



Strategy Appraisal Report

Authority scheme reference

Defra LDW number

Promoting authority

Strategy name



Runswick Bay Village seawall on 17th December 2013 showing damage to blockwork following the storm surge incident of 5th December 2013

Date

Version

StAR for Runswick Bay Coastal Strategy

Version	Status	Signed off by:	Date signed	Date issued
00	Internal Draft 30Sept14	-	-	-
01	Client Draft 08Oct14	M Cali	08 Oct 14	09 Oct 14
02	Draft pre-meeting issue (unchecked)			14 Nov 14
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04	Natural England letter of comfort added - Final draft	M Cali	17 Feb 15	17 Feb 15
05	Including StAR final draft public consultation responses – LPRG issue	M Cali	19 Mar 15	19 Mar 15
06	Post LPRG – amended in line with LPRG comments	M Cali	27 April 15	28 April 15
07	Final - LPRG approved	M Cali	8 June 15	9 June 15

Template version – April 2011

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Glossary and Acronyms

Benefit Cost Ratio (BCR): used to identify the relative worth of one approach over another. It is the ratio of the PV benefits to the PV costs for each option.

Coastal Defence Asset: Any structure with the prime purpose to provide flood defence or erosion protection e.g. seawalls, groynes, beach.

Defra: Department for Environment, Food and Rural Affairs.

Do Minimum: An option where the Operating Authority takes the minimum amount of action necessary to maintain an asset. For many places, this means patch and repair works of existing defences with no replacement should the defences fail.

Do Nothing: An option used in appraisal to act as a baseline against which all other options are tested. It assumes that no action whatsoever is taken. In the case of existing works, it assumes for the purposes of appraisal that Risk Management Authorities cease all maintenance, repairs and other activities immediately. In the case of new works, it assumes that there is no intervention, and natural and other external processes are allowed to take their course.

Flood & Coastal Risk Management Grant in Aid (FCRM GiA): Government money allocated to Risk Management Authorities (Environment Agency, Local Authorities, Internal Drainage Boards) for capital works which manage and reduce flood and coastal erosion risk.

Flood and Coastal Erosion Risk Management Appraisal Guidance (FCERM-AG): Defra guidance to Risk Management Authorities on the process for appraising flood and coastal defence projects to ensure best use of public money.

Habitats Regulations Assessment (HRA): Formal assessment process that all European Union Member States are required to adhere to, where a project or plan may affect a site that has been protected under the Habitats Directive or the Birds Directive. Sites protected ('designated') under the Habitats Directive are called Special Areas of Conservation (SACs) and those designated under the Birds Directive are called Special Protection Areas (SPAs). HRA also applies to sites protected under the Ramsar Convention, although this is not always specified in law. These sites are designated because of their high value in terms of nature conservation, meaning that they contain rare and highly valued habitats or species, and often both.

Heritage Coast: these represent stretches of the most attractive, undeveloped coastline, which are managed to conserve their natural beauty and, where appropriate, to improve accessibility for visitors. They are 'defined' rather than designated, as there is no statutory designation process like that associated with National Parks and AONBs.

Incremental Benefit Cost Ratio (iBCR): In economic assessment, the ratio of the additional benefit to the additional cost, when two options are compared.

Joint Probability: The probability of two separate events occurring at the same time.

LiDAR: Light Detection and Ranging. This is a remote sensing method used to survey the surface of the Earth, usually from the air.

Multi-coloured Manual (MCM): The MCM provides techniques and data that can be used in benefit assessments for flood and coastal erosion risk management appraisals.

NE: Natural England

Net Present Value (NPV): Stream of all benefits net of all costs for each year of the project life discounted back to the present date.

NYMNP: North York Moors National Park. This area was designated as a National Park in 1952, due to its diverse landscape of moorland, dales, woodland and coast. National Parks are protected by law. The NYMNP Authority is the statutory planning authority for the National Park.

Outcome Measure (OM): the Department for Environment, Food and Rural Affairs sets Outcome Measures to ensure that the Environment Agency and other risk management authorities achieve the aims of government FCERM policy through targeted investment of FCERM grant in aid. There are currently six Outcome Measures including OM 1 benefit cost and OM 3 households with reduced risk of erosion.

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Present Value (PV): Monetary value of ongoing or future costs, discounted using standard rates specified by HM Treasury to provide equivalent present day costs.

PV Benefits (PVb): The present day lifetime total of economically quantifiable benefits that a project will produce over its lifetime.

PV Costs (PVc): The present day lifetime cost for implementation of a project.

PV Damage Avoided: The economic damages avoided once an option has been implemented.

Regional Coastal Monitoring Programme (RCMP): a suite of survey and monitoring activities undertaken along the coast including topographic surveys, walkover inspections and aerial photography. The Cell 1 Regional Coastal Monitoring Programme covers approximately 300km of the north east coastline, from the Scottish Border (just south of St. Abb's Head) to Flamborough Head in East Yorkshire.

Scheduled Monument (SM): To protect archaeological sites for future generations, the most valuable sites may be "scheduled". Scheduling means nationally important sites and monuments are protected by law by being placed on a list, or 'schedule'.

Site of Special Scientific Interest (SSSI): Sites notified under the Wildlife and Countryside Act 1981 (as amended by the Countryside and Rights of Way (CRoW) Act 2000) for their flora, fauna, geological or physiographical features. Notification of a SSSI includes a list of activities that may be harmful to the special interest of the site. Section 28 of the Wildlife and Countryside Act 1981 (provisions relating to SSSIs) has been replaced by a new Section 28 in Schedule 9 of the CRoW Act.

Shoreline Management Plan (SMP): A Shoreline Management Plan is a long term, high level assessment of the risks associated with both coastal erosion and tidal (sea) flooding at the coast. It offers a vision for how the coast is to be managed in the future in a sustainable manner. SMPs are non-statutory but set out a framework for action. The original SMPs have now been updated by second round SMPs (SMP2). For the length of coastline covered by this strategy the relevant SMP2 is the River Tyne to Flamborough Head Shoreline Management Plan, completed in 2007.

Special Area of Conservation (SAC): An internationally important site for habitats and/or species, designated as required under the European Community 'Habitats Directive' (92/43/EEC). SACs are protected for their internationally important habitat and non-bird species. SACs also receive SSSI designation under The Countryside and Rights of Way (CRoW) Act (2000) and The Wildlife and Countryside Act (1981) (as amended).

Special Protection Area (SPA): A site of international importance for birds, designated as required by the EC Birds Directive. The Government has to consider the conservation of SPAs in all its planning decisions. SPAs receive SSSI designation under The Countryside and Rights of Way (CRoW) Act 2000 and The Wildlife and Countryside Act 1981 (as amended).

Strategic Environmental Assessment (SEA): A process set out in European and domestic legislation that must be followed to ensure that significant environmental effects arising from policies, plans and programmes are identified, assessed, mitigated, communicated to decision-makers, monitored and that opportunities for public involvement are provided.

Strategy Appraisal Report (StAR): A business case including a programme of works that supports a recommendation to implement a management plan. The plan is approved by the Environment Agency under the Non-Financial Scheme of Delegation from Defra and does not confer any financial authorisation. The plan is supported by technical appendices.

United Kingdom Climate Impacts Programme (UKCIP): A body set up to help organisations, sectors and governments adapt to the changing climate through practice-based research, and to provide support and advice.

United Kingdom Climate Projections 2009 (UKCP09): These projections provide climate information designed to help those needing to plan how they will adapt to a changing climate. UKCP09 is the fifth generation of climate change information for the UK.

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Water Framework Directive (WFD): A European Directive to help to protect and enhance the quality of surface freshwater (including lakes, streams and rivers), groundwaters, groundwater dependant ecosystems, estuaries and coastal waters out to one nautical mile from low-water. European Community Directive (2000/60/EC) on integrated river basin management. The WFD sets out environmental objectives for water status based on: ecological and chemical measures; common monitoring and assessment strategies; arrangements for river basin administration and planning; and a programme of measures to meet the objectives.

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For technical approval of the business case

Scarborough Borough Council

Project name: Runswick Bay Coastal Strategy

Approval Value: £ 2.89 million whole life 100 year cash costs

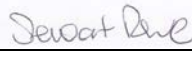
Sponsoring Director: Steve Moore Director of Operations North and East

Non-financial scheme of delegation

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

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Approval history sheet

APPROVAL HISTORY SHEET (AHS)			
1. Submission for review (to be completed by team)			
Project Title: Runswick Bay Strategy		Project Code: SBC8	
Project Manager: Robin Siddle		Date of Submission:	
Lead Authority: Scarborough Borough Council		Version No:	
Consultant Project Manager: Marcello Cali		Consultant: CH2M HILL (Halcrow)	
The following confirm that the documentation is ready for submission to PAB or LPRG. The Project Executive has ensured that relevant parties have been consulted in the production of this submission.			
Position	Name	Signature	Date
Project Executive	Stewart Rowe		
	Job Title:	Principal Coastal Officer	
2. Review by: Large Projects Review Group (LPRG)			
Date of Meeting(s): 15 April 2015 – 18 May 2015		Chairman: Richard Nunn	
Recommended for approval: In the sum of £: 2.89 million		Date: 29 May 2015	Version No: 06
3. Environment Agency NFSoD approval <i>Officers in accordance with the NFSoD.</i>			
Version No: 07		Date:	
Project Approval	By: In the sum of: £ 2.89 million	Date:	
4. Defra or WAG approval <i>(Delete as appropriate)</i>			
Submitted to Defra / WAG or Not Applicable (as appropriate)		Date:	
Version No. (if different):			
Defra/ WAG Approval: or Not applicable (as appropriate)		Date:	
Comments:			

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

1. Project name	Runswick Bay Strategy			Start date	May 2013
				End date	Mar 2015
Business unit		Programme			
Project ref.	SBC8	Regional SoD ref.	YOS351C/001A/011A	Head Office SoD ref.	-

2. Role	Name	Post Title
Project Sponsor		
Project Executive	Stewart Rowe	Principal Coastal Officer
Project Manager	Robin Siddle	Senior Coastal Officer

3. Risk Potential Assessment (RPA) Category	Low	<input type="checkbox"/>	Medium	<input checked="" type="checkbox"/>	High	<input type="checkbox"/>
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4. NFSoD value	£k
Whole Life Costs (WLC) of Complex Change Project / Strategic Plan	2,890

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

6. NFSoD approver name	Post title	Signature	Date
Steve Moore	Director of Operations for the North and East		
NFSoD consultee name	Post title	Signature	Date
	LPRG Chair		

1 Executive summary

1.1 Introduction and background

1.1.1 The Runswick Bay Coastal Strategy has been developed to identify the preferred strategic approach for managing flood and coastal erosion risk to the coastal frontage between Thorndale Shaft (in the north) to Sandsend Ness (in the south), North Yorkshire, a length of approximately 7 kilometres. It includes the communities of Runswick Bay Village and the smaller settlements of Port Mulgrave and Kettlethness.

1.1.2 The strategy will also support an application for Flood Defence Grant-in-Aid funding and approval to undertake the proposed works at the village of Runswick Bay. The primary objectives for the strategy are to:

- identify and consider all relevant social, physical and environmental issues;
- present and appraise a range of options against technical, environmental and socio-economic criteria;
- develop a long-term (100 year) programme of measures;
- set out likely funding requirements and possible sources of funding, taking into account current national funding policy and responsibilities for coastal management.

1.1.3 This area of coast consists of unstable cliffs susceptible to landslides, which are made up of soft Jurassic bed rock and weak glacial sediments. On-going erosion of these different rocks has formed the indented coastline seen today, with embayments at Runswick Bay and Port Mulgrave and intervening headlands.

1.1.4 It is important to note that, whilst Scarborough Borough Council (SBC) are leading this strategy, the defences at Runswick Bay are not all owned by SBC, and actual ownership is uncertain for the majority of the village's defences. SBC have been maintaining the structures as a 'goodwill gesture' on an ad hoc basis, but have no obligation to do so now or in the future.

1.1.5 The Strategy has been developed through the involvement of a Project Steering Group led by SBC and including the Environment Agency, North Yorkshire County Council, North York Moors National Park Authority, North Yorkshire & Cleveland Coastal Forum, Natural England, Runswick Bay Homeowners Association, The Mulgrave Estate, Local Councillors and Local Parish Representatives. The Steering Group has been involved in decision making at each key stage and has ensured an appropriate level of engagement within each organisation.

1.2 Problem

1.2.1 The primary area of concern is Runswick Bay. The main problem is the ongoing risk of seawall deterioration, toe erosion and the implications for the stability of the slopes behind. Failure or loss of even part of the existing defence structures at Runswick Bay could have serious and relatively rapid implications. Around 96 residential and 17 non-residential properties are considered to be at risk from coastal erosion. Wave overtopping is also a problem, causing occasional damage to properties and slopes behind the existing seawalls.

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- 1.2.2 Currently patch and repair works are undertaken on an as-required basis by SBC, but this is not considered to be a sustainable approach much beyond the short-term, and these issues will be exacerbated over time with sea level rise.
- 1.2.3 There is also an issue relating to bathing water quality and seaweed accumulation in the area of the southern defences.
- 1.2.4 At Port Mulgrave virtually all coastal defences have been lost, and what is left of the southern breakwater is undergoing large scale cracking, deformation, undercutting and outflanking. However at this stage no planned intervention is considered necessary, although ongoing monitoring is required. Likewise at Kettleness there are a limited number of properties on the cliff top and these are currently considered to be at low risk, but again ongoing monitoring is required.

1.3 Options considered

- 1.3.1 The starting point for the consideration of options for Runswick Bay Village was to review the policy options within the SMP2 and the previous 2002 coastal strategy. A range of potential measures was then considered including no active intervention (NAI), ongoing maintenance, minimal works, more substantial works and inspection and monitoring.
- 1.3.2 The options for more substantial works included a long list of technical solutions covering rock armour, stepped seawalls, re-nourishment, groynes, seawall buttressing and offshore breakwaters, plus combinations of these.
- 1.3.3 After an initial appraisal a short list of options was agreed by the project steering group, and the following taken forward for more detailed appraisal:
- Option 1 - do nothing
 - Option 2 - do minimum
 - Option 3 - rock armour apron
 - Option 6 - rock armour fillet
 - Options 7 & 8 - rock groyne with reduced length rock armour fillet
- 1.3.4 In addition, all options other than Do nothing would be supported by maintenance to the southern defence works in Runswick Bay (completed in 2001), and inspection and monitoring covering the whole of the strategy study area would form an integral part of the strategy.

1.4 Economic case

- 1.4.1 The economic assessment includes the derivation of capital, maintenance and other costs for each of the Runswick Bay Village protection options, along with maintenance costs for the southern defences. Ongoing inspection and monitoring costs are also included. Costs include an Optimism Bias factor of 60%, and costs have been adjusted to a base date of November 2014.
- 1.4.2 The assessment of damages has included residential and non-residential properties, however the inclusion of infrastructure has been limited to the Yorkshire Water pumping station. In addition an assessment of recreational loss has been made based on annual visitor numbers. Damage costs have also been adjusted to a base date of November 2014. No losses or gains to environmental assets have been included in the economics.

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1.4.3 The following table summarises the benefit cost assessment for the five short listed options considered for Runswick Bay. Costs take account of anticipated cash and in-kind contributions of £350k (see 1.7.2 below) which would apply equally to options 3, 6 and 7&8.

Table 1-1 Benefit-cost assessment (including contributions) (£k)

Option number	Option 1	Option 2	Option 6**	Options 7&8	Option 3
Option name	Do-nothing	Do Minimum (20 years)	Rock armour fillet	Rock groyne & reduced rock fillet	Rock armour apron
Total PV Costs including contributions	0	216	1,400	2,257	2,333
Total PV damages	21,812	11,421	720	720	720
Total PV benefits £k		10,391	21,092	21,092	21,092
Net Present Value NPV		10,175	19,692	18,836	18,759
Average benefit/cost ratio BCR		48.2	15.1	9.3	9.0
Incremental benefit/cost ratio iBCR			9.0	N/A	N/A
		Highest BCR	iBCR>1		
Option for incremental calculation			Option 2		

** Economically preferred option.

1.4.4 Overall the economically preferred option is Option 6, rock armour fillet construction and associated works (see Section 1.8 below).

1.4.5 Sensitivity checks have been undertaken to consider whether any foreseeable changes to costs and benefits for any of the options would be likely to change the preferred option, or even affect the economic justification for proceeding with any works. Based upon current estimates it is clear that the choice of Option 6 is economically robust. Average benefit cost ratios remain relatively high and none of the checks undertaken suggest a change of option.

1.5 Environmental considerations

1.5.1 A Strategic Environmental Assessment (SEA) has been undertaken to appraise the potential effects arising from strategy options, and to ensure that environmental considerations are taken into account during the strategy level decision-making process. The SEA is presented in the Environmental Report (ER). There is no legal requirement to undertake an SEA for strategies such as this. However, these types of strategies set a planning framework for planning decisions and they have the potential to result in significant environmental effects.

1.5.2 The scoping process was initially undertaken for the SEA at the Environmental Scoping Consultation Stage, between November 2013 and January 2014. Consultation was undertaken with Natural England, the Environment Agency and a range of other bodies. There was a further review of the scope in April 2014, when key stakeholders and the public were consulted on the Draft SEA ER which included a public exhibition. The final draft of the strategy report was available for public consultation during February and March 2015.

1.5.3 In addition a study was commissioned to undertake an assessment of the marine ecology in the area of the proposed works at Runswick Bay. This was undertaken by the University of Hull.

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- 1.5.4 Natural England have provided a letter of comfort, dated 17 February 2015, for the proposed strategy. It is Natural England's view that the proposals are likely to lead to an environmentally acceptable solution and that an Appropriate Assessment under the Habitats Regulations will not be required.
- 1.5.5 The development of a preferred option for Runswick Bay is likely to have a number of impacts and effects associated with it, which may require an Environmental Impact Assessment (EIA) to be undertaken.

1.6 Implementation and Outcome Measures

- 1.6.1 The elements of the strategy for which funding is being sought comprise the rock armour works at Runswick Bay Village, and the works to address bathing water quality issues.
- 1.6.2 It is envisaged that the rock armour works will be design and build, and that delivery will be by invitation to tender from within the Council's contractor framework or through the YorCivils/YorConsult Framework. The works will be undertaken in a single phase, as it is expected that rock delivery and placing could all be undertaken in a matter of weeks. Enabling works are required. It will be necessary for Yorkshire Water to have undertaken the diversion of their pipelines prior to rock placement.
- 1.6.3 Addressing bathing water quality issues at Nettledale Beck will require further study work and, depending upon the outcome of the study, design work prior to any works on site. This work is not directly linked to the rock armour scheme so the timing is independent.
- 1.6.4 The contributions to Outcome Measures (OMs) relate to the economic benefits, and the protection of properties from erosion. Given that the scheme is scheduled to be completed in 2016/17 the benefits are assessed to accrue in that year.
- 1.6.5 It has been estimated that 91 residential properties will be lost from the lower village in the medium term and a further 5 properties in the long term in a Do Nothing scenario. These properties are all in the 21–40% most deprived areas band. Additional residential properties in the upper village are at a lower risk of loss, and have not been included in the OM assessment.

1.7 Contributions and funding

- 1.7.1 It is anticipated that funding of the preferred option will be through FCRM GiA supported by contributions.
- 1.7.2 It has been assumed that two contributions will be forthcoming. The Runswick Bay Residents Association has advised that they would be able to contribute £100k. In addition, Yorkshire Water has proposed that they cover the cost of diverting their services from the foreshore, included as a budget cost of £250k. These contributions equate to a value (cash and in-kind) of PV £326k.
- 1.7.3 A preliminary FCRM GiA Partnership Funding Calculator has been completed to gauge the likely scale of Grant in Aid that may be provided for the scheme works. This shows that the scheme has a partnership funding score of 186% with an adjusted score of 212%. The resulting FCRM GiA contribution towards the up-front cost of the scheme is approximately £956k.

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1.8 Summary of Recommended strategy

1.8.1 The recommended strategy comprises the following activities:

Runswick Bay Village

- scheme works - rock armour fillet construction;
- ongoing scheme maintenance - patch repairs to the seawall, rock armour re-profiling and associated annual monitoring survey;
- maintenance of the earlier south side works including rock armour re-profiling, drainage works, shear key piling and concrete patch repairs, plus annual monitoring survey;
- address bathing water quality issues (Nettle Dale Beck)
- seaweed removal programme (funded separately)

Port Mulgrave

- occasional intervention to make safe, for example following storm damage;

Whole Study Area

- On-going inspection of the study area frontage between Thorndale Shaft and Sandsend Ness, through the Regional Coastal Monitoring Programme.

1.8.2 The proposed strategy is consistent with the current SMP2 policies.

1.8.3 Surface drainage investigation works for the upper part of Runswick Bay Village do not form part of this strategy, but nonetheless the potential impact of any proposals on slope drainage should be considered.

1.9 Recommendations

1.9.1 It is recommended that the Runswick Bay Coastal Strategy is approved under the Non-financial scheme of delegation to enable the coastal and erosion risks to the village to be managed appropriately.

1.9.2 The strategy Whole Life Cash Cost (excluding inflation) is £2,890k including optimism bias.

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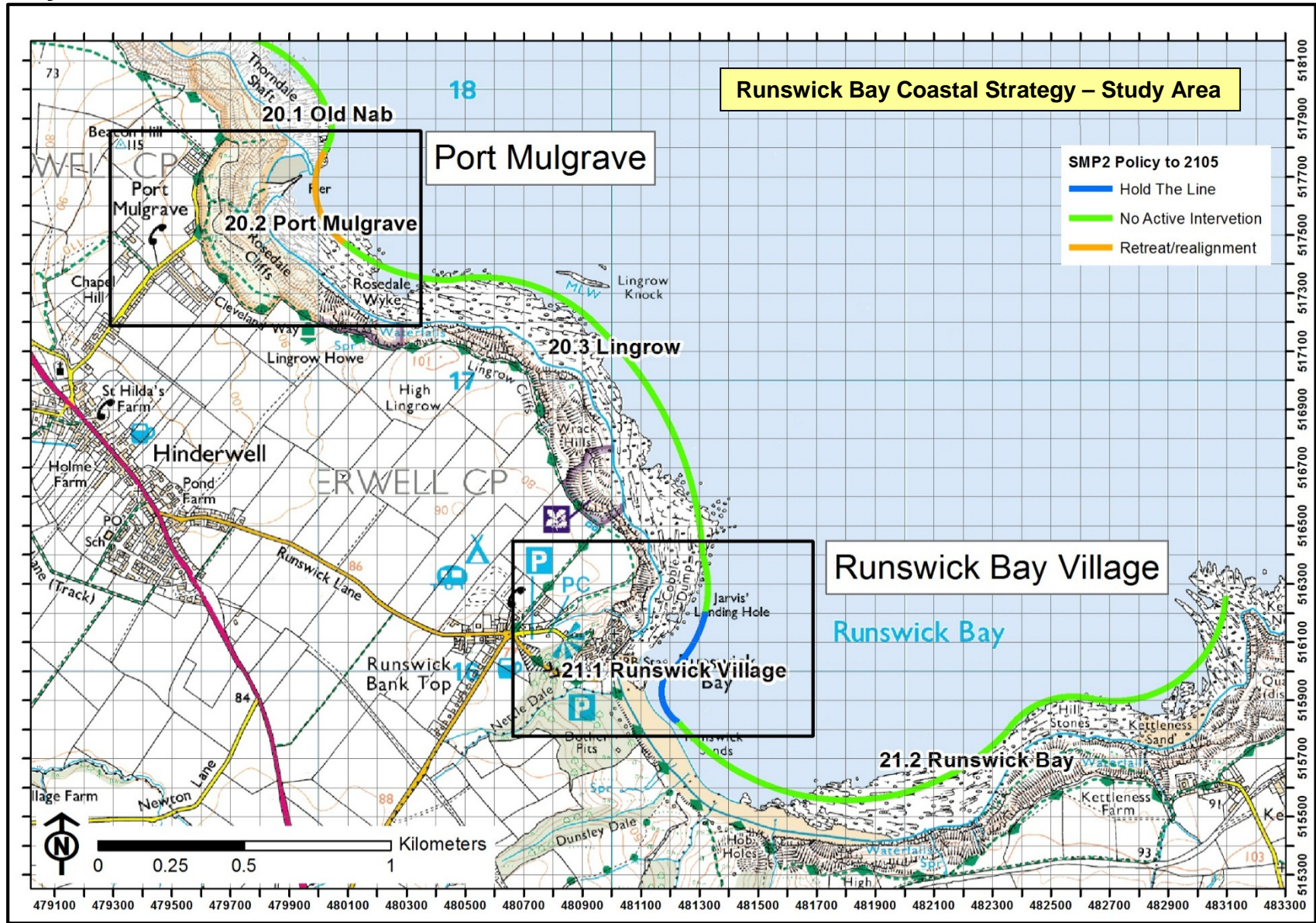
1.10 Director Briefing Paper

Region:	North East	Project Executive:	Stewart Rowe																
Function:	Coastal Erosion Risk Management	Project Manager:	Robin Siddle																
Project Title:	Runswick Bay Coastal Strategy	Code:	SBC8																
Consultant:	Halcrow	NCF Contractor:	n/a	Cost Consultant:	n/a														
The Problem:	The primary area of concern is Runswick Bay. The coastal defences protecting the village are at an increasing risk of seawall deterioration and toe erosion. Failure or loss of even part of the existing defence structures at Runswick Bay could have serious and relatively rapid implications for the properties founded on the protected coastal slopes.																		
Assets at risk from flooding and erosion:	The whole village of Runswick Bay, including a total of 96 residential and 17 non-residential properties access road to village, car parks and popular amenity beach.																		
Existing standard of flood protection:	N/A	Proposed standard of flood protection:	N/A																
Description of proposed schemes:	Over the next five years the strategy recommends construction of new sea defences at Runswick Bay village. Whole life costs include maintenance of existing and new sea defences over the next 100 years.																		
Costs (Pvc): (100 year life inc. maintenance)	£1,400k	Benefits: (PVb)	£21,100k	Ave. B: C ratio: (PVb/PVc)	15.1														
NPV:	£19,700k	Incremental B: C ratio:	9.0	Whole life cost (cash value):	£2,890k														
Choice of Preferred Option:	Option 6 Rock Armour Fillet																		
Total cost for which approval is sought:	£ 2.89m whole life cost (including £1,11k OPTIMISM BIAS)																		
Delivery programme:	<table border="0"> <tr> <td>Rock Armour Runswick Village</td> <td></td> </tr> <tr> <td>Approval</td> <td>June 2015</td> </tr> <tr> <td>Enabling works - Yorkshire Water diversion</td> <td>August 2016</td> </tr> <tr> <td>Construction start</td> <td>September 2016</td> </tr> <tr> <td>Construction completion</td> <td>November 2016</td> </tr> <tr> <td>Bathing Water (Nettle Dale Beck)</td> <td></td> </tr> <tr> <td colspan="2">To be confirmed (will follow rock armour works)</td> </tr> </table>					Rock Armour Runswick Village		Approval	June 2015	Enabling works - Yorkshire Water diversion	August 2016	Construction start	September 2016	Construction completion	November 2016	Bathing Water (Nettle Dale Beck)		To be confirmed (will follow rock armour works)	
Rock Armour Runswick Village																			
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To be confirmed (will follow rock armour works)																			
Are funds available for the delivery of this project?	N/A																		
External approvals:	N/A																		
Defra approval:	N/A																		

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Key Plan

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2 Introduction and background

2.1 Purpose of this report

- 2.1.1 The Runswick Bay Coastal Strategy has been developed to identify the preferred strategic approach for managing flood and coastal erosion risk to the coastal frontage extending from Thorndale Shaft (in the north) to Sandsend Ness (in the south), North Yorkshire, a length of approximately 7 kilometres. The strategy will also support an application for Flood Defence Grant-in-Aid funding and approval to undertake the works at the village of Runswick Bay.
- 2.1.2 The preferred Strategy has been developed in accordance with Flood and Coastal Erosion Risk Management Appraisal Guidance (FCERM-AG) and associated Environment Agency policies and procedures.

2.2 Background

Strategic and legislative framework

- 2.2.1 The length of coastline covered by this strategy is included within the River Tyne to Flamborough Head Shoreline Management Plan. The lead authority for the second round SMP (SMP2) was Scarborough Borough Council (SBC). The SMP2 was completed in 2007 by Royal Haskoning and subsequently approved by the Environment Agency.
- 2.2.2 The following table sets out the SMP2 policy units included within the strategy study area, along with the SMP2 recommendations through the three epochs.

Table 2-1 Summary of SMP2 Policy Options

Policy Unit		Policy Plan			
		To 2025	2025 to 2055	2055 to 2105	Comment
MA20.2	Port Mulgrave	Retreat or Realign	Retreat or Realign	NAI	Subject to further investigation
MA20.3	Lingrow	NAI	NAI	NAI	
MA21.1	Runswick Bay Village	HTL	HTL	HTL	96 residential and 17 non-residential properties at risk
MA21.2	Runswick Bay	NAI	NAI	NAI	Loss of property south of Runswick
MA21.3	Kettleness	NAI	NAI	NAI	
NAI – No active intervention HTL – Hold the line					

- 2.2.3 The “Retreat or Realign” policy for the short and medium term at Port Mulgrave appears to have originated in the first SMP (SMP1). The SMP2, which confirms this policy, comments that the implications or intention of this is not discussed in SMP1, and that it assumed that the policy merely refers to management of loss over the longer period.

- 2.2.4 For Runswick Bay Village the SMP2 commented in relation to the original strategy (see previous studies below) that it supported the findings of the 2002 strategy and that the preferred policy for the village was to hold the line over the next 100 years. In addition, the SMP2 Action Plan includes a specific recommendation to develop the recommendations of the 2002 strategy and to undertake a scheme appraisal for the defence of Runswick Bay.
- 2.2.5 Any works to provide improved protection against erosion at Runswick Bay would be carried out through the Coast Protection Act 1949.
- 2.2.6 It is important to note that, whilst SBC is leading this strategy, the defences at Runswick Bay are not owned by SBC, and actual ownership is uncertain. SBC has been maintaining the structures as a 'goodwill gesture' on an ad hoc basis but has no obligation to do so. SBC leases the foreshore from the Crown Estate and owns the main car parks in the village.

Previous studies

- 2.2.7 A number of studies have been undertaken over past years, looking at slope stability, seawall deterioration and overtopping, and options to manage these problems. In addition several reports have been prepared collating and analysing monitoring data, and very recently a marine ecology study was undertaken.
- 2.2.8 Three of the earlier studies, and the recent marine ecology study, are summarised briefly below. Further information relating to work undertaken in relation to slope stability and coastal erosion is presented in the Technical Note "Runswick Bay Slope Stability – Review of Previous Work" - Halcrow May 2013 (See Appendix F).

Runswick Bay Coastal Strategy Rapid Risk Assessment High-Point Rendel (1998)

- 2.2.9 In 1998 the sea defences on the south side of the village were at risk of collapse. High-Point Rendel was commissioned to inspect the defences and design a new seawall due to the rapidly deteriorating condition of the sea wall and concerns about a landslide area that extended a distance of 300m inland from the rear of the sea wall at the time. There were concerns about the southern area of the village, car park and the only public highway to the village.
- 2.2.10 Following the assessment a slope stabilisation and coastal defence scheme was completed in April 2001.

Runswick Bay Coastal Defence Strategy Study HR Wallingford (2001)

- 2.2.11 This report presented the outcome of a study to assess the joint probability of waves and water levels, and to assess the inshore wave climate, beach behaviour and overtopping performance of the Runswick Bay frontage. The study concluded that raising beach levels would significantly reduce overtopping discharges.
- 2.2.12 It also noted that the most severe waves approach the bay from the north, and a structure to interrupt these waves would provide significant shelter from wave attack. Alternatively a "modest" rock armour structure in front of the existing walls might reduce overtopping discharges and also encourage sand deposition.

Runswick Bay Coastal Defence Strategy Study Cauldron Cliff to Kettleless Point High-Point Rendel (2002)

- 2.2.13 The Runswick Bay Coastal Defence Strategy Study undertaken by High-Point Rendel (HPR Strategy) was finalised in August 2002 following completion of the coast protection

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and slope stabilisation emergency works in April 2001. The strategy noted the “rapidly deteriorating condition of the existing coastal defence elements and slopes which were not engineered as part of the Emergency Works constructed in 1999-2000”, and recommended a programme of future capital works, together with details of the management, monitoring and maintenance needs to implement the strategy plan over the next 50 years (i.e. to around 2050).

- 2.2.14 Short term recommendations included construction in Year 2 of a small rock armour groyne on the raised rocky foreshore known locally as Cobble Dump headland (below Cauldron Cliff), and of a rock armour apron in front of the existing sea defences that flank the northern frontage of the village. To date these works have not been undertaken.

Rapid Marine Ecology Overview – University of Hull (2014)

- 2.2.15 This report details the main findings of a Rapid Marine Overview of the northern end of Runswick Bay in the region of proposed coastal defence works. To inform the study intertidal surveys, literature searches for additional information, examination of mammal records and an evaluation of any proposed works on fisheries activity were undertaken. In addition the report contains a full intertidal species list for the area that may add to the information required for the designation of the proposed Marine Conservation Zone (MCZ). The report is enclosed in Appendix D of the SEA.

Water Quality Issues at Nettledale Beck - University of Hull (2015)

- 2.2.16 This report investigates possible diffuse pollution sources in the Nettledale Beck that could be contributing to occasional poor bathing water quality in Runswick Bay. The investigation comprised a walkover survey of the catchment, baseflow water quality assessment consisting of measurement of major physio-chemical parameters and an assessment of invertebrate communities, and a Geographic Information System (GIS)-based assessment of land use and landscape features in the catchment. The report is enclosed at Appendix K.

Social and political background

- 2.2.17 The key social issue within the strategy relates to the preservation of Runswick Bay village. Although the village has only a limited number of permanent residents it is extremely popular with tourists and artists due to its extremely picturesque setting on the hillside and within the bay. Ongoing protection would preserve not only the existing village community but also one of the most popular holiday destinations along the Yorkshire coast.

Location and designations

- 2.2.18 The Runswick Bay Strategy study area includes Runswick Bay and also the coastlines to Thorndale Shaft to the north, and to Sandsend Ness to the south. It includes the communities of Runswick Bay Village and the smaller settlements of Port Mulgrave and Kettle Ness. Historical papers relating to Runswick Bay and Port Mulgrave are at Appendix M.
- 2.2.19 Runswick Bay is formed between the bedrock headlands of Caldron Cliff to the north and Kettle Ness to the south and comprises a deeply indented sandy bay approximately 2 km in length that is cut in softer glacial sediments. The margins of the bay are backed by steep cliffs of Jurassic shale and sandstone while its centre is backed by less-steep slopes of superficial glacial sediments that are deeply incised by streams. Both the glacial sediments and the bedrock are prone to instability and thick sequences of landslide debris have been commonly encountered.

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- 2.2.20 The village of Runswick Bay is developed between the valleys of the Runswick and Nettledale Becks in the north-western part of the bay. Most of the eastern part of the village is founded on weathered shale and associated landslide debris. Properties further west and the access road (Runswick Bank) and car parks are founded on glacial sediments that have been affected by landsliding to a depth of many metres. The village is fronted by four separate sea defences, of varying age and construction, which stretch from Runswick Beck north of Caldron Cliff south to Nettledale Beck.
- 2.2.21 Port Mulgrave is a considerably smaller settlement than Runswick Bay, with some cliff top properties, but with no properties on the cliff face and few coast protection assets. There are currently no erosion defences at the Port Mulgrave site, but there are remnants of the now-defunct port.
- 2.2.22 The area between Kettleless and Sandsend Ness is also undeveloped, with only the small cliff top settlement of Kettleless and no coast protection assets. This stretch of coast was formerly a centre for the alum industry and a series of disused cliff-side quarries are still visible today.
- 2.2.23 There are no Ramsar Sites, Special Protection Areas (SPA), Special Areas of Conservation (SAC), Scheduled Monuments or Protected Wreck Sites within the Runswick Bay Strategy Study area. There are, however, two Sites of Special Scientific Interest (SSSIs) in the vicinity, notified because of their geology, and the village of Runswick Bay has been designated as a Conservation Area.
- 2.2.24 The whole of the strategy study area, including Runswick Bay Village, is within the North York Moors National Park. This area was designated as a National Park in 1952, due to its diverse landscape of moorland, dales, woodland and coast. The area of Runswick Bay, in addition to other coastal regions along this stretch of coast, has been defined as a Heritage Coast for its landforms and abundance of minerals and fossils and is known as a coastline of tall cliffs and secluded bays. The village and surrounding coastline at Runswick are some of the most scenically outstanding areas of the National Park and Heritage Coast attracting thousands of visitors each year.

History of Slope Instability and Coastal Erosion

- 2.2.25 This area of coast consists of unstable cliffs susceptible to landslides, which are made up of soft Jurassic bed rock and weak glacial sediments. Ongoing erosion of these different rocks has formed the indented coastline seen today, with embayments at Runswick Bay and Port Mulgrave and intervening headlands.
- 2.2.26 Runswick Bay has a long history of slope instability. The first recorded slope failures occurred in 1682 when the whole village, located further north than at present, collapsed towards the shore. Successive landslips of varying severity occurred in 1873, 1953 and, in 1958 when the old road was closed twice in one week due to landslides. This road was abandoned in 1961 with the construction in 1961 and 1963 of a new access road on its present alignment further to the west. Around the same time a sea wall extension and new car park were constructed at the base of this road. Landslips and rock falls were experienced immediately north of the village during the 1970's, including a landslip at Rose Cottage in 1975, resulting in the loss of various assets.
- 2.2.27 A mass concrete sea-wall constructed in 1970 provided coastal protection to the southern edge of the village, access road and car park areas. Following its construction, the seawall was subjected to a combination of marine and land based erosional mechanisms causing the wall to move in a seaward direction with backwards rotational tilting. Seawall deterioration and failure was caused by earth pressure loading from slope failures behind the wall, beach erosion exposing the toe of the wall and wall toe failure of the fractured and folded shale bedrock (Mouchel 2012). This sea wall was replaced by the Emergency Works scheme in 1999-2000.

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- 2.2.28 Whilst slope stability and coast protection are the dominant issues at Runswick Village, HR Wallingford noted in their June 2001 report that even though water depths are quite shallow in front of the structures, calculated overtopping discharges were generally in excess of the suggested tolerable discharges.
- 2.2.29 At Port Mulgrave erosion is continuing. The SMP 2 notes that the stability of this slope, as recorded in the SMP1, is still uncertain but there are no records of concern or significant movement.

2.3 Current approach to slope instability and coastal erosion risk management

Measures to manage the probability of slope instability and coastal erosion

- 2.3.1 Following the Rapid Risk Assessment undertaken by High-Point Rendel in 1998 a slope stabilisation and coastal defence scheme was constructed at Runswick Bay. This consisted of: drainage, piling and earthworks, including the removal of slipped material, to the slopes in the Ings End area, along with placement of a rock apron at the toe of the slope.
- 2.3.2 In addition, two monitoring regimes have been set up, one for ground movement and one for coastal monitoring.
- 2.3.3 Scarborough Borough Council (SBC) conduct a ground movement monitoring programme for a number of sites along the North Yorkshire coastline, which includes the collection and analysis of all groundwater and ground movement data every 6 months. At Runswick Bay this comprises monitoring four inclinometers and taking groundwater readings.
- 2.3.4 The Cell 1 Regional Coastal Monitoring Programme (Cell 1 RCMP) includes the whole of the Strategy area. The programme consists of:
- topographic survey of the beach at Runswick Bay every 6 months (since 2008);
 - 2-yearly walkover inspection of asset condition and cliff activity for the whole SBC frontage (undertaken since 2006);
 - 2-yearly collection and analysis of aerial photography and LiDAR data for the whole Cell 1 frontage (collected in 2010, 2012-13 and proposed for 2015).
- 2.3.5 Elsewhere along the strategy area no coastal defence or slope stability risk management works have been installed.

Measures to manage the consequences of slope instability and coastal erosion

- 2.3.6 At this time there are no specific measures in place to manage the consequences of erosion or slope failure.

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3 Problem definition and objectives

3.1 Outline of the problem

- 3.1.1 The primary area of concern is Runswick Bay, refer to the photographs in appendix C. The main problem is the ongoing risk of seawall deterioration, toe erosion and the implications for the stability of the slopes behind. In recent years, erosion has been more common, which suggests a loss of beach material from the bay and increased exposure of the seawalls and cliffs. Inspections undertaken in 2012 identified for example significant cracking in the wall running below the village properties, and undercutting of the toe in several locations. In addition the northern seawall is cracked and damaged, and there is erosion of the rocky foreshore and undercutting of the seawall.
- 3.1.2 On 5th December 2013 a significant storm surge, driven by strong northerly winds, coincided with one of the highest astronomical tides of the year. Significant elements of the patchwork defences north of the old RNLI building were damaged and removed by the sea. The old RNLI timber slipway was also damaged.
- 3.1.3 The predominant risk is therefore toe erosion and the consequent risk of landslides being triggered as a result. To date there has not been any evidence of seawall movement nor recent slope activity resulting from land-based slope stability problems. The risk of localised, shallow slides in saturated soil following intense and sustained rainfall cannot be discounted, however it is anticipated that this would entail limited remedial works.
- 3.1.4 Wave overtopping is also a problem, causing occasional damage to properties and slopes behind the existing seawalls. Calculations (Appendix I) indicate that in the do nothing scenario overtopping discharges at the Runswick Village seawall would reach around 3.5 litres per second per metre (l/s/m) during a storm event having a 2% annual probability (1 in 50 year return period), increasing to 22 l/s/m for a 0.05% annual probability event. These figures are much higher than the mean discharge limit of 0.1 l/s/m for an “aware pedestrian with a clear view of the sea, not easily upset or frightened and able to tolerate getting wet” (reference EurOtop, Wave Overtopping of Sea Defences and Related Structures: Assessment Manual).
- 3.1.5 Currently patch and repair works are undertaken on an as-required basis by SBC. This approach is reasonably effective but over time the overall integrity of the seawall is likely to reduce, and there is always the risk of storm conditions leading to failure before remedial works can be undertaken. Consequently it is not considered to be a sustainable approach much beyond the short-term.
- 3.1.6 The issues at Runswick Village will be exacerbated over time with climate change. As sea levels rise increased water depths will allow larger waves to propagate further up the beach and cause greater damage to the existing defences. In areas where overtopping is an issue this will also be significantly amplified.
- 3.1.7 The UKCP09 projections have been reviewed to assess the most recent sea level rise projections. The data for the medium emissions scenario for Runswick Bay was extracted from the UK Climate Projections website. The predictions are based on a spread of probabilities for reactions of sea level to climate change. The central estimate which predicts an increase of 0.42m in sea level, is considered to be the most likely and has been used in the assessment of risk.
- 3.1.8 Failure or loss of even part of the existing defence structures at Runswick Bay could have serious and relatively rapid implications. With reference to the Cliff Instability (refer to the LiDAR mapping in Appendix E) and Erosion Risk Map (Appendix F), along the village

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frontage the defences protect an extensive area of soft glacial settlements. Loss of part or all of the existing seawall would probably lead to rapid toe erosion, with the potential to cause landslides and accelerated material loss. Equally failure of the northern seawall could trigger re-activation of the “old village slip” (the landslide that caused the village to largely disappear in the 17th century).

- 3.1.9 Further south there are ongoing issues with localised cliff failures at Nettleton Beck, and also ongoing movement of shallow mudslides at Ings End. Currently these issues are small relatively scale and dealt with on an ad-hoc basis by SBC as maintenance works. No funding is being sought for these activities through this strategy.
- 3.1.10 There is also an issue relating to bathing water quality. With reference to Runswick Bay Water Quality Technical Memo CH2M Hill 17 Sept 2013 (Appendix K), the Environment Agency has reported a deterioration in bathing water quality at Runswick Bay in 2013 compared with previous years. The monitoring point is close to the end of the access ramp to the beach, to the South of the Lifeboat Station. This area has a tendency to collect seaweed between the two lines of rock armour, and is also the area where the Nettledale Beck emerges through the rock armour onto the beach. The combination of seaweed accumulation and the presence of surface water with a high sediment load (which is correlated with high bacterial loading) causes odorous ponds to develop in certain conditions, and inhibits access to the beach.
- 3.1.11 One option is to develop a pond or wetland area to reduce sediment loading – this is discussed in the University of Hull Assessment 2015 in Appendix K. For the purpose of this strategy a budget cost has been included for the design and construction of this option. Linked to this is the need for SBC to develop and implement a seaweed clearance programme.
- 3.1.12 Approximately 500m south of the rock aprons, at the foot of the car parks, is the Runswick Bay Beach and Sailing Club. The clubhouse buildings are constructed at the rear of the beach and are vulnerable to wave attack. Any reduction in beach levels would significantly increase this vulnerability. However at this stage it is considered that this remains an issue for the private club to address. Any additional protection measures would be unlikely to have a wider impact, and consequently this issue will not be pursued through this strategy.
- 3.1.13 At Kettleness at the southern end of the bay there is a limited number of properties on top of the cliffs. Based upon current data (e.g. NCERM predictions) these properties are considered to be at low risk over the period of this strategy (i.e. the next 100 years). However this area should be monitored in order to ensure that any increases in predicted erosion rates are identified.
- 3.1.14 At Port Mulgrave virtually all coastal defences have been lost, and what is left of the southern breakwater is undergoing large scale cracking, deformation, undercutting and outflanking. Any benefit that it provides in sheltering and helping to stabilise the slopes behind is being rapidly diminished as a result. The cliffs are generally well vegetated, but with patches of intense erosion and weathering with some slumping at the toe.
- 3.1.15 The Port Mulgrave Cliff Instability and Erosion Risk Map in Appendix F shows the projected erosion risk over the next 100 years. There are a limited number of properties close to the top of the cliff. However, the uncertainty with regard to future rates of erosion and the likelihood and scale of landslides being triggered make the assessment of risk to properties in this area uncertain. As with Kettleness, this area should be monitored in order to confirm ongoing risks from erosion. In addition, there may be a need for occasional intervention if, for example, storm damage has resulted in the cliff or remnant port structures being left in a hazardous state.
- 3.1.16 At the upper part of the village, around Hinderwell Lane, there is a surface drainage issue. Flooding of the highway and gardens has been recorded several times in recent years,

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and in November 2012 some property flooding occurred. The resolution of this is outside the scope of this coastal strategy, and funding responsibility lies with the Lead Local Flood Authority (North Yorkshire CC). It is recommended that the County Council investigate this issue within their Flood Risk Management Plan. However, any proposals should take into account the risk of unforeseen impacts as a result, for example, of diverting flows towards the village's water courses.

3.2 Consequences of doing nothing

Runswick Bay

- 3.2.1 Under the do nothing scenario, no measures would be undertaken to prevent deterioration of the seawalls, toe erosion and ongoing erosion of exposed cliffs. (Appendix F Risk Map refers). Seawall damage and failures would not be addressed, leading to an acceleration of structural damage, cliff exposure and subsequent erosion, all compounded by sea level rise. The actual rate of deterioration and time to significant failure is difficult to predict, however there is potential for the defences to unravel quite quickly leading to significant erosion and the initiation of landslides. In the medium to long term the village would need to be abandoned.
- 3.2.2 A range of assets would be at risk including residential and non-residential properties, and various infrastructure and recreational assets. Most of the properties in the village are second homes – SBC advise that 12 properties are first homes occupied on a permanent basis. There are also a number of Grade II listed buildings. With regard to the natural environment, there is a potential to revert to a more natural coast in the long term, but it is anticipated that there would be short term impacts such as pollution due to erosion damage to sewerage infrastructure and smothering of seabed habitats with debris from erosion.
- 3.2.3 Once the seawall has failed the access road and paths to the majority of the properties in the lower village (post code area TS13 5HU) would be lost - this is estimated to occur within 3 to 10 years. The other post code area in the lower village, TS13 5HT, has some properties with an access lane coming off the main road down the cliff just above the car parks and so these properties are assumed to be lost over a longer period of time. There is also a risk that cliff failures and recession of the top cliff line would result in loss of properties in the upper village.
- 3.2.4 The lower car parks, sailing club boat park and access road down the cliff are protected by the rock armour defences and cliff stabilisation works that were completed in 2001. Whilst these works would continue to provide protection, say for up to 75 years, there is a significant risk that beyond 20 years outflanking of the defence from a failure in the village to the north, or from the active unprotected cliff to the south, could initiate loss of these assets.

Table 3-1 Runswick Bay Assumed Do Nothing Property Losses

Location	Properties at Risk	Timing of Loss
Lower village - post code area TS13 5HU	47 residential 11 non-residential	3 to 10 years
Lower village - post code area TS13 5HT	49 residential 6 non-residential	90% chance of loss between years 10 and 50
Upper village – post code area TS13 5HS	27 residential 4 non-residential	4% chance of loss within 100 years.
Upper village – post code area TS13 5JQ	5 residential	0.2% chance of loss within 100 years
Lower car park area	Access road and car parks	10% chance of loss by year 50 50% chance of loss by year 99

Port Mulgrave

- 3.2.5 At Port Mulgrave there are a number of properties at risk of loss due to erosion in the do nothing scenario (Appendix F Risk Map refers).

Table 3-2 Port Mulgrave Assumed Do Nothing Property Losses

Location	Properties at Risk	Timing of Loss
Cliff cottages and Far Rosedale	10 residential	1% chance by year 20 10% chance by year 100
77 & 79 Rosedale Ln	2 residential	1% chance by year 20 20% chance by year 100
Long Row	34 residential	0.5% chance by year 100
46 to 74 Rosedale Lane	20 residential	0.1% chance by year 100
76 Rosedale Lane	6 residential	1.0% chance by year 100
The bungalows	11 residential	0.5% chance by year 50 5% chance by year 100

- 3.2.6 No other assets have been identified at Port Mulgrave as being significant for inclusion in the economic assessment.

Other Locations

- 3.2.7 At other locations within the Study area, including Kettleless, the Do nothing scenario is not considered to have any significant consequences based upon current data.

3.3 Strategic issues

- 3.3.1 This Strategy has been developed through the involvement of a Project Steering Group led by SBC and including the Environment Agency, North Yorkshire County Council, North York Moors National Park Authority, North Yorkshire & Cleveland Coastal Forum, Natural England, Runswick Bay Home Owners Association, The Mulgrave Estate, Local Councillors and Local Parish Representatives. The Steering Group has been involved in decision making at each key stage and has ensured an appropriate level of engagement within each organisation. Notes of the Steering Group meetings are enclosed at Appendix W.
- 3.3.2 The SMP2 Action Plan recommends that all SBC coastal strategies are reviewed. This Strategy has reviewed and extended the HPR 2002 strategy, as it considers long term management not only for Runswick Bay village but also for the settlements at Port Mulgrave and Kettleless. The strategy draws on both the HPR 2002 Strategy and the SMP2 for data and data assessment, and future management proposals will be based upon the SMP2 policy options. Given the limited interdependency between areas in terms of sediment processes, there are no boundary issues of significance.
- 3.3.3 For Runswick Bay village future management will be readily defined based upon available data and the prevalent risks. For other areas, primarily Port Mulgrave and Kettleless, it is likely that the need for adaptation to coastal change will be assessed on a regular basis using the outputs from ongoing inspection and monitoring.

3.4 Key constraints

- 3.4.1 Key constraints include the need to:
- avoid adverse impacts on the North York Moors National Park, North Yorkshire and Cleveland Heritage Coast, the Cleveland Way National Trail/proposed England

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Coast Path, North Yorkshire Moors Important Bird Area and the Runswick Bay and Staithes-Port Mulgrave SSSIs;

- ensure there are no detrimental impacts or loss of extent of the recommended MCZ;
- ensure that the strategy does not cause deterioration in the current status of the waterbodies in the area and that it supports their achievement of WFD objectives;
- ensure that there are no detrimental impacts on the unstable cliffs formed in glacial sediments, or on coastal processes or sediment transport on adjacent coastlines
- take account of the Yorkshire Water pumping station located north of the lifeboat station and slipway, and the sewers located in the foreshore;
- ensure compatibility with any proposed surface water drainage measures at Hinderwell.

3.4.2 It is likely that further more detailed Environmental Impact Assessment will be required to inform the proposed Project Appraisal Report.

3.5 Objectives

3.5.1 The purpose of the Strategy is to set out a long-term, sustainable plan for the management of erosion and slope instability risks to people, properties and public infrastructure. The primary objectives for the strategy are to:

- identify and consider all relevant social, physical and environmental issues (including the conclusions of the HPR Strategy 2002, the SMP2, and monitoring data accrued to date);
- present and appraise a range of options against technical, environmental and socio-economic criteria;
- develop a preferred long-term (100 year) programme of measures (e.g. capital projects, maintenance, studies, investigations, consultation, asset relocation);
- set out likely funding requirements and possible sources of funding, taking into account current national funding policy and responsibilities for coastal management.

3.5.2 There is also an opportunity to explore options and implement works for improving bathing water quality in Runswick Bay, and working towards achieving Water Framework Directive Objectives.

3.5.3 Further, there is a need for SBC to develop a programme of work to manage clearance of seaweed accumulations on the beaches.

3.5.4 In addition, there has been significant flooding of properties in the upper village (Hinderwell Lane) that need to be investigated and resolved.

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4 Options for managing coastal erosion and slope instability

4.1 Potential FCRM measures

4.1.1 For Port Mulgrave an initial economic assessment of the do nothing option has demonstrated that no capital or maintenance works options will be economically justified (see Appendix N). Similarly for Kettleness there is no evidence of risks to assets at this time. Consequently an early decision can be made to retain the SMP2 policies at these locations. At Port Mulgrave (MA 20.2) this is a policy of retreat or realign in the short and medium-term, then NAI. At Kettleness (MA 21.3) all three epochs are NAI. This will nonetheless be subject to review as further data is collected in the future through the current inspection and monitoring programmes.

4.1.2 Consequently the current focus for management activities is Runswick Bay Village, and a range of potential measures has been considered for addressing coastal erosion as follows:

- Walk away (do nothing) - baseline case to measure benefits of other options;
- Minimal works to existing defences and cliffs - maintenance and small scale repairs in response to visible damage e.g. post storm repairs;
- More substantial works to enhance the protection afforded by the existing defences and to preserve slope stability;
- Inspection and monitoring.

4.1.3 In discussing options for this strategy 'Short Term' is considered to apply up to 20 years from now (2014); 'Medium Term' between 20 and 50 years, and 'Long Term' beyond the next 50 years.

4.2 Long list of options

4.2.1 A long list of coastal management options has been developed with a view to undertaking an initial, high-level screening followed by a more detailed assessment of the most favourable options. This list includes 'do nothing' as an economic baseline against which all other options are compared.

4.2.2 The starting point for the 'do something' options was the HPR 2002 Strategy. However, in discussion with SBC it was agreed that a full range of technically feasible options should be considered, and these are listed below.

- 1 No Active Intervention (NAI) (do nothing economic baseline)
- 2 Do minimum
- 3 Rock apron to seawall toe (see HPR Strategy Option 1 Rock Armour)
- 4 Seawall buttressing (see HPR Strategy Option 1 Mass Concrete)
- 5 Stepped concrete revetment to seawall
- 6 Rock armour fillet (reduced section rock apron)
- 7 Rock groyne at Cobble Dump (see HPR Strategy Option 2)
- 8 Reduced length rock armour fillet to seawalls (see HPR Strategy Option 2))

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- 9A Shingle recharge
- 9B Shingle recharge with rock groynes
- 10 Rock berm to protect exposed cliff
- 11 Fishtail groyne
- 12 Offshore breakwaters

4.2.3 An Appraisal Summary Table (AST) which briefly reviews all twelve options is included at Appendix G.

4.3 Options rejected at preliminary stage

4.3.1 The following table sets out the options that have been screened out at an early stage by the Project Steering Group, along with their reasons for rejection.

Table 4-1 Options Rejected at Preliminary Stage

Option	Description	Reasons for Rejection
Option 4 – seawall buttressing	Construction of new near vertical mass concrete wall in front of the existing walls.	Technically it is considered to offer a lesser performance than a rock apron for an additional cost of £0.5 million. The vertical face would continue to cause wave reflection and potentially foreshore scour. Although this option would minimise any new defence footprint, it has no redeeming aesthetic or amenity features.
Option 5 – stepped concrete revetment	Construction of new stepped seawall in front of existing walls.	Difficult site access for transporting large precast concrete units. Alternatively onsite casting technically challenging. Steps may have greater amenity potential than rock or vertical walls. Also marine growth may cause significant H&S risks. Aesthetically considered too severe and footprint too large, and not in keeping with frontage.
Option 9A – shingle nourishment	Gravel beach material brought to site by dredger and pumped to form a new beach in front of existing wall.	High cost of transporting shingle to site by pipeline from dredger. Difficulty sourcing coarse dredged gravel. High level of uncertainty over the performance of the beach and the frequency and cost associated with future topping-up campaigns – potentially large ongoing costs.
Option 9B – shingle nourishment and groynes	New gravel beach stabilised with around 6 rock armour groynes.	Similar issues to Option 9A regarding cost and performance of the shingle beach, although groynes would reduce risk of substantial material loss. Rock armour groynes would restrict beach use and have potential H&S risks.
Option 10 – rock berm at cliff	Construction of rock berm to prevent outflanking of northern end of defences.	Insufficient evidence of cliff erosion presenting a significant outflanking risk and justifying a change of SMP2 option. Consequently would not meet project objectives unless it formed part of another option for the seawall. Not recommended for further consideration on its own.
Option 11 – fish tail groyne	Construction of a large rock groyne to the north of the existing defences.	Impact on coastal processes uncertain - would require extensive investigation to confirm plan shape. Would not meet the main project objective unless combined with another option, such as 9a. Capital cost likely to be high. Environmental and H&S concerns. Visual amenity impacts.
Option 12 – offshore breakwaters	Construction of a series of 4 breakwaters in the bay to protect the seawall.	Uncertain coastal process impacts - would require extensive investigation to confirm optimum breakwater layout. Capital cost likely to be even higher than Option 11. Navigation issues. Environmental, H&S and visual amenity concerns as Option 11.

4.4 Options short-listed for appraisal

- 4.4.1 Five options, including do nothing as the economic baseline, have been taken forward for detailed appraisal for Runswick Village. In line with the project objectives above these will be assessed against technical, environmental and socio-economic criteria by applying standard appraisal techniques.
- 4.4.2 Each option is summarised below. In addition reference should be made to the Option Assessment Technical Note at Appendix G, to option drawings at Appendix H, and to the SEA at Appendix J.
- 4.4.3 With respect to the SMP2 Management Areas and policies, the boundary between MA 21.1 Runswick Bay Village MA 20.3 and MA 20.3 to the north is at Cobble Dump, assessed to be in excess of 100 metres north of the end of the Upgarth Hill seawall. Options 3 and 6 therefore include works wholly within MA 20.3. The groyne in combined Options 7&8 may, depending upon final form and location, be sited in MA 20.3 but would be providing protection to the village frontage. All three options are therefore consistent with current SMP2 policies.

Option 1 - do nothing

- 4.4.4 This option is the economic baseline. It is a zero cost option; no repair, maintenance or other works would be carried out other than necessary actions to deal with immediate health and safety risks. The consequences of this option are discussed in Section 3.2 above.

Option 2 - do minimum

- 4.4.5 This option is a low cost maintenance option providing limited risk reduction and consequently benefits. It would consist of patch and repair works to the seawalls, and monitoring to provide early warning of any significant problems. However, it would not include for large scale repair works and consequently may have a limited design life.
- 4.4.6 This option effectively adopts a reactive maintenance approach. Monitoring of the seawalls would identify the occurrence of problems at an early stage so that repair works could be undertaken before problems escalated. It would include for example patch repairs to areas of concrete spalling or cracking, repair or replacement of loose or missing blockwork, repairs to access steps.
- 4.4.7 If repairs are undertaken effectively and carried out in a timely manner this type of do minimum approach can be effective. It follows that this option is highly dependent upon regular monitoring, including post-storm surveys, and prompt repairs. There also remains the risk that storm events would cause significant damage before any remedial works could be carried out. It is considered that this option would only be viable for a limited period of time, say around 20 years, after which it would revert to Do Nothing. Overall it is not considered to meet objectives to reduced flood and erosion risks in the long term.

Option 3 - rock armour apron

- 4.4.8 The option comprises the protection of the seawalls by the placement of rock armour aprons at the toe. The rock aprons, which would be similar to the existing rock revetment south of the village, would extend from the lifeboat station to the outlet of Runswick Beck, and then around the convex seawall at Upgarth Hill tapering out along the cliff toe.

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- 4.4.9 A 3 metre berm (at crest level of +6.0m AOD) and slope of 1 in 2, giving overall apron widths of 12 or 13 metres has been assumed, using rock provisionally sized at 3 to 6 tonnes.
- 4.4.10 The primary reason for protecting the toe of the seawalls is to reduce the amount of wave energy reaching the walls. Rock is very effective for a number of reasons. It is very good at dissipating wave energy, and would significantly reduce the energy reaching the walls themselves and reduce overtopping. This energy dissipation would also encourage any available sediments to settle. The rock also provides additional weight at the toe of the structure which improves overall seawall stability. Further, if limited erosion of the beach was to occur the rock could settle without losing the overall integrity of the apron.
- 4.4.11 Ongoing maintenance of the exposed upper part of the seawalls would still be required but this would be significantly less due to the protection provided by the rock apron. In addition, no special measures would need to be undertaken to ensure that drainage through the seawall remained uninterrupted.
- 4.4.12 A rock structure of this type would be expected to last with minimal maintenance for 100 years plus. The most likely maintenance work would be the reinstatement of any displaced rocks.

Option 6 - rock armour fillet

- 4.4.13 A rock armour fillet approximately 2 metres high (i.e. at a crest level of +4.7m AOD) and 7 metres wide would be placed at the toe of the seawalls and extend some 30 or 40m north of the seawall at Upgarth Hill.
- 4.4.14 This option would provide protection to the toe of the seawall to limit outflanking, undermining and scour. The performance of the rock armour fillet would be similar but less effective than Option 3, due to the reduced quantity of rock. Nonetheless the lower face of the seawall would be protected from direct impact, the risk of scour would be reduced and overtopping would also be reduced. There would remain an ongoing need to maintain the upper parts of the existing walls, to a greater extent than expected for Option 3 to compensate for the reduced rock quantity.

Options 7&8 - rock groyne with reduced length rock armour fillet

- 4.4.15 This option comprises a rock groyne at Cobble Dump (Option 7), with the addition of a rock armour fillet approximately 2 metres high which would be placed at the toe of the seawalls. The fillet would be to the same profile as Option 6, but would not extend as far along the seawall. North of the Upgarth Hill (northern) seawall, shelter from the predominant northerly waves would be provided by the rock groyne.
- 4.4.16 The rock groyne would consist of 3 to 6 tonne rock with a core of locally-sourced rock. Crest level would be at 4.5m ODN 2 metres wide. The rock fillet would use similar size rock armour with a 2m wide berm and apron slope at 1 in 2 approximately 5.5m wide.
- 4.4.17 The rock armour fillet would provide protection to the toe of the seawall to limit undermining and scour. The performance would be limited compared to a more substantial rock apron (as in Option 3), but the lower face of the seawall would be protected from direct impact and the risk of scour would be reduced. The rock groyne would provide protection to the undefended area to the north of the seawall, reducing the risk of outflanking.

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5 Options appraisal and comparison

5.1 Technical issues

- 5.1.1 The primary objective of the do something options is to protect the frontage from erosion through maintenance or enhancement of the existing defences. Option 2 - do minimum relies on effective and timely repairs being undertaken to the existing defences themselves. Unlike the other three do something options this approach is very dependent upon frequent inspection, particularly after storm events, to identify any deterioration of the existing seawalls. In addition it is not always easy to undertake repairs to a standard equivalent to the original wall construction.
- 5.1.2 Option 3 involves the placement of a rock armour apron in front of the existing seawalls. It is assumed that rock delivery would be by sea, a well-established approach for this type of work. At this stage rock type, sourcing and detailed delivery techniques have not been established. Good performance of the apron would depend upon correct sizing of the main armour and underlayer, as well as controlled placement, to minimise the risk of rock displacement. The existing rock armour at the slipway is a good indicator of what would be required. At least one access to the beach through the rock would be required.
- 5.1.3 A rock apron of this type would be effective in reducing wave energy before it reaches the existing seawalls, reducing the risk of further seawall damage and undercutting, reducing overtopping and encouraging sediment deposition.
- 5.1.4 The footprint of Option 3 would cover portions of the Yorkshire Water sewers that run down from the village and extend onto the beach, and then along the beach to the pumping station. It is very unlikely that the apron could be configured to avoid covering the sewers, and a sewer diversion would be required.
- 5.1.5 Option 6, the rock armour fillet, is a cut-down version of Option 3, having the same attributes but to a lower level. The reduced volume of rock would provide reduced energy dissipation, and the smaller profile (lower berm level, narrower overall profile) would allow more waves to reach the existing seawalls. However, crucially the toe of the existing seawall would be protected so that the risk of undermining and seawall instability would still be reduced. Given the reduced profile the rock size would need to be optimised for the layer thickness.
- 5.1.6 As Option 3 there would be an issue with covering Yorkshire Water sewers, and again diversion works would be required. Also at least one access to the beach through the rock would be required.
- 5.1.7 The final option, Options 7&8, is a combined (reduced length) rock armour fillet and rock groyne option. The rock fillet would be the same as Option 6, but would not extend as far northwards. Instead a rock groyne or bund would be constructed running perpendicular to the coast, to intercept waves coming from the north, the predominant wave direction. The intention would be for large northerly waves to be forced to break, limiting the size of waves (and amount of wave energy) reaching the area north of the Upgarth seawall, and to an extent the northern seawall itself.
- 5.1.8 The performance of this combined option would be expected to be the same as Option 6. The key uncertainty is the effectiveness of the rock groyne, and further work would be required to confirm the groyne length, crest level and location to ensure that it is optimised. In addition possible impacts on sediment supply would need to be considered.
- 5.1.9 The issues relating to the Yorkshire Water sewers are the same as for Option 6.

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- 5.1.10 The impacts of future sea level rise on the three major options would vary. For Option 3 it would lead to larger waves impinging on the rock, but the rock apron would retain its integrity and any reduction in effectiveness would be relatively limited. Sea level rise would potentially be more of an issue with Option 6, simply because the volume of rock is smaller than Option 3. Consequently increases in water level and wave height have more potential to impact upon the existing seawall. However, as long as the rock is not displaced the toe of the seawall would remain protected.
- 5.1.11 For the rock armour fillet in Options 7&8 the comments on the impacts of sea level rise for Option 6 are relevant. With regard to the groyne, the design would need to assess the appropriate crest level to ensure that sufficient wave energy was being dissipated even with increases in water level over time.

5.2 Environmental assessment

- 5.2.1 A Strategic Environmental Assessment (SEA) has been undertaken to appraise the potential effects arising from strategy options, and to ensure that environmental considerations are taken into account during the strategy level decision-making process. The Environmental Report (ER) which presents the SEA is at Appendix J. There is no legal requirement to undertake an SEA for strategies such as this. However, these types of strategies set a planning framework for planning decisions and they have the potential to result in significant environmental effects.
- 5.2.2 The SEA comprises a number of discrete stages, including setting the context and objectives, establishing the baseline and deciding on the scope, as well as developing and refining alternatives and assessing their effects. The baseline has been collated from a variety of desk based studies, collation of pre-existing information and also includes any issues conveyed by stakeholders and interested parties through the earlier scoping consultation process.
- 5.2.3 The scoping process was initially undertaken for the SEA at the Environmental Scoping Consultation Stage, between November 2013 and January 2014. Consultation was undertaken with Natural England, the Environment Agency and English Heritage, Yorkshire Water, The National Trust, North York Moors National Park Authority, North Yorkshire and Cleveland Heritage Coast, North Yorkshire Council, The Crown Estate, The Marine Management Organisation and the North Eastern Inshore Fisheries and Conservation Authority.
- 5.2.4 There was a further review of the scope in April 2014, when key stakeholders and the public were consulted on the Draft SEA ER via on-line publication and attendance at a public exhibition in Runswick Bay. This review served to check that the scope fully addressed any issues or concerns that may have been missed. The final draft of the strategy report was available for public consultation between the 25th February and 18th March 2015. Three responses were received during this period and are included in Appendix J for reference. The only potential issue raised by the responses concerned undertaking the main works during the tourist season. As this was also a recorded Steering Group concern, the proposed timing of the works ensures that works are undertaken outside of the main holiday periods.
- 5.2.5 A number of comments have been provided by Natural England in response to the initial consultation and planning consultation respectively. These included inter alia environmental impacts that they identified for the individual options. Following various correspondence a meeting was held (18 November 2014) between Natural England, SBC and their consultants to agree upon a slightly amended list of environmental receptors and the impacts (positive or negative) arising from each of the short-listed options.

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- 5.2.6 Following this meeting an amended SEA was issued, and Natural England provided a letter of comfort (letter dated 17 February 2015, see Appendix L). In summary Natural England's advice is that the strategy proposal is likely to lead to an environmentally acceptable solution and that an Appropriate Assessment under the Habitats Regulations will not be required.
- 5.2.7 The development of a preferred option for Runswick Bay is likely to have a number of impacts and effects associated with it, which is likely to require further and more detailed environmental impact assessment at scheme level, including technical and social assessment, at which stage an Environmental Impact Assessment (EIA) may be undertaken.
- 5.2.8 The following table summarises the key environmental impacts for the short-listed options taken forward for full appraisal, and also flags any mitigation or enhancement opportunities. Full details are contained within the SEA itself in Appendix J.

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Table 5-1 Key environmental impacts, mitigation and opportunities

Key positive impacts	Key negative impacts	Mitigation/enhancement opportunity
Option 1 – do nothing		
<ul style="list-style-type: none"> in the medium term, this option would allow for a naturally functioning coastline to develop, which would have minor positive effects in the medium to long term and would achieve Strategy objectives linked to ‘naturalness and natural evolution of the coast’ 	<ul style="list-style-type: none"> would not maintain the current standard of protection afforded to properties or local residents in Runswick Bay Village loss of the majority of properties in the lower village in the short term, and access to the lower village and properties in the upper village in the longer term, with complete failure of the defences leading to significant erosion, landslides and abandonment of the Village in the medium to long term major adverse impact on cultural and architectural heritage on the North Yorkshire and Cleveland Heritage Coast major adverse impact on local infrastructure 	Not applicable
Option 2 - do minimum		
<ul style="list-style-type: none"> this option would maintain (but not improve) the existing standard of defence in the short term in the longer term, this option would allow for a naturally functioning coastline to develop, which would have minor positive effects in the long term and would achieve Strategy objectives linked to ‘naturalness and natural evolution of the coast’ 	<ul style="list-style-type: none"> increase in the frequency and level of intervention required to maintain the defences. The seawall would deteriorate and fail in the medium term loss of the majority of properties in the lower village in the medium term, and access to the lower village and properties in the upper village in the longer term, with complete failure of the defences leading to significant erosion, landslides and abandonment of the Village in the long term major adverse impact in the long term on cultural and architectural heritage on the North Yorkshire and Cleveland Heritage Coast major loss of local infrastructure in the long term 	Any patch repairs should have surface texture added to the concrete walls to increase colonisation potential
Option 3 - rock armour apron		
<ul style="list-style-type: none"> major beneficial impacts in terms of flood protection for residents, the local economy and community structure, and the protection of the Runswick Bay village from erosion and dereliction beneficial in terms of the visual appearance of the built townscape which would otherwise be lost to erosion (balancing the adverse impact on the natural landscape) major beneficial impact on the cultural heritage interest of the village and its contribution to the interest of the North Yorkshire Moors National Park and the Yorkshire and Cleveland National Trail major beneficial impact on local infrastructure 	<ul style="list-style-type: none"> major adverse impacts on ecology in the medium and long term due to a loss of inter-tidal habitat from coastal squeeze associated with sea level rise within area of recommended MCZ, although this is currently an area of relatively low ecological value major adverse impact associated on the natural landscape and seascape as the defences would not allow the landscape to respond to the existing environmental conditions (balancing the adverse impact on the built townscape) short-term disruption during construction works 	<ul style="list-style-type: none"> provision of additional access from the promenade area to the beach Measures (including warning signs) would be required to reduce the risk of harm from clambering over rock boulders During construction undertake good construction practices

Key positive impacts	Key negative impacts	Mitigation/enhancement opportunity
Option 6 - rock armour fillet		
<ul style="list-style-type: none"> major beneficial impacts in terms of flood protection for residents, the local economy and community structure, and the protection of the Runswick Bay village from erosion and dereliction beneficial in terms of the visual appearance of the built townscape which would otherwise be lost to erosion (balancing the adverse impact on the natural landscape) major beneficial impact on the cultural heritage interest of the village and its contribution to the interest of the North Yorkshire Moors National Park and the Yorkshire and Cleveland National Trail major beneficial impact on local infrastructure 	<ul style="list-style-type: none"> minor adverse impacts on ecology in the medium and long term due to a loss of inter-tidal habitat from coastal squeeze associated with sea level rise. However, the reduced footprint would result in less impact on the ecology of the inter-tidal area compared to the rock apron (Option 3) adverse impact associated on the natural landscape and seascape as the defences would not allow the landscape to respond to the existing environmental conditions, albeit a lower level of visual impact as a result of the smaller scale and footprint of the rock armour fillet compared to the rock armour apron (Option 3) short-term disruption during construction works 	As Option 3
Options 7 & 8 - reduced length rock armour fillet plus rock groyne		
<ul style="list-style-type: none"> major beneficial impacts in terms of flood protection for residents, the local economy and community structure, and the protection of the Runswick Bay village from erosion and dereliction beneficial in terms of the visual appearance of the built townscape which would otherwise be lost to erosion (balancing the adverse impact on the natural landscape), but to lower level than Option 6 beneficial impact on the cultural heritage interest of the village and its contribution to the interest of the North Yorkshire Moors National Park and the Yorkshire and Cleveland National Trail, but to lower level than Option 6 due to greater visual impact on setting major beneficial impact on local infrastructure 	<ul style="list-style-type: none"> higher levels of adverse impact compared to those associated with Option 3 and Option 6 (with a similar adverse impact of the natural landscape as the defences would not allow the landscape to respond to the existing environmental conditions) higher level of adverse visual impact on the built landscape and cultural heritage compared to rock fillet (Option 6) as a result of the construction of the groyne within the bay, which would represent a new element on the landscape in addition to the rock apron or fillet in front of the built landscape of the Village increased footprint compared to rock armour fillet (Option 6) as a result of the new rock groyne would result in a greater impact on the ecology of the inter-tidal area within the recommended MCZ short-term disruption during construction works 	As Option 3

5.2.9 A summary of the assessment scores associated with each Strategy option is shown visually in the table below.

Table 5-2 Summary of Short List Option Assessment (Short, Medium and Long Term)

Environmental Receptor	Option 1			Option 2			Option 3			Option 6			Option 7&8		
	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L
Population	Minor Adverse	Major Adverse	Major Adverse	Neutral	Minor Adverse	Major Adverse	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive
Landscape (Natural)	Minor Adverse	Minor Adverse	Minor Adverse	Neutral	Minor Adverse	Minor Adverse	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive
Landscape (Built)	Minor Adverse	Major Adverse	Major Adverse	Neutral	Minor Adverse	Major Adverse	Minor Positive	Minor Positive	Minor Positive	Minor Positive	Minor Positive	Minor Positive	Neutral	Minor Positive	Minor Positive
Biodiversity	Minor Adverse	Minor Positive	Minor Positive	Neutral	Minor Adverse	Minor Positive	Minor Adverse	Major Adverse	Major Adverse	Neutral	Minor Adverse	Minor Adverse	Major Adverse	Major Adverse	Major Adverse
Cultural heritage	Minor Adverse	Major Adverse	Major Adverse	Neutral	Minor Adverse	Major Adverse	Minor Positive	Minor Positive	Minor Positive	Major Positive	Major Positive	Major Positive	Minor Positive	Minor Positive	Minor Positive
Geology and coastal morphology	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Minor Adverse
Water resources	Minor Adverse	Minor Adverse	Neutral	Neutral	Minor Adverse	Minor Adverse	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive
Traffic and transportation	Minor Adverse	Major Adverse	Major Adverse	Neutral	Minor Adverse	Major Adverse	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive	Major Positive

Key

Significance	
Major Positive Effect	Major Positive Effect
Minor Positive Effect	Minor Positive Effect
Neutral/Not Significant/No Effect	Neutral/Not Significant/No Effect
Minor Adverse Effect	Minor Adverse Effect
Major Adverse Effect	Major Adverse Effect

5.3 Social and community impacts

5.3.1 For Runswick Bay the key concern for home-owners and businesses is the long term protection of property and assets from erosion and potentially cliff instability. Tied into this is the need to maintain the village as a very popular tourist destination. In the absence of a programme of measures to provide protection there would be both actual losses and the stress of dealing with those losses.

5.3.2 Clearly ‘do nothing’ would not provide protection. Do minimum would defer the problem by providing short-term protection, but formal adoption of this approach would almost certainly have present-day consequences with regard to, for example, property prices and health implications with increased stress.

5.3.3 From an economic perspective all three major do something options would provide virtually equivalent longer term protection to the Village. However the public consultation suggested that these three options were not perceived in exactly the same way. Clearly the implementation of any of these options would provide reassurance and reduce stress for home-owners, businesses and other asset owners. However Option 3 was considered to provide the greatest level of reassurance as it was less dependent upon downstream works. This is reflected in the summary table above.

5.4 Option costs

- 5.4.1 The derivation of capital, maintenance and other costs for each of the village protection options is briefly summarised below. All options include the default 60% Optimism Bias added to the present value (PV) cost estimate for the main works, which makes allowance for detailed design elements such as overtopping modelling and beach access provision. At this stage it has not been considered necessary to adjust the Optimism Bias between options. Note also that the costs discussed below are inclusive of fees.
- 5.4.2 Cost rates have been drawn from several sources including the Environment Agency's "Flood Risk management Estimating Guide – Update 2010", other recent PARs, and SPONs Civil Engineering and Highway Works Price Book (2009). All costs (and benefits) have been adjusted to a base date of November 2014. The cost estimates are considered to provide a good comparison between options and also a good indication of the overall scale of costs.
- 5.4.3 **Option 1 - do nothing** - zero costs.
- 5.4.4 **Option 2 - do minimum** - it is assumed that for the duration of this option, two post-storm site visits will be conducted to inspect the structure and provide early warning of defects. Notwithstanding the performance issues in the long term, it has been assumed that patch repair of the concrete structure will on average occur at 10 year intervals. It is very difficult to predict when total failure may occur but it has been assumed that expenditure will cease after 20 years. The whole life (20 yr) cash costs for this option are therefore assessed to be around £0.25m.
- 5.4.5 **Option 3 - rock apron** - the development of the costs for the construction of a rock armour apron along the study area, with a small gap at Runswick Beck, assumes construction within 2 to 3 years, with maintenance works (patch repairs to existing seawall, rock armour re-profiling) every 20 years until year 50. Thereafter maintenance frequency is assumed to increase to 10 years between year 50 and year 100 due to the projected effects of climate change. The whole life (100 year) cash costs for this option are circa £2.4 million.
- 5.4.6 **Option 6 – rock armour fillet** - the cost build-up and maintenance frequency is similar to Option 3. Capital costs are lower but maintenance costs are higher. The cost rate for patch repairs to the existing seawall has been tripled to take account of the increased exposure of the seawall. The whole life (100 year) cash costs for this option are circa £1.5 million.
- 5.4.7 **Options 7&8 - rock groyne and reduced length rock armour fillet** - again similar to Option 3. Capital costs are slightly lower. Although the seawall is only protected by the rock fillet as Option 6, it has been assumed that the sheltering effect of the groyne will reduce exposure of the existing seawall to wave action and consequently the cost rate for patch repairs is as Option 3. Nonetheless overall the maintenance works, which include re-profiling of both the rock armour fillet and the rock armour groyne, are estimated to cost significantly more than Option 3 and approximately twice as much as Option 6. The whole life (100 year) cash costs for this option are circa £2.8 million. This is the most expensive option in cash terms.
- 5.4.8 Table 5-3 presents the PV costs of the four do something options, in order of total PV cost. Cost estimates include all inspection and monitoring costs beyond the RCMP Cell 1, which is funded separately.
- 5.4.9 In addition to the works to protect the village directly, an assessment of costs to maintain and repair the rock armour, seawall and cliff stabilisation works completed in 2001 has been made. These works protect the south side of the village and the beach access, and

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future maintenance and repair works are expected to include rock armour re-profiling, drainage works, shear key piling and concrete patch repairs every 20 years. In addition costs have been allowed for the Yorkshire Water sewer diversion, works at Nettledale Beck to improve bathing water quality, and an annual survey. These costs would be applicable to Option 3, Option 6 and Options 7 & 8, and have been included in the summary table.

Table 5-3 Summary of options PV costs (£) (no contributions)

Option number	PV Costs £			
	Option 2	Option 6	Options 7 & 8	Option 3
Option name	Do Minimum (20 years)	Rock armour fillet	Rock groyne and reduced rock fillet	Rock armour apron
<i>Implementation (Year 0-4)</i>				
Capital	0	448,800	855,800	959,400
Maintenance	3,900	3,900	3,900	3,900
PV South ex. seawall capital & maint.	0	3,900	3,900	3,900
PV Other (env. etc. 5%)	200	22,800	43,200	48,400
PV fees etc. (12%)	500	54,800	103,600	116,100
Optimism Bias (60%)	2,700	320,500	606,200	678,900
StAR & PAR preparation fees	150,000	150,000	150,000	150,000
Yorkshire Water service diversion	0	233,400	233,400	233,400
Nettledale Beck design & construct	0	45,100	45,100	45,100
Sub Total	157,300	1,283,200	2,045,100	2,239,000
<i>Future Costs (Year 5-100)</i>				
Capital	0	0	0	0
Maintenance	31,200	53,800	104,200	41,500
PV South ex. seawall capital & maint.	0	183,300	183,300	183,300
PV Other (env. etc. 5%)	1,600	11,900	14,400	11,200
PV fees etc. (12%)	3,700	28,400	34,500	27,000
Optimism Bias (60%)	21,900	166,400	201,800	157,800
Sub Total	58,300	443,800	538,200	420,800
Total PV Cost	215,600	1,727,000	2,583,300	2,659,800

5.4.10 Option 2 - do minimum has a significantly lower cost than the other options. Option 6 is the next lowest PV cost option, at around 60% of the cost of Option 3. This reflects the reduced scale of rock included in this option compared to Option 3. The PV cost of Option 7&8 is similar to Option 3.

5.4.11 As discussed in Section 6.3 below, it is anticipated that a financial contribution towards a capital scheme would be offered to SBC by the local residents. Based upon current information this has been estimated at £100k (PV £93,400), and this sum has been deducted from the first 5 year costs of Options 3, 6 and 7&8 in the table below. In addition the anticipated cost of diverting Yorkshire Water's pipelines is expected to be met by Yorkshire Water themselves as a contribution in kind, currently valued at £250k (PV £233,400). Consequently a total contribution of PV £326,800 has been included.

Table 5-4 Impact of contributions on option PV costs

Option number	PV Costs £			
	Option 2	Option 6	Options 7 & 8	Option 3
Option name	Do Minimum (20 years)	Rock armour fillet	Rock groyne and reduced rock fillet	Rock armour apron
<i>Implementation (Year 0-5)</i>				
PV costs no contributions	157,300	1,283,200	2,045,100	2,239,000
PV value of contributions	0	326,800	326,800	326,800
PV Costs incl. contributions	157,300	956,400	1,718,300	1,912,200
<i>Future Costs (Year 6-100)</i>	0	0	0	0
PV costs (no further contributions anticipated)	58,300	443,800	538,200	420,800
Total PV costs no contributions	215,600	1,727,000	2,583,300	2,659,800
Total PV Cost incl. contributions	215,600	1,400,200	2,256,500	2,333,000

5.4.12 Given the scale of contributions, and that they apply equally to the three major do something options, they have no impact on option choice as the relative differences in cost remain very similar. Full details of the cost estimates are included in Appendix N.

5.5 Options benefits (Damages avoided)

5.5.1 Potential economic damages to assets at risk have been assessed as summarised below. The base date for prices is November 2014 (as costs). The timing of property losses under the do nothing scenario are set out in Section 3.2.

Residential Properties

5.5.2 Reference has been made to the Valuation Office website council tax valuation list (www.voa.gov.uk). In accordance with the MCM valuation of properties has used risk free market values, i.e. not taking into account reductions in value due to perceived or real erosion risks.

5.5.3 House prices were obtained from recent sale data provided by the Land Registry (<http://houseprices.landregistry.gov.uk/price-calculator>) and from other internet sources (www.zoopla.co.uk) for the post code area. The average prices for the post code area and property types were then assigned to the individual identified properties on the basis of council tax banding.

5.5.4 Due to the desirable location the property values were expected to be relatively high compared to regional averages. The average property value in the village based on sales between 1995 and 2013, using the Land Registry house price calculator, is £271,000.

Non-Residential Properties

5.5.5 As above, reference has been made to the Valuation Office website. Non-residential properties include properties such as shops, self-catering holiday units, public conveniences, car parks, village reading room, sailing club building and life boat house and rescue boat station. Market values were estimated from the rateable value published by the VOA and a yield factor as described in the MCM.

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Infrastructure

5.5.6 The Yorkshire Water Pumping Station is built into the coastal defences and has been included as a non-residential property based on its rateable value. No allowance for infrastructure such as electricity, gas, telecommunications or potable water supply has been included as it is assumed that the whole lower village would be lost at the same time. Likewise the access road into the village has not been counted as it is assumed that it would be lost at the same time as the village properties and the use of the beach.

Recreational assets

5.5.7 An assessment of recreational loss has been made based on annual visitor numbers, using the Value of Enjoyment methodology as detailed in Chapter 8 of the MCM (2010). Based upon available data (e.g. people count data for the Cleveland Way) it has been estimated that there are 110,000 day visitors to Runswick Bay each year. The actual loss per adult has been estimated at £2.00. Assigning failure probabilities over 100 years gives total recreational and amenity damages of £2.2m for do nothing, and £1.6m for do minimum. The remaining options are considered to have no recreational and amenity damages.

Environmental assets

5.5.8 No losses or gains to environmental assets have been included in the economics.

Table 5-5 Summary of present value (PV) damages and benefits (£k)

	Damages and Benefits £k				
	Option 1	Option 2	Option 6	Options 7&8	Option 3
Option name	Do-nothing	Do Minimum (20 years)	Rock armour fillet	Rock groyne and reduced rock fillet	Rock armour apron
PV asset damages	19,493	9,771	720	720	720
PV recreational damages	2,319	1,650	0	0	0
PV total damages	21,812	11,421	720	720	720
PV total benefits		10,391	21,092	21,092	21,092

5.5.9 The Do nothing PV damages over the 100 year appraisal period are estimated at £22m; the Do minimum PV damages are about half of this figure. The remaining three options, i.e. the major do something options, are all assessed to provide the same standard of protection and consequently the same residual damages. These are significantly less than the Do minimum PV damages, at well under £1m.

Risk to Life

5.5.10 The economic damages associated with “risk to life” has not been included in the assessment. It has been assumed that any significant slope stability/landslide problem would not occur suddenly but would be a relatively slow event which would allow time for evacuation (eg. Holbeck Hall).

5.5.11 Full details of the economic assessment are provided at Appendix N.

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6 Selection and details of the preferred option

6.1 Selecting the preferred option

6.1.1 The following table summarises the benefit cost assessment for the five options considered for Runswick Bay. Costs take account of anticipated contributions.

Table 6-1 Benefit-cost assessment (including contributions) (£k)

Option number	Option 1	Option 2	Option 6**	Options 7&8	Option 3
Option name	Do-nothing	Do Minimum (20 years)	Rock armour fillet	Rock groyne and reduced rock fillet	Rock armour apron
Total PV Costs including contributions	0	216	1,400	2,257	2,333
Total PV damages	21,812	11,421	720	720	720
Total PV benefits £k		10,391	21,092	21,092	21,092
Net Present Value NPV		10,175	19,692	18,836	18,759
Average benefit/cost ratio BCR		48.2	15.1	9.3	9.0
Incremental benefit/cost ratio iBCR			9.0	N/A	N/A
		Highest BCR			
			iBCR>1		
Option for incremental calculation			Option 2		

** Economically preferred option.

6.1.2 Option 2 - do minimum has the highest average BCR but does not meet the majority of the project objectives, given that it is anticipated to be sustainable for only around 20 years before reverting to do nothing. Under the FCERM guidance a move to Option 6 is economically justified as it has a robust BCR and an iBCR of 9.0 to 1.

6.1.3 Options 3 and 7&8 are assessed to provide the same level of protection as Option 6, consequently choosing between these three options is simply a matter of least cost. Any other decision would be on the basis of other non-economic influences or requirements.

6.1.4 Overall the economically preferred option is Option 6. Consequently the full strategy comprises:

Runswick Bay Village

- scheme works - rock armour fillet construction;
- ongoing scheme maintenance - patch repairs to the seawall, rock armour re-profiling and associated annual monitoring survey;
- maintenance of the earlier south side works including rock armour re-profiling, drainage works, shear key piling and concrete patch repairs, plus annual monitoring survey;
- address bathing water quality issues (Nettle Dale Beck);

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- seaweed removal programme (funded separately)

Port Mulgrave

- occasional intervention to make safe, for example following storm damage;

Whole Study Area

- On-going inspection of the study area frontage between Thorndale Shaft and Sandsend Ness (undertaken and funded through the Regional Coastal Monitoring Programme).

6.1.5 Surface drainage investigation works for the upper part of Runswick Bay Village do not form part of this strategy, but nonetheless the potential impact of any proposals on slope drainage should be considered.

6.2 Sensitivity testing

6.2.1 It is important to consider whether any foreseeable changes to costs and benefits for any of the options would be likely to change the preferred option, or even affect the economic justification for proceeding with any works. The following table presents the outcomes of the checks undertaken.

Table 6-2 Sensitivity Checks

No.	Sensitivity Check	Op. 6 BCR	Op. 6 iBCR	Impact
	Baseline case	15.1	9.0	
1	Do Nothing damages – 25% reduction.	11.2	9.0	Option benefits and average BCRs reduce. For Option 6 the BCR reduces. The iBCR remains the same.
2	Rock armour – increase in cost rate (20% option cost increase)	12.6	7.3	This has a similar impact upon all three rock armour options. The iBCR relative to Option 2 decreases but is still very robust.
3	Option 6 - increase in scale of rock required (25% overall option cost increase)	12.1	7.0	The average BCR and the iBCR both drop but remain robust. Overall PV cost is still significantly lower than Options 3 and 7&8.
4	Option 6 - maintenance cost increase 200% to cover higher than anticipated repair works to seawall and rock armour.	14.4	8.6	Increases PV costs by limited amount. This only has a small impact upon the average BCR which remains robust.
5	Option 6 - increased damages resulting from earlier than predicted property loss (Year 75)	14.5	8.4	Limited impact on overall benefits. Small reductions in average BCR and iBCR. Both remain robust.
6	No contributions (currently estimated at PV £326,800K)	12.2	7.1	Reductions in the BCRs for Options 3, 6 and 7&8. Also decrease in the iBCR for Option 6 but still robust.
7	No contributions & monetised benefits only	10.9	6.0	As above, reductions in the BCRs for Options 3, 6 and 7&8. Also decrease in the iBCR for Option 6 but still robust. No change in economic option choice.

- 6.2.2 Based upon current estimates it is clear that the choice of Option 6 is economically robust. Average benefit cost ratios remain relatively high and none of the checks undertaken suggest a change of option.

6.3 Details of the preferred option

Technical aspects

- 6.3.1 The new rock armour element of the preferred option is intended to achieve a balance between on the one hand environmental impacts and cost, and on the other performance. Rock armour fillets of this type have an established track record in reducing wave impacts, erosion and overtopping. Optimisation of the rock profile will ensure that wave energy is sufficiently reduced to limit impacts on the existing seawall and provide the proposed 100 year design life. Further, rock sizing will take into account the need for rock stability, the proposed cross-section and the founding beach material. In addition, there may be benefit in using larger rock towards the northern end of the rock fillet where wave exposure is greater, and smaller rock in front of the village. There will be the inclusion of concrete steps to maintain access to the seawall from the beach.
- 6.3.2 In order to retain the integrity of the existing seawalls ongoing patch and repair works will be required throughout the 100 year design life. Aside from responding to any damage identified through regular monitoring it will also be prudent to inspect the defences following any significant storm incidents.
- 6.3.3 In addition to the new construction works ongoing maintenance to the southern defences will also be required, as described above.
- 6.3.4 There is a risk in relation to the impact upon Yorkshire Water sewers in the foreshore. This is being dealt with through discussion with Yorkshire Water – at this stage we have received written agreement from YW that a sewer diversion would be required. The diversion costs would be met by YW as an external contribution.
- 6.3.5 It is not anticipated that there will be any issues relating to delivery and placement of the rock, especially given the earlier construction of the Southern Defence works. Nonetheless early involvement of a contractor would be helpful to confirm this.

Environmental aspects

- 6.3.6 No formal screening letter has been sought to date on the need for formal EIA of the preferred option, Option 6. The requirement for formal EIA under the Town and Country Planning (EIA) Regulations, the Marine Works (EIA) Regulations and the EIA (Land Drainage Improvement Works) Regulations (1999) will need to be determined in consultation with the local planning authority, the Marine Management Organisation and the Environment Agency, early during the detailed design stage. It is worth noting that SBC is not the local planning authority; this is the North York Moors National Park Authority.
- 6.3.7 There are no Ramsar Sites, Special Protection Areas (SPAs) or Special Areas of Conservation (SACs), within the Runswick Bay Strategy Study Area. Consequently there is no requirement for appropriate assessment under the Habitats Regulations.

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- 6.3.8 With regards to the achievement of Water Framework Directive objectives, the strategy includes an objective to ensure that the strategy does not cause deterioration in the current status of the waterbodies in the area and that it supports their achievement of WFD objectives. For the preferred option, Option 6, no significant impact on compliance with WFD objectives is envisaged. Implementation would prevent the potential release of sediments and pollutants into coastal waters through erosion in the medium term, which would have minor beneficial effects on coastal water quality. No significant impact on surface or ground water is envisaged except in the immediate vicinity of the bay. Section 9.2 of the SEA Environmental Report refers.
- 6.3.9 The preferred option would reduce the risk of seawall failure in the short, medium and long term (the life of the Strategy), and reduce wave overtopping for residents in Runswick Bay Village. Consequently the risks to residential and commercial properties and other infrastructure would be significantly reduced. Further, this would alleviate much of the stress and anxiety felt by residents and property owners, particularly as the rock apron would provide visual reassurance.
- 6.3.10 With regard to the natural environment, this option would not allow the landscape to respond to the existing environmental conditions, and would not result in a natural coastal landscape. However, the protection of the Runswick Bay from erosion and the Village from dereliction would represent a major beneficial impact on the townscape and built environment, which would contribute to the landscape of the North Yorkshire Moors National Park (meeting the aims of the NYMNP Core Strategy to protect and enhance the special qualities of the National Park) and the North Yorkshire and Cleveland Heritage Coast.
- 6.3.11 Currently mitigation measures being considered include the need for sensitive ecological features to be protected from disturbance or damage and opportunities to be sought to establish new habitats where possible. In addition measures such as warning signs would be required to reduce the risk of harm from clambering over rock boulders. Access through the rocks would also be provided.
- 6.3.12 It is also noted that SBC had commissioned the University of Hull to investigate approaches to habitat colonisation of rock armour, particularly anything that speeds up the colonisation process. The outcomes will be monitored, and there would be an opportunity for any successful methods to be considered for use at Runswick Bay.
- 6.3.13 The major part of the work would be rock delivery by sea and rock placement. During construction close liaison with local residents and businesses would be undertaken. Careful consideration to programming and timing to minimise adverse impacts on bathing waters, local residents, visitor amenities, local businesses, the tourist economy and ecology would be needed. Particular issues to be addressed include the provision of suitable access arrangements, management of traffic and considerate site practices, suitable siting of construction and storage areas and avoiding the release of fines or contaminants.
- 6.3.14 On completion of the works it is anticipated that minimal maintenance would be required to the rock armour, and a reduced level of repair works required to the seawall.
- 6.3.15 The consultation with the public indicated that Option 3, the larger rock apron, was perceived as providing greater certainty of protection. As part of the liaison process it would be important to explain how the preferred option would also provide effective protection.

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Costs of the preferred option

- 6.3.16 The following table summarises the capital and non-capital costs, year-on-year for the first 5 years. It has been assumed that the rock armour construction works will take place in 2016/17.

Table 6-3 PV Costs of Preferred Option (rock armour fillet - £k)

Cost	Year 0	Year 1	Year 2	Year 3	Year 4	Five Year	Future Years	Overall Total
	2014/15	2015/16	2016/17	2017/18	2018/19	Totals		
	(£K)	(£K)	(£K)	(£K)	(£K)	(£K)	(£K)	(£K)
PV Capital	150	0	747	45	0	942	0	942
PV Maintenance	3	3	3	3	3	15	444	458
PV Total	153	3	750	48	3	956	444	1,400

Contributions and funding

- 6.3.17 It is anticipated that funding of the preferred option will be through FCRM GiA supported by contributions. At the project funding group meeting (held on 6th March 2014) a declaration by the Runswick Bay Residents Association indicated that a significant contribution could be made available towards a capital scheme option. It is understood that the amount being proposed is currently £100,000., and that a Charity Trust has already been set up to manage the local contribution. Consequently there appears a very high likelihood of this amount being provided.
- 6.3.18 As a scheme is anticipated to be undertaken in Year 2 (2016/17), this sum equates to a £93,400 PV contribution (£100,000 x 0.934 at 3.50%).
- 6.3.19 Yorkshire Water installed and now maintain the foul water pumping station located on the seawall. In addition they have pipework within the foreshore to which they would lose some access if the preferred scheme option was taken forward. Consequently Yorkshire Water have proposed re-locating their pumping station inflow pipework out of the foreshore to within the existing seawall footprint, although the existing storm water overflow pipe would remain. Yorkshire Water would pay for the re-location work as a contribution in kind. Whilst no firm estimate has been developed, based upon preliminary discussion a budget cost of £250,000 to undertake the works has been included in the strategy. This would represent a significant contribution towards the cost of the proposed scheme.
- 6.3.20 No other contributions have been sourced at this stage and whilst no firm commitment in writing from Yorkshire Water has yet been received, SBC are confident that both the financial contribution from the residents and the contribution in kind will materialise. Consequently these have been accounted for in the project summary sheet presented above. Relevant correspondence is enclosed at Appendix P.
- 6.3.21 A preliminary FCRM GiA Partnership Funding Calculator has been completed (Appendix O) to gauge the scale of Grant in Aid that may be provided for the scheme works, taking into account the costs, contributions and qualifying benefits. This shows that the scheme has a partnership funding score of 186% with an adjusted score of 212%. This includes qualifying benefits under Outcome Measure 3, which are based upon 93 households in the 21 to 40% most deprived areas being better protected against coastal erosion, 82 in the medium term and 11 in the long term.

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6.4 Summary of preferred strategy

6.4.1 The following table summarises the economics for the preferred strategy, along with the cash costs for both capital and non-capital works. These costs are for the full 100 year strategy taking into account anticipated contributions. Non-capital costs include all costs for the Southern Defence works, along with Option 6 Rock Armour maintenance costs. In addition all costs include optimism bias but exclude inflation.

Table 6-4 Summary of preferred strategy

	Values
PV Costs (£k)	
Capital	943
Non-capital	458
Total PV Costs (£k)	1,400
PV Benefits (£k)	21,100
Average Benefit Cost Ratio	15.1
Cash Costs (£k)	
Capital	1,000
Non-capital	1,890
Total Cash Costs (£k)	2,890

7 Implementation

7.1 Project planning

Phasing and approach

- 7.1.1 The capital works elements of the strategy for which funding is being sought comprise the rock armour works at Runswick Bay Village, and the works to address bathing water quality issues.
- 7.1.2 The rock armour works will be undertaken in a single phase, as it is expected that rock delivery and placing could all be undertaken in a matter of weeks. It is anticipated that rock delivery will be by barge, possibly being shipped from Norway. Associated works include the construction of an access through the rock, which will be undertaken over the same period.
- 7.1.3 Enabling works are required. It will be necessary for Yorkshire Water to have undertaken the diversion of their pipelines prior to rock placement, and it would be preferable for the diversion to have been completed and commissioned before the main works start on site.
- 7.1.4 At this stage the only constraint on the timing of the works is to avoid the peak summer tourist season (June to August).
- 7.1.5 Engagement with key stakeholders and communities will need to continue in order, for example, to:
- address habitat and other environmental issues. This may include compliance with the proposed Marine Conservation Zone, depending upon the timing of the designation.
 - communicate scheme proposals and the potential impacts.
 - enter into legal agreements with Yorkshire Water and the local residents (Runswick Bay Coastal Protection Trust).
- 7.1.6 Addressing bathing water quality issues at Nettledale Beck will require further study work and, depending upon the outcome of the study, design work prior to any works on site. This work is not directly linked to the rock armour scheme so the timing is independent. If the proposals ultimately include some rock re-positioning then there may be an opportunity for the rock armour contractor to undertake this using plant already on site, but this is not critical.
- 7.1.7 Other works including monitoring and maintenance are to be undertaken using different funding sources, and do not impact upon the approaches for the work outlined above.

Programme and spend profile

- 7.1.8 The anticipated programme for the rock armour and bathing water quality works are as outlined in the table below. Refer also to Appendices Q and R.

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Table 7-1 Key dates

Activity	Date
Rock Armour Fillet Scheme	
Commence detailed appraisal	November 2014
Approvals and consents	June 2015-December 2015
Detailed design	January 2016
Yorkshire Water Diversion works	August 2016
Construction start	September 2016
Construction completion	January 2017
Bathing Water Quality Measures	
Outline programme (to be confirmed) – assume all expenditure in Years 2&3 (2016/17 & 17/18)	

Table 7-2 Annualised spend profile including inflation*

Cash Cost £k	Year 0	Year 1	Year 2	Year 3	Year 4	Five Year Totals	Future Years	Overall Total
	2014/15	2015/16	2016/17	2017/18	2018/19			
Rock Armour Scheme								
Cash Capital	150	0	832	53	53	1,088	0	1,088
Cash Non capital	3	3	3	3	3	16	6,034	6,050
Bathing Water Quality								
Cash Capital	0	0	52	0	0	52	0	52
Cash Non capital	0	0	0	0	0	0	0	0

* Note - figures include inflation at 2%

Outcome measures contributions

- 7.1.9 The contributions to Outcome Measures (OMs) relate to the economic benefits, and the protection of properties from erosion. Given that the scheme is scheduled to be completed in 2016/17 the benefits are assessed to accrue in that year.
- 7.1.10 It has been estimated that 91 residential properties will be lost from the lower village in the medium term and a further 5 properties in the long term in a Do Nothing scenario. These properties are all in the 21–40% most deprived areas band. Additional residential properties in the upper village are at a much lower risk of loss, and consequently have not been included in the OM assessment.

Table 7-3 Medium term outcome measures contributions

Outcome Measure	2014/15	2015/16	2016/17	2017/18	2018/19	Future Years	Total
OM1 Economic Benefit							
PV Benefits (£k)			21,100			-	21,100
PV Damages (£k)			720			-	720
OM2 Households at risk (nr)	None						
OM2b Households moving Risk Bands (Nr)	None						

Outcome Measure	2014/15	2015/16	2016/17	2017/18	2018/19	Future Years	Total
OM3 Households at risk in Deprived Areas (Nr)			96			-	96
OM4 Improved condition of SSSI (ha)	None						
OM5 BAP Habitat (ha)	None						
Outcome Measure Partnership Funding Score Raw				186%			
Adjusted				212%			

7.1.11 The Partnership Funding Score is high at 186% and well above the 100% score required to secure partnership funding.

7.2 Procurement strategy

7.2.1 The procurement of the works will be under the control of SBC. It is envisaged that the works will be design and build, and that delivery will be by invitation to tender from within the Council's contractor framework or through the YorCivils/YorConsult Framework, which covers the Yorkshire and Humber region.

7.2.2 SBC's procurement philosophy and approach entails a partnership approach based upon the principles of Latham's *Constructing the Team* and Egan's *Rethinking Construction* reports, as enshrined in the philosophy of the New Engineering Contract. More information is contained in Appendix U. A sustainability register has been included in Appendix V and an initial carbon calculation is included in Appendix T.

7.3 Delivery risks

High level risk register

7.3.1 The table below sets out what are considered to be the high level project risks. A detailed risk register is included at Appendix S.

Table 7-4 High level risk schedule and mitigation

Key project risk	Adopted mitigation measure
Defence failure before implementation of the works	<ul style="list-style-type: none"> Ongoing monitoring and maintenance, including prompt inspection and repairs following storms.
Lack of approval by EA to this strategy or the subsequent PAR	<ul style="list-style-type: none"> Ensure that business case is prepared in line with EA appraisal guidance. Undertake early liaison with EA to get comments.
Lack of agreement from Natural England	<ul style="list-style-type: none"> Ongoing dialogue with Natural England to ensure that environmental reporting meets their requirements, and that the works include any necessary mitigation measures.
Cost estimates prove to be low	<ul style="list-style-type: none"> Optimism bias of 60% applied to all major costs.
Yorkshire Water fail to secure internal approval to funding service diversion	<ul style="list-style-type: none"> YW have advised (email from YW dated 27 January 2015) that the investment needed for the sewer relocation has been prioritised into the programme. Following design (of the diversion) the scheme will be submitted for authorisation of expenditure. Residual risk now considered to be low.

Key project risk	Adopted mitigation measure
Delay to construction of service diversion.	<ul style="list-style-type: none"> • Maintain regular liaison with YW and ensure notification of any delay is received as early as possible. • Provide assistance (data etc.) with progressing design works.
Objection from local residents or businesses regarding temporary or permanent works	<ul style="list-style-type: none"> • Ongoing engagement. Clarity over what is planned and why it is necessary.
Technical or programme issues relating to procurement and delivery of suitable rock.	<ul style="list-style-type: none"> • Early contractor involvement.

Safety plan

7.3.2 The decisions made at this strategic stage considered the possible solutions for minimising the health and safety risks whilst still achieving the required coastal erosion risk management. The initial high level risks associated with the options considered include:

- construction and buildability
- operation and maintenance
- foreseeable emergency requirements
- alterations to the existing situation

7.3.3 On the basis of the initial risk assessment, and subject to any changes resulting from amendments to CDM legislation¹, the development of any PAR will include:

- early input from the CDM co-ordinator²
- use of early contractor involvement (ECI)
- health and safety input into detailed design, buildability and planning
- designers to identify specific risks/mitigation as part of the Design Risk Register
- identify specific residual risks to the contractor
- include safety, health and environment (SHE) boxes on design drawings
- provide the contractor with accurate and comprehensive pre-construction Information
- Public Safety Risk Assessment

7.3.4 During the construction phase, and subject to any changes resulting from amendments to CDM legislation, site health and safety will be the responsibility of the principal contractor supported by the CDM co-ordinator, supervisor, designers and client. The site will be subject to regular checks and audit by the principal contractor, supervisor and the client.

¹ Construction (Design and Management) Regulations (CDM) Regulation 2015 are due to come into force on 6th April 2015.

² The role of CDM co-ordinator in the previous CDM Regs 2007 has been removed and replaced with a new role of principal designer.

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Appendix A Project appraisal report data sheet

Entries required in clear boxes, as appropriate.

GENERAL DETAILS

Authority Project Ref. (as in forward plan):	YOS351C/001A/011A
Project Name (60 characters max.):	Runswick Bay Coastal Strategy
Promoting Authority: Defra ref (if known)	SBC8
Name	Scarborough Borough Council
Emergency Works:	<input type="checkbox"/> No <input type="checkbox"/> Yes/No
Strategy Plan Reference:	n/a
River Basin Management Plan	n/a
System Asset Management Plan	n/a
Shoreline Management Plan:	River Tyne to Flamborough Head
Project Type:	Strategy Plan
Shoreline Management Study/ Preliminary Study/ Strategy Plan/Prelim. Works to Strategy/ Project within Strategy/Stand-alone Project/ Strategy Implementation/Sustain SOS. Coast Protection/Sea Defence/Tidal Flood Defence/Non-Tidal Flood Defence/Flood Warning Tidal/Flood Warning - Fluvial/Special	

CONTRACT DETAILS

Estimated start date of works/study:	Apr 2013
Estimated duration in months:	Ongoing
Contract type*	Framework

(*Direct labour, Framework, Non Framework, Design/Construct)

COSTS

	APPLICATION (£000's)
Appraisal:	150
Costs for Agency approval:	2,540 (excluding external contributions)
Total Whole Life Costs (cash):	2,890

For breakdown of costs see Table in Section 6.4

CONTRIBUTIONS

Windfall Contributions:	
Deductible Contributions:	£350,000 cash
ERDF Grant:	
Other Ineligible Items:	

LOCATION - to be completed for all projects

EA Region/Area of project site (all projects):	North East
Name of watercourse (fluvial projects only):	n/a
District Council Area of project (all projects):	Scarborough Borough Council
EA Asset Management System Reference:	1221D901D0601C01 – 07 1221D901D0602C01
Grid Reference (all projects):	NZ 810160

(OS Grid reference of typical mid point of project in form ST064055)

DESCRIPTION

Specific town/district to benefit:

Runswick Bay Village, Port Mulgrave, Kettleless

Brief project description including essential elements of proposed project/study
(Maximum 3 lines each of 80 characters)

Strategy recommends rock armour scheme works to protect Runswick Bay Village, ongoing maintenance of existing defence works to south, bathing water quality improvement works, inspection and maintenance of whole frontage between Thorndale Shaft and Sandsend Ness.

DETAILS

Design standard (chance per year):	n/a	yrs
Existing standard of protection (chance per year)	n/a	yrs
Design life of project:	100	yrs
Fluvial design flow (fluvial projects only):	n/a	m ³ /s
Tidal design level (coastal/tidal projects only):	n/a	m
Length of river bank or shoreline improved:	220	m
Number of groynes (coastal projects only):	0	
Total length of groynes* (coastal projects only):	0	m
Beach Management Project?	No	Yes/No
Water Level Management (Env) Project?	No	Yes/No
Defence type (embankment, walls, storage etc)	Rock armour	

* i.e. total length of all groynes added together, ignore any river training groynes

ADDITIONAL AGREEMENTS:

Maintenance Agreement(s):	n/a	Not Applicable/Received/Awaited
EA Region Consent (LA Projects only):	North East	Not Applicable/Received/Awaited
Non Statutory Objectors:	n/a	Yes/No
Date Objections Cleared:	n/a	
Other:	n/a	Not Applicable/Received/Awaited

ENVIRONMENTAL CONSIDERATIONS

Natural England (or equivalent) letter:	Received	Not Applicable/Received/Awaited
Date received	17/02/15	

SITES OF INTERNATIONAL IMPORTANCE

(Answer Y if project is within, adjacent to or potentially affects the designated site)

Special Protection Area (SPA):	No	Yes/No
Special Area of Conservation (SAC):	No	Yes/No
Ramsar Site	No	Yes/No
World Heritage Site	No	Yes/No
Other (Biosphere Reserve etc)	No	Yes/No

SITES OF NATIONAL IMPORTANCE (Answer Y if project is within, adjacent to or potentially affects the designated site)

Environmentally Sensitive Area (ESA):	No	Yes/No
Site of Special Scientific Interest (SSSI):	Yes	Yes/No
National/Regional Landscape Designation:	No	Yes/No
National Park/The Broads	Yes	Yes/No
National Nature Reserve	No	Yes/No
AONB, RSA, RSC, other	No	Yes/No
Scheduled Ancient Monument	Yes	Yes/No
Other designated heritage sites	Yes	Yes/No

OTHER ENVIRONMENTAL CONSIDERATIONS

Listed structure consent	n/a	Not Applicable/Received/Awaited
Water Level Management Plan Prepared?	No	Yes/No
MMO consent required?	Yes	Not Applicable/Received/Awaited
Statutory Planning Approval Required	Yes	Yes/No/Not Applicable

COMPATIBILITY WITH OTHER PLANS

Shoreline Management Plan	Yes	Yes/No/Not Applicable
River Basin Management Plan	n/a	Yes/No/Not Applicable
Catchment Flood Management Plan	n/a	Yes/No/Not Applicable
Water Level Management Plan	n/a	Yes/No/Not Applicable
Local Environment Agency Plan	n/a	Yes/No/Not Applicable

SEA/ENVIRONMENTAL IMPACT ASSESSMENT

SEA	Agency voluntary	Statutory required/Agency voluntary/not applicable
EIA	n/a	Yes (schedule 1); Yes (schedule 2); SI1217; not applicable
SEA/EIA status	Final SEA prepared	Scoping report prepared/draft/draft advertised/final

Other agreements	Detail	Result	(Not Applicable/Received/Awaited for each)

Costs, benefits and scoring data

(Apportion to this phase if part of a strategy)

Local authorities only: For projects done under Coast Protection Act 1949, please separately identify: FRM = Benefits from reduction of asset flooding risk; CERM = Benefits from reduction of asset erosion risk

Benefit type (DEF: reduces risk (contributes to Defra SDA 27); CM: capital maintenance; FW: improves flood warning; ST: study; OTH: other projects)

DEF

LAND AREA

Total area of land to benefit:	6 approx. (Runswick Bay Village)		Ha
of which present use is:	FRM	CERM	
Agricultural:			0 Ha
Developed:			3 Ha
Environmental/Amenity:			3 Ha
Scheduled for development			0 Ha

PROPERTY & INFRASTRUCTURE PROTECTED

	Number		Value (£'000s)	
	FRM	CERM	FRM	CERM
¹ Residential		128		35,263
Commercial/Industrial		21		969
Critical Infrastructure				
Key Civic Sites				
Other (description below):				
Description:	This is the total number of properties considered to have some probability of loss.			

costs and Benefits

¹ Present value of total project whole life costs (£'000s):	1,400	
Project to meet statutory requirement? Y/N	No	
	Value (£'000s)	
	FRM	CERM
Present value of residential benefits:		18,271
Present value of commercial/industrial benefits:		502
Present value of public infrastructure benefits:		0
Present value of agricultural benefits:		0
Present value of environmental/amenity benefits:		0
¹ Present value of total benefits (FRM & CERM)	21,100	
Net present value:	19,700	
Benefit/cost ratio:	15.1 to 1	
Base date for estimate:	Nov. 2014	
FCERM-AG Decision Rule stage 3 applied	Yes	Yes/No
FCERM-AG Decision Rule stage 4 applied	Yes	Yes/No

OTHER OUTCOME MEASURE SCORING DETAILS

Super Output Area No*:	0.3-0.4	Indicate if deprived:	Yes	Yes/No
(*as ranked by Indices of Multiple Deprivation)				
Risk:	H	VH, H or N/A		
	Wetland	Saltmarsh/ Mudflat		
Net gain of BAP habitat:	0	0	Ha	
SSSI protected:	0	Ha		
Other Habitat:	0	Ha		
Heritage Sites:	0	"I or II", "II or other" or "N/A"		

Exemption Details (if exempt from OM scoring system)

Exempt from Scoring: No Yes/No

Reason (max 100 chars):

Appendix B List of reports produced

Title	Date	Author
Technical Memorandum - Runswick Bay Strategy Economics Update	02/07/2014	CH2M Hill
Technical Memorandum - Runswick Bay Water Quality	17/09/2013	CH2M Hill
Runswick Bay Coastal Strategy: Strategic Environmental Assessment - Environmental Report	Jul-14	CH2M Hill
Technical Memorandum - Runswick Bay Strategy Option Screening Technical Assessment	24/03/2014	CH2M Hill
Technical Note - Runswick Bay Slope Stability - Review of Previous Work	31/05/2013	Halcrow
Runswick Bay SEA - Environmental Report - Results of Public Consultation following Public Exhibition and Online Survey	09/07/2014	CH2M Hill
Option Screening Technical Assessment (for Steering Group Meeting)	Nov-13	CH2M Hill
Storm Surge Damage, 5th December 2013 (for Steering Group Meeting)	Feb-14	CH2M Hill
Option Appraisal Summary Tables	Nov-13	CH2M Hill
Walk-over Visual Inspections of Assets following UK East Coast Storm Surge of 5th December 2013	Dec-13	CH2M Hill
Runswick Bay Coastal Protection Scheme: Rapid Marine Ecology Overview	25/08/2014	University of Hull
Water Quality Issues at Runswick Bay: Nettledale Beck Diffuse Pollution Assessment	11/11/2015	University of Hull
Runswick Bay Coastal Strategy Final Draft Public Consultation Analysis	18/03/2015	Scarborough Borough Council

Appendix C Photographs

- Runswick Bay Aerial 1999
- Runswick Bay March 2002
- Runswick Bay July 2003
- Runswick Bay May 2012
- Runswick Bay December 2013

Other Appendices

Appendix D	Inspection Reports
Appendix E	LiDAR Mapping
Appendix F	Slope Stability Technical Note & Hazard Maps
Appendix G	Option Assessment Technical Note & Summary Table
Appendix H	Option Drawings & Photo Montages
Appendix I	Overtopping Assessment
Appendix J	SEA Consultation & Environmental Report
Appendix K	Bathing Water Quality Tech Note and Assessment Report
Appendix L	Natural England Letter of Comfort
Appendix M	Historical Papers Runswick and Port Mulgrave
Appendix N	Economic Appraisal
Appendix O	FCRM Funding Spreadsheets
Appendix P	Contributions Correspondence
Appendix Q	Expenditure Profile
Appendix R	Project Programme
Appendix S	Risk Register
Appendix T	Carbon Calculator
Appendix U	Procurement Strategy
Appendix V	Sustainability Register & Risk Assessment
Appendix W	Notes of Steering Group Meetings