinstate gabion baskets as designed (and anchor in place)	2.2		2		4			•Reduces marine erosion of the cliff toe, therefore slowing the rate of cliff retreat - reduced input of sediment from cliffs, but this is mainly fines, therefore unlikely to represent a substantially feed to beaches. •Little impact on longshore linkages	•Doesn't address cliff face erosion associated with flow of water course behind The Pillar •Beach draw-down would still continue due to a hard backshore and wave reflection (although less than a seawall) •Does not address beach volatility and has the potential to increase it	• Reinstating the gabion baskets at The Pillar would provide cliff toe protection from coastal erosion • Quick and simple construction programme	• Gabions have a short design-life and would require frequent replacement. (The previous gabions were built in 2005 and lasted less than 10 years) • The gabions are unlikely to address long-term erosion risk, allowing outflanking and cliff failure	• Relatively low capital cost	• Require frequent replacement, which incurs higher maintenance and replacement costs	•Some social-economic benefit of protecting cliffs from erosion to provide protection to homes, infrastructure etc but limited as option in isolation may not address cliff erosion from the top-down	•Construction activities may directly impact on biological and geological features of the designated sites •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations.		N	The gabions would provide an insufficient level of protection; they have failed in the past and it is suggested that a more robust level of protection is considered for this section of coastline.	n/a	-
The Pillar	22	Upgrade the gabion baskets (e.g. use rock at toe, encase in concrete, or incorporate into Check House Seawall)	2.2		2		4			•Reduces marine erosion of the cliff toe, therefore slowing the rate of cliff retreat - reduced input of sediment from cliffs, but this is mainly fines and as reported on in the Coastal Process Baseline report is unlikely to represent a substantial feed to the beaches •Little impact on longshore linkages •Potential for beach scour at toe of defences, due to wave reflection	•Doesn't address cliff face erosion associated with flow of water course behind The Pillar •Beach draw-down would still continue due to a hard backshore and wave reflection (although less than a seawall) •Does not address beach volatility and has the potential to increase it	• Upgrading the gabion baskets would provide an increased standard of protection for erosion, and prevent outflanking • Incorporating into Check House Wall would provide more uniform defence type would simplify maintenance activities	• Gabions have a short design-life and would require frequent replacement. (The previous gabions were built in 2005 and lasted less than 10 years) • Vertical structure may encourage beach draw down at the toe of the structure, helping to undermine the defence.	• Moderate capital cost for more significant works to upgrade gabion baskets • Simplified maintenance of extended Check House Wall will offer cost savings • Good access to the site due to proximity to West Seaton promenade	• Complication with interfaces with adjacent areas may be experienced, increasing potential cost	•Some social-economic benefit of protecting cliffs from erosion to provide protection to homes, infrastructure etc but limited as option in isolation may not address cliff erosion from the top-down	•Construction activities may directly impact on biological and geological features of the designated sites •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations.		N	This option would provide an insufficient level of protection with respect to the wave exposure and nature of the cliff erosion behind. It is suggested that a more robust level of protection is considered for this section of coastline.	n/a	-
The Pillar	23	Replace gabion baskets with new defences (e.g. a more substantial wall structure)	2.2		2		4			•Prevents marine erosion of the cliff toe, therefore slowing the rate of cliff retreat - reduced input of sediment from cliffs, but this is mainly fines and as reported on in the Coastal Process Baseline report is unlikely to represent a substantial feed to the beaches •Little impact on longshore linkages •Potential for draw-down and beach scour at toe of structure, due to wave reflection	•Doesn't address cliff face erosion associated with flow of water course behind The Pillar •Beach draw-down would still continue due to a hard backshore and wave reflection •Does not address beach volatility and has the potential to increase it •Increased footprint of structure, resulting in reduced beach width with potentially no beach at higher states of the tide over the longer-term as SLR	• Replacing the gabion baskets would provide an increased standard of protection for erosion, and prevent outflanking • A new wall would provide a more uniform defence type would simplify maintenance activities	• Vertical structure may encourage beach draw down at the toe of the structure, helping to undermine the defence.	• Likely low maintenance costs from a more robust flood defence • Good access to the site due to proximity to West Seaton promenade	• Relatively high capital cost to replace existing structure and replace with new defences	•Some social-economic benefit of protecting cliffs from erosion to provide protection to homes, infrastructure etc but limited as option in isolation may not address cliff erosion from the top-down	•Construction activities may directly impact on biological and geological features of the designated sites •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations. •Potential to have visual and landscape impact - careful consideration and stakeholder engagement required		Y	This option would provide an insufficient level of protection with respect to the wave exposure and nature of the cliff erosion behind. It is suggested that a more robust level of protection is considered for this section of coastline. Since this option only address a section of the eroding cliff, it would need to be considered in combination with other options.	Y	-
The Pillar	24	Extend 'new' revetment to Check House Seawall (replace former gabion baskets)	2.2		2		4			•Little impact on longshore transport eastwards to Seaton •Potential to bury structure beneath beach and stabilise the shingle beach •Less reflection than a structure such as a seawall, so reduced risk of beach draw-down and scour	•Doesn't address cliff face erosion associated with flow of water course behind The Pillar •Beach draw-down would still continue due to a hard backshore and wave reflection (although less than a seawall) •Does not address beach volatility and has the potential to increase it •Increased footprint of structure, resulting in reduced beach width with potentially no beach at higher states of the tide over the longer-term as SLR	• An extension of the revetment would provide protection to the toe of the cliff west of Check House Seawall. • The former gabion baskets would be replaced and would no longer require maintenance.	• A larger revetment structure will narrow the beach width • Might struggle to get rock of specified size if Norwegian rock is unavailable.	• Lower maintenance costs to maintain newly designed rock structure	• Costs associated with sourcing and transporting rock are currently high, particularly larger material from outside the UK • Extension of revetment in narrow coastal area with tidal working conditions will increase cost	•Some social-economic benefit of protecting cliffs from erosion to provide protection to homes, infrastructure etc but limited as option in isolation may not address cliff erosion from the top-down	•Construction activities may directly impact on biological and geological features of the designated sites •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations. •Potential to have visual and landscape impact - careful consideration and stakeholder engagement required •Reduced beach width would mean reduced amenity value of the beach		Y	This option would provide a more suitable standard of protection for the cliffs; it would also provide a more continues line of defence along the length of the cliffs between the rock revetment and check house seawall. There are relatively high costs associated with this option, which will need to be explored as part of the short-list appraisal. Since this option only address a section of the eroding cliff, it would need to be considered in combination with other options.	Y	-
The Pillar (CBU 5)	25	Cliff drainage scheme (shallow drainage measures, e.g. could comprise machine-excavated catch-drains of nominal 4m depth that intercept shallow groundwater before it reaches the coastline)	2.2		2		4			•Would draw-down ground water below a critical level would reduce the rate of degradation and clifftop retreat	•Cliff stabilisation may cause a reduction in sediment supply to beach	• Contributes to local cliff stability, but does not address erosion at toe of cliff • Relatively simple construction process, with short programme	•Requires ground investigation to support design • May be damaged if alternative cliff erosion processes cause losses •Would need to be completed alongside improvements to cliff toe protection •Would need to be considered in conjunction with cliff stabilisation • This option may align with the SMP2 policy of Managed Realignment in the medium and long term.	•Moderate initial capital cost •Negates costs associated with property demolition and relocating	•May lead to redesign and upgrade of local drainage to account for additional discharge with associated costs •In combination coasts also associated with required cliff stabilisation measures •Costs are very approximate at this stage of options appraisal - it is difficult to price this option accurately as cost of GI, design and construction are unknown until the site is looked at it more detail/option details are refined	•Helps to reduce erosion rates and the associated socio-economic impact	•Works to the cliff inside the designated site or outside on a designated feature will require further detailed consideration to examine the effects. Complex approvals process and extensive consultation with stakeholder required. •Works may effect ecology of the designated site		Y	Cliff drainage will help to reduced cliff erosion via groundwater weathering, but should be considered alongside cliff stabilisation measures. Generally a cliff drainage scheme will have little if any impact on coastal processes; any material supplied to the beach would consist of fine grained material and is not reported to be a significant source of beach-building material. The success of cliff drainage will ultimately be dependent on the stability of the cliff toe, therefore this option would need to be considered in combination with marine toe protection. The option could potentially be affordable, but more refined costs would inform this. There is potential for this option to conflict with the SMP2 policy of managed retreat for the medium and long-term.	Y	-
The Pillar (CBU 5)	26	Cliff drainage scheme (deep drainage measures, e.g. could involve drilling vertical boreholes in an array and pumping the water away / gravity drainage)	2.2		2		4			•Would draw-down ground water below a critical level would reduce the rate of degradation and clifftop retreat	•Cliff stabilisation may cause a reduction in sediment supply to beach	• Contributes to local cliff stability, but does not address erosion at toe of cliff	•Requires ground investigation to support design • May be damaged if alternative cliff erosion processes cause losses •Would need to be considered in conjunction with cliff stabilisation • This option may align with the SMP2 policy of Managed Realignment in the medium and long term.	•Negates costs associated with property demolition and relocating	•May lead to redesign and upgrade of local drainage to account for additional discharge with associated costs •Relatively high cost when compared to shallow drainage options and stabilisation •In combination coasts also associated with required cliff stabilisation measures •Costs are very approximate at this stage of options appraisal - it is difficult to price this option accurately as cost of GI, design and construction are unknown until the site is looked at it more detail/option details are refined	•Helps to reduce erosion rates and the associated socio-economic impact	•Works to the cliff inside the designated site or outside on a designated feature will require further detailed consideration to examine the effects. Complex approvals process and extensive consultation with stakeholder required. •Works may effect ecology of the designated site		Y	Cliff drainage will help to reduced cliff erosion via groundwater weathering, but should be considered alongside cliff stabilisation measures. Generally a cliff drainage scheme will have little if any impact on coastal processes; any material supplied to the beach would consist of fine grained material and is not reported to be a significant source of beach-building material. The success of cliff drainage will ultimately be dependent on the stability of the cliff toe, therefore this option would need to be considered in combination with marine toe protection. The option could potentially be affordable, but more refined costs would inform this. There is potential for this option to conflict with the SMP2 policy of managed retreat for the medium and long-term.	Y	Y
The Pillar (CBU 5)	27	Cliff-face stabilisation (e.g. netting to stop lose material falling to the beach and rock bolts to hold blocks of failed bedrock in place)	2.2		2		4			•Would increase material strength in upper cliff would hold weak, weathered mudstone and Head deposits in place and allow vegetation to develop and further stabilise the weak materials •May also allow large pre-failed blocks of mudstone on the cliff to be held in place	•Cliff stabilisation may cause a reduction in sediment supply to beach	• Contributes to local cliff stability, but does not address erosion at toe of cliff • Relatively simple construction process, with short programme	•Requires ground investigation to support design • May be damaged if alternative cliff erosion processes cause losses •Would need to be considered in conjunction with cliff drainage • This option may align with the SMP2 policy of Managed Realignment in the medium and long term.	•Moderate initial capital cost •Negates costs associated with property demolition and relocating	•May lead to redesign and upgrade of local drainage to account for additional discharge with associated costs •In combination coasts also associated with required cliff drainage measures •Costs are very approximate at this stage of options appraisal - it is difficult to price this option accurately as cost of GI, design and construction are unknown until the site is looked at it more detail/option details are refined	•Helps to reduce erosion rates and the associated socio-economic impact	•Works to the cliff inside the designated site or outside on a designated feature will require further detailed consideration to examine the effects. Complex approvals process and extensive consultation with stakeholder required. •Works may effect ecology of the designated site		Y	Cliff stabilisation would work alongside cliff drainage. Generally a cliff stabilisation scheme will have little if any impact on coastal processes; any material supplied to the beach would consist of fine grained material and is not reported to be a significant source of beach-building material. The success of cliff stability measures will ultimately be dependent on the stability of the cliff toe, therefore this option would need to be considered in combination with marine toe protection. The option could potentially be affordable, but more refined costs would inform this. There is potential for this option to conflict with the SMP2 policy of managed retreat for the medium and long-term.	Y	-
Check House Seawall	28	Maintain Check House Seawall	2.2		2			5		•Continue to prevent marine erosion of the cliff toe, therefore slowing the rate of cliff retreat •Little impact on longshore transport eastwards to Seaton	• Will continue to hold shoreline in a fixed position - over time this may become increasingly exposed to waves and tides •beach draw-down would still continue due to a hard backshore and wave reflection •Does not address beach volatility and has the potential to increase it	• Maintaining the Check House Seawall would ensure there is continued cliff toe protection from coastal erosion. • This option aligns with the SMP policy of HTL in the short term and Manage Realignment in the medium and long term,	• Currently the steel reinforcement in the Check House Seawall is corroding, therefore residual life of the existing structure is limited.	• Low cost of initial maintenance	• Ongoing maintenance to address corrosion issues with reinforcement • Increased maintenance costs as beach narrows in the future due to climate change	•Some social-economic benefit of protecting cliffs from erosion to provide protection to homes, infrastructure etc but limited as option in isolation may not address cliff erosion from the top-down	•Potential for construction based impacts to residential communities such as increased noise and vibration.		Y	Would improve the standard of protection and design life of the structure, thereby potentially negating the need for a new structure. Since this option only address a section of the eroding cliff, it would need to be considered in combination with other options. Funding streams for this option need to be explored further, since maintenance funds may be available in addition to FCERM-GIA - if not, the option will need to be considered in combination with other options.	Y	-
Check House Seawall	29	Upgrade Check House Seawall (e.g. add a thicker concrete layer) or replace with a new structure	2.2		2			5		•Continue to prevent marine erosion of the cliff toe, therefore slowing the rate of cliff retreat •Little impact on longshore transport eastwards to Seaton	•More reflective structure at back of the beach would increase wave reflection and therefore beach erosion/draw-down •Does not address beach volatility and has the potential to increase it •Reduced beach width due to increased footprint of structure, resulting in reduced beach width with potentially no beach at higher states of the tide over the longer-term as SLR •Will continue to hold shoreline in a fixed position - over time this may become increasingly exposed to waves and tides	• An upgrade of the Check House Seawall would provide a more robust cliff toe to protect against coastal erosion. • A thicker layer of concrete could be added to improve the existing residual life of the structure. • Access to structure is good (via Fisherman's Gap).	• Adding thicker concrete layer would not overcome the existing issue of corrosion to the reinforcement. This is likely to be too significant for simple cleaning • This option does not align with the SMP2 policy of Managed Realignment in the medium and long term.	• Low cost of initial upgrade if increasing thickness of existing structure • Low maintenance of revised structure	• High capital cost if existing structure is replaced • Increased maintenance costs as beach narrows in the future due to climate change	•Some social-economic benefit of protecting cliffs from erosion to provide protection to homes, infrastructure etc but limited as option in isolation may not address cliff erosion from the top-down	•Potential for construction based impacts to residential communities such as increased noise and vibration. •Reduced beach width would mean reduced amenity value of the beach		Y	Would improve the standard of protection and design life of the structure, thereby potentially negating the need for a new structure. Since this option only address a section of the eroding cliff, it would need to be considered in combination with other options. Note that this option does not align with the SMP2 policy of Managed Realignment in the medium and long term. Funding streams for this option need to be explored further, since maintenance funds may be available in addition to FCERM-GIA - if not, the option will need to be considered in combination with other options.	Y	-
Check House Seawall	30	Extend 'new' revetment to east, so runs along base of Check House Seawall	2.2		2			5		•Prevents marine erosion of the cliff toe, therefore slowing the rate of cliff retreat •Little impact on longshore transport eastwards to Seaton •Potential to bury structure beneath beach and stabilise the shingle beach •Less reflection than a structure such as a seawall, so less beach draw-down	•Reduced beach width due to increased footprint of structure, resulting in reduced beach width with potentially no beach at higher states of the tide over the longer-term as SLR •Does not address beach volatility and has the potential to increase it	• A new revetment east would protect the existing Check House Seawall from further wave damage. • The Check House Seawall will continue to provide cliff erosion protection • The construction of the revetment would be relatively straightforward, and access to structure is good (via Fisherman's Gap)	• Currently the steel reinforcement in the Check House Seawall is corroding, therefore residual life of the existing structure is limited. • This option does not align with the SMP2 policy of Managed Realignment in the medium and long term	• Low maintenance of revised structure • Lower maintenance costs for existing Check House Wall due to additional toe protection	• High initial capital costs associated with construction of new structure • Costs associated with sourcing and transporting rock are currently high, particularly larger material from outside the UK • Costs associated with removal of displaced shingle	•Social-economic benefit of protecting cliffs from erosion provides protection to homes, infrastructure and help to promote community cohesion	•Reduced beach width would mean reduced amenity value of the beach •Potential to have visual and landscape impact - careful consideration and stakeholder engagement required		N	A sufficient standard of protection could be provided mu maintain g or upgrading Check House Seawall (see Options 28 and 29). Considering the limited funds available to protect against erosion along the western end of the BMP study area, they may be better directed towards presently undefended coastline. Note also that this option does not align with the SMP2 policy of Managed Realignment in the medium and long term.	n/a	-
Check House Seawall (CBU 6 + 7)	31	Cliff-face stabilisation (e.g. netting to stop lose material falling to the beach and rock bolts to hold blocks of failed bedrock in place)	2.2		2		4			•Would increase material strength in upper cliff would hold weak, weathered mudstone and Head deposits in place and allow vegetation to develop and further stabilise the weak materials •May also allow large pre-failed blocks of mudstone on the cliff to be held in place	•Cliff stabilisation may cause a reduction in any sediment supplied to beach	• Contributes to local cliff stability, but does not address erosion at toe of cliff • Relatively simple construction process, with short programme	•Requires ground investigation to support design • May be damaged if alternative cliff erosion processes cause losses •Would need to be considered in conjunction with cliff drainage • This option may not align with the SMP2 policy of Managed Realignment in the medium and long term.	•Moderate initial capital cost •Negates costs associated with property demolition and relocating	•May lead to redesign and upgrade of local drainage to account for additional discharge with associated costs •In combination coasts also associated with required cliff drainage measures •Costs are very approximate at this stage of options appraisal - it is difficult to price this option accurately as cost of GI, design and construction are unknown until the site is looked at it more detail/option details are refined	•Helps to reduce erosion rates and the associated socio-economic impact	•Works to the cliff inside the designated site or outside on a designated feature will require further detailed consideration to examine the effects. Complex approvals process and extensive consultation with stakeholder required. •Works may effect ecology of the designated site		Y	Cliff stabilisation would work alongside cliff drainage. Generally a cliff stabilisation scheme will have little if any impact on coastal processes; any material supplied to the beach would consist of fine grained material and is not reported to be a significant source of beach-building material. The success of cliff stability measures will ultimately be dependent on the stability of the cliff toe, therefore this option would need to be considered in combination with marine toe protection. The option could potentially be affordable, but more refined costs would inform this. There is potential for this option to conflict with the SMP2 policy of managed retreat for the medium and long-term.	Y	-
Seaton Hole to Check House Seawall	32	Extend the East Walk Promenade (concrete / stone blockwork seawall) along the length of the cliffs as far as Seaton Hole	2.2		2					•Prevents marine erosion of the cliff toe, therefore slowing the rate of cliff retreat	•Reduced beach width due to increased footprint of structure, resulting in reduced beach width with potentially no beach at higher states of the tide over the longer-term as SLR •More reflective structure at back of the beach would increase wave reflection and therefore beach erosion/draw-down •Does not address beach volatility and has the potential to increase it •Will continue to hold shoreline in a fixed position - over time this may become increasingly exposed to waves and tides	• Extending the East Walk Promenade to Seaton Hole would provide a more robust cliff toe.	• This option would require the removal of the existing defences that currently provide cliff toe protection • It would also require substantial drainage works between the cliff and seawall • There is potential for overtopping to deposit shingle onto the promenade which would then require movement/maintenance • This option does not align with the SMP2 policy of Managed Realignment in the medium and long term	• Reduces cliff erosion protection costs due to increased protection	• High initial capital costs associated with construction of new structure • Costs associated with removal of displaced shingle	•Promenade would offer improve the amenity value and possibly improved access to the beach •Social-economic benefit of protecting cliffs from erosion provides protection to homes, infrastructure and would help to promote community cohesion	•Reduced beach width would mean reduced amenity value of the beach •Potential to have visual and landscape impact - careful consideration and stakeholder engagement required •Construction activities may directly impact on biological and geological features of the designated sites •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations.		N	This is a very popular option for Seaton, however, there are significant costs associated with it and it does not align to the SMP2. There are also associated negative impacts on coastal processes and the environment. It could be considered for more detailed appraisal should more funds become available.	n/a	Y
Seaton Spit (seaward face) / Seaton/Seaton Hole / Old Beer Road	33	Recycle material from east to west to increase beach volume (and make wider). An access route may need to be created to allow plant access through the seawall; this is only likely to be required if access cannot be achieved through the existing Fisherman's Gap.	2.2		2					•Works with natural processes - i.e. replicates natural alongshore transport, but requires ongoing management •Increase in beach width and volume should make the beach more resilient to storms •Would reinstate some of the natural buffer the beach provides against storm erosion, and erosion caused by movement eastwards (under longshore transport processes) •Potential for responsive management, to ensure critical beach volumes are maintained	•In isolation the additional sediment to the overall beach system may be insufficient to account for fluctuations in longshore transport (gains may not be equal to losses) - may need to be done in combination with a beach control structure(s). •Sediment cycles are dependent on incident wave conditions and recycling would need to work with those not against • Would reduce volume of beach at eastern end so the beach here could become less resilient	• Recycling material from the east to west would create a larger wider beach which would dissipate energy and provide a defence function.	• This option would reduce the standard of protection at the eastern end of the study area • It is also unclear if sufficient material would be available to provide an adequate defence level and standard of protection • There is no certainty that the material will stay in place and provide necessary beach width/levels and therefore function • A new access route may be required at the eastern end of beach. This could result in the beach being opened up and having a greater flood risk • There would also be health and safety issues associated with plant movement on the beach • This option does not align with the SMP2 policy of No Active Intervention across all epochs	• Potentially low initial cost, based on volume required and method of transport. • Low mitigation costs required due to similarity in beach material	• Method of movement will determine cost. Expected that transport will be along the main beach area • Requirements will increase over time as a consequence of sea level rise	•Promenade would offer improve the amenity value and possibly improved access to the beach •Social-economic benefit of protecting cliffs from erosion provides protection to homes, infrastructure and would help to promote community cohesion	•Construction activities may directly impact on biological and geological features of the designated sites •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations.		Y	An option that works well with natural processes and can be controlled. Increasing the volume if the beach at the western end has the potential to provide improved defence function there, however, there are risks (increased risk of overtopping) associated with a reduced beach width at the eastern end. At this stage there are also some unknowns; how much material is required to be recycled, how often and most importantly would it stay in place without control structures? It may also need to be considered along with a control structure(s), such as timber groynes. Note also that this option does not align with the SMP2 policy of Managed Realignment in the medium and long term.	Y	-
Seaton Hole / Old Beer Road	34	Recharge beach at Seaton Hole with new material	2.2		2					•Works with natural processes (compared to construction of new structures) •Increase in beach width and volume should make the beach more resilient to storms •Would reinstate some of the natural buffer the beach provides against storm erosion, and erosion caused by movement eastwards (under longshore transport processes)	•In isolation the additional sediment to the overall beach system may be insufficient to account for fluctuations in longshore transport - may need to be done in combination with a beach control structure •New material needs to match sediment at site, or be slightly coarser to reduce transport rates	• Beach recharge at Seaton Hole would create a larger wider beach which would dissipate energy and provide a defence function • The beach would remain mobile, which is therefore in line with the SMP2 policy of Managed Realignment in the medium and long term	• Differences in sediment distribution will result in changes to the existing beach profile and behaviour • The source of suitable recharge material could be difficult to identify • Would work best with addition of control structures (i.e. groynes) to retain new sediment in areas required (much as for beach recycling). Control structures would increase costs further as stated for timber/rock groynes	•Would increase size of beach and therefore its value as an amenity, which may attract more beach users/visitors to the area.	•Very high cost activity material would need to be sourced from an appropriate licensed dredge site in the area (nearest are offshore of Isle of Wight). • Requirements will increase over time as a consequence of sea level rise	•Promenade would offer improve the amenity value and possibly improved access to the beach •Social-economic benefit of protecting cliffs from erosion provides protection to homes, infrastructure and would help to promote community cohesion	•Construction activities may directly impact on biological and geological features of the designated sites and impact from operation of the structure (beach narrowing) may also impact these features. •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations. •Potential to have visual and landscape impacts and would require detail consultation with stakeholders.		Y	There are a number of uncertainties associated with this option, similarly to recycling, how much material is required, how frequently is recharge required, and would it stay in place. without control structures? It may also need to be considered along with a control structure(s), such as timber groynes.	Y	-
Seaton Hole / Old Beer Road	35	Beach control structures - timber groynes	2.2		2					•Reduces the natural alongshore transport of sediment but does not completely inhibit alongshore transport •Some cross-shore movement during storms may still occur - depending upon design •Would stabilise the beach, providing a buffer to erosion •Could be combined with recharge or recycling to provide a more resilient and reliable beach	•Potential sediment starvation and beach narrowing at the downdrift side of each timber groyne - this could reverse when wave direction switches •Depending on placement and design could cause sediment starvation and beach erosion downdrift at east Seaton and Seaton Spit) •Length of groynes need to consider the active zone of the beach where longshore transport takes place (i.e. any sub-tidal transport of material)	• Timber groynes would retain sediment in localised areas, performing FCERM for approximately 20 years • Timber groynes are proven to work on shingle beaches	• The groynes will require maintenance post-20 years, depending or rate of timber wear • Uncertain of long-term defence performance (beyond 20 years) due to climate change • A large number of timber groynes would be required to be spaced closer together than rock groynes • This option is not completely in line with the SMP2 Managed Realignment policy in the medium and long term	• Moderate maintenance costs expected, although dependent on rate of wear	• High initial capital cost to install timber groynes • May need to include recycling/recharge costs to provide required standard of protection	•Promenade would offer improve the amenity value and possibly improved access to the beach •Social-economic benefit of protecting cliffs from erosion provides protection to homes, infrastructure and would help to promote community cohesion	•Construction activities may directly impact on biological and geological features of the designated sites •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations. •Potential to have landscape impacts through change in beach substrate and risks amenity value. •Construction impacts to benthic ecological features, shellfish and fish.		Y	Timber groynes would help to stabilise the beach, however, there are risk associated with this type of structure, such as moving the site of erosion along the coast. They need to be designed accordingly ultimately the cost will depend on the number and configuration required. The available funds are unlikely to be sufficient for a groyne structure, so third-party funding will be required. Further still, it may be that some form of recycling/recharge is also required, or conversely, rock groynes are required in support of a recycling/recharge option. Note also that this option does not align with the SMP2 policy of Managed Realignment in the medium and long term.	Y	Y
Seaton Hole / Old Beer Road	36	Beach control structures - rock groynes	2.2		2					•Reduces the natural alongshore transport of sediment but does not completely inhibit alongshore transport •Some cross-shore movement during storms may still occur - depending upon design (rock groynes may be better at achieving this than timber groynes) •Would stabilise the beach, providing a buffer to erosion •Could be combined with recharge or recycling to provide a more resilient and reliable beach	•Potential sediment starvation and beach narrowing at the downdrift side of each timber groyne - this could reverse when wave direction switches •Depending on placement and design could cause sediment starvation and beach erosion downdrift at east Seaton and Seaton Spit) •Length of groynes need to consider the active zone of the beach where longshore transport takes place (i.e. any sub-tidal transport of material)	• The rock groynes would retain sediment in localised areas, performing FCERM for approximately 20 years • A smaller number of groynes would be required in comparison to timber groynes, due to expected wider spacing	• The groynes will require maintenance post-20 years, depending or rate of timber wear • Uncertain of long-term defence performance (beyond 20 years) due to climate change • This option is not in line with the SMP2 Managed Realignment policy in the medium and long term	• Low maintenance costs expected	• High initial capital cost to install rock groynes • May need to include recycling/recharge costs to provide required standard of protection	•Promenade would offer improve the amenity value and possibly improved access to the beach •Social-economic benefit of protecting cliffs from erosion provides protection to homes, infrastructure and would help to promote community cohesion	•Construction activities may directly impact on biological and geological features of the designated sites •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations. •Potential to have landscape impacts through change in beach substrate and risks amenity value. •Construction impacts to benthic ecological features, shellfish and fish.		Y	Rock groynes would help to stabilise the beach, however, there are risk associated with this type of structure, such as moving the site of erosion along the coast. They need to be designed accordingly ultimately the cost will depend on the number and configuration required. The available funds are unlikely to be sufficient for a groyne structure, so third-party funding will be required. Further still, it may be that some form of recycling/recharge is also required, or conversely, rock groynes are required in support of a recycling/recharge option. Note also that this option does not align with the SMP2 policy of Managed Realignment in the medium and long term.	Y	Y
West Walk Promenade	37	Maintain the concrete / stone blockwork seawall	2.2		2					•Little impact on longshore transport eastwards to Seaton	•More reflective structure at back of the beach would increase wave reflection and therefore beach erosion/draw-down •Does not address beach volatility and has the potential to increase it •Will continue to hold shoreline in a fixed position - over time this may become increasingly exposed to waves and tides	• Maintaining the West Walk Promenade wall would reduce the risk of cliff erosion • Seawall maintenance would be relatively straightforward	• Diminishing standard of protection over time due to climate change	• Low initial maintenance costs expected	• Increasing maintenance costs expected as the beach area narrows as a consequence of climate change	•Promenade would offer improve the amenity value and possibly improved access to the beach •Social-economic benefit of protecting cliffs from erosion provides protection to homes, infrastructure and would help to promote community cohesion	•Potential for construction based impacts to residential communities such as increased noise and vibration. •No provision for sea level rise.		Y	Would improve the standard of protection and design life of the structure, thereby potentially negating the need for a new structure. Since this option only address a section of the eroding cliff, it would need to be considered in combination with other options. Funding streams for this option need to be explored further, since maintenance funds may be available in addition to FCERM-GIA - if not, the option will need to be considered in combination with other options.	Y	-
West Walk Promenade	38	Upgrade the concrete / stone blockwork seawall (e.g. make higher and wider) or replace with a new structure (if suitable, incorporate beach huts into seawall structure, refer to Milford-on-Sea)	2.2		2					•Little impact on longshore transport eastwards to Seaton	•More reflective structure at back of the beach would increase wave reflection and therefore beach erosion/draw-down •Does not address beach volatility and has the potential to increase it •Will continue to hold shoreline in a fixed position - over time this may become increasingly exposed to waves and tides	• Upgrading the West Walk Promenade Wall would reduce the risk of cliff erosion • An upgraded wall may also account for climate change, and may improve the residual life of the structure • This option is in line with the SMP2 policy of Hold the Line across all epochs	• This option does not address flood and coastal erosion to the west of the seawall • Structures would be required to the west to prevent cut-back and outflanking of the wall	• Relatively low capital costs to upgrade existing structure • Low initial maintenance costs expected	• High capital costs to replace existing structure • Increasing maintenance costs expected as the beach area narrows as a consequence of climate change	•Promenade would offer improve the amenity value and possibly improved access to the beach •Social-economic benefit of protecting cliffs from erosion provides protection to homes, infrastructure and would help to promote community cohesion	•Potential for construction based impacts to residential communities such as increased noise and vibration. •Potential to have visual and landscape impact - careful consideration and stakeholder engagement required		N	A very expensive option.	n/a	Y
Seaton Hole to Seaton	39	Define the area as a Coastal Change Management Area (CCMA) to guide coastal change adaptation via the planning system to include development and implementation of local rollback scheme linked to CCMA to support removal / relocation of properties and infrastructure at risk in a planned way.	2.2		2				8	•Not appraised as an option; to be taken forward as a recommendation in the BMP.	•Not appraised as an option; to be taken forward as a recommendation in the BMP.	•Not appraised as an option; to be taken forward as a recommendation in the BMP.	•Not appraised as an option; to be taken forward as a recommendation in the BMP.	•Not appraised as an option; to be taken forward as a recommendation in the BMP.	•Not appraised as an option; to be taken forward as a recommendation in the BMP.	•Not appraised as an option; to be taken forward as a recommendation in the BMP.	•Not appraised as an option; to be taken forward as a recommendation in the BMP.		N	This option will be carried forward as a recommendation in the BMP.	n/a	-
Seaton	40	Maintain the existing concrete seawall	2.3	1						•Little impact on longshore transport eastwards	•More reflective structure at back of the beach would increase wave reflection and therefore beach erosion/draw-down •Does not address beach volatility and has the potential to increase it •Will continue to hold shoreline in a fixed position - over time this may become increasingly exposed to waves and tides •Does not address problem of beach ramping, which is understood to increase the risk of overtopping	• Maintaining the concrete wall would provides sufficient protection against flood risk (overtopping) • Access for maintenance is good	• The standard of protection will deteriorate over time due to climate change • Narrowing beach (due to coastal squeeze) will expose the seawall to more significant wave conditions	• Low initial maintenance costs expected	• Increasing maintenance costs expected as the beach area narrows as a consequence of climate change	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•Doesn't improve on existing access routes •No provision for sea level rise.		Y	Would improve the standard of protection and design life of the structure, thereby potentially negating the need for a new structure. This option would need to be considered in combination with other options. Funding streams for this option need to be explored further, since maintenance funds may be available in addition to FCERM-GIA - if not, the option will need to be considered in combination with other options.	Y	-

											High Level Assessment Coastal Processes		High Level Assessment Defences		High Level Assessment Economics		High Level Assessment Environment							
Location	Option Number	Option Description	FCERM Issue Addressed - Including Reference To Table - Issues, current management practices and actions								Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages	Show Stopper	Take Forward to Short-List Appraisal (Y/N)	Summary of Rationale for Discounting from Long-List / Taking Forward to Short-List	Consider in Combination With Other Options	Sensitivity Test - More funding
Seaton	41	Upgrade the existing concrete seawall (for example raise the height, make wider, or add a secondary seawall on top) (if suitable, incorporate beach huts into seawall structure, refer to Milford-on-Sea)	2.3	1							•Little impact on longshore transport eastwards to Seaton	•More reflective structure at back of the beach would increase wave reflection and therefore beach erosion/draw-down •Does not address beach volatility and has the potential to increase it •Will continue to hold shoreline in a fixed position - over time this may become increasingly exposed to waves and tides •Does not address problem of beach ramping, which is understood to increase the risk of overtopping	• Relatively minor modification to existing structure • Improved standard of protection due to higher crest level • This option is in line with the SMP2 policy of Hold the Line across all epochs.	• Not straightforward to design and build, as a secondary seawall already exists; this would require retrofitting landward wall or replacement of the upper wall. Little space between upper wall and Promenade	• Low initial maintenance costs expected	• High capital costs to replace existing structure • Increasing maintenance costs expected as the beach area narrows as a consequence of climate change	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•Potential for construction based impacts to residential communities such as increased noise and vibration. •Potential to have visual and landscape impact - careful consideration and stakeholder engagement required		N	A very expensive option.	Y	Y
Seaton	42	Demountable defences to reduce the volume of overtopping (demountable defences cannot take direct wave loading, so they would need to be placed landward of the seawall and used as a means to divert overtopped water back to sea)	2.3	1							•Does not directly impact coastal processes	•Does not directly impact coastal processes	• Demountable defences can manage overtopping discharge •Demountable defences could be used behind properties to divert flow of overtopped water into the lagoon rather than the properties behind	• Demountable defences could not be used in wave loading situations • Potentially long lengths of demountables required • Structures would need to be located further inland to divert overtopping water back to sea, failing to protect some properties behind the seawall	• Low initial capital costs • Low maintenance costs	•Issues of storage and responsibility to put up/take-down.	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•Might be considered a temporary solution in lieu of investment by the local communities		N	In isolation, demountable defences do not provide sufficient protection against erosion and flooding. They may be used ion conjunction with alternative approaches to divert the flow of overtopped water, but even then, the funds available would be better spent on an all-encompassing solution. Considered to be a 'show stopper'.		
Seaton	43	Improve drainage behind the seawall to encourage water that has overtopped the defences to flow back to sea	2.3	1							•Does not directly impact coastal processes	•Does not directly impact coastal processes	• Overtopping discharge managed by drainage, reducing flood risk to nearby properties	• This option may require regular maintenance to ensure blockages do not affect the performance of the drains. • Additional drainage capacity required to address additional overtopping as a consequence of climate change	• Relatively low initial capital costs	• High ongoing maintenance costs to ensure drainage is clear and functional during extreme events	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•No known disadvantages to the environment		Y	Improving the drainage would have no significant impact, and depending on design could be affordable. This option would need to be considered in combination with other options.	Y	-
Seaton	44	Maintain flood gates	2.3					5			•Does not directly impact coastal processes	•Does not directly impact coastal processes	• Maintaining the flood gates would ensure the gates perform correctly and reduce the risk of flooding to Seaton.	• Flood gates and hinges show signs of corrosion, with patch repairs. Continuing this indefinitely may not be possible.	• Relatively low initial capital costs	• High ongoing maintenance costs to ensure flood gates are operational during extreme events • Need to replace gates in the future due to cumulative corrosion issues	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•No known disadvantages to the environment		N	This option will be carried forward as a recommendation in the BMP. Consider in combination with Option 44 and Option 45. Funding streams for this option need to be explored further, since maintenance funds may be available in addition to FCERM-GIA - if not, the option will need to be considered in combination with other options.	n/a	-
Seaton	45	Flood gates - follow flood warning procedures recommended by the Lyme Bay Coastal Flood Forecasting Project to instigate flood gate closure.	2.3				4				•Does not directly impact coastal processes	•Does not directly impact coastal processes	• Following the flood warning procedures and having the gate key stored locally would ensure the gates are closed before a storm event.	•No associated disadvantages	•No associated economic advantages	•No associated economic disadvantages	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•No known disadvantages to the environment		N	This option will be carried forward as a recommendation in the BMP. Consider in combination with Option 43	n/a	-
Seaton	46	Local holder of flood gate keys to close as needed	2.3				4				•Does not directly impact coastal processes	•Does not directly impact coastal processes	• Following the flood warning procedures and having the gate key stored locally would ensure the gates are closed before a storm event.	•No associated disadvantages	•No associated economic advantages	•No associated economic disadvantages	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•No known disadvantages to the environment		N	This option will be carried forward as a recommendation in the BMP. Consider in combination with Option 43	n/a	-
Seaton	47	Re-profile the beach to 'design beach levels' to reduce wave run-up (as per Angus Walker report). An access route may need to be created to allow plant access through the seawall; this is only likely to be required if access cannot be achieved through the existing Fishermen's Gap or via the Axe Yacht Club.	2.3			3					•Could reduce wave run-up and overtopping during storms	•Very difficult to maintain a design beach level as the beach changes position and form on a daily basis in response to incident wave and water level conditions •Could address the problem of beach ramping, which is linked to increased risk of wave overtopping •Frequent access of plant on shingle beach could lead to compaction of the shingle, resulting in change to how the beach behaves to incident wave and tidal conditions	• Re-profiling the beach may reduce wave run up in storm events.	• This will only be successful if the re-profiling can be completed prior to every storm event. • Re-profiling may not help if the beach volume is not sufficient to withstand erosion losses during storm (see modelling). • A new access route may be needed through the seawall if plant cannot use the Fishermen's Gap or the Axe Yacht Club access.	• Potentially low initial cost, based on volume required and method of transport • Low mitigation costs expected, as sediment reprofiled after storm event, therefore few affected species	• Requirements will increase over time as a consequence of sea level rise	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion •Increased beach width would improve the amenity resource	•No known disadvantages to the environment		N	It would be very difficult to maintain a design beach level as the beach changes position and form on a daily basis in response to incident wave and water level conditions. Likely to be 'wasted effort'. As suggested by the Baseline Reports, placing more material on the beach at this location could provide sufficient defence function to reduce the impacts of wave-ramping and overtopping.	n/a	-
Seaton	48	Recycle shingle that has been thrown over the seawall by wave overtopping back onto the beach. An access route may need to be created to allow plant access through the seawall; this is only likely to be required if access cannot be achieved through the existing Fishermen's Gap or via the Axe Yacht Club.	2.3		2						•Works with natural processes (compared to construction of new structures) •Helps to maintain beach levels	•No substantial change to existing coastal processes	• Recycling shingle that has been thrown over the seawall would help retain beach volume, and help reduce wave run up in subsequent storms	• A new access route may be needed through the seawall if plant cannot use the Fishermen's Gap or the Axe Yacht Club access • There would also be H&S issues associated with plant movement on the beach	• Potentially low initial maintenance cost as frequency of sediment overwash is expected to be low	• Method of movement will determine cost. Expected that transport will be along the main beach area • Requirements will increase over time as a consequence of sea level rise	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion •Increased beach width would improve the amenity resource	•No known disadvantages to the environment		N	This option will be carried forward as a recommendation in the BMP. Funding streams for this option need to be explored further, since maintenance funds may be available in addition to FCERM-GIA - if not, the option will need to be considered in combination with other options.	n/a	-
Seaton Spit (seaward face) / Seaton	49	Recycle material from east to west to increase beach volume (and make wider). An access route may need to be created to allow plant access through the seawall; this is only likely to be required if access cannot be achieved through the existing Fisherman's Gap or via the Axe Yacht Club.	2.3		2						•Works with natural processes - i.e. replicates natural alongshore transport, but requires ongoing management •Increase in beach width and volume should make the beach more resilient to storms •Would reinstate some of the natural buffer the beach provides against storm erosion, and erosion caused by movement eastwards (under longshore transport processes)	•In isolation the additional sediment to the overall beach system may be insufficient to account for fluctuations in longshore transport - may need to be done in combination with a beach control structure •Sediment cycles are dependent on incident wave conditions and recycling would need to work with those not against •Reduces volume of beach at eastern end so here the beach could become less robust	• Beach recycling would perform as a defence by increasing the beach volume and width to the west.	• Reduces the standard of protection in the east • It is also unclear if sufficient material would be available to provide an adequate defence level. • There is no certainty that the material will stay in place and provide necessary beach width/levels and therefore function. • This option will also require beach control structures to retain sediment in place. • There would be H&S issues associated with plant movement on the beach • A new access route may be needed through the seawall if plant cannot use the Fishermen's Gap or the Axe Yacht Club access. • This option does not align with the SMP2 policy of No Active Intervention across all epochs.	• Potentially low initial cost, based on volume required and method of transport • Low mitigation costs required due to similarity in beach material	• Method of movement will determine cost. Expected that transport will be along the main beach area • Requirements will increase over time as a consequence of sea level rise	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion •Increased beach width would improve the amenity resource	•No known disadvantages to the environment		Y	An option that works well with natural processes and can be controlled. Increasing the volume if the beach has the potential to provide improved defence function there, however, there are risks (increased risk of overtopping) associated with a reduced beach width at the eastern end. At this stage there are also some unknowns; how much material is required to be recycled, how often and most importantly would it stay in place without control structures? It may also need to be considered along with a control structure(s), such as timber groynes. Note also that this option does not align with the SMP2 policy of Managed Realignment in the medium and long term.	Y	-
Seaton	50	Recharge beach with new material and make wider to reduce wave run-up and overtopping. An access route may need to be created to allow plant access through the seawall; this is only likely to be required if access cannot be achieved through the existing Fisherman's Gap or via the Axe Yacht Club.	2.3		2						•Works with natural processes •Would reinstate some of the natural buffer the beach provides against storm erosion (wave run-up and overtopping, as well as draw-down), and erosion caused by movement eastwards (under longshore transport processes)	•In isolation the additional sediment to the overall beach system may be insufficient to account for fluctuations in longshore transport - may need to be done in combination with a beach control structure •New material needs to match sediment at site, or be slightly coarser to reduce transport rates •Any recharge needs to take account of the existing problem of 'beach-ramping' and ensure the problem is not exacerbated	• Recharging the beach with new material would increase beach volume and width, reducing wave run-up and overtopping • This option aligns with the SMP2 policy of Hold the Line across all epochs	• Differences in sediment distribution will result in changes to the existing beach profile and behaviour • The source of suitable recharge material could be difficult to identify • Would work best with addition of control structures (i.e. groynes) to retain new sediment in areas required (much as for beach recycling). Control structures would increase costs further as stated for timber/rock groynes • A new access route may be needed through the seawall if plant cannot use the Fishermen's Gap or the Axe Yacht Club access	•Would increase size of beach and therefore its value as an amenity, which may attract more beach users/visitors to the area.	•Very high cost activity material would need to be sourced from an appropriate licensed dredge site in the area (nearest are offshore of Isle of Wight). • Requirements will increase over time as a consequence of sea level rise	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion •Increased beach width would improve the amenity resource	•Potential to have landscape impacts, biological impacts and reduce amenity value if the source material is deemed to be incompatible. •Construction risk to benthic ecological features, shellfish and fish.		Y	There are a number of uncertainties associated with this option, similarly to recycling, how much material is required, how frequently is recharge required, and would it stay in place. without control structures? It may also need to be considered along with a control structure(s), such as timber groynes.	Y	-
Seaton	51	Beach control structures - timber groynes	2.3								•Reduces the natural alongshore transport of sediment but does not completely inhibit alongshore transport •Some cross-shore movement during storms may still occur - depending upon design •Would stabilise the beach, providing a buffer to erosion •Could be combined with recharge or recycling to provide a more resilient and reliable beach	•Potential sediment starvation and beach narrowing at the downdrift side of each timber groyne - this could reverse when wave direction switches •Depending on placement could cause sediment starvation and beach erosion downdrift at east Seaton and Seaton Spit) •Length of groynes need to consider the active zone of the beach where longshore transport takes place (i.e. any sub-tidal transport of material)	• Timber groynes would retain sediment in localised areas and perform for design life • Timber groynes are proven to work on shingle beaches • This option aligns with the SMP2 epochs	• The groynes will require maintenance or replacement post-20 years • Uncertain of long term defence performance (beyond 20 years) due to SLR • A large number of timber groynes would be required to be spaced closer together than rock groynes • A new access route may be needed through the seawall if plant cannot use the Fishermen's Gap or the Axe Yacht Club access	• Moderate maintenance costs expected, although dependent on rate of wear	• High initial capital cost to install timber groynes • May need to include recycling/recharge costs to provide required standard of protection	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion •Increased beach width would improve the amenity resource	•Potential to have landscape impacts through change in beach substrate and risks amenity value and properties downdrift of the proposed structures.		Y	Timber groynes would help to stabilise the beach, however, there are risk associated with this type of structure, such as moving the site of erosion along the coast. They need to be designed accordingly ultimately the cost will depend on the number and configuration required. The available funds are unlikely to be sufficient for a groyne structure, so third-party funding will be required. Further still, it may be that some form of recycling/recharge is also required, or conversely, timber groynes are required in support of a recycling/recharge option.	Y	Y
Seaton	52	Beach control structures - rock groynes	2.3								•Reduces the natural alongshore transport of sediment but does not completely inhibit alongshore transport •Some cross-shore movement during storms may still occur - depending upon design (rock groynes may be better at achieving this than timber groynes) •Would stabilise the beach, providing a buffer to erosion •Could be combined with recharge or recycling to provide a more resilient and reliable beach	•Potential sediment starvation and beach narrowing at the downdrift side of each timber groyne - this could reverse when wave direction switches •Depending on placement and design could cause sediment starvation and beach erosion downdrift at east Seaton and Seaton Spit) •Length of groynes need to consider the active zone of the beach where longshore transport takes place (i.e. any sub-tidal transport of material)	• Rock groynes would retain sediment in localised areas and perform for design life • Rock groynes are proven to work on shingle beaches • A smaller number of groynes would be required in comparison to timber groynes. • This option aligns with the SMP2 policy of Hold the Line across all epochs.	• The groynes will require periodic maintenance • They have a larger and longer footprint than timber groynes • A new access route may be needed through the seawall if plant cannot use the Fishermen's Gap or the Axe Yacht Club access	• Low maintenance costs expected	• High initial capital cost to install rock groynes • May need to include recycling/recharge costs to provide required standard of protection	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion •Increased beach width would improve the amenity resource	•Potential to have landscape impacts through change in beach substrate and risks amenity value and properties downdrift of the proposed structures.		Y	Rock groynes would help to stabilise the beach, however, there are risk associated with this type of structure, such as moving the site of erosion along the coast. They need to be designed accordingly ultimately the cost will depend on the number and configuration required. The available funds are unlikely to be sufficient for a groyne structure, so third-party funding will be required. Further still, it may be that some form of recycling/recharge is also required, or conversely, rock groynes are required in support of a recycling/recharge option.	Y	Y
Seaton Spit (seaward face)	53	Do nothing	2.4				4				•As per baseline study.	•No associated disadvantages.	•No associated advantages.	•No associated disadvantages.	•No associated economic advantages	•No associated disadvantages.	•Maintains exiting beach with no change to existing habitat	•No associated disadvantages to the environment		Y	Continue as present (excluding management of dredge disposal process)	Y	-
Seaton Spit (seaward face)	54	Remove buried dredged deposits from the spit to increase permeability and enable it to better dissipate wave energy	2.4	1							•More permeable beach in long-term - would reduce reflective nature of the spit enabling it to respond dynamically to storms •Removal of material could cause short term change to the morphology of the spit •Risk that fines could be released into the wider system during removal works	•Spit could become narrow and lower in the short-term •Increased risk of wave overtopping	• More permeable beach area responds to wave energy, dissipating wave energy • Reduced reflection from solid beach core reduces cliffing	• Quantities of beach material to be removed are unknown • No existing procedure in place for disposal of dredged deposits • Unlikely to substantially increase the standard of protection • This option does not align with the SMP2 policy of No Active Intervention across all epochs.	• No associated economic advantages	• Costs unknown though potentially very high • Large costs associated with disposal of former dredge waste, requiring a permit	•No associated advantage to the environment	•Loss of ecological communities •Potential risk of re-mobilisation of contaminated material		Y	Taking through to short-list to consider in more detail. Note that this option does not align with the SMP2 policy of Managed Realignment in the medium and long term.	Y	-
Seaton Spit (seaward face)	55	Recharge with new material	2.4	1							•Works with natural processes (compared to construction of new structures) •Increase in beach width and volume should make the beach more resilient to storms •Would reinstate some of the natural buffer the beach provides against storm erosion, and erosion caused by movement eastwards (under longshore transport processes)	•In isolation may be insufficient sediment (gains may not be equal to losses) in system - may need to be done in combination with a beach control structure •New material needs to match sediment at site, or be slightly coarser to reduce transport rates	• Recharging the beach with new material would increase beach volume and width, reducing wave run-up and overtopping	• Differences in sediment distribution will result in changes to the existing beach profile and behaviour • The source of suitable recharge material could be difficult to identify • Would work best with addition of control structures (i.e. groynes) to retain new sediment in areas required (much as for beach recycling). Control structures would increase costs further as stated for timber/rock groynes	•Would increase size of beach and therefore its value as an amenity, which may attract more beach users/visitors to the area.	•Very high cost activity material would need to be sourced from an appropriate licensed dredge site in the area (nearest are offshore of Isle of Wight). • Requirements will increase over time as a consequence of sea level rise	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion •Increased beach width would improve the amenity resource	•Potential to have landscape impacts, biological impacts and amenity value. •Construction risk to benthic ecological features, shellfish and fish.		Y	There are a number of uncertainties associated with this option, similarly to recycling, how much material is required, how frequently is recharge required, and would it stay in place. without control structures? It may also need to be considered along with a control structure(s), such as timber groynes.	Y	-
Seaton Spit (seaward face)	56	Beach control structures - timber groynes	2.4	1							•Reduces the natural alongshore transport of sediment but does not completely inhibit alongshore transport •Some cross-shore movement during storms may still occur - depending upon design •Would stabilise the beach, providing a buffer to erosion •Could be combined with recharge or recycling to provide a more resilient and reliable beach	•Potential sediment starvation and beach narrowing at the downdrift side of each timber groyne - this could reverse when wave direction switches •Spit currently stable, groynes would intervene with natural mobility of beach and ability to respond to storms and recover •Length of groynes need to consider the active zone of the beach where longshore transport takes place (i.e. any sub-tidal transport of material)	• Timber groynes would retain sediment in localised areas, performing FCERM for approximately 20 years • Timber groynes are proven to work on shingle beaches	• The groynes will require maintenance post-20 years, depending or rate of timber wear • Uncertain of long-term defence performance (beyond 20 years) due to climate change • A large number of timber groynes would be required to be spaced closer together than rock groynes • This option is not completely in line with the SMP2 Managed Realignment policy in the medium and long term	• Moderate maintenance costs expected, although dependent on rate of wear	• High initial capital cost to install timber groynes • May need to include recycling/recharge costs to provide required standard of protection	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion •Increased beach width would improve the amenity resource	•Potential to have landscape impacts through change in beach substrate and risks amenity value and properties downdrift of the proposed structures.		N	Timber groynes would help to stabilise the beach, however, there are risk associated with this type of structure, such as moving the site of erosion along the coast. They need to be designed accordingly ultimately the cost will depend on the number and configuration required. The available funds are unlikely to be sufficient for a groyne structure, so third-party funding will be required. Further still, it may be that some form of recycling/recharge is also required, or conversely, timber groynes are required in support of a recycling/recharge option. Note also that this option does not align with the SMP2 policy of Managed Realignment in the medium and long term.	n/a	Y
Seaton Spit (seaward face)	57	Beach control structures - rock groynes	2.4	1							•Reduces the natural alongshore transport of sediment but does not completely inhibit alongshore transport •Some cross-shore movement during storms may still occur - depending upon design (rock groynes may be better at achieving this than timber groynes) •Would stabilise the beach, providing a buffer to erosion •Could be combined with recharge or recycling to provide a more resilient and reliable beach	•Potential sediment starvation and beach narrowing at the downdrift side of each timber groyne - this could reverse when wave direction switches •Spit currently stable, groynes would intervene with natural mobility of beach and ability to respond to storms and recover •Length of groynes need to consider the active zone of the beach where longshore transport takes place (i.e. any sub-tidal transport of material)	• Rock groynes would retain sediment in localised areas, performing FCERM for approximately 20 years • A smaller number of groynes would be required in comparison to timber groynes, due to expected wider spacing	• The groynes will require maintenance post-20 years, depending or rate of timber wear • Uncertain of long-term defence performance (beyond 20 years) due to climate change • This option is not in line with the SMP2 Managed Realignment policy in the medium and long term	• Low maintenance costs expected	• High initial capital cost to install rock groynes • May need to include recycling/recharge costs to provide required standard of protection	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion •Increased beach width would improve the amenity resource	•Potential to have landscape impacts through change in beach substrate and risks amenity value and properties downdrift of the proposed structures.		N	Rock groynes would help to stabilise the beach, however, there are risk associated with this type of structure, such as moving the site of erosion along the coast. They need to be designed accordingly ultimately the cost will depend on the number and configuration required. The available funds are unlikely to be sufficient for a groyne structure, so third-party funding will be required. Further still, it may be that some form of recycling/recharge is also required, or conversely, rock groynes are required in support of a recycling/recharge option. Note also that this option does not align with the SMP2 policy of Managed Realignment in the medium and long term.	n/a	Y
Axe Estuary (west side)	58A	Flood gate at entrance to Axe Yacht Club (Motts Option 1)	2.4			3					•Reduce flooding into Harbour Road	•Will contain flood waters in the Axe Yacht Club boat yard	• Flood gates would reduce the risk of flood water propagating inland along Harbour Road	• Maintenance of the flood gates would be required to ensure they perform during extreme events • Uncertainty over responsibility for the closure of the gates before storm events would have to be clarified •Does not protect the Axe Yacht Club from flooding	•Costs unknown at this stage, so no associated economic advantages	• Potentially expensive initial cost for installation • Expensive monitoring and maintenance • Cost required to identify closure protocol	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•No known disadvantages to the environment		Y	A flood gate effectively provides a barrier to a flood route out of the back of the Axe Yacht Club, but does not prevent flooding of the Yacht Club itself. Consider in more detail in short-list. Environment Agency/Motts study to inform thinking?	n/a	-
Axe Estuary (west side)	58B	Embankment at entrance to Axe Yacht Club (Option 2)	2.4			3					•Reduce flooding into Harbour Road	•Will contain flood waters in the Axe Yacht Club boat yard	• An embankment would reduce the risk of flood water propagating inland along Harbour Road	•Does not protect the Axe Yacht Club from flooding	•Costs unknown at this stage, so no associated economic advantages	•Potentially expensive to build	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•No known disadvantages to the environment		Y	A flood gate effectively provides a barrier to a flood route out of the back of the Axe yacht Club, but does not prevent flooding of the Yacht Club itself. Consider in more detail in short-list. Environment Agency/Motts study to inform thinking?	n/a	-
Axe Estuary (west side)	58C	Road raising at entrance to Axe Yacht Club (Option 3)	2.4			3					•Reduce flooding into Harbour Road	•Will contain flood waters in the Axe Yacht Club boat yard	• Road raising would reduce the risk of flood water propagating inland along Harbour Road	•Associated impacts on highways (Email comms, Tom Walling, Environment Agency) •Does not protect the Axe Yacht Club from flooding	•Costs unknown at this stage, so no associated economic advantages	•Associated with high costs (Email comms, Tom Walling, Environment Agency)	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•No known disadvantages to the environment		N	Discounted on the basis of the impact on highways. Environment Agency/Motts study to inform thinking?	n/a	-
Axe Estuary (west side)	58D	Beneficial use if dredge material – ground raising. Use dredge material to raise ground levels in the Axe Yacht Club Boat Yard (Option 4)	2.4			3					•More permeable beach in long-term would reduce reflective nature of the spit enabling it to respond dynamically to storms •Reduced flood risk to Axe Yacht Club boat yard	•Permanently removes sediment from the system, reducing the sediment budget	•Prevents exacerbation of current issues associated with burying dredged material in the spit	•Has no benefit to Axe yacht Club (Email comms, Tom Walling, Environment Agency)	•Costs avoided of disposing of dredged material into trenches in the beach/spit	•Associated with high costs (Email comms, Tom Walling, Environment Agency)	•Function of harbour continued, bringing with it amenity value to local community	•Uncertain if the dredged material is suitable for this use - sediment testing required		Y	This option is likely to be discounted by the Environment Agency/Motts study on the basis of cost and that there is no benefit to the Axe Yacht Club. Environment Agency/Motts study to inform thinking? However, an alternative option to the current disposal of dredged material is required and some possible use beneficially still needs to be considered within the short-list. Funding streams for this option need to be explored further, since maintenance funds may be available in addition to FCERM-GIA - if not, the option will need to be considered in combination with other options.	Y	Y
Axe Estuary (west side)	58E	Flood gate at top of slipway with walls around the boat yard •Reduce flooding into Harbour Road	2.4			3					•Reduce flooding of Axe Yacht Club boat yard •Reduce flooding into Harbour Road	•No substantial change to existing coastal processes	• Flood gates and walls would reduce the risk of flood water propagating inland along Harbour Road and assets in the boat yard	• Maintenance of the flood gates would be required to ensure they perform during extreme events • Uncertainty over responsibility for the closure of the gates before storm events would have to be clarified	•Costs unknown at this stage, so no associated economic advantages	• Potentially expensive initial cost for installation • Expensive monitoring and maintenance • Cost required to identify closure protocol	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•No known disadvantages to the environment		Y	Still an option in the running with the Environment Agency/Motts study. Provides protection to the Axe Yacht Club and flood risk area.	n/a	-
Axe Estuary (west side)	58F	Flood gate at top of slipway with embankments (Motts Option 6 - still being developed)	2.4			3					•Reduce flooding of Axe Yacht Club boat yard •Reduce flooding into Harbour Road	•No substantial change to existing coastal processes	• Flood gates and embankments would reduce the risk of flood water propagating inland along Harbour Road and assets in the boat yard	• Maintenance of the flood gates would be required to ensure they perform during extreme events • Uncertainty over responsibility for the closure of the gates before storm events would have to be clarified	•Costs unknown at this stage, so no associated economic advantages	• Potentially expensive initial cost for installation • Expensive monitoring and maintenance • Cost required to identify closure protocol	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•No known disadvantages to the environment		Y	Still an option in the running with the Environment Agency/Motts study. Provides protection to the Axe Yacht Club and flood risk area.	n/a	-
Axe Estuary (west side)	58G	Creation of a new entrance into the Yacht Club site off Trevelyan Road and add a barrier to existing entrance (Motts Option - still being developed)	2.4			3					•Reduce flooding into Harbour Road	•No substantial change to existing coastal processes •Flooding of Axe Yacht Club boat yard would not be reduced	•A wall in the place of the existing entrance would reduce the risk of flood water propagating inland along Harbour Road	•Removed uncertainties associated with a flood gate. •Flooding of the Axe Yacht Club boat yard would continue	•Costs unknown at this stage, so no associated economic advantages	•Associated with high costs (Email comms, Tom Walling, Environment Agency)	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•No known disadvantages to the environment		Y	Still an option in the running with the Environment Agency/Motts study.	n/a	-
Axe Estuary (west side)	59	Improve drainage to take flood water away and prevent flow into Harbour Road	2.4			3					•No substantial change to existing coastal processes	•No substantial change to existing coastal processes	• Improving the local drainage would reduce the risk of flooding along Harbour Road, where overtopping is an issue	• Local drainage improvements do not address extreme water level flood conditions • Regular maintenance to ensure blockages do not affect the performance of the drainage improvements	• Potentially low initial cost for installation	• Regular monitoring and maintenance	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•No known disadvantages to the environment		Y	May or may not be required depending on option selection for the areas occupied by the Axe Yacht Club. This will need to be determined via the short-list appraisal.	Y	-
Axe Estuary (east side)	60	Maintain existing walls (stone wall 1, sheet pile wall, stone wall 2) (this includes related monitoring, surveys etc and measures to address ALW Corrosion, such as timing of replacement of sheet piles)	2.4					5	6		•No substantial change to existing coastal processes	•No substantial change to existing coastal processes	• Preserves the existing defences and maintains flood protection to properties and protect cliffs from erosion	• Deterioration in standard of protection over time due to influence of climate change	• Low initial maintenance costs expected	• increasing maintenance costs expected as the beach area narrows as a consequence of climate change • Expensive future replacement of steel sheet pile is likely to be required	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•No known disadvantages to the environment		Y	Carried forward on the basis that this option will assist to reduce flood risk. Recommended that a form of property level resilience is added to the area, e.g. flood boards Funding streams for this option need to be explored further, since maintenance funds may be available in addition to FCERM-GIA - if not, the option will need to be considered in combination with other options.	Y	-
Axe Estuary (east side)	61	Upgrade existing walls (stone wall 1, sheet pile wall, stone wall 2) (this includes related monitoring, surveys etc and measures to address ALW Corrosion)	2.4					5	6		•No substantial change to existing coastal processes	•No substantial change to existing coastal processes	• Preserves the existing defences and maintains flood protection to properties and protect cliffs from erosion • Upgrading would allow the wall to be adapted to account for influence of climate change	• Deterioration in standard of protection over time due to influence of climate change	• Moderate initial cost • Low initial maintenance costs expected	• Increasing maintenance costs expected as the beach area narrows as a consequence of climate change • Expensive future replacement of steel sheet pile is likely to be required	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•No known disadvantages to the environment		Y	Carried forward on the basis that this option will assist to reduce flood risk.	Y	-
Axe Estuary (east side)	62	Maintain existing training wall (and add scour protection where necessary)	2.4							7	•No substantial change to existing coastal processes	•No substantial change to existing coastal processes	• Preserves the existing defences and maintains erosion protection to the east of the harbour • Increases residual life by addressing scour issues along the wall	• Does not directly contribute to the FCERM of the main Seaton area	• Low initial maintenance costs expected	• Increasing maintenance costs expected as the beach area narrows as a consequence of climate change	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•No known disadvantages to the environment	✓	N	This option does not directly reduce flooding or erosion. Considered to be a 'show stopper'.	n/a	-
Axe Estuary (east side)	63	Reconfigure training wall (extend and/or change alignment of seaward end)	2.4							7	•Could alter the configuration of the channel so tidal flows through the mouth are slower	•Depending on configuration and beach holding potential, potential for reduced width of the beach at toe of Haven Cliff, leading to increased cliff erosion there •Slower tidal flows through the mouth could result in increased rates of deposition	• Preserves the existing defences and maintains erosion protection to the east of the harbour • Encourages slower flow rates through the harbour area, allowing changes to areas accretion and deposition, potentially increasing standard of protection provided	• Does not directly contribute to the FCERM of the main Seaton area	• Moderate maintenance costs expected, dependent on the new exposure of the structure	• High initial capital costs expected	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•Construction activities may directly impact on biological and geological features of the designated sites. (although likely to be over a short time frame only) •Works within the SSSI will need consent. Works within the MCZ will require consideration under the Marine and Coastal Access Act. Works within the SAC will require consideration under the Habitat Regulations.	✓	N	This option does not directly reduce flooding or erosion. Considered to be a 'show stopper'.	n/a	-
Axe Estuary	64	Wave breaking structure – fixed or floating pontoon/barrier to reduce wave propagation into the estuary	2.4			3					•Reduced wave energy in the estuary	•Surge element of storm not addressed •Could have updrift/don-drift impacts on the wave climate to the wider area	• Reduces incident wave energy within the Axe Estuary, reducing flooding through the harbour	• May cayse changes to the bathymetry close to the River Axe affecting wave conditions to adjacent areas	• Reduced maintenance costs for other structures due to modification of wave and flow conditions	• Very high initial capital costs to construct offshore structure • Expensive maintenance due to difficulty in accessing offshore structure within the mouth of the River Axe	•Social-economic benefit of providing protection to homes and infrastructure from flooding and would help to promote community cohesion	•Construction activities may directly impact on biological and geological features of the designated sites. (although likely to be over a short time frame only) •Works within the SSSI will need consent. Works within the SAC will require consideration under the Habitats Regulations.		N	A wave breaking structure may reduce wave energy in the estuary but does not address surge elements. The structure is unproven and may not provide year-round protection. There are also high costs associated with the structure.	n/a	-

Location	Option Number	Option Description	FCERM Issue Addressed - Including Reference To Table - Issues, current management practices and actions								High Level Assessment Coastal Processes	
											Advantages	Disadvantages
Dredged material disposal options	1	Remove deposited material from the trenches within the spit	2.4		2						•More permeable beach in long-term - would reduce reflective nature of the spit enabling it to respond dynamically to storms •Removal of material could cause short term change to the morphology of the spit •Risk that fines could be released into the wider system during removal works	•Spit could become narrow and lower in the short-term •Increased risk of wave overtopping
Dredged material disposal options	2	Deposit dredge material within the spit above MHWS	2.4		2						•Potential increase to height of spit, reducing the risk of overtopping	•Spit prone to compaction, impermeability, cliffing and erosion leading to inability to respond to and recover from storms
Dredged material disposal options	3	Beneficial use – ground raising. Use dredge material to raise ground levels in the Axe Yacht Club Boat Yard.	2.4		2						•Refer to Option 58D above	•Refer to Option 58D above
Dredged material disposal options	4	Beneficial use – ground raising. Use dredge material to raise ground levels on the east side of the estuary.	2.4		2						•More permeable beach in long-term would reduce reflective nature of the spit enabling it to respond dynamically to storms •Reduced flood risk to properties on the east side of the estuary	•Permanently removes sediment from the system, reducing the sediment budget
Dredged material disposal options	5	Beneficial use – habitat creation	2.4		2						•Not assessed on the basis that no suitable location for habitat creation at present, either in Axe Estuary or nearby otter Estuary	•Not assessed on the basis that no suitable location for habitat creation at present, either in Axe Estuary or nearby otter Estuary
Dredged material disposal options	6	Deposit dredge material within spit below MHWS	2.4		2						•Deposited within a mobile part of the beach, so the silt is washed out as the waves move the beach shingle around; likely to happen over the course of a tidal cycle so no dumping of sediment on mass into the system	•Affects beach morphology and response of the beach to storms •Potential for compaction and the associated problems (i.e. cliffing and beach erosion) remains if the dredged material is not washed out •Increased turbidity, which could have impacts on the marine environment
Dredged material disposal options	7	Pump dredge material into the estuary on the ebb tide	2.4		2						•Prevents exacerbation of current issues associated with burying dredged material in the spit •More permeable beach in long-term - would reduce reflective nature of the spit enabling it to respond dynamically to storms	•Works against natural processes in part, as natural accumulation of some of the sediment and build-up of mudflat/saltmarsh not taking place •Increased turbidity of water column •Risk that silt is washed back onshore once at sea
Dredged material disposal options	8	Pump dredged material directly into the sea, using fixed pipes	2.4		2						•Prevents exacerbation of current issues associated with burying dredged material in the spit •More permeable beach in long-term - would reduce reflective nature of the spit enabling it to respond dynamically to storms	•Works against natural processes in part, as natural accumulation of some of the sediment and build-up of mudflat/saltmarsh not taking place •Increased turbidity of water column •Risk that silt is washed back onshore
Dredged material disposal options	9	Pump dredged material directly into the sea, using flexible pipes	2.4		2						•Prevents exacerbation of current issues associated with burying dredged material in the spit •More permeable beach in long-term - would reduce reflective nature of the spit enabling it to respond dynamically to storms	•Works against natural processes in part, as natural accumulation of some of the sediment and build-up of mudflat/saltmarsh not taking place •Increased turbidity of water column •Risk that silt is washed back onshore
Dredged material disposal options	10	Increase pump diameter to reduce dredging period	2.4		2						•No substantial change to existing coastal processes	•No substantial change to existing coastal processes
Dredged material disposal options	11	Pump material onto a dredger and dispose of at sea.	2.4		2						•Prevents exacerbation of current issues associated with burying dredged material in the spit •More permeable beach in long-term - would reduce reflective nature of the spit enabling it to respond dynamically to storms	•Works against natural processes in part, as natural accumulation of some of the sediment and build-up of mudflat/saltmarsh not taking place •Increased turbidity of water column •Risk that silt is washed back onshore
Dredged material disposal options	12	Deposit the dredged material into an on-site settlement tank.	2.4		2						•Prevents exacerbation of current issues associated with burying dredged material in the spit	•Permanently removes sediment from the system, reducing the sediment budget
Dredged material disposal options	13	Deposit the dredged material into a smaller on-site settlement tank/temporary storage, which is then taken away.	2.4		2						•Prevents exacerbation of current issues associated with burying dredged material in the spit	•Permanently removes sediment from the system, reducing the sediment budget
Dredged material disposal options	14	Reduce the amount of material that settles in the harbour basin by increasing flow rates through it by removing promontory, preventing back eddy into the basin and thus siltation	2.4		2						•Prevents exacerbation of current issues associated with burying dredged material in the spit •More permeable beach in long-term - would reduce reflective nature of the spit enabling it to respond dynamically to storms	•May destabilise back of spit making it more mobile, impacting on harbour

Option Number	High Level Assessment Defences		High Level Assessment Economics	
	Advantages	Disadvantages	Advantages	Disadvantages
1	• More permeable beach area responds to wave energy, dissipating wave energy • Reduced reflection from solid beach core reduces cliffing	• Quantities of beach material to be removed are unknown • No existing procedure in place for disposal of dredged deposits • Unlikely to substantially increase the standard of protection • This option does not align with the SMP2 policy of No Active Intervention across all epochs.	•No associated economic advantages	• Costs unknown though potentially very high • Large costs associated with disposal of former dredge waste, requiring a permit
2	•Height increase provides protection function	•Compaction, impermeability, cliffing and erosion reduces integrity of the spit and therefore the standard of protection, working against benefit of height increase	•Relatively affordable option	•No associated economic disadvantages
3	•Refer to Option 58D above	•Refer to Option 58D above	•Refer to Option 58D above	•Refer to Option 58D above
4	•Higher ground levels would provide a defence function and reduce the risk of overtopping/flooding via overtopping of the estuary walls	•Uncertain if the dredged material is suitable for this use •Uncertain if quantities could be used to provide sufficient ground levels •Would require works to retain the material	•Costs unknown at this stage	•Uncertain if the dredged material is suitable for this use
5	•Not assessed on the basis that no suitable location for habitat creation at present, either in Axe Estuary or nearby otter Estuary	•Not assessed on the basis that no suitable location for habitat creation at present, either in Axe Estuary or nearby otter Estuary	•Not assessed on the basis that no suitable location for habitat creation at present, either in Axe Estuary or nearby otter Estuary	•Not assessed on the basis that no suitable location for habitat creation at present, either in Axe Estuary or nearby otter Estuary
6	•Prevents exacerbation of current issues associated with burying dredged material in the spit above MHWS, thereby improving integrity of the spit and in turn improving its function as a defence	•Height of spit potentially reduced, removing element of protection provided •MMO confirmed license required; until sediment sampling is completed and a decision made by MMO if allowed, then not possible to assess this option	•Costs unknown at this stage	•Costs unknown at this stage
7	•Prevents exacerbation of current issues associated with burying dredged material in the spit above MHWS, thereby improving integrity of the spit and in turn improving its function as a defence	•Height of spit potentially reduced, removing element of protection provided •MMO confirmed license required; until sediment sampling is completed and a decision made by MMO if allowed, then not possible to assess this option	•Costs unknown at this stage	•Costs unknown at this stage
8	•Prevents exacerbation of current issues associated with burying dredged material in the spit above MHWS, thereby improving integrity of the spit and in turn improving its function as a defence	•Height of spit potentially reduced, removing element of protection provided •Significant length of pipe would be required. •MMO confirmed license required; until sediment sampling is completed and a decision made by MMO if allowed, then not possible to assess this option	•Costs unknown at this stage	•Costs unknown at this stage •However, costs associated with pipe and licensing fees
9	•Prevents exacerbation of current issues associated with burying dredged material in the spit above MHWS, thereby improving integrity of the spit and in turn improving its function as a defence	•Height of spit potentially reduced, removing element of protection provided •MMO confirmed license required; until sediment sampling is completed and a decision made by MMO if allowed, then not possible to assess this option	•Costs unknown at this stage	•Costs unknown at this stage •However, costs associated with pipe and licensing fees
10	•Prevents exacerbation of current issues associated with burying dredged material in the spit above MHWS, thereby improving integrity of the spit and in turn improving its function as a defence	•Height of spit potentially reduced, removing element of protection provided •The amount of material dredged at a time is dependent on the capability of the dredger; at present, there is only scope to increase by 10-20%. •Doesn't solve dredge disposal issue in isolation. Will need to be considered in combination	•Costs unknown at this stage	•Costs unknown at this stage
11	•Prevents exacerbation of current issues associated with burying dredged material in the spit above MHWS, thereby improving integrity of the spit and in turn improving its function as a defence	•Height of spit potentially reduced, removing element of protection provided	•Costs unknown at this stage	•Has the potential to be expensive
12	•Prevents exacerbation of current issues associated with burying dredged material in the spit above MHWS, thereby improving integrity of the spit and in turn improving its function as a defence	•Height of spit potentially reduced, removing element of protection provided •Prevents exacerbation of current issues associated with burying dredged material in the spit •No room on site of Axe Yacht Club.	•Costs unknown at this stage •Possible funding to come from third-party in support of option?	•Costs unknown at this stage
13	•Prevents exacerbation of current issues associated with burying dredged material in the spit above MHWS, thereby improving integrity of the spit and in turn improving its function as a defence	•Height of spit potentially reduced, removing element of protection provided •Prevents exacerbation of current issues associated with burying dredged material in the spit	•Costs unknown at this stage •Possible funding to come from third-party in support of option?	•An expensive option, understood to be in the region of £250k/year (Bill Price)
14	•Prevents exacerbation of current issues associated with burying dredged material in the spit above MHWS, thereby improving integrity of the spit and in turn improving its function as a defence •Could negate the need for dredging if successful •Material could be used alongside a beneficial-use/ground raising option (Options 3 and 4)	•Height of spit potentially reduced, removing element of protection provided	•Costs unknown at this stage	•Costs unknown at this stage

Option Number	High Level Assessment Environment		Show Stopper	Take Forward to Short-List Appraisal (Y/N)	Summary of Rationale for Discounting from Long-List / Taking Forward to Short-List	Consider in Combination With Other Options	Sensitivity Test - More funding
	Advantages	Disadvantages					
1	•No associated advantage to the environment	•Loss of ecological communities •Potential risk of re-mobilisation of contaminated material		Y	Taking through to short-list to consider in more detail.	Y	-
2	•Deposition of dredge material currently supports growth of vegetated shingle	Construction activities may directly impact on biological and geological features of the designated sites. •Works within the SSSI will need consent. Works within the MCZ will require consideration under the Marine and Coastal Access Act. •Potential long-term risk of contaminate leaching into the marine environment		Y	This is current practice, however, the Environment Agency would like to seek alternative options. Carried through on the basis that it may be an interim option, with a view for change going forward,	Y	-
3	•Refer to Option 58D above	•Refer to Option 58D above		Y	This option is likely to be discounted by the Environment Agency/Motts study on the basis of cost and that there is no benefit to the Axe Yacht Club. Environment Agency/Motts study to inform thinking? However, an alternative option to the current disposal of dredged material is required and some possible use beneficially still needs to be considered within the short-list. Funding streams for this option need to be explored further, since maintenance funds may be available in addition to FCERM-GiA - if not, the option will need to be considered in combination with other options.	Y	Y
4	•Function of harbour continued, bringing with it amenity value to local community	•Uncertain if the dredged material is suitable for this use - sediment testing required		N	The suitability and feasibility of this option is questioned,. Not carried forward on this basis.	n/a	-
5	•Not assessed on the basis that no suitable location for habitat creation at present, either in Axe Estuary or nearby otter Estuary	•Not assessed on the basis that no suitable location for habitat creation at present, either in Axe Estuary or nearby otter Estuary		N	No suitable location for habitat creation at present, either in Axe Estuary or nearby otter Estuary	n/a	-
6	•Function of harbour continued, bringing with it amenity value to local community	•MMO confirmed that a license is required to deposit the dredged material below MHWS Construction activities may directly impact on biological and geological features of the designated sites. •Works within the SSSI will need consent. Works within the MCZ will require consideration under the Marine and Coastal Access Act. •Risk of contaminates entering the marine environment effecting food chains and designated species (birds) •Direct impact through increased turbidity, indirect through reduced foraging opportunities		Y	Will depend on MMO licensing. Could funding come from Environment Agency/third-party in support of option?	n/a	-
7	•Function of harbour continued, bringing with it amenity value to local community	•MMO confirmed that a license is required to deposit the dredged material below MHWS Construction activities may directly impact on biological and geological features of the designated sites. •Works within the SSSI will need consent. Works within the MCZ will require consideration under the Marine and Coastal Access Act. •Risk of contaminates entering the marine environment effecting food chains and designated species (birds) •Direct impact through increased turbidity, indirect through reduced foraging opportunities		Y	Will depend on MMO licensing. Could funding come from Environment Agency/third-party in support of option?	n/a	-
8	•Function of harbour continued, bringing with it amenity value to local community	•MMO confirmed that a license is required to deposit the dredged material below MHWS Construction activities may directly impact on biological and geological features of the designated sites. •Works within the SSSI will need consent. Works within the MCZ will require consideration under the Marine and Coastal Access Act. •Risk of contaminates entering the marine environment effecting food chains and designated species (birds) •Direct impact through increased turbidity, indirect through reduced foraging opportunities		Y	Will depend on MMO licensing. Could funding come from Environment Agency/third-party in support of option?	n/a	-
9	•Function of harbour continued, bringing with it amenity value to local community	•MMO confirmed that a license is required to deposit the dredged material below MHWS Construction activities may directly impact on biological and geological features of the designated sites. •Works within the SSSI will need consent. Works within the MCZ will require consideration under the Marine and Coastal Access Act. •Risk of contaminates entering the marine environment effecting food chains and designated species (birds) •Direct impact through increased turbidity, indirect through reduced foraging opportunities		Y	Will depend on MMO licensing. Could funding come from Environment Agency/third-party in support of option?	n/a	-
10	•Function of harbour continued, bringing with it amenity value to local community	•MMO confirmed that a license is required to deposit the dredged material below MHWS Construction activities may directly impact on biological and geological features of the designated sites. •Works within the SSSI will need consent. Works within the MCZ will require consideration under the Marine and Coastal Access Act. •Risk of contaminates entering the marine environment effecting food chains and designated species (birds) •Direct impact through increased turbidity, indirect through reduced foraging opportunities		N	This option doesn't address the issue of disposing dredge material within the spit.	n/a	-
11	•Function of harbour continued, bringing with it amenity value to local community	•MMO confirmed that a license is required to deposit the dredged material below MHWS Construction activities may directly impact on biological and geological features of the designated sites. •Works within the SSSI will need consent. Works within the MCZ will require consideration under the Marine and Coastal Access Act. •Risk of contaminates entering the marine environment effecting food chains and designated species (birds) •Direct impact through increased turbidity, indirect through reduced foraging opportunities		Y	Will depend on MMO licensing. However, if other options such as disposal on the ebb tide, via pipes are favourable, then likely to be discounted.	n/a	-
12	•Function of harbour continued, bringing with it amenity value to local community	•No known disadvantages to the environment		N	No room on site of Axe Yacht Club.	n/a	-
13	•Function of harbour continued, bringing with it amenity value to local community	•No known disadvantages to the environment		Y	A possible option, if funding were to come from Environment Agency/third-party in support of option?	n/a	-
14	•Function of harbour continued, bringing with it amenity value to local community •Promotes natural function of spit	Construction activities may directly impact on biological and geological features of the designated sites. •Works within the SSSI will need consent. Works within the MCZ will require consideration under the Marine and Coastal Access Act. •Reduction in amenity value of the harbour and beach •Removal of the promontory will likely impact on designated features of the European sites and will require further detailed consideration under the Habitats Regulations. •Landscape and visual impact through changes in the coastal seascape		Y	A possible option, the impacts would need to be considered carefully, and potentially more detailed studies undertaken to better understand the changes that could take place to estuary flows and subsequent deposition	n/a	-

Non-FCERM Issue	Reference	Description of Non-FCERM Issue	Option to Consider
Debris falling from cliff	A	A consequence of erosion of the cliffs between Seaton Hole and West Seaton is the accumulation of debris at the cliff toe, for example an outfall pipe and a large section of trees and vegetation. Such items could represent a health and safety hazard to beach users and removal of such items should be considered.	
Pollution of beach at Old Beer Road	B	It has been observed that pollution is entering the sea from the brook running adjacent to Old Beer Road (west). The BMP should seek to identify options to improve beach quality on the beach, which is also used by tourists.	
Landscape and connectivity with the beach	C	The stakeholder group have raised concerns over the height of the existing Environment Agency wall which can cut off views from Esplanade, and the lack of connectivity between the Esplanade and beach as a result of the limited access points through the seawall itself.	E.g. 48, 49, 50, 51
Opportunities for Concessions	D	EDDC Streetscene who manage the beach, and the stakeholder group have expressed a desire to encourage more activity on the beach to attract visitors, generate income to maintain the area and add to the economic activity within the Town.	
Seaton Sea Front Enhancement	E	Seaton Town Council have been granted planning permission for the enhancement of the Esplanade between the point known as Fishermen's Gap adjacent to the junction with Marine Place, and the junction with Beach Road. The Beach Management Plan should aim to complement and guide these plans.	
Waterborne Transport	F	Seaton currently lacks landing facilities for tourist boats (for example Stuart Line Cruises in Exmouth) and as such, it is difficult for operators to regularly run services as landing onto the beach is heavily weather dependant. The stakeholder group would like to see improved landing facilities considered as part of options for management of the frontages.	
Overnight anchorage	G	Overnight anchorage and development of an enclosed bay. Moorings are also being looked at as part of aspirations to improve of waterborne access (see above).	
Public Engagement	H	Consult locals and visitors when determining future of Seaton.	
Car parking on harbour road	I	There is a local feeling that Devon County Council charging for Parking on harbour road all year round has resulted in a decrease in visitors to the beach and town centre in the winter period.	
Beach access	J	Access over shingle for walking, wheelchairs and pram, is difficult. Addition of matting.	
Beach huts	K	The beach huts should remain on the beach.	
Boat access across the beach	L	Extend slipway at Fisherman's gap for day-trippers to launch boats from	
Beach access across the beach at western	M	Construct a walkway along the cliff toe (like Sidmouth?) to improve beach access at high tide	
Improved walking access an top of cliffs	N	Improve foot access over landslip at Old Beer Road, such as abridge to reduce the length of the diversion route inland.	
Seawall enhancements	O	Change the colour of the seawall	
Seawall enhancements	P	More seating along the seawall	
Seawall enhancements	Q	More shelter along the seawall	
Seawall enhancements	R	Increased lighting along the seawall	
Seawall enhancements	S	Addition of public toilet along seawall	