Joint Defra/EA Flood and Coastal Erosion Risk Management R&D Programme

Annex B.7:

Case study no.7:

Assessment of the Newbiggin-by-the-Sea coast protection strategy

R&D Project Record FD2013/PR2

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Statement of use
This report provides guidance on the use of MCA and ASTs to assist in the appraisal of flood and coastal erosion risk management projects, strategies and policies. It should be noted that it does not constitute official government policy or guidance, which is unlikely to be available until work to develop the methodology and identify appropriate sources of data has been undertaken through pilot studies.

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1. Introduction

This report presents the MCA-based project appraisal process for the Newbiggin-by-the-Sea Coast Protection Strategy. This strategy assessment was based on the original appraisal process carried out for Wansbeck District Council in December 2003, which short-listed a number of defence options for Newbiggin Bay.

The information reported here is based on the following documents:

- Newbiggin Bay Coast Defence Strategy: Project Appraisal Report (Atkins, 2003a); and
- Newbiggin Seaside Strategy Draft Final Report (Atkins, 2003b).

1.1 Summary of the project area

Newbiggin-by-the-Sea is situated on the Northumberland coastline within Wansbeck District Council's (WDC) boundary. The village faces Newbiggin Bay, which is predominantly south-east facing and bounded by two rocky headlands, Church Point (north) and Spital Carrs (south). Main features at this frontage are a narrow sandy beach, the Southwest Promenade on the south side of the frontage and the Bridge Street sea wall. The entire bay is at risk from erosion, and part of the village is a flood risk zone.

Newbiggin lies within the Northumberland Shore SSSI, the Northumberland Coast Special Protection Area (SPA), and is recognised as a Ramsar site. Newbiggin is also part of the North Northumberland Heritage Coast designation.

There are two main environmental issues relating to the protection of Newbiggin bay:

- the effect of any proposed works on the intertidal bird feeding area in the north of the bay; and
- the covering of the geological SSSI in the south of the bay with sediment.

1.2 Existing defences

Historically Newbiggin beach was a recreational attraction due to the wide sandy beach. However, since the 1920s the beach has eroded, and this has necessitated sea walls to be constructed around the bay to provide protection from erosion and inundation. However, the beach has continued to erode and a significant quantity of beach material has been lost from the central areas of the bay. Monitoring has established an erosion rate of 0.2m/yr of the sand and clay levels in the centre of the bay.

The area surrounding Newbiggin has been extensively mined (both on land and offshore). This has been suggested as the cause of the subsidence in the area. Since the 1960s the bed of the bay has subsided 1-2m, leading to the redistribution of sediment throughout the bay (Atkins, 1996; 1998). Wave propagation into the bay has been altered by the subsidence, with an increase in wave height of approximately 10-15% in the last twenty years (UKCIP02). Waves approaching Newbiggin are typically from the North East, and extreme off-shore wave heights can exceed 8m. The impact of these waves maintains the erosive influence in the bay.

Newbiggin is currently protected by a variety of coastal defences. The northern part of the bay is protected by the Bridge Street stepped concrete sea wall, constructed in 1984. This provides protection against flooding and from erosive processes. The standard of protection offered is greater than 1 in 200 against overtopping. However, if there is a continued removal process of beach material, the base of the structure will be undermined. An estimate of the remaining life of the seawall has been given as 5 years (WDC).

The Southwest Promenade rock revetment was built in 1992; however, it is poor condition due to storm damage. Presently existing revetment stones can be displaced by storms with a 1 in 1 year return period. The standard of protection against complete collapse of the wall is in excess of 1 in 20 years. Nevertheless, continued erosion will reduce this standard to 1 in 10.

In terms of flooding, currently overtopping of the Southwest Promenade does not cause flooding. It is estimated that a 1 in 10 year storm will cause structural damage behind the revetment. However, if beach levels are allowed to continue to reduce, in five years this will decrease to a 1 in 1 year storm event.

1.3 The policy framework

The St. Abb's Head to the River Tyne Shoreline Management Plan, is the policy document that covers this stretch of coastline. The preferred policy option identified in the SMP for the area is to hold the line.

Other policies with relevance for this case study include (Atkins, 2003b):

- on the planning policy context, the Regional Planning Guidance for the North East, the Northumberland Structure Plan and the Wansbeck Local Plan; and
- on the regeneration context, the Regional Economic Strategy, the Northumberland Strategic Partnership Strategy and Action Plan, the South East Northumberland and North Tyneside Regeneration Initiative, the Framework for Tourism Development and the Wansbeck District Council Tourism Strategy.

1.4 Stakeholders and interested parties

Consultation was undertaken by the consultants with statutory and non-statutory consultees throughout the project, with particular emphasis given to consultation with the general public and affected bay users. The consultation with stakeholders was carried out through meetings and letters with all interested parties. In addition, a public exhibition was also undertaken in October 2003.

According to the Draft PAR (Atkins, 2003), all of the concerns and comments were addressed in the Environmental Scoping Report.

Due to time restrictions, it was not possible for RPA to consult the consultation files for this particular case study.

2. Definition of objectives and management options

The Newbiggin-by-the-Sea coast defence strategy states that:

"the key objective is to provide sustainable coast protection to the town of Newbiggin by the Sea that is technically robust, environmentally acceptable and economically justified".

The appraisal of strategic options has to take into account the policy options selected by the Shoreline Management Plans. In undertaking any construction works WDC will seek to "minimise adverse environmental effects and ensure opportunities are realised to further the conservation and enhancement of the environment as is consistent with statutory purposes" (Atkins, 2003a).

The selection of options was undertaken in two stages, involving an initial option appraisal, followed by the selection of the preferred option.

For the initial options appraisal an Options Report (Atkins, 2002, *in* Atkins 2003a) was produced which assessed a total of ten different schemes. Options were appraised through evaluation of technical, economic and environmental impacts. Consequently, four options were short-listed and the detailed appraisal stage was then undertaken. For this second stage, numerical and physical modelling was carried out to assess the technical performance of the options.

Table 2.1 illustrates the final four options taken forward for further appraisal in addition to the 'do-nothing' option, which will serve as the baseline for the appraisal.

Table 2.1 Description of short listed options

Option	Description	Comments
'Do-nothing'	• once current defence fails, no action will be undertaken to remedy this situation, or to carry out any emergency works to save life or property.	• beach levels will continue to fall, with the clay levels against the piles at Bridge Street likely to fall below critical levels in approximately 5 years; • permanent flooding of low lying areas of Newbiggin; • damage to rock revetment along the promenade will increase as beach levels decrease; • following breach of sea wall and collapse of the Southwest Promenade, the town of Newbiggin will be unprotected from erosion from the sea and flooding will occur in the northern part of the town.
Remedial Works	• refurbishment of the Southwest Promenade with new rock	• as beach levels lower in the centre of the bay, the Bridge

Table 2.1 Description of short listed options

Option	Description	Comments
	armour extended down to rockhead level - 2005 • slope stability works along the Southwest Promenade comprising soil nailing of the slope - 2005 • scour protection to the Bridge Street sea wall (200m) – 2005 • future scour protection to the Bridge Street sea wall (200m) – 2010 • replacement of the Bridge Street sea wall (400m) – 2030 • refurbishment of the Church Point walls (180m) - 2030	Street wall would become more exposed to waves, limiting the life of the wall and requiring a replacement in 30 years time • the Southwest Promenade would have a design life of 60 years • continued erosion of the beach would result in the loss of recreational use of the beach • the effect of coastal squeeze would result in the loss of intertidal habitats
Beach restoration and fishtail groyne	• restoration of the beach using beach nourishment derived from dredging • construction of a control structure to keep in place the imported sand material. A shore linked groyne or 'fishtail' groyne would be the preferred structure	• beach nourishment would provide protection against continued erosion • without the construction of a groyne, the imported sand would be lost off-shore and alongshore
Beach restoration and breakwater	This option is similar to the previous option however, it uses: • a detached off-shore breakwater as the control structure	• beach nourishment would provide protection against continued erosion • without the construction of a breakwater the imported sand would be lost off-shore and alongshore
Beach restoration and small northern harbour	• creation of harbour covering half of the bay, and beach nourishment on the other half • the southern Harbour arm would include an access roadway and would be set at a high level to prevent movement of sand to the north of the bay	• this option would provide a sheltered area to moor boats

For the purpose of this report, the following four options were considered in the appraisal:

- Option 1 - 'Do-nothing';
- Option 2 - Do minimum 'remedial works' option;
- Option 3 - Improve 'beach restoration and Fishtail Groyne' option; and
- Option 4 - Improve plus 'beach restoration and breakwater' option.

The main objective of the options is to minimise erosion. The onset of erosion under each option is expected to be:

- Option 1: erosion generally begins in year 1 (for some categories the onset of erosion is later than year 1, due to the location of particular characteristics as given in Table 5.1);
- Option 2: erosion is delayed until year 30, whereupon the option reverts to do-nothing;
- Option 3: erosion is delayed until year 100; and
- Option 4: erosion is delayed until year 100.

3. Structuring the problem

This section intends to break down the problem into its component parts, identifying the set of impacts and associated criteria that will be used to make the decision. In other words it carries out a screening exercise for the Newbiggin-by-the-Sea coast defence strategy.

3.1 Summary of the screening exercise

The screening exercise was based on the information provided in the PAR for the Newbiggin-by-the-Sea coast protection strategy. The results of the screening exercise are shown in Table 3.1. A more detailed screening is presented in Appendix A7.1.

Table 3.1 Table summarising the results in the screening exercise

Project name	Newbiggin-by-the-Sea coast protection strategy	
Category	**Approach used**	
	Monetary value	**Score**
Economic impacts		
Assets	✓	
Land use		✓
Transport	Not relevant	
Business development		✓
Environmental impacts		
Physical habitats		✓
Water quality	Not relevant	
Water quantity		
Natural processes		✓
Historical environment		✓
Landscape and visual amenity		✓
Social impacts		
Recreation		✓
Health and safety		✓
Availability and accessibility of services	Not relevant	
Equity	Not relevant	
Sense of community		✓
Cross-cutting impacts		
Policy integration		✓

As it can be seen from Table 3.1, the only impact category being valued in monetary terms is ‘Assets’. All other categories will be assessed using the ChaRT scoring system, devised for erosion (see Section 5).

4. Costs of options

The economic assessment of the options to protect Newbiggin-by-the-Sea was undertaken in accordance with the Flood and coastal defence project appraisal guidance (FCDPAG) series, in particular FCDPAG3.

The scheme development costs have been worked out in terms of whole life scheme costing. The construction and maintenance costs have been assessed on the basis of a 100-year design life. An optimism bias of 30% has been applied to all scheme costs to provide a risk contingency.

Table 4.1 summarises all costs for the options being considered. The costs reported by Atkins (2003a) in their draft report seem to suffer from some inaccuracies, in particular since the estimates gave the impression that the 'beach restoration and breakwater' option was less expensive than the do minimum option, which appears unlikely. For this reason the costs for the options were adjusted so that this case study could be continued.

The costs of the 'do minimum' option were recalculated to account for £32,500/year of non-construction costs, plus 2% of capital construction costs as consultancy costs. Note that these estimates are likely to be inaccurate, as RPA did not have access to all information to produce accurate estimates. They will however allow for the case study to proceed.

Table 4.1 Summary of total costs of the options being appraised in the Newbiggin Bay strategy

OPTIONS Costs	Do minimum (Remedial Works)	Improve Beach restoration + fishtail groyne	Improve Plus Beach restoration and breakwater
PV Costs from estimates	5,965	9,268	9,761
Optimism bias adjustment	3,579	5,561	5,857
Total PV costs for appraisal PVc	9,544	14,829	15,618

5. Assessment of impacts

5.1 Qualitative and quantitative assessment

The qualitative and quantitative assessment of the different options for each of the management units was carried out using the appraisal summary table for the main assessment (MA-AST) and it is presented in Appendix B7.2 to this Annex.

The assessment followed a stepped approach, starting with the qualitative assessment of all impact categories and moving to the quantitative assessment whenever information was available.

5.2 Monetary valuation of impacts

As it has been said before, the majority of impacts are due to erosion. For simplification in this case study, it is assumed properties that may be affected by flooding will first be eroded, hence, no flooding damages are calculated. Erosion along the frontage will result in:

- loss of promenade and adjacent residential and commercial properties;
- loss of 529 residential properties from erosion over next 20 years; and
- loss of 56 commercial properties from erosion next 20 years.

The average property value in Newbiggin area is £69,692 (Land Registry Site Jan-March 2004) such that the total loss of residential and commercial properties is estimated at £40.8 million over the next 20 years (PV).

5.3 Scoring of impacts

Impacts of the options have been scored using a ChaRT-type approach, where the scores are based on the numbers of a defined characteristic and the recovery time following flooding. As this case study relates to erosion, the approach has been refined so that the damages are based on the time when the characteristics would be lost as a result of erosion. The scores are calculated using the 'Erosion' worksheet of the FCDPAG3 spreadsheet allowing the delay provided by each option to be taken into consideration.

The characteristics used are summarised in Table 5.1. Recovery times are not relevant where erosion is the problem rather the delay provided by the options that determines differences between them in terms of damages. Where this delay is greater than the onset of erosion for the option (e.g. due to the particular characteristics being set back from the coastline immediately at threat), the time that erosion is expected to affect the characteristic in question is given in Table 5.1. It is also important to know if the impacts are one-offs (e.g. erosion of a property) or recur annually (e.g. loss of access to for recreation). This is also reported in Table 5.1

Table 5.1 Basis for the characteristic and recovery times for Newbiggin

Category	Characteristic used	Timing of erosion
Economic impacts		
Assets	Valued in monetary terms	
Land use	Loss of land (area)	Year 20, one-off impact
Transport	Not relevant – no significant transport infrastructure will be eroded	
Business development	Loss of commercial property (number of properties)	Year 20, one-off impact
Environmental impacts		
Physical habitats	Loss of intertidal habitats, SSSIs and Ramsar (area)	Year 1, one-off impact
Water quality	Not relevant – significant effect on water quality is not expected	
Water quantity	Not relevant – no water supplies will be affected	
Natural processes	Erosion rate (m/yr)	Year 1, annual impact
Historical environment	Loss of historical buildings (number of buildings)	Year 10, one-off impact
Landscape and visual amenity	Loss of land recognised for landscape value (area)	Year 20, one-off impact
Social impacts		
Recreation	Number of visits lost from onset of loss of footpaths	Year 10, annual impact
Health and safety	Number of people affected (residential properties x 2.3)	Year 15, one-off impact
Availability and accessibility of services	Not relevant – no significant impact on services	
Equity	Number of people affected (residential properties x 2.3)	Year 15, one-off impact
Sense of community	Number of people affected (residential properties x 2.3)	Year 15, one-off impact
Cross-cutting impacts		
Policy integration	Number of policies affected	Year 5, one-off impact

The scores are calculated automatically by the spreadsheet once the characteristic number (or area, etc.), year and type of impact are entered. Table 5.2 provides a summary of the scores for each option.

Table 5.2 ChaRT Scores for Newbiggin-by-the-Sea case study

Category	'Do-nothing'	Do minimum	Improve	Improve plus
Land Use	0	85	100	100
Transport	Not relevant			
Business development	0	85	100	100
Physical habitats	0	67	100	100
Water quality	Not relevant			
Water quantity	Not relevant			
Natural processes	100	33	0	0
Historical environment	0	77	100	100
Landscape and visual amenity	0	85	100	100
Recreation	0	77	100	100
Health and safety	0	81	100	100
Availability and accessibility of services	Not relevant			
Equity	0	81	100	100
Sense of community	0	81	100	100
Policy Integration	0	72	100	100

6. Weighting and comparison of options

6.1 Source of weights

In all cases, the Constrained Random Weight Generator (CRWG) was used to calculate minimum, maximum and average total weighted scores and total weighted incremental scores for the options under consideration. These, along with interpretation, are provided in the summary tables for each management unit.

6.2 Comparison of options

Table 6.1 provides a summary table of monetary costs and benefits and scores for Newbiggin.

From the Table, Option 2: Do minimum is the option with the highest benefit-cost ratio and, hence, is the starting option for the appraisal. The next highest options are Options 3 and 4 (improve and Improve+ Sub-options), which represent sub-options. To be justified over Option 2: Do minimum, both of these options must achieve an incremental benefit-cost ratio of 1.5. Neither of the Improve sub-options, achieve this and require additional intangible benefits to achieve the criterion, with Option 3 requiring an additional £5,804,500 and Option 4 an additional £6,988,000 of intangible benefit.

In considering the options, the first observation that should be made is that both of the Improve options score exactly the same on the intangible scoring index. As such, Option 4 can never have a higher intangible benefit than Option 3. This combined with the fact that Option 4 requires a higher level of additional benefit than Option 3 to reach the criterion, means that Option 4 can never be preferred over Option 3. The remainder of the appraisal is thus focussed on whether Option 3 is likely to be preferred over Option 2.

Analysis with the CRWG provides the lower, middle and upper bound estimates of the intangible incremental benefit of Option 3 relative to Option 2 expressed in units on the scoring index. These are 10.7, 18.1 and 23.6 respectively.

Combining these with the magnitude of the additional benefits required to reach the 1.5 criterion suggests that the value of a point on the index (k in pounds) would have to be, at very least, greater than £246,261 (where this reflects the maximum incremental benefit score achievable with the most favourable weight combination - however realistic/unrealistic this is). If the value of a single point (k) were taken as being £246,261, this implies that the total value of the intangible assets being considered in the 100 point scoring appraisal would have to be greater than 100 x £246,261. In other words, if Option 3: Improve were to be the preferred option, this would imply that the total value of intangible assets considered in the AST and scoring matrix would have to be greater than £24,626,100 at the very least. This is a value in excess of the total PV damage costs of the ‘do-nothing’ option of £20,505,000, which represent maximum

possible benefits of protection at Newbiggin valued under the traditional monetary approach to economic value. In other words, for Option 3: Improve to be preferred, the intangible assets at Newbiggin would have to have a value of at least 1.25 times those of the assets valued under the traditional monetary approach to economic value. As this is very unlikely to be the case, it is concluded that Option 3: Improve is not justified.

Option 2: Do minimum is the preferred Option.

6.1 Summary table of costs and benefits – Newbiggin

	Option 1: Do-nothing	Option 2: Do minimum	Option 3: Improve			Option 4: Improve +		
PV costs from estimates								
Optimism bias adjustment								
Total PV Costs for appraisal PVc		4,528,000	14,829,000			15,618,000		
PV damage PVd								
PV damage avoided								
PV assets Pva	20,505	10,305,000	657,000			657,000		
PV asset protection benefits		10,200,000	19,847,000			19,847,000		
Total PV benefits PVb		10,200,000	19,847,000			19,847,000		
Net Present Value NPV		5,672,000	5,019,000			4,230,000		
Average benefit/cost ratio		2.25	1.34			1.27 (relative to Option 2)		
Incremental benefit/cost ratio			0.94			0.87 (relative to Option 2)		
Required Incremental B/C ratio			1.5			1.5 (relative to Option 2)		
Required Additional Benefits to Meet Criterion			5804500			6988000		
			Min	**Ave**	**Max**	**Min**	**Ave**	**Max**
Weighted Score (CRWG)			79.8	**93.8**	98.9	79.8	**93.8**	98.9
Scored Intangible Incremental Benefit of Moving to the Next Option (CRWG)			10.7	**18.1**	23.6	10.7	**18.1**	23.6
Comments		N/A	Justified when value per point (k) exceeds	Justified when value per point (k) exceeds	Justified when value per point (k) exceeds	Justified when value per point (k) exceeds	Justified when value per point (k) exceeds	Justified when value per point (k) exceeds
Implied additional benefits per point (k) to meet criterion		N/A	£540,396	£320,418	£246,261	£650,579	£385,749	£296,472

7. References

Atkins 2003a. Newbiggin Bay Coast Defence Strategy Project Appraisal Report – Consultation Draft, Report produced for Wansbeck District Council, December 2003.

Atkins 2003. Newbiggin Seaside Strategy – Draft Final Report, report produced for Wansbeck District Council, December 2003.

Atkins 1998. Newbiggin Bay Coastal Feasibilty Study, Final report, 1998. prepared for Wansbeck District Council

Atkins 1996. Newbiggin Bay Coastal Processes Study, Final report, February 1996. prepared for Wansbeck District Council

UKCIP02 Climate Change Scenarios for the United Kingdom: The UKCIP02 Scientific Report, April 2002

Appendix A7.1:

Appraisal summary table for high-level Screening – S-AST for the Newbiggin-by-the-Sea coast protection strategy

Table A7.1 Appraisal summary table for flood management and coastal defence – high level screening

Project name	**Newbiggin Bay coast defence strategy**			
Assumptions:	The high level screening will correspond to the 'do-nothing' option.			
Impact category	**Impact likely? (Y/N)**	**Impact details**	**Qualitative or quantitative assessment**	**Monetary valuation**
Economic Impacts				
Assets	Y	• Loss of promenade and adjacent residential and commercial properties • Loss of frontage in 5 years • Loss of 529 residential properties from erosion over next 20 years • Loss of 56 commercial properties from erosion next 20 years • Los of promenade in less than 2 years • Loss of 54 residential homes from flooding • Loss of 16 commercial properties from flooding • Average property value in Newbiggin area is £69,692 (Land Registry Site Jan-March 2004) Total loss value: £40.8 million over the next 20 years (PV)	✓	✓
Land use	Y	• Change from residential and commercial land use to abandoned areas with derelict/damaged properties. • 1-5 years: 13,000m^2 lost due to erosion • 5-10 years: 28,000m^2 lost due to erosion • 10-20 years: 98,000m^2 lost due to erosion	✓	
Transport	N			
Business development	Y	• Commercial loss of fishing industry • Decline in tourism as sites of interest are lost and recreational use of beach is no longer possible • Loss of 56 commercial properties from erosion next 20 years • Loss of 16 commercial properties from flooding • 56 + 16 • Total loss: £5 million • Potential loss of a tourist industry valued at £25 million in 2002 (Wansbeck District Council)	✓	
Environmental impacts				
Physical habitats	Y	• Due to continued erosive processes loss of intertidal area as the sea encroaches upon the seawall. This would result in the loss of SSSI and SPA/Ramsar sites; • 218,000m^2 : loss of SPA/Ramsar sites	✓	

Table A7.1 Appraisal summary table for flood management and coastal defence – high level screening

Project name	**Newbiggin Bay coast defence strategy**			
Assumptions:	The high level screening will correspond to the 'do-nothing' option.			
Impact category	**Impact likely? (Y/N)**	**Impact details**	**Qualitative or quantitative assessment**	**Monetary valuation**
		• Extra 49,000 m^2:loss of Northumberland Shore SSSI's • Extra 49,000 m^2 Cresswell and Newbiggin Shores SSSI's		
Water quality	N			
Water quantity	N			
Natural processes	Y	• Increased wave penetrations and continued erosion of Newbiggin beach	✓	
Historical Environment	Y	• Loss of North Northumberland Heritage Coast • Loss of historic buildings • St Bartholomew's Church threatened by erosion. Assumed value x 2.5 residential property. Total loss: £174,230	✓	
Landscape and visual amenity	Y	• The beach will retreat changing the coastal landscape • The degraded seawall will alter the visual amenity of the town.	✓	
Social impacts				
Recreation	Y	• Potential for water sports lost • Loss of promenade • Slipway will be lost, reducing accessibility	✓	
Health and safety	Y	• Residents and visitors will be at risk from flooding events • Degrading defences may create a risk • Boat launching will become dangerous due to wave reflections • The stability of the lifeboat slipway will be threatened • Continued erosion the land behind the promenade has a safety factor of less than 1 • Loss of lifeboat facility assumed to have the same value as residential property £69,692	✓	
Availability and accessibility of services	N			
Equity	**Y**	Loss of tourism will reduce number of jobs available locally and is likely to increase deprivation.	✓	

Table A7.1 Appraisal summary table for flood management and coastal defence – high level screening

Project name	**Newbiggin Bay coast defence strategy**			
Assumptions:	The high level screening will correspond to the 'do-nothing' option.			
Impact category	**Impact likely? (Y/N)**	**Impact details**	**Qualitative or quantitative assessment**	**Monetary valuation**
Sense of community	**Y**	Loss of tourism based jobs and properties are likely to result in people having to move out of the local area.	✓	
Cross-cutting impacts				
Policy Integration	**Y**	• Regeneration projects relevant to Newbiggin may be adversely affected with the adoption of this option. • This option will conflict with the current 'Hold the Line' policy adopted by the Newbiggin Strategy and the SMP	✓	

Appendix A7.2:

Appraisal summary table for main assessment – MA-AST for the Newbiggin-by-the-Sea coast protection strategy

Table A7.2.1 Appraisal summary table for flood management and coastal defence – main assessment

Project name		Newbiggin-by-the-Sea Coast Defence Strategy			
Description of option		'Do-nothing'			
Description of area affected by option		The Northumberland village of Newbiggin-by-the-Sea faces Newbiggin Bay. The bay is characterised by a narrow sandy beach and promenade. The area is of significant environmental importance, having a number of national and international designations. There is a significant risk from erosion and some flooding.			
Impact category	**Impact likely? (Y/N)**	**Qualitative description of impacts**	**Quantitative assessment of impacts (no. units/monetary)**	**Score**	**Monetary value**
Economic impacts					
Assets	Y	Loss of promenade and adjacent residential and commercial properties	Loss of frontage in 5 years Loss of 529 residential properties from erosion over next 20 years Loss of 56 commercial properties from erosion next 20 years Los of promenade in less than 2 years Loss of 54 residential homes from flooding Loss of 16 commercial properties from flooding Average property value in Newbiggin area is £69,692 (Land Registry Site Jan-March 2004) Total loss value: £40.8 million over the next 20 years (PV)		Damages £40.8 million over the next 20 years (PV)
Land use	Y	Change from residential and commercial land use to abandoned areas with derelict/damaged properties.	1-5 years: 13,000m^2 lost due to erosion 5-10 years: 28,000m^2 lost due to erosion 10-20 years: 98,000m^2 lost due to erosion	0	
Transport	N			-	-

Table A7.2.1 Appraisal summary table for flood management and coastal defence – main assessment

Project name		Newbiggin-by-the-Sea Coast Defence Strategy			
Description of option		'Do-nothing'			
Description of area affected by option		The Northumberland village of Newbiggin-by-the-Sea faces Newbiggin Bay. The bay is characterised by a narrow sandy beach and promenade. The area is of significant environmental importance, having a number of national and international designations. There is a significant risk from erosion and some flooding.			
Impact category	**Impact likely? (Y/N)**	**Qualitative description of impacts**	**Quantitative assessment of impacts (no. units/monetary)**	**Score**	**Monetary value**
Business development	Y	Commercial loss of fishing industry Decline in tourism as sites of interest are lost and recreational use of beach is no longer possible	Loss of 56 commercial properties from erosion, next 20 years Loss of 16 commercial properties from flooding 56 + 16 Total loss: £5 million Potential loss of a tourist industry valued at £25 million in 2002 (Wansbeck District Council)	0	
Environmental impacts					
Physical habitats	Y	Due to continued erosive processes loss of intertidal area as the sea encroaches upon the seawall. This would result in the loss of SSSI and SPA/Ramsar sites	218,000m^2 : loss of SPA/Ramsar sites Extra 49,000 m^2: loss of Northumberland Shore SSSI's Extra 49,000 m^2: Cresswell and Newbiggin Shores SSSI's	0	
Water quality	N				
Water quantity	N				
Natural processes	Y	Increased wave penetrations and continued erosion of Newbiggin beach		100	
Historical Environment	Y	Loss of North Northumberland Heritage Coast Loss of historic buildings	St Bartholomew's Church threatened by erosion. Assumed value x 2.5 residential property. Total loss: £174,230	0	

Table A7.2.1 Appraisal summary table for flood management and coastal defence – main assessment

Project name		Newbiggin-by-the-Sea Coast Defence Strategy			
Description of option		'Do-nothing'			
Description of area affected by option		The Northumberland village of Newbiggin-by-the-Sea faces Newbiggin Bay. The bay is characterised by a narrow sandy beach and promenade. The area is of significant environmental importance, having a number of national and international designations. There is a significant risk from erosion and some flooding.			
Impact category	**Impact likely? (Y/N)**	**Qualitative description of impacts**	**Quantitative assessment of impacts (no. units/monetary)**	**Score**	**Monetary value**
Landscape and visual amenity	Y	The beach will retreat changing the coastal landscape The degraded seawall will alter the visual amenity of the town.		0	
Social Impacts					
Recreation	Y	Potential loss of water sports Loss of promenade Slipway will be lost, reducing accessibility		0	
Health and safety	Y	Residents and visitors will be at risk from flooding events Degrading defences may create a risk Boat launching will become dangerous due to wave reflections The stability of the lifeboat slipway will be threatened	Continued erosion the land behind the promenade has a safety factor of less than 1 Loss of lifeboat facility assumed to have the same value as residential property £69,692	0	
Availability and accessibility of services	N				
Equity	Y	Loss of tourism will reduce number of jobs available locally and is likely to increase deprivation.		0	
Sense of community	Y	Loss of tourism based jobs and properties are likely to result in people having to move out of the local area.		0	
Cross-cutting impacts					

Table A7.2.1 Appraisal summary table for flood management and coastal defence – main assessment

Project name		Newbiggin-by-the-Sea Coast Defence Strategy			
Description of option		'Do-nothing'			
Description of area affected by option		The Northumberland village of Newbiggin-by-the-Sea faces Newbiggin Bay. The bay is characterised by a narrow sandy beach and promenade. The area is of significant environmental importance, having a number of national and international designations. There is a significant risk from erosion and some flooding.			
Impact category	**Impact likely? (Y/N)**	**Qualitative description of impacts**	**Quantitative assessment of impacts (no. units/monetary)**	**Score**	**Monetary value**
Policy integration	Y	Regeneration projects relevant to Newbiggin may be adversely affected with the adoption of this option. This option will conflict with the current 'Hold the Line' policy adopted by the Newbiggin Strategy and the SMP		0	

Table A7.2.2 Appraisal summary table for flood management and coastal defence – main assessment

Project name		Newbiggin-by-the-Sea Coast Defence Strategy			
Description of option		Do minimum (maintains 1:200 for up to 30 years. Standard after this time is unknown)			
Description of area affected by option		The Northumberland village of Newbiggin-by-the-Sea faces Newbiggin Bay. The bay is characterised by a narrow sandy beach and promenade. The area is of significant environmental importance, having a number of national and international designations. There is a significant risk from erosion and some flooding.			
Impact category	**Impact likely? (Y/N)**	**Qualitative description of impacts**	**Quantitative assessment of impacts (no. units/monetary)**	**Score**	**Monetary value**
Economic impacts					
Assets	Y	After 20 years would result in complete loss of Newbiggin Bay	Loss of frontage in 5 years Loss of 529 residential properties from erosion over next 20 years Loss of 56 commercial properties from erosion next 20 years Los of promenade in less than 2 years Loss of 54 residential homes from flooding Loss of 16 commercial properties from flooding Average property value in Newbiggin area is £69,692 (Land Registry Site Jan-March 2004) Total loss value: £40.8 million over the next 20 years (PV)	-	Damages: £40.8 million after 20 years (PV)
Land use	Y	After 20 years there will be a change from residential and commercial land use to abandoned areas with derelict/damaged properties		85	
Transport	N				

Table A7.2.2 Appraisal summary table for flood management and coastal defence – main assessment

Project name		Newbiggin-by-the-Sea Coast Defence Strategy			
Description of option		Do minimum (maintains 1:200 for up to 30 years. Standard after this time is unknown)			
Description of area affected by option		The Northumberland village of Newbiggin-by-the-Sea faces Newbiggin Bay. The bay is characterised by a narrow sandy beach and promenade. The area is of significant environmental importance, having a number of national and international designations. There is a significant risk from erosion and some flooding.			
Impact category	**Impact likely? (Y/N)**	**Qualitative description of impacts**	**Quantitative assessment of impacts (no. units/monetary)**	**Score**	**Monetary value**
Business development	Y	Commercial loss of fishing industry Decline in tourism as sites of interest are lost and recreational use of beach is no longer possible. However this would be delayed for 20 years.	Loss of 56 commercial properties from erosion next 20 years Loss of 16 commercial properties from flooding Total loss: £5 million (calculated using average residential property value 2004) After 20 years, potential loss of a tourist industry valued at £25 million in 2002 (Wansbeck District Council)	85	
Environmental impacts					
Physical habitats	Y	Loss of intertidal habitats Increased sediment load in water column during construction may impact on shellfish stocks. Losses would occur at year 1		67	
Water quality	N				
Water quantity	N				
Natural processes	Y	Continued erosion as the scheme would not stabilise the beach. Increased wave penetration		33	
Historical environment	Y	Eventual loss of North Northumberland Heritage Coast due to continued erosion	St Bartholomew's Church threatened by erosion. Assumed value x2.5 residential property. Total loss: £174,230	77	
Landscape and visual amenity	Y	High visual impact of additional armour stone Loss of sand beach due to erosion After 30 years the impacts of this option will be the same as the 'do-nothing'.		85	
Social Impacts					

Table A7.2.2 Appraisal summary table for flood management and coastal defence – main assessment

Project name	Newbiggin-by-the-Sea Coast Defence Strategy
Description of option	Do minimum (maintains 1:200 for up to 30 years. Standard after this time is unknown)
Description of area affected by option	The Northumberland village of Newbiggin-by-the-Sea faces Newbiggin Bay. The bay is characterised by a narrow sandy beach and promenade. The area is of significant environmental importance, having a number of national and international designations. There is a significant risk from erosion and some flooding.

Impact category	**Impact likely? (Y/N)**	**Qualitative description of impacts**	**Quantitative assessment of impacts (no. units/monetary)**	**Score**	**Monetary value**
Recreation	Y	Erosion of beach will result in the loss of the beach area for recreational purposes in most areas Increased wave penetration will make launching and retrieving boats more difficult	People will seek alternative locations for leisure activities	77	
Health and safety	Y	Residential safety from flooding provided for up to 30 years After 30 years increased risk of slope instability along southwest promenade		81	
Availability and accessibility of services	N				
Equity	Y	After 30 years, loss of tourism will reduce number of jobs available locally and is likely to increase deprivation		81	
Sense of community		The economic viability of the village will be removed due to the inaccessibility of the beach			
Cross-cutting impacts					
Policy integration	Y	Regeneration projects relevant to Newbiggin may be adversely affected with the adoption of this option After 30 years this option will conflict with the current 'Hold the Line' policy adopted by the Newbiggin Strategy and the SMP		72	

Table A7.2.3 Appraisal summary table for flood management and coastal defence – main assessment

Project name		Newbiggin-by-the-Sea coast defence strategy			
Description of option		Improve *(Option 3)*			
Description of area affected by option		The Northumberland village of Newbiggin-by-the-Sea faces Newbiggin Bay. The bay is characterised by a narrow sandy beach and promenade. The area is of significant environmental importance, having a number of national and international designations. There is a significant risk from erosion and some flooding.			
Impact category	**Impact likely? (Y/N)**	**Qualitative description of impacts**	**Quantitative assessment of impacts (no. units/monetary)**	**Score**	**Monetary value**
Economic impacts					
Assets	Y	Greater protection from flood events and erosion Residential and commercial property protected to a greater extent		-	Benefits: £40.8 million (PV)
Land use	N			100	
Transport	Y	Increased traffic disturbance due to construction			
Business development	Y	Fishing industry would benefit from a stabilised beach Potential for improvement to the tourist industry in the area Improved commercial fishing due to increased mooring and sheltering However fishing would not be able to occur during construction and the presence of groynes could result in salmon netting no longer being viable	Fishermen would require compensation as following construction net may be permanently affected	100	
Environmental impacts					
Physical habitats	Y	The intertidal habitats will be sustained. Rock structures will provide bird roosting sites and habitats for fish Increased sediment load may have adverse effects on local shellfish stocks		100	
Water quality	N				
Water quantity	N				

Table A7.2.3 Appraisal summary table for flood management and coastal defence – main assessment

Project name		Newbiggin-by-the-Sea coast defence strategy			
Description of option		Improve *(Option 3)*			
Description of area affected by option		The Northumberland village of Newbiggin-by-the-Sea faces Newbiggin Bay. The bay is characterised by a narrow sandy beach and promenade. The area is of significant environmental importance, having a number of national and international designations. There is a significant risk from erosion and some flooding.			
Impact category	**Impact likely? (Y/N)**	**Qualitative description of impacts**	**Quantitative assessment of impacts (no. units/monetary)**	**Score**	**Monetary value**
Natural processes	Y	Present erosion problem would be stabilised without affecting sediment exchange with other areas		0	
Historical environment	Y	Protection of North Northumberland Heritage Coast		100	
Landscape and visual amenity	Y	The beach would be maintained New rock/groyne structures would have a negative visual impact on the bay		100	
Social impacts					
Recreation	Y	Beach restoration would widen the scope for beach/water related activities in the area		100	
Health and safety	Y	Residents would have greater protection from flooding events and erosion		100	
Availability and accessibility of services	Y	Access to life-boat service improved		100	
Equity	Y	Beach amenity could create more jobs for the local population, reducing deprivation in the area		100	
Sense of community	Y	Increased sense of community as resident no longer at risk from flooding or erosive processes.		100	
Cross-cutting impacts					

Table A7.2.3 Appraisal summary table for flood management and coastal defence – main assessment

Project name		Newbiggin-by-the-Sea coast defence strategy			
Description of option		Improve *(Option 3)*			
Description of area affected by option		The Northumberland village of Newbiggin-by-the-Sea faces Newbiggin Bay. The bay is characterised by a narrow sandy beach and promenade. The area is of significant environmental importance, having a number of national and international designations. There is a significant risk from erosion and some flooding.			
Impact category	**Impact likely? (Y/N)**	**Qualitative description of impacts**	**Quantitative assessment of impacts (no. units/monetary)**	**Score**	**Monetary value**
Policy integration	Y	Regeneration projects relevant to Newbiggin would benefit from the positive impacts of this option. This option does not entail conflict with the policy of 'Hold the Line' adopted by the Newbiggin Strategy and the SMP		100	

Table A7.2.4 Appraisal summary table for flood management and coastal defence – main assessment

Project name		Newbiggin-by-the-Sea Coast Defence Strategy			
Description of option		Improve Plus *(Option 4)*			
Description of area affected by option		The Northumberland village of Newbiggin-by-the-Sea faces Newbiggin Bay. The bay is characterised by a narrow sandy beach and promenade. The area is of significant environmental importance, having a number of national and international designations. There is a significant risk from erosion and some flooding.			
Impact category	**Impact likely? (Y/N)**	**Qualitative description of impacts**	**Quantitative assessment of impacts (no. units/monetary)**	**Score**	**Monetary value**
Economic impacts					
Assets	Y	Residential and commercial property protected from erosion, and protected to a greater extent from flooding events Protection of promenade		-	Benefits: £40.8 million (PV)
Land use	N			100	
Transport	Y	Increased traffic disturbance due to construction			
Business development	Y	Potential for improvement to the tourist industry in the area Fishing industry would benefit from a stabilised beach Improved commercial fishing due to increased mooring and sheltering Reduced wave activity would improve navigation in the bay However fishing would not be able to occur during construction and the presence of a central groyne could result in salmon netting no longer being viable	Fishermen would require compensation as following construction net may be permanently affected	100	
Environmental impacts					
Physical habitats	Y	Scheme will create additional intertidal habitats Increased armourstone will provide additional fish habitats Increased sediment load may have adverse effects on local shellfish stocks		100	

Table A7.2.4 Appraisal summary table for flood management and coastal defence – main assessment

Project name		Newbiggin-by-the-Sea Coast Defence Strategy			
Description of option		Improve Plus *(Option 4)*			
Description of area affected by option		The Northumberland village of Newbiggin-by-the-Sea faces Newbiggin Bay. The bay is characterised by a narrow sandy beach and promenade. The area is of significant environmental importance, having a number of national and international designations. There is a significant risk from erosion and some flooding.			
Impact category	**Impact likely? (Y/N)**	**Qualitative description of impacts**	**Quantitative assessment of impacts (no. units/monetary)**	**Score**	**Monetary value**
Water quality	Y	Increased risk of pollution due to potential for water sports and recreation			
Water quantity	N				
Natural processes	Y	Breakwater would reduce wave impact on the shore. Combined with beach nourishment this would reduce erosive processes		0	
Historical Environment	Y	Protection of North Northumberland Heritage Coast		100	
Landscape and visual amenity	Y	New rock/groyne structures would have a negative visual impact on the bay		100	
Social Impacts					
Recreation	Y	Breakwater construction would force boats out into unsheltered areas		100	
Health and safety	Y	Residents would have greater protection from flooding events and erosion		100	
Availability and accessibility of services	Y	Access to life-boat service improved		100	
Equity	Y	Beach amenity could create more jobs for the local population, reducing deprivation in the area		100	
Sense of community	Y	Increased sense of community as resident no longer at risk from flooding or erosive processes.		100	

Table A7.2.4 Appraisal summary table for flood management and coastal defence – main assessment

Project name		Newbiggin-by-the-Sea Coast Defence Strategy			
Description of option		Improve Plus *(Option 4)*			
Description of area affected by option		The Northumberland village of Newbiggin-by-the-Sea faces Newbiggin Bay. The bay is characterised by a narrow sandy beach and promenade. The area is of significant environmental importance, having a number of national and international designations. There is a significant risk from erosion and some flooding.			
Impact category	**Impact likely? (Y/N)**	**Qualitative description of impacts**	**Quantitative assessment of impacts (no. units/monetary)**	**Score**	**Monetary value**
Cross-cutting impacts					
Policy integration	Y	Regeneration projects relevant to Newbiggin would benefit from the positive impacts of this option. This option does not entail conflict with the policy of 'Hold the Line' adopted by the Newbiggin Strategy and the SMP		100	