Humber Estuary Coastal Authorities Group

Flamborough Head to Gibraltar Point Shoreline Management Plan

Non-Technical Summary

Draft Plan

December 2010




Prepared for:

Humber Estuary Coastal Authorities Group


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Revision Schedule

Flamborough Head to Gibraltar Point Shoreline Management Plan
Non-Technical Summary
December 2010

Rev	Date	Details	Prepared by	Reviewed by	Approved by
CD1	6 November 2009	Consultation draft	**Jonathan Short** Assistant Coastal Engineer **Laura Mitchell** Engineer	**Dr John Pos** Associate	**David Dales** Director
1.0	16 June 2010	Draft Plan	**Jonathan Short** Assistant Coastal Engineer **Laura Mitchell** Engineer	**David Dales** Director **Dr John Pos** Associate	**David Dales** Director
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Table of Contents

Glossary

Term	Definition
Accretion	The addition of newly deposited sediment leading to a relative rise in elevation of a beach or surface.
Adaptation	The need for a community or habitat to modify the way it functions in response to a changing environment.
Agricultural land classification	An assessment that provides an indication of the quality of agricultural land as a grade from 1 (best quality) to 5 (poorest quality). The classification system is the responsibility of Defra.
Appropriate Assessment (AA)	An Appropriate Assessment is required to comply with the requirements of the EU Habitats Directive for land use plans that are likely to have a significant effect on a Natura 2000 site.
Baseline scenarios	Concept used in developing a SMP to illustrate the role of shoreline management by assessing the effect of two contrasting management approaches – 'no active intervention' and 'with present management' – for all frontages and all epochs.
Beach nourishment	Artificial process of replenishing the beach with material from another source.
Benefits (related to issue)	The service that a feature provides. In other words, why people value or use a feature. For example, a nature reserve, as well as helping to preserve biodiversity and meet national legislation, may also provide a recreation outlet much like a sports centre provides a recreation function.
Climate change	Long-term change in the patterns of average weather. Its relevance to shoreline management concerns its effect on sea levels, current patterns and storminess.
Coastal squeeze	The reduction in habitat area that can arise if the natural landward migration of a habitat due to sea level rise is prevented by the fixing of the high water mark, for example by sea wall.
Conservation Areas	Places of special architectural or historic interest deserving special protection which are designated as conservation areas
Department for Environment, Food and Rural Affairs (Defra)	Government department which is responsible for the environment, for food and farming, and for rural matters.
Downdrift	Relates to the movement of beach materials along the shoreline. Places that are downdrift receive an input of sediment from erosion of 'updrift' areas.
Epoch	A period of time. For SMPs, three epochs are defined: Epoch 1: present day to 2025 Epoch 2: 2025 to 2055 Epoch 3: 2055 to 2105
Erosion	The process of removing sediment from the cliff or beach.
EU Birds Directive	European legislation on the conservation of birds.
EU Habitats Directive	European legislation on the conservation of habitats.
Feature	Something tangible that provides a service to society in one form or

Term	Definition
	another or, more simply, benefits certain aspects of society by its very existence. Usually this will be in a specific place and relevant to the SMP.
Flood tide	Rising tide, part of the tidal cycle between low water and the next high water.
Foreshore	Zone on the beach between the high water and low water marks.
Groyne	Coast protection structure built perpendicular to the shoreline and designed to trap sediment (shingle, sand and mud).
Heritage Coast	A non-statutory designation by Natural England for coasts of scenic quality, their largely undeveloped nature and their special wildlife and historic interest. Local authorities assist with the management of Heritage Coasts.
Intent of management	A vision for the future of shoreline management along a certain frontage for all epochs. This vision is then translated to specific policies for the purpose of management.
Intertidal	The area between high and low tide.
Listed building	A building or other structure officially designated as being of special architectural, historical or cultural significance.
Longshore transport/ drift	The natural transport of beach material along the coast.
Maintain	That the value of a feature is not allowed to deteriorate
Mean sea level	Average height of the sea surface over a 19-year period.
Mean high water	The average level of all high waters observed over a sufficiently long period.
Mean low water	The average level of all low waters observed over a sufficiently long period.
Mudflat	Low-lying muddy land that is covered at high tide and exposed at low tide.
National Nature Reserves	These represent some of the most important natural and semi-natural ecosystems in Great Britain and are managed to protect the conservation value of the habitats that occur on these sites. These are a statutory designation by Natural England.
Natura 2000	A term used commonly to refer to Special Protection Areas and Special Areas of Conservation.
Objective	A desired state to be achieved in the future. An objective is set, through consultation with key parties, to encourage the resolution of an issue or a range of issues.
Offshore zone	Extends from the low water mark seawards.
Outflanking	The process whereby erosion occurs immediately adjacent to a defended section of coast, eventually resulting in the land behind the defence being eroded from the side.
Policy	In this context, “policy” refers to the generic shoreline management options (no active intervention, hold the existing line of defence, managed realignment and advance the existing line of defence)

Term	Definition
Policy Development Zone (PDZ)	A length of coastline defined to assess similar issues and interactions to examine and develop management scenarios. These zones are only used to develop policy.
Principle	High-level statement outlining a goal or vision agreed by partner authorities and used to develop the SMP.
Ramsar site	Area designated under the Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat, 1971
Regional Spatial Strategy (RSS)	A collection of regional development documents that outline how a regional assembly will manage planning in their area.
Residual life	Period of time until a defence has deteriorated to a state in which it no longer performs its function
Rollback	The process by which assets physically move further inland away from the threat of coastal erosion.
Revetment	A structure at the rear of the beach to provide protection to the cliff, dune or hard structure at the rear of the beach.
Scheduled Monument	A statutory designation under the Ancient Monuments and Archaeological Areas Act, 1979.
Sea level rise	Increase in sea levels in relation to land levels
Sediment transport	The movement of shingle, sand and mud within the coastal zone through the actions of waves, currents, tides and wind.
Shoreline Management Plan	A non-statutory plan that provides a large-scale assessment of the risks associated with coastal processes and presents a policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner.
Site of Special Scientific Interest (SSSI)	An area designated under the Wildlife and Countryside Act, 1981 as representing some of the best examples of Britain's natural features including flora, fauna and geology.
Special Area of Conservation (SAC)	Area designated under the EU Habitats Directive (92/43/EEC) in order to protect habitats or species of European importance.
Special Protection Area (SPA)	Area designated under the EU Birds Directive (79/409/EEC) in order to establish a network of protected areas for birds.
Stakeholder	An organisation or individual affected by or interested in the Flamborough Head to Gibraltar Point Shoreline Management Plan.
Storm surge	A temporary rise in the sea level on an open coast resulting from a storm.
Strategic Environmental Assessment (SEA)	An environmental assessment required by the EU SEA Directive (2001/42/EC) for a range of land use plans and programmes. SEA is not a statutory requirement for Shoreline Management Plans.
Sustainable	Meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. In terms of sustainability of coastal defences, this refers to the technical, economic and environmental viability of maintaining a defence line.
Swell	Waves which have travelled into the area after having been generated by winds in other areas. These waves may travel

Term	Definition
	thousands of kilometres from their origin before dying away.
Tidal flood risk	The risk of flooding associated with the normal and extreme tidal cycles. Flood risk is measured as the probability of flooding (that is, at location X, there is a 1 in 100 or one per cent chance of flooding in any given year) multiplied by the impact or consequences that will result if flooding occurs.
Tide	Periodic rising and falling of the sea resulting from the gravitational attraction of the moon and sun.
Topography	Level or surface of the land.
Water Framework Directive (WFD)	EU water legislation designed to improve and integrate the way water bodies are managed throughout Europe.

1 Introduction

What this summary tells you:

This summary tells you about Shoreline Management Plan (SMP) for Flamborough Head to Gibraltar Point. The Shoreline Management Plan for Flamborough Head to Gibraltar Point is a high-level policy document from which the organisations that manage the shoreline set their long term plan. This document is the non-technical summary of the SMP. It presents the preferred Plan which has been developed based on a full appraisal of options carried out against a wide range of criteria. The final Plan also takes account of the feedback received during the consultation phase on the draft Plan.

This document aims to inform interested groups or individuals of our understanding of why and how coastal flooding and erosion might occur, and the impacts of it on people, their use of the land and the environment. It presents the Plan for managing the shoreline between Flamborough Head and Gibraltar Point, including the outer Humber Estuary, in the short, medium and long term. The policies recommended for stretches of the coast broadly take the form of:

- Hold the Line (HTL). Holding the current line of flood/erosion defence.
- Advance the Line (ATL). Advancing the current flood/erosion defence seawards.
- No Active Intervention (NAI). This allows natural processes to take place. If present, existing flood/erosion defences would not be maintained.
- Managed Realignment (MR). Moving the flood/erosion defence landwards.

For further details on any of the aspects covered in this summary document, or to read the full Shoreline Management Plan, please refer to the main SMP document and the appendices.

2 What is a Shoreline Management Plan?

A Shoreline Management Plan (SMP) is a plan for managing flood and erosion risk for a particular stretch of shoreline, looking at the short, medium and long term. The main aim of the SMP is to develop a sustainable management approach (actions that do not cause problems elsewhere) for the shoreline that takes account of the key issues and achieves the best possible balance of all the values and features that occur around the shoreline over the next 100 years. This needs to recognise the strong relationship with social, economic and environmental activities around the shoreline. SMP policies therefore have to be realistic.

Approximately 10 years ago a first round of SMPs was completed for the entire length of the coastline of England and Wales. SMPs are reviewed every five to 10 years; the first round SMPs are now being reviewed to take into account updated information and changing circumstances.

This SMP describes the intent of shoreline management (a vision for the future of shoreline management for the Flamborough Head to Gibraltar Point frontage) for the short term (up to 2025), the medium term (2026 – 2055) and the long term (up to 2105). These are referred to as Epochs 1, 2 and 3 respectively. The intent for the medium and long term sets a vision for the future, but is based on our current knowledge and understanding. The intent of management is translated into SMP policies.

The coastal defences along the coastline, which protect the low lying land against flooding or prevent erosion, are owned and managed by a variety of organisations; mainly local authorities, the Environment Agency and some privately maintained. The Shoreline Management Plan has been developed in partnership with the following organisations who have been involved throughout the process:

- East Riding of Yorkshire Council;
- North East Lincolnshire Council;
- East Lindsey District Council;
- Lincolnshire County Council;
- Environment Agency;
- Natural England;
- English Heritage; and
- National Farmers' Union.

The above organisations were represented through a Client Steering Group (CSG) which worked alongside a forum of Elected Members (EMF) throughout the development of the Plan. This partnership approach is important because there are many different groups with various interests in the coast which need to be considered and balanced: shoreline management can influence coastal land use and the coastal environment, but management can also be influenced these factors. The Plan was developed with, and alongside a Strategic Environmental Assessment (a systematic appraisal of the environmental consequences of high-level decision-making, related to the associated EU Directive) and an Appropriate Assessment (the process to support a decision as to whether the proposed plan or project would have an adverse effect on the integrity of any international nature conservation site).

Funding has not been a key driver of policy development as it is not the role of an SMP to account for the current funding system as it is a forward looking aspirational Plan. Neither is it the role of an SMP to state how policies should be funded in the future; however a broad indication of the potential funding that may

be needed to implement the preferred policy is provided. It is recognised that funding is often a major hurdle in delivering the policies put forward. In some instances Government funding may not always be available (especially where benefits only marginally outweigh, or are similar to, the costs), and funding maybe required from other sources, otherwise actions on the ground to carry out the recommended policy may not occur.

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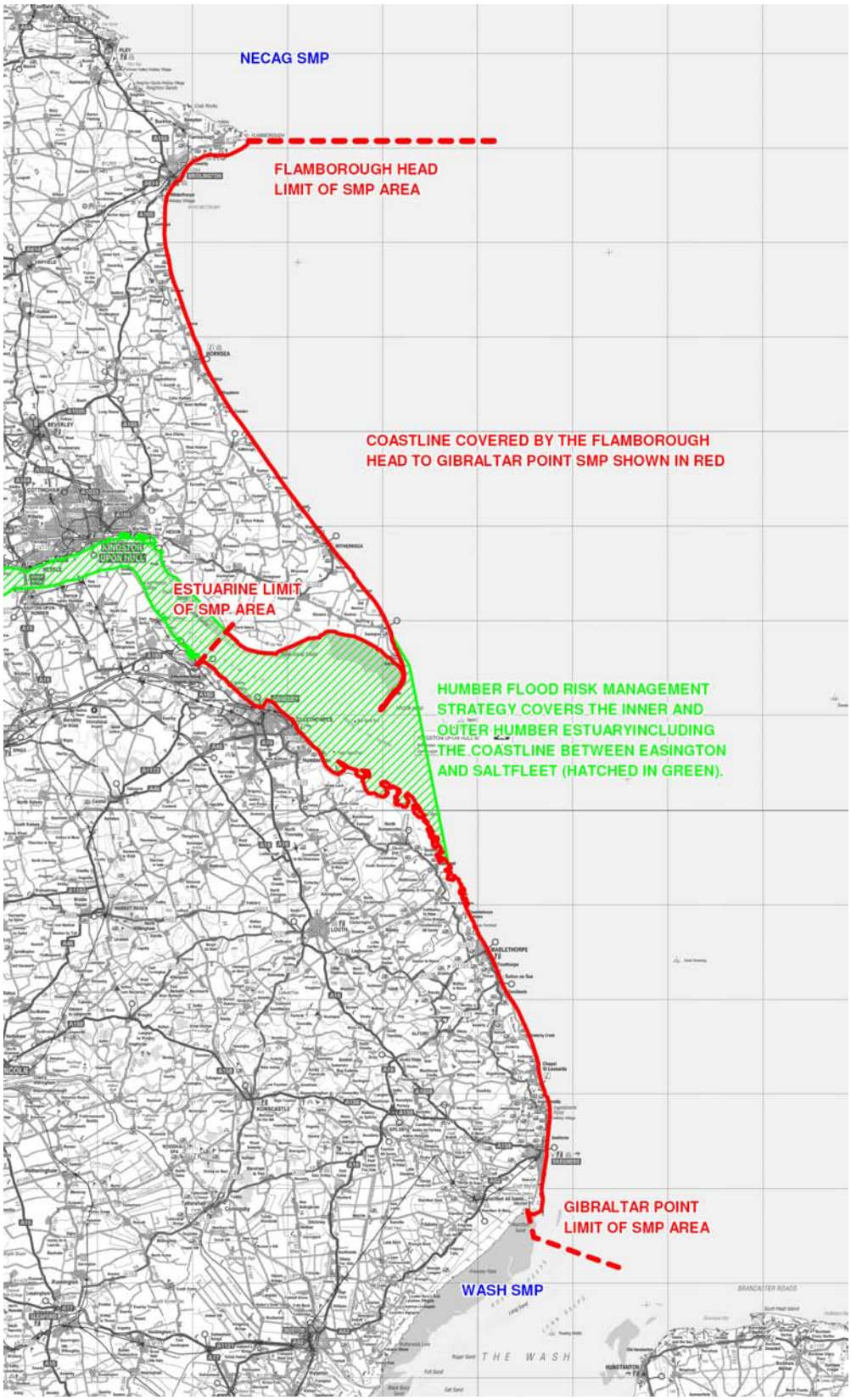
3 Project Area Overview

This Shoreline Management Plan covers the coastline from Flamborough Head to Gibraltar Point. The northern boundary of the SMP is at Flamborough Head (as shown on the map on the next page) where this SMP joins the adjacent North East Coastal Authorities Group (NECAG) SMP, to the north. The southern boundary of the SMP is at Gibraltar Point (as shown on the map on the next page) where this SMP joins the adjacent Wash SMP, to the south. The boundary runs along the River Steeping. The estuary boundary of the SMP is from Stone Creek on the north bank of the Humber and the eastern jetty at Immingham on the south bank of the Humber.

The Humber Flood Risk Management Strategy has recently been published (March 2008) and the area covered by it (shown as the green hatching on the following map) overlaps the SMP area. The Humber Flood Risk Management Strategy covers the inner, middle and outer Humber Estuary including the coastline between Easington and Saltfleet. To ensure this overlap is addressed, there has been close communication between the project teams with the Humber Strategy team represented on the SMP Client Steering Group.

The Plan area covers a highly varied coastline with a range of different land uses and environments. Much of the Holderness coastline has experienced rapid erosion over recent centuries. Due to the presence of human settlement along the coast, there are many conflicting local issues and objectives. The floodplain of the outer Humber Estuary includes some of the most productive agricultural land in the UK as well as major industry and many commercial buildings. In Lincolnshire, flooding is the core issue, as there are extensive areas of land at or just above present day sea level.



Flamborough Head to Gibraltar Point Shoreline Management Plan area

4 Coastal Processes

An important part of the SMP is to understand what is happening along the coastline and how it is currently developing. The following paragraphs provide a brief summary of the key information relating to the coastal processes.

The Flamborough Head to Gibraltar Point coastline can be considered as one system in terms of coastal processes as the effects of a change (e.g. building a defence) in one area will be felt in another. However, there are five main components of the shoreline of this SMP:

- Chalk cliffs (Flamborough Head to Sewerby);
- Holderness cliffs (Sewerby to Kilnsea);
- Spurn Head;
- Outer Humber; and
- Lincolnshire coast (Donna Nook to Gibraltar Point).

Chalk cliffs

At the northern end of the study area, Flamborough Head is a headland composed of 30-50 metre high near-vertical chalk cliffs. The cliffline has formed into a series of small bays in which sandy and rocky beaches occur, such as at South Landing and Danes Dyke. The chalk is relatively hard in comparison to the clay cliffs of Holderness to the south. The cliffs are eroding at a slow rate (0 - 0.4 metres per year) and this is the reason that a headland has formed. The headland provides shelter to the coastline to the south from the most common north-easterly waves. In this area, the coastline runs approximately east-west.

At the foot of the cliffs there is a rocky platform cut into the chalk which, in places, extends for up to 1 kilometre offshore of Flamborough Head.

Flamborough Head cliffs (view from South Landing)

There is a 10 kilometre long sandbank to the south of Flamborough Head, known as the Smithic Sands. This sandbank is believed to provide a link for sediment movement between Filey Bay to the north and Bridlington Bay to the south.

Holderness cliffs

The Holderness cliffs extend for 60km from Sewerby to Easington and are relatively 'soft' cliffs ranging from less than 3 metres up to around 40 metres in height. The cliffs are made up of silts and clays (as shown in the picture below) with the oldest parts of the cliffs formed approximately 130,000 to 300,000 years ago.

Along much of the Holderness frontage, a thin sandy beach is present in front of the cliffs. This beach sits on top of a clay base layer.

Holderness cliffs (view at Auburn Sands just south of Bridlington)

The cliffs are eroding rapidly at an average rate of approximately 1.8 metres per year. The process of erosion along the Holderness cliffs is not new and has been occurring since the end of the last ice age. Over the last 1,000 years, the Holderness coast has retreated by around 2 kilometres, causing the loss of 26 villages listed in the Domesday survey of 1086.

Erosion of the Holderness cliffs takes place through repeated landslide activity. Waves reaching the base of the cliffs remove material and this causes the cliff face to steepen to the point at which it collapses under its own weight. Rain water can also help these processes by saturating the cliff material, making it slide and collapse more easily.

Erosion of the Holderness cliffs and the beaches provides coarse and fine sediment (i.e. shingle, sand and muds). The gravel and sands are moved down to Spurn Head and offshore sand banks by waves and currents. It is likely that gravel and coarse sand cannot cross the Humber mouth, although fine and medium sands are transported to the Lincolnshire coastline. Fine sediment is also transported southwards, and some of this is deposited in the Humber Estuary and the Wash. This cliffline is sub-divided into defended / undefended sections due to coastal defences (e.g. at Bridlington, Hornsea, Mappleton, Withernsea and Easington).

Left: Holderness cliff tops (view at Auburn Sands).

Right: Concrete seawall and groyne field at Hornsea preventing erosion.

Spurn Head

The peninsular of Spurn Head is an important feature at the mouth of the Humber Estuary. Spurn Head is made up of a narrow ridge consisting mainly of sands and gravels. This feature forms a barrier extending 5.5 km into the mouth of the Humber Estuary. Coarse sediment eroded from Holderness cliffs feeds the Spurn barrier and helps maintain the feature. Spurn's historic and predicted future behaviour is complex and there are a number of different theories of how it has developed and changed over the years.

During the 17th and 18th centuries, the length of Spurn increased rapidly (recorded by the requirements for new lighthouses). East Riding of Yorkshire Council monitoring data indicates that Spurn has lengthened by 30 metres since 1997.

Spurn Head has breached (meaning a section of the barrier has been broken through by storms) repeatedly in historic times. In 1996 there was a severe breach of the dunes requiring a section to be infilled to maintain access along the Spurn Head road. East Riding of Yorkshire Council monitoring data shows the ridge between the Holderness cliffs and Spurn Point has narrowed by approximately 20 metres between 2003 and 2008, making the barrier increasingly vulnerable to a breach.

Spurn provides shelter for the extensive mudflats within the Estuary, especially at Spurn Bight. It also helps give protection against waves from the north east to areas such as Cleethorpes and Grimsby on the south bank of the Humber Estuary.

Aerial view of Spurn Head

Outer Humber Estuary

Within this SMP, the term 'outer Humber Estuary' describes the shoreline from Kilnsea to Stone Creek on the north bank of the Humber and from Immingham (eastern jetty) to Donna Nook on the south bank of the Humber. This stretch of the Humber is influenced both by the tide and the flow from the river.

Fine sediment that has been eroded from the Holderness cliffs is pulled into the Estuary by the tide. Much of this fine material is deposited within the Estuary and forms the mudflats, salt marshes and beach areas that line both the north and south banks. In order to keep pace with the predicted rates of sea level rise, a large amount of extra sediment is likely be required in the future to maintain these important natural features and habitats.

The strong tidal flows into and out of the estuary cut across the north-south movement of sediment along the open coast. These flows into and out of the estuary mean that gravels and coarse sands are mainly prevented from crossing the Humber mouth. Medium and fine sands eroded from the Holderness cliffs are able to cross the Humber channel, mainly during storms and these sediments build up in sand banks around Donna Nook. From Donna Nook, some of the sand moves westwards into the Estuary and some moves southwards along the Lincolnshire coastline.

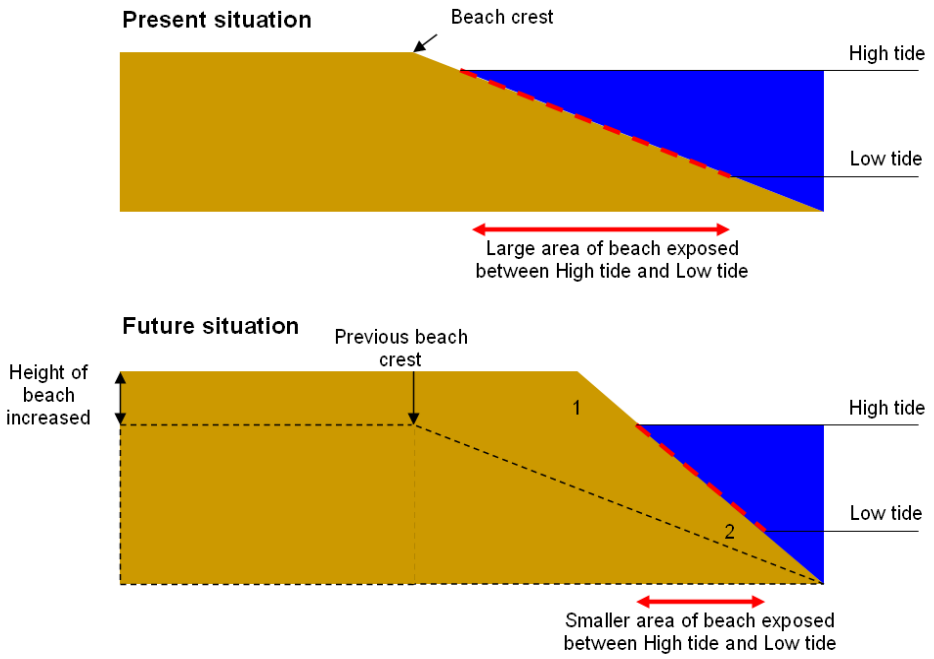
The north and south banks of the Humber Estuary are very different in their land use. This has affected how they have developed. The north bank is low-lying; the land which makes up the area known as Sunk Island was reclaimed from the sea in the 17th century. The south bank from Immingham to Grimsby and Cleethorpes is defended through hard structures protecting the towns and the industrial areas.

Left: North bank of the Humber (Kilnsea).

Right: south bank of the Humber (Immingham).

Lincolnshire coastline

The Lincolnshire coastline has many wide sandy beaches between Grimsby and Donna Nook, decreasing in width towards Mablethorpe. The beaches and sand flats are accreting, fed by sediment from the eroding Holderness cliffs. Because more sediment is building up at the top of the beaches, and less towards the bottom, the beaches are steeping. This is a fairly gradual process, but over time is significant, and it means that if this process continues, the area of beach exposed between high and low tide will reduce (see diagram below).



1. Greater build up of sand at the top of the beach around the high tide mark.
2. Smaller build up of sand at the bottom of the beach around the low tide mark.

Diagram showing how beaches are accreting and steepening between Grimsby and Mablethorpe.

Between Tetney Haven and Donna Nook and also at Gibraltar Point, extensive and well developed salt marsh exists due to the continued deposition of sediment and the sheltering provided by the by the wide beaches and sand flats. These areas provide important breeding and feeding grounds for birds and wildlife. In various areas along the Lincolnshire coastline (including at Donna Nook, Saltfleetby and Gibraltar Point), sand dunes have formed.

View from looking out to sea from Saltfleetby-Theddlethorpe Dunes National Nature Reserve

Between Saltfleetby/Theddlethorpe and Gibraltar Point, the beaches are formed of a thin sandy layer which sits on top of clay. The beach material here comes from the fine and medium grained sands eroded from the Holderness cliffs, moved to this area by waves and currents. Much of this frontage also has a variety of 'hard' defences and dunes behind the beaches. The dunes, hard defences and the beaches provide the protection against flooding. Historically, during storms, the thin sand layer on the beaches has moved seaward and the underlying clay was exposed to the waves and eroded. To counter this erosion, since 1994 the Environment Agency has undertaken a major beach renourishment scheme (known as 'Lincshore') along the entire coast between Mablethorpe and Skegness. This scheme periodically puts a significant amount of sand back onto the beaches to replace the sediment removed through erosion. This helps to maintain the beaches and the defences which protect the area against flooding.

Left: Armoured dune at Chapel Six Marshes

Right: Seabees at Skegness

Along this entire stretch of coastline, the defences provide flood protection for land which is low-lying for several kilometres inland.

Future sea level rise is likely to cause more erosion of the beaches which will place more pressure on the hard defences and dunes at the rear of the beaches.

Sea level rise

Facts and Figures

Climate change is occurring due to both human and natural factors. Some facts and figures have been produced by the International Panel for Climate Change in 2007 to show how the climate has changed over recent times:

- The linear global warming trend over the last 50 years (approximately 0.13°C per decade) is nearly twice as much as that for the last 100 years.
- The total temperature increase from 1850–1899 to 2001–2005 is approximately 0.76°C.
- Global average sea level has risen at an average rate of approximately 1.8 millimetres per year over the period 1961 to 2003. The rate was faster over the period between 1993 and 2003 at about 3.1 millimetres per year.
- The total 20th-century rise in sea level is estimated to be approximately 0.17 metres.

- In the Flamborough Head to Gibraltar Point SMP region, the historic rate of sea level rise is just over 1.1 millimetres per year, based on the sea level measured at Immingham over the period between 1960 and 1995.

How does climate change cause sea levels to rise?

A warming climate affects mean sea levels in three principal ways:

- Melting of glaciers following the last Ice Age has led to a long-term slow but steady re-adjustment of the land mass of Great Britain
- A physical increase in water volumes is occurring globally due to the melting of ice caps and ice sheets; and
- Ocean water is expanding on a global scale due to rising temperatures.

The change in sea level directly observed at the coast is the result of a combination of the above factors.

Future sea level rise predictions

There is considerable uncertainty about the scale of future climate change and sea level rise; however, the rate of future sea level rise is expected to accelerate due to continued global warming and more rapid melting of the ice caps and ice sheets. In addition, it is likely that climate change will bring about increased storminess.

Despite the uncertainty over rates of future sea level rise, it is essential that this SMP takes into account the possibility of sea level rise, regardless of the cause. Along with other second generation SMPs, this SMP has used the recommended Defra 2006 sea level rise predictions to develop the Plan. These allowances for future sea level rise take account of the scientific research undertaken by the Intergovernmental Panel on Climate Change and are the most up-to-date predictions available at the time of SMP development. The predictions suggest a total rise in sea level of just under 1 metre by 2105 for this area.

5 Land Use and Environment

Before policies could be developed for the frontage, the key features were identified and were used to characterise sections of the SMP frontage. In order to undertake this assessment, the entire frontage was split into nineteen Character Areas which covered areas with broadly similar character or issues. A general overview of the character of the SMP area is given below outlining the key issues, assets and features of the coastline.

Agriculture and industry

The coastline along much of the SMP frontage is mainly rural with substantial areas of land used for agriculture. For this reason, agriculture is a key employer throughout the SMP area with many jobs dependent on the agricultural industry.

In the East Riding of Yorkshire, the coast between the settlements of Bridlington, Hornsea and Withernsea is rural and is used mainly for growing crops. There is a large area of fertile agricultural land on the north bank of the Humber between Spurn Head and Stone Creek with a small area of extremely fertile agricultural land towards the centre of Sunk Island. In East Lindsey, the rural areas are mainly used for farming. There are areas of particularly fertile agricultural land at Donna Nook and Gibraltar Point. Future food security is an important issue for the nation as a whole and relevant to the SMP because of the large areas of agricultural land with the potential to be affected by coastal management policy.

The area covered by the SMP also includes some important industrial sites; the natural gas storage and processing facilities to the north of Atwick and to the east of Aldbrough, neither of which are predicted to be at risk from coastal erosion within the timescale of this Shoreline Management Plan. Dimlington and Easington gas terminals are located on the cliff top at Dimlington, just north of Easington. The south bank of the Humber to the west of Grimsby is heavily industrialised with infrastructure relating to the petrochemical industry; chemical works; oil storage; bulk and liquid storage; power generation; and other manufacturing, processing and storage infrastructure. Grimsby dock is a large commercial port and handles large volumes of foodstuffs, timber, steel, minerals, ores and grain. There are also fish processing facilities adjacent to the dock area. There is an oil storage tank farm at Tetney and the Viking gas terminal is located to the north of Mablethorpe, set back approximately 300 metres from the shoreline. There are also wind turbines at Mablethorpe.

Communities

There are several coastal towns, villages and individual dwellings along the SMP coastline. The coast is generally viewed as an attractive place to live and visit. However, many coastal communities experience a range of common challenges such as:

- Physical and social isolation;
- High proportions of older people together with higher levels of outward migration among young people;
- Low-wage, low-skill economies and seasonality of employment;
- Frequent dependency on a single industry; and
- A high incidence of poor housing conditions and a high proportion of private rented homes.

It was important for the SMP to consider other plans and studies within the area such as planning and regeneration strategies that aim to tackle some of these issues and problems above.

Coastal flood and erosion risk

In the East Riding of Yorkshire, the towns of Bridlington, Hornsea and Withernsea as well as the village of Mappleton and the gas terminals at Easington are defended against coastal erosion. The current planning permission for the Easington defences expires on 31 January 2020 and requires that all coastal defence works at Easington shall be permanently removed within a year of that date.

Within the East Riding, the rural areas between the defended frontages are currently eroding at a rate of approximately 0.5 – 2.0 metres per year on average and if natural processes continue, there will be properties at risk from coastal erosion along these frontages within the time frame of the SMP as well as agricultural land.

Within the East Riding, there are low-lying areas of land at risk from coastal and/or estuarine flooding, particularly the areas around Barmston drain, south Hornsea, Tunstall drain and the north bank of the Humber, including Sunk Island and parts of Easington.

Within North East Lincolnshire, virtually the entire frontage is protected by hard defences, however much of the area (including large areas of Grimsby) is within the coastal flood plain.

Within East Lindsey, the majority of the frontage is defended by a combination of embankments or hard defences fronted by a beach. There are large areas of low-lying land behind the defences, potentially at risk of flooding from the sea. This area includes towns, villages and significant areas of agricultural land. The back of the floodplain is marked by a ridge of higher ground as the land rises towards the Lincolnshire Wolds. As sea levels rise in the future, the drainage of freshwater into the sea may be constrained; this could increase the threat of flooding from fresh water backing up as the sea prevents in escaping and this would increase the requirement for pumping to prevent flooding.

Historic environment

There are a considerable number of historic environment assets along the coastal strip including Scheduled Monuments, Listed Buildings, Parks and Gardens and Conservation Areas. There are no World Heritage Sites or Registered Battlefields within the area covered by the SMP. The historic environment designations are listed below:

- Scheduled monument: Scheduled monuments are designated and added to a ‘Schedule’ by the Secretary of State under powers contained in the Ancient Monuments and Archaeological Areas Act, 1979. Scheduling refers to the legal system for protecting nationally important archaeological sites in England. There are approximately 19,500 scheduled monuments in England.
- Listed building: A building or other structure that is officially designated by English Heritage as being of special architectural and historic interest. Listed building status brings the structure under the consideration of the planning system. There are approximately 372,900 listed buildings in England.
- Registered parks and gardens: Since the 1980s there has been a national record of historic parks and gardens which make such a rich and varied contribution to our landscape,

maintained by English Heritage. There are approximately 1,500 registered parks and gardens.

- Registered historic battlefield: There are nearly 50 important English battlefields identified on the Register of Historic Battlefields maintained by English Heritage.
- Conservation area: Conservation areas are designated by local authorities as any area of special architectural or historic interest whose character or appearance is worth protecting or enhancing. There are over 8,000 conservation areas in England.

A number of these sites are potentially at risk from coastal erosion within the East Riding. A considerable number of these sites are potentially at risk from coastal flooding within North East Lincolnshire and East Lindsey due to the size of the flood plain as well as sites within East Riding on the north bank of the Humber which are vulnerable to flooding.

Infrastructure

There is a wide range of infrastructure associated with towns and villages along the entire SMP frontage including: water and sewerage infrastructure; outfalls; RNLI stations; coastguard stations; coastal access points; wind farm infrastructure; piers; slipways; reservoirs; and visitor centres at Spurn Head and Gibraltar Point. In each of the main towns, there are many local and regional services as well as community facilities such as schools, places of worship, public houses, shops, police stations, hospitals, doctors, museums, leisure centres etc.

The harbour area at Bridlington provides facilities for the local fishing community and is a focus for tourists and water sports enthusiasts.

There are three Ministry of Defence sites along the frontage: the bombing range in the vicinity of Cowden Parva; the RAF bombing range at Donna Nook; and the RAF underground bunker to the south of Hollym.

Throughout North East Lincolnshire, East Lindsey and along the north bank of the Humber, there is drainage infrastructure such as land drainage pumping stations, outfalls, drainage channels, dykes and streams to facilitate the drainage of the low-lying land in these areas.

The road and rail network within this area provides important transport links between towns and villages. The B1242 within the East Riding runs parallel to the coast, approaching close to the coastline in places and provides a key connection between the towns and villages of Skipsea, Atwick, Hornsea, Mappleton, Aldbrough, Roos and Withernsea. The A1031 and A52 within East Lindsey run parallel to the coast and provide a key connection between the towns and villages of Humberston, Saltfleet, Mablethorpe, Trusthorpe, Sutton on Sea, Ingoldmells and Skegness as well as smaller villages. The train station in Bridlington provides a rail connection between Hull and Scarborough. Several train stations within Grimsby and Cleethorpes provide rail access to the west. The train station in Skegness provides a rail connection between Skegness and Grantham.

Landscape

Flamborough Head and Spurn Head are both defined as Heritage Coasts in recognition of the value of their landscape character.

The East Riding coastal strip is predominantly exposed open landscape with limited tree cover and scattered small scale hamlets and villages contrasting with the surrounding large scale agricultural

landscape. Coastal caravan parks are prominent in the coastal strip. The undefended eroding boulder clay cliffs and narrow beaches are a feature of much of this coastline.

North East Lincolnshire's coastal strip within the SMP area is heavily industrialised between Immingham and Grimsby due to activities associated with the docks. Grimsby and Cleethorpes are predominantly urban landscapes with an industrial area around the port of Grimsby. Landward of the residential and urban areas, is open, agricultural landscape.

East Lindsey's coastal strip is a low-lying drained coastal plain which is mostly flat with some areas of gentle undulations. Predominantly mixed agricultural land use with both arable and pasture and there are extensive networks of drainage ditches and dykes around field boundaries. There are sparsely scattered rural settlements throughout the area and a stretch of coastal resorts from Mablethorpe to Skegness with associated static caravan parks on their outskirts.

Natural environment

The coastline includes a number of nationally and internationally designated sites located on the coast as well as sites located in the vicinity of the coast line. The environmental designations are listed below:

- Special Area of Conservation (SAC): SACs are areas which have been given special protection under the European Union's Habitats Directive (Council Directive 92/43/EEC of 21 May 1992). They provide increased protection to a variety of wild animals, plants and habitats and are a vital part of global efforts to conserve the world's biodiversity.
- Special Protection Area (SPA): SPAs are areas which have been identified as being of national and international importance for the breeding, feeding, wintering or the migration of rare and vulnerable species of birds found within European Union countries. They are European designated sites, classified under the European Union's Birds Directive (79/409/EEC).
- Ramsar sites: Ramsar sites are wetlands of international importance, designated under the Ramsar Convention (signed in Ramsar, Iran in 1971). Wetlands are defined as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.
- European Marine Site: The term 'European Marine Site' (EMS) (as defined by the Habitats Regulations) refers to those marine areas of both Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), which are protected under the EC Habitats and Birds Directives. These are a non statutory designation and are essentially management units for those parts of Natura 2000 sites.
- Site of Special Scientific Interest (SSSI): SSSIs are the best sites for the country's wildlife and geology. There are over 4,000 SSSIs in England, covering around 7% of the country's land area.
- National Nature Reserve (NNR): Many of the finest sites in England for wildlife and geology are National Nature Reserves. As well as managing some of our most pristine habitats, our rarest species and our most significant geology, most Reserves now offer great opportunities to the public as well as schools and specialist audiences to experience England's natural heritage.

- Local Geological Sites: Local Sites (previously Regionally Important Geological/geological Site (RIGS)) are non-statutory areas of local importance for nature conservation that complement nationally and internationally designated geological and wildlife sites.

An important site for nature conservation can have more than one environmental designation; in particular, sites of European importance are usually also designated as SSSIs. The following internationally and nationally designated sites are present within this SMP area:

- Flamborough Head SAC;
- Flamborough Head and Bempton Cliffs SPA;
- Flamborough Head SSSI;
- Skipsea Bail Mere SSSI;
- Withow Gap, Skipsea SSSI;
- Hornsea Mere SPA;
- Hornsea Mere SSSI;
- Dimlington Cliff SSSI;
- The (Easington) Lagoons SSSI;
- Humber Estuary SAC;
- Humber Estuary SPA;
- Humber Estuary Ramsar site;
- Humber Estuary SSSI;
- Saltfleetby – Theddlethorpe Dunes and Gibraltar Point SAC;
- Saltfleetby-Theddlethorpe Dunes SSSI;
- Chapel Point to Wolla Bank SSSI;
- Sea Bank Clay Pits SSSI;
- Gibraltar Point SPA; and
- Gibraltar Point Ramsar site.

Just south of the SMP area is the extensive area of the Wash SPA and Ramsar site and the Wash & North Norfolk Coast SAC. In addition, in the area adjacent to the southern portion of the SMP area there are three draft Special Areas of Conservation: Inner Dowsing, Race Bank, and North Ridge.

In addition to the internationally and nationally designated sites, there are locally designated wildlife sites such as Biodiversity Action Plan (BAP) species and local wildlife sites within the SMP area; their importance has also been considered throughout the Plan's development.

Tourism

Tourism is a key industry along much of the SMP frontage. In the East Riding, Bridlington, Hornsea and Withernsea have developed as seaside resorts and Bridlington continues to be the East Riding's premier holiday resort serving a catchment covering West and South Yorkshire and North Nottinghamshire.

Tourism is an important contributor to the local economy with numerous EC-designated bathing beaches along the Holderness coast and tourist-related development along the coast, including caravan parks. The scenic beauty and wildlife of Flamborough Head and Spurn Head also attract visitors and there are interpretation boards and facilities for visitors.

Tourism is a key part of the economy at Cleethorpes (North East Lincolnshire) and this area has many recreation and tourism developments close to the EC-designated bathing beach that fronts the town.

Tourism is a vital input to the local economy within East Lindsey, with tourism and agriculture the main sources of employment. The 'Fun Coast' stretches between Mablethorpe and Skegness and includes traditional seaside resorts with Blue Flag beaches at Mablethorpe, Sutton on Sea and Skegness. There are many tourist-related developments along this part of the coast, including the legendary Butlins at Ingoldmells. There are approximately 28,000 caravans within East Lindsey, with over 300 licensed sites; the highest concentration in Europe. Beyond the popular beaches, visitors are drawn to the wild stretches of coast at Gibraltar Point and north of Mablethorpe. There is a visitor centre at Gibraltar Point to cater for tourists.

Offshore activity

Windfarms

There are currently two offshore windfarms under construction along the SMP coastline; Inner Dowsing and Lynn, offshore of Skegness. The Inner Dowsing and Lynn windfarms will each have 27 turbines with an output of 90MW. The windfarm cables extend to the mainland where they come onshore near Skegness. There are also a number of planned and/or proposed offshore windfarms (including the Westermost Rough, Humber Gateway and Lincs windfarms as well as a number of windfarms further offshore), which may require on-shore facilities along the coastline. Existing power generation infrastructure on the south bank of the Humber is a particular attraction for further wind turbine development. However, care needs to be taken to protect this area from over-development of wind turbines to the detriment of the area's character and amenity.

Offshore dredging of marine aggregates

Currently 20-25 million tonnes of marine aggregates are dredged from the seabed around the coast of England and Wales, contributing about 20% to the total sand and gravel used by the UK construction industry each year. Areas of the seabed licensed for commercial dredging are also the source for most of the material used in beach nourishment works. Beach nourishment is regarded internationally as an effective and environmentally acceptable method of coastal defence, when used in suitable locations and in accordance with best practice. Dredged material is put onto beaches and shingle ridges to return them to a set height. One of the largest beach nourishment programs currently running in the UK is the 'Lincshore Project' between Mablethorpe and Skegness which helps protect vast swathes of Lincolnshire against coastal flooding.

There are eight areas licensed for marine sand and aggregate extraction along the SMP frontage; the most northerly area is offshore of Easington and the most southerly area offshore of Chapel St Leonards; typically these are in water depths of over 15 m. The Crown Estate issues licences to developers who wish to exploit marine resources in these designated areas. Each dredging licence application is subject to an in-depth Environmental Impact Assessment and Coastal Impact Study, which assess the impact that operations may have upon the shoreline. It is important to realise that any dredging operation (whether for aggregates or harbour maintenance/ capital works) has the potential to result in changes to the physical

processes which interact with the coastline if it is permitted to take place in an inappropriate location (shallow water, too close to the shoreline).

There are continual measures in place to ensure dredging does not impact on the adjacent shoreline. Seabed modelling is used in an Environmental Impact Assessment to predict possible environmental impacts of dredging. However there are common concerns that dredging 'holes' offshore will steepen the seabed near the shore and therefore lead to coastal erosion and loss of beach sand. The analogy of a hole being dug on a beach being rapidly filled is often used to support this concern.

Such concerns have led to much research into this topic. An independent study commissioned by local authorities (the Southern North Sea Sediment Transport Study (HR Wallingford 2002)) studied the coast and sea in the Humber region. This study concluded that there was no noticeable impact on the coast from offshore dredging. A similar conclusion was drawn the BMAPA briefing paper (July 2009). It stated that it is "impossible for dredging in the licensed areas offshore to steepen the shore profile and that the coast is effectively 'unaware' of the dredging taking place." The Marine Aggregate Extraction summary report produced by the Marine Aggregate Levy Sustainability Fund concluded that both individual offshore dredging licences and the cumulative impacts of such licences have not contributed to coastal erosion.

The Crown Estate and the dredging industry have commissioned Marine Aggregate Regional Environmental Assessments (MAREA) which will provide additional assessment information. The HECAG SMP recognises the requirement for further detailed research into this important and controversial matter, and an in-depth study has been put forward in the Action Plan to collect vital data and further improve the knowledge of the processes involved.

6 Principles for Shoreline Management for the Project Area

As a starting point for developing shoreline management policies that reflect the range of interests on the coast, a set of principles was agreed among the organisations involved in developing the SMP. These principles summarise what the SMP aims to achieve across the breadth of issues affected by the SMP. Some of these principles may be contradictory; during the development of shoreline management policies, the intention is that an acceptable balance is sought between these competing coastal interests.

The following set of principles formed the basis for setting policy appraisal objectives for shoreline management. In applying the principles it should be understood that all principles are to be considered in conjunction with one another and that their order is not significant.

- To balance flood and erosion risk management in a sustainable manner appropriate to the overall value of the features affected.
- To ensure that shoreline management policies encompass longer term adaptation options, and give time for communities and individuals to adapt to changing climate conditions and levels of risk.
- To develop policies for flood and erosion risk management that will inform spatial planning processes and provide a robust evidence base for Local Development Frameworks.
- To support sustainable patterns of development and consider possible effects on communities and their welfare.
- To support the nationally, regionally and locally important social and economic assets of the area in a sustainable manner.
- To consider the effects of coastal change on local industries, agriculture and employment and provide a secure environment for economic activity and development.
- To ensure that local decisions do not have a disproportionately adverse affect on the natural balance of the coastline and shoreline management elsewhere.
- To contribute to the positive management and enhancement of environmentally designated sites and protected species, subject to natural change.
- To support the conservation and enhancement of biodiversity in the wider coastal zone.
- To support the maintenance and enhancement of the character of the coastal landscape.
- To support the preservation and enhancement of the historic environment.
- To comply with legislative requirements and contribute to a safe and healthy environment.

7 Summary of Policy Appraisal Process

Following the background work to identify features and issues of importance along the coastline, combined with the understanding of how the shoreline will develop under management situations, a series of policies for the frontage were identified, appraised and compared.

Specific objectives were then set for different parts of the coast with broadly similar character (known as Character Areas); these objectives were based on the general SMP principles (listed in chapter 6) and from considering the features and issues of importance for each Character Area. The objectives were then used to test and compare SMP policy options identified for each section of coast.

The standard SMP policies available for appraisal are as follows:

- HTL: Hold the Line. This policy will cover those situations where work or operations are carried out on the existing defences (such as beach recharge, rebuilding the toe of a structure, building offshore breakwaters and so on). Included in this policy are other policies that involve operations to the back of existing defences (such as building secondary floodwalls) where they form an essential part of maintaining the current coastal defence system.
- ATL: Advance the Line. Advancing the existing defence line by building new defences on the seaward side of the original defences. Using this policy should be limited to those policy units where significant land reclamation is considered.
- MR: Managed Realignment. This policy allows the shoreline to move backwards, with management to control or limit movement (such as building new defences on the landward side of the original defences).
- NAI: No Active Intervention. A decision not to invest in providing or maintaining defences.

In areas where flood risk is an issue, management policies which address flood risk have also been selected. Flood risk management policies defined in Catchment Flood Management Plans have been considered in policy development and used in this SMP to indicate the aspirational intent regarding the future standard of protection for specific sections of coast. The Catchment Flood Management Plan flood risk management policies (P1-P5) are defined below:

- P1: No active intervention (*Not used n this SMP)*
- P2: Reduce existing flood risk management actions, accepting increase of risk over time;
- P3: Continue with existing or alternative actions to manage flood risk at the current level, accepting that flood risk will increase over time from this baseline;
- P4: Take further action to sustain the current level of flood risk into the future (responding to a potential increase in risk from climate change); and
- P5: Take further action to reduce flood risk.

The first step of policy appraisal involved identifying SMP and flood risk management policies (see above list) for appraisal for each Character Area. The policies were put forward if they were deemed sufficiently relevant and realistic to be worthy of full appraisal, but did not necessarily need to be viable. In some instances there were recognised benefits of appraising policies even if they were not likely to be the preferred option; for example, in some cases it was be considered to be in the public interest to fully assess a policy anticipated to be unviable, and by doing so, add weight to the preferred policy chosen.

Rather than each Character Area being assessed separately for each possible policy option, Character Areas were assessed in groups with a consistent policy being applied across the group; known as a Policy Package.

The appraisal process used an agreed 'traffic light' approach based on how well a policy package met the individual criteria. A narrative was also provided to explain the assessment and why a red, amber or green colour had been chosen. Part of the appraisal process included comparing the shoreline responses to the different policy packages. A number of guidelines were devised to aid the appraisal processes.

Part of the development of the preferred policy was the consideration of various legislative requirements and the wider sediment transport impacts of different policy combinations.

The partnership organisations were closely involved in the entire process, agreeing the general approach, policy options for testing, appraisal methodology and developing the preferred policies. The process of developing the preferred plan required a number of reviews which incorporated comments and feedback to ensure the plan produced the most sustainable and beneficial outcomes.

Public consultation also formed an important and integral part of the policy development process. A number of public exhibitions were held along the frontage to present and gain feedback on the policy options for appraisal and then the draft Plan. Comments and feedback received from the consultation phase were evaluated and this information fed into the development of the final Plan.

8 The Shoreline Management Plan

This section summarises the Shoreline Management Plan.

Overview of the Plan

The intention of the SMP is to develop a set of policies that provides an acceptable balance between the competing interests on the coast whilst moving towards more sustainable ways of managing the shoreline. Each stretch of coastline within this SMP is very different, presenting different challenges and so the policies are different in each area. The intent of management within each area is summarised below:

Chalk cliffs (Flamborough Head to Sewerby)

The intent of management for this area is to allow natural processes to continue.

Holderness cliffs (Sewerby to Kilnsea coast)

The intent of management for this area is to allow natural processes to continue along the frontage whilst sustaining Bridlington, Hornsea and Withernsea as viable towns and seaside resorts. The policies intend to sustain the viability of the village of Mappleton and a strategic north-south transport link. The policies intend to sustain the Dimlington and Easington gas terminals while there is a strategic need for the site. The continued functionality of Tunstall Drain and Barmston Drain may be maintained.

Spurn Head

The intent of management for this area is to allow the Spurn barrier to evolve largely naturally with as limited intervention as is required to maintain the integrity of the Spurn barrier. The intention is to maintain access to the key facilities and assets at Spurn Point whilst causing minimal interruption to the natural environment, coastal processes and the functioning of Spurn Head and the Humber Estuary.

Outer Humber Estuary

The intent of management for this area is to continue to provide sustainable flood protection to assets in the floodplain, whilst balancing the needs of the human, natural and historic environments, including the requirements of applicable legislation.

Lincolnshire coast

The intent of management for the area from south of Humberston Fitties to Theddlethorpe St Helen is to continue to provide sustainable flood protection to assets in the floodplain, whilst balancing the needs of the human, natural and historic environments, including the requirements of applicable legislation. The intent of management from the Viking Gas Terminal to Gibraltar Point is to continue protecting against flooding at the same standard as the present day.

Policy Units

The Plan is presented for sections of the coast. These areas have been divided up so that each area has the same management intent: these are known as Policy Units. The map below shows the boundaries of the Policy Units.

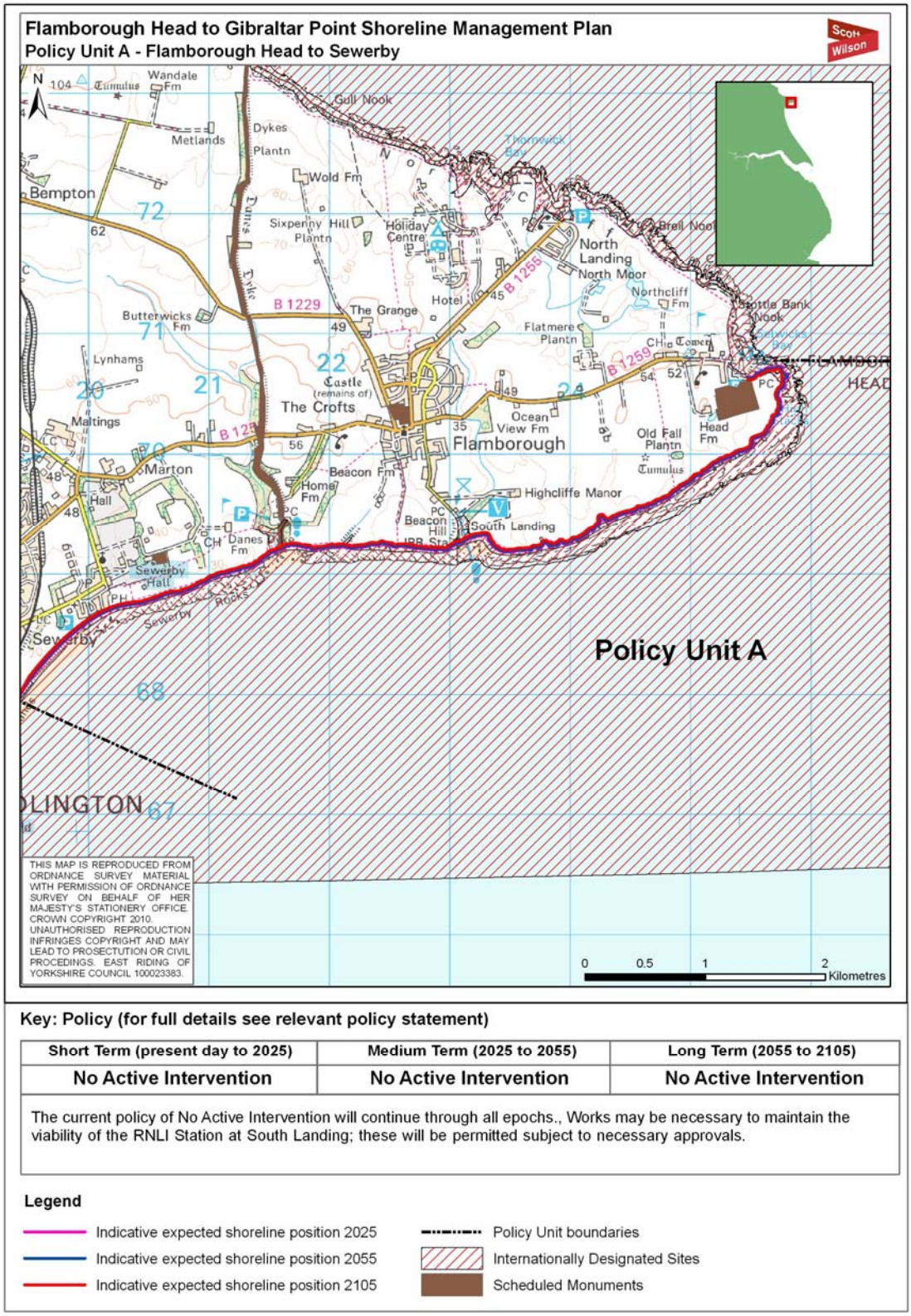
Map showing the Policy Units for the frontage.

Policy Mapping

The maps below summarise the policies chosen for each Policy Unit for the Plan. Where erosion will continue, the maps also indicate the expected shoreline positions for the short, medium and long term taking into account the effects of climate change.

There is considerable uncertainty about how the shoreline will respond to future changes (such as sea level rise), and the expected shoreline position shown on the maps should be regarded as indicative only, and not as a precise prediction.

Policy Unit A



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
No Active Intervention	**No Active Intervention**	**No Active Intervention**

The current policy of No Active Intervention will continue through all epochs., Works may be necessary to maintain the viability of the RNLI Station at South Landing; these will be permitted subject to necessary approvals.

Legend

- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Policy Unit boundaries
- Internationally Designated Sites
- Scheduled Monuments

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit A

Preferred policy to implement Plan	
From present day to 2025	There will be no management intervention or defences constructed. If works are necessary to maintain the viability of the RNLI station these will be permitted, subject to necessary approvals.
Medium term 2025 - 2055	There will be no management intervention or defences constructed. If works are necessary to maintain the viability of the RNLI station these will be permitted, subject to necessary approvals.
Long term 2055 - 2105	There will be no management intervention or defences constructed. If works are necessary to maintain the viability of the RNLI station these will be permitted, subject to necessary approvals.

Policy Unit B

Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold The Line (P4)	**Hold The Line (P4)**	**Hold The Line (P4)**
The current defence line will be held throughout all epochs, however if the marina development goes ahead, the defence line may be locally realigned seawards of its current position. If monitoring supports it, defence works may need to be considered to manage outflanking and protect the town of Bridlington.		

Legend

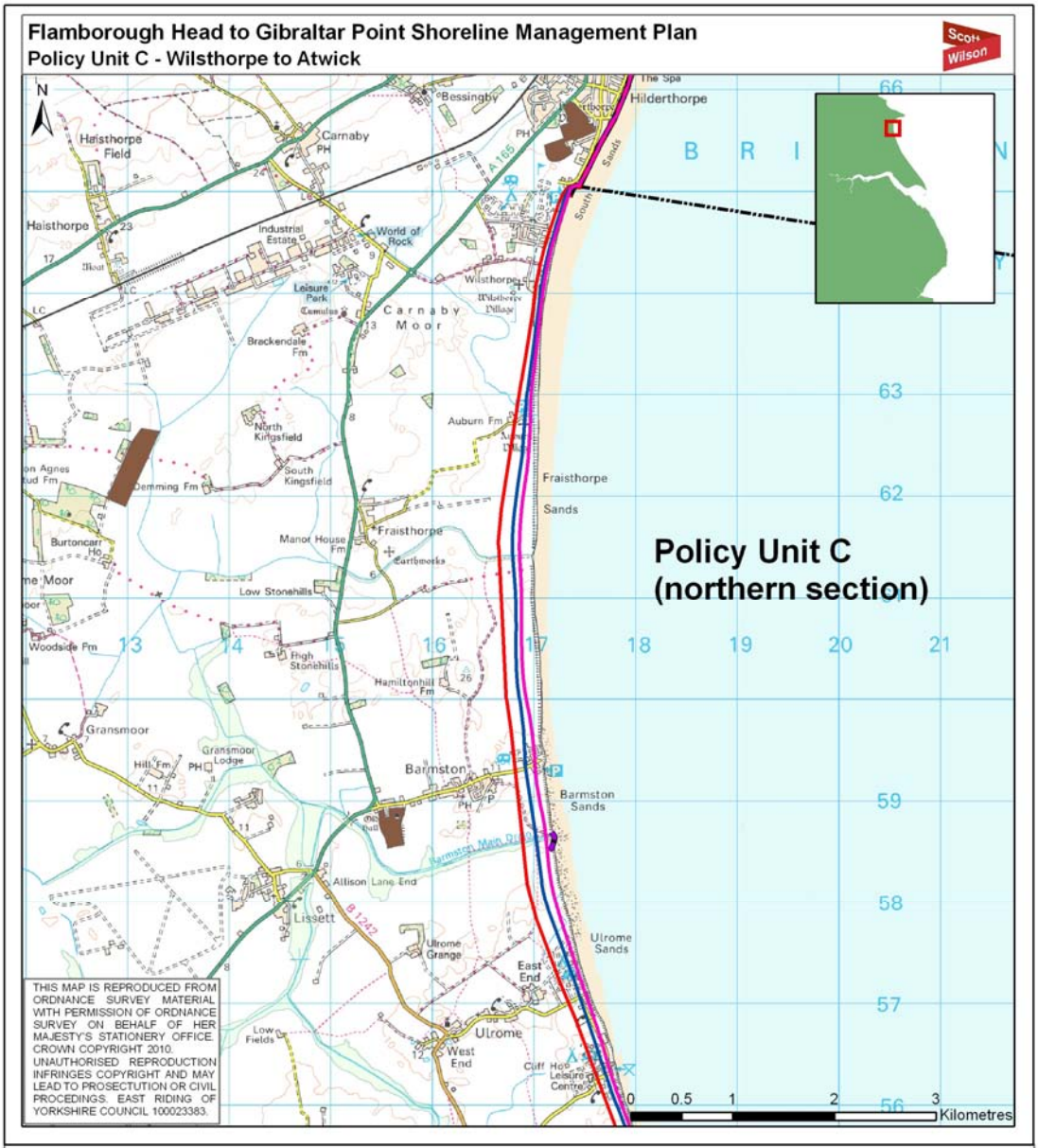
- Current defences(ERYC/Harbour Authority maintained)
- Internationally Designated Sites
- Scheduled Monuments
- Policy Unit boundaries
- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit B

Preferred policy to implement Plan	
From present day to 2025	The defences will be held in their current position and their function will be maintained.
Medium term 2025 - 2055	The defences will be held in their current position and their function will be maintained. If monitoring supports it, defence works may need to be considered to manage outflanking and protect the town of Bridlington.
Long term 2055 - 2105	The defences will be held in their current position and their function will be maintained. If monitoring supports it, defence works may need to be considered to manage outflanking and protect the town of Bridlington.

Policy Unit C

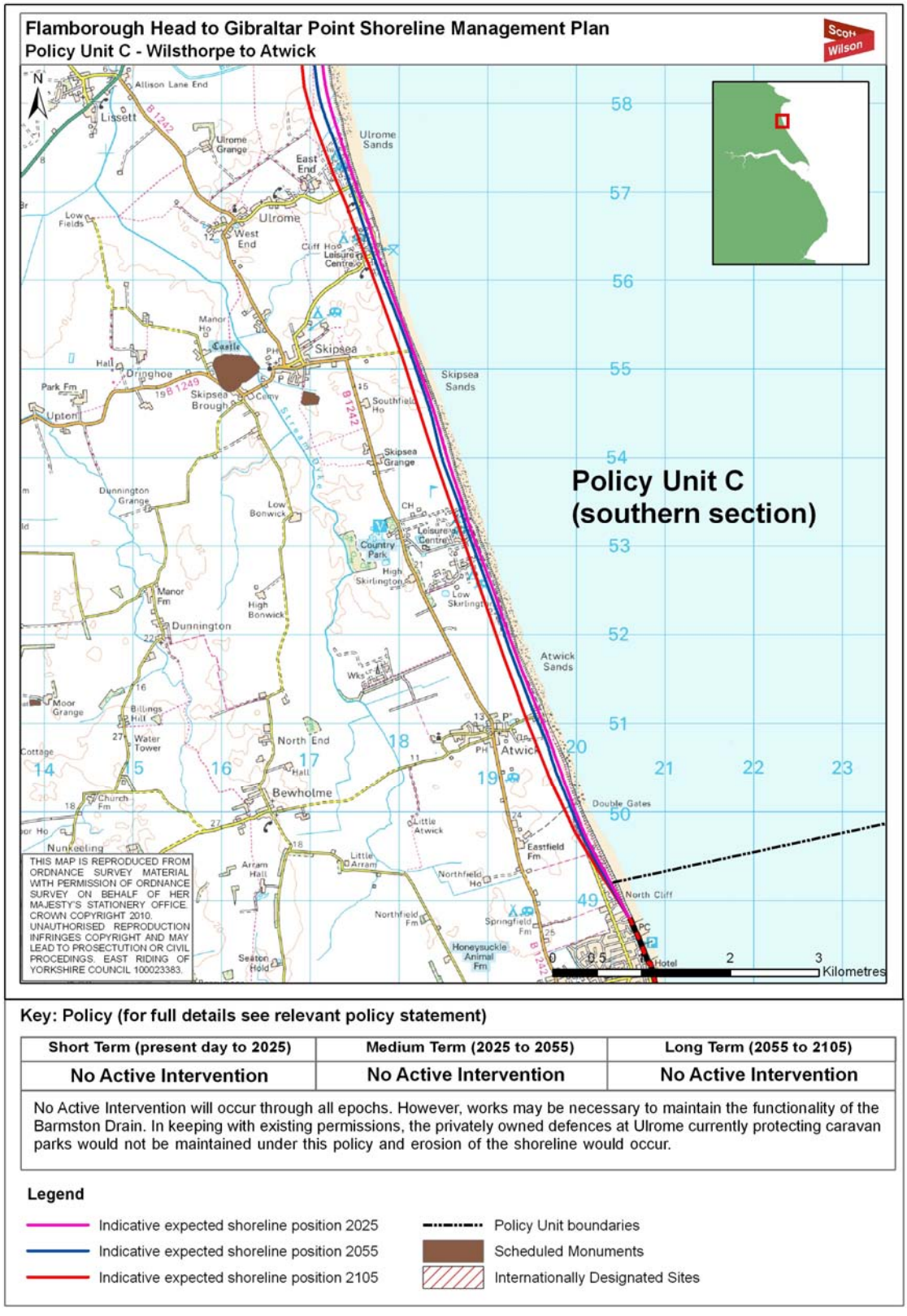


Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
No Active Intervention	**No Active Intervention**	**No Active Intervention**
No Active Intervention will occur through all epochs. However, works may be necessary to maintain the functionality of the Barmston Drain. In keeping with existing permissions, the privately owned defences at Ulrome currently protecting caravan parks would not be maintained under this policy and erosion of the shoreline would occur.		

Legend

- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
No Active Intervention	**No Active Intervention**	**No Active Intervention**
No Active Intervention will occur through all epochs. However, works may be necessary to maintain the functionality of the Barmston Drain. In keeping with existing permissions, the privately owned defences at Ulrome currently protecting caravan parks would not be maintained under this policy and erosion of the shoreline would occur.		

Legend

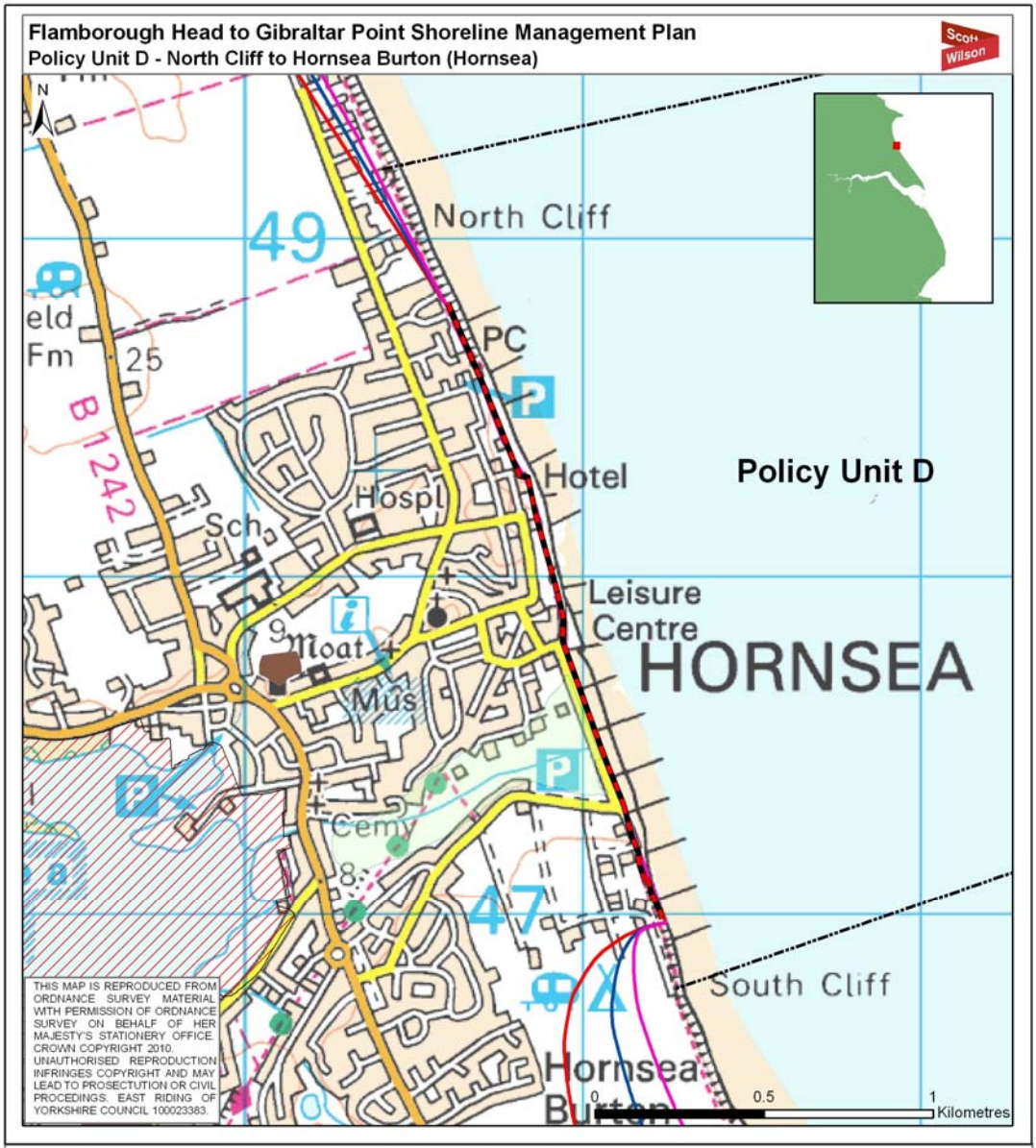
- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Policy Unit boundaries
- Scheduled Monuments
- Internationally Designated Sites

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit C

Preferred policy to implement Plan	
From present day to 2025	There will be no management intervention or defences constructed, except if required locally to maintain the functionality of Barmston Drain.
Medium term 2025 - 2055	There will be no management intervention or defences constructed, except if required locally to maintain the functionality of Barmston Drain.
Long term 2055 - 2105	There will be no management intervention or defences constructed, except if required locally to maintain the functionality of Barmston Drain.

Policy Unit D



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4)**
If monitoring supports it, defence works may need to be considered to manage outflanking and protect the town of Hornsea. It is uncertain in which epoch this may be required.		

Legend

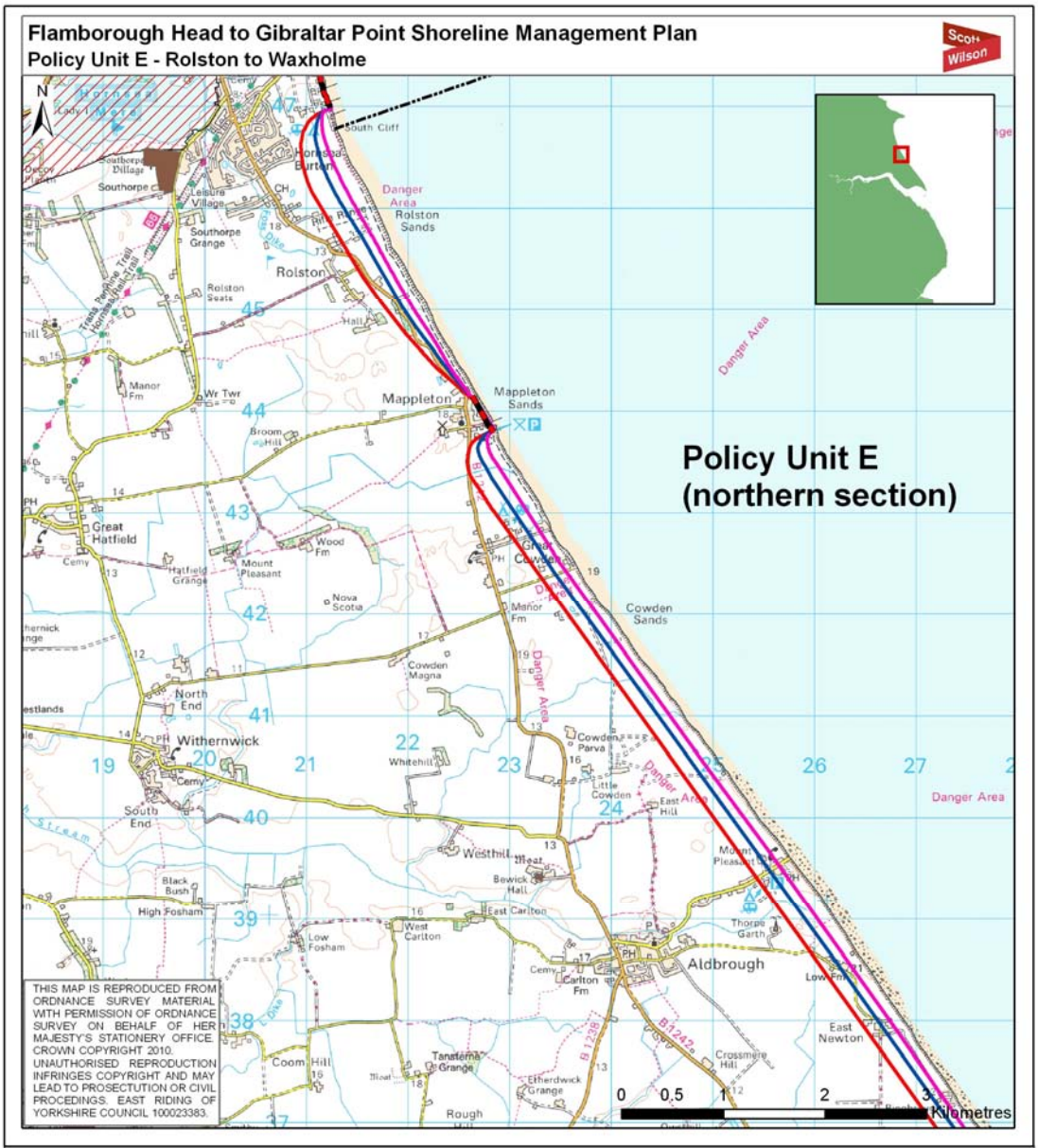
- Current defences(ERYC maintained)
- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit D

Preferred policy to implement Plan	
From present day to 2025	The defences will be held in their current position and their function will be maintained at the current standard. Currently undefended areas will remain unprotected. If monitoring supports it, defence works may need to be considered to manage outflanking to protect the town of Hornsea.
Medium term 2025 - 2055	The defences will be held in their current position and their function will be maintained at the current standard. Currently undefended areas will remain unprotected. If monitoring supports it, defence works may need to be considered to manage outflanking to protect the town of Hornsea.
Long term 2055 - 2105	The defences will be held in their current position and their function will be maintained at the current standard. Currently undefended areas will remain unprotected. If monitoring supports it, defence works may need to be considered to manage outflanking to protect the town of Hornsea.

Policy Unit E



Key: Policy (for full details see relevant policy statement)

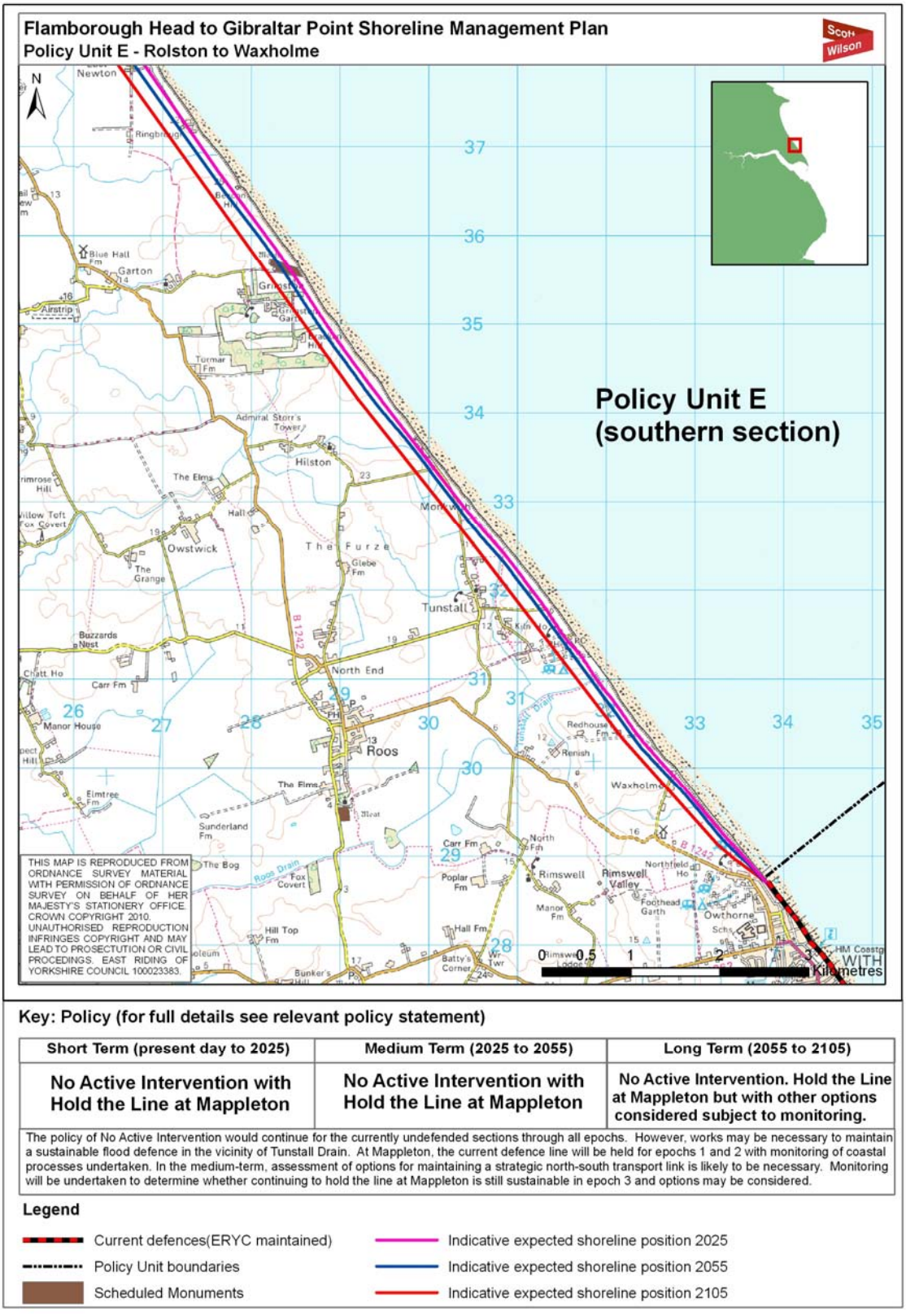
Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
No Active Intervention with Hold the Line at Mappleton	No Active Intervention with Hold the Line at Mappleton	No Active Intervention. Hold the Line at Mappleton but with other options considered subject to monitoring.

The policy of No Active Intervention would continue for the currently undefended sections through all epochs. However, works may be necessary to maintain a sustainable flood defence in the vicinity of Tunstall Drain. At Mappleton, the current defence line will be held for epochs 1 and 2 with monitoring of coastal processes undertaken. In the medium-term, assessment of options for maintaining a strategic north-south transport link is likely to be necessary. Monitoring will be undertaken to determine whether continuing to hold the line at Mappleton is still sustainable in epoch 3 and options may be considered.

Legend

- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Current defences(ERYC maintained)
- Policy Unit boundaries
- Scheduled Monuments

N.B. Mapping shows a Hold the Line policy for Mappleton in all epochs.



There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit E

Preferred policy to implement Plan	
From present day to 2025	There will be no management intervention or defences constructed on the currently undefended frontages. Works may be necessary to maintain a sustainable flood defence in the vicinity of Tunstall Drain. At Mappleton the current defence line will be held.
Medium term 2025 - 2055	There will be no management intervention or defences constructed on the currently undefended frontages. Works may be necessary to maintain a sustainable flood defence in the vicinity of Tunstall Drain. At Mappleton the current defence line will be held. Assessment of options for maintaining a strategic north-south transport link is likely to be necessary.
Long term 2055 - 2105	There will be no management intervention or defences constructed on the currently undefended frontages. Works may be necessary to maintain a sustainable flood defence in the vicinity of Tunstall Drain. At Mappleton, the current defence line will be held, subject to review in the intervening period.

Policy Unit F

Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4)**
If monitoring supports it, defence works may need to be considered to manage outflanking and protect the town of Withernsea. It is uncertain in which epoch this may be required.		

Legend

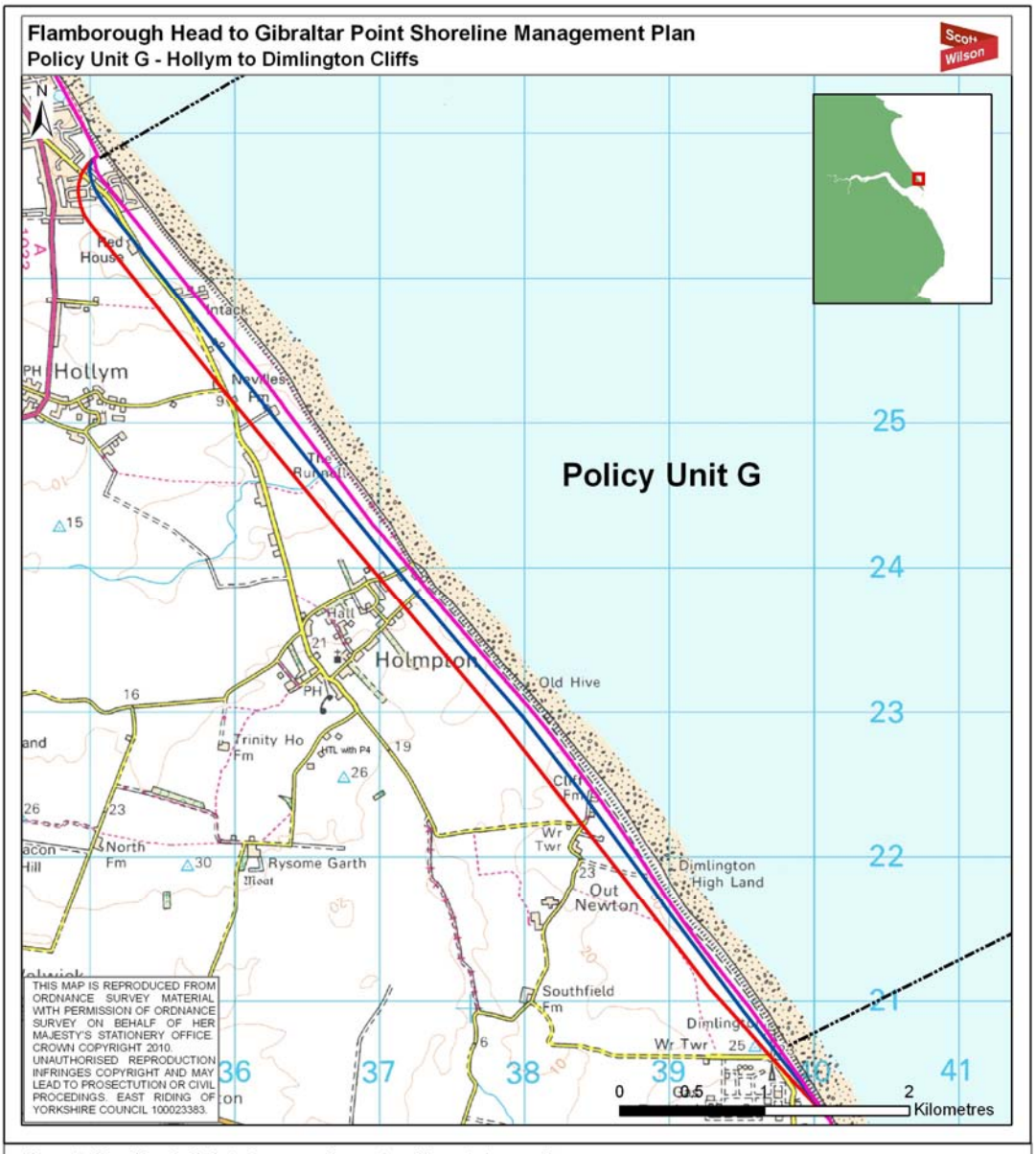
- Current defences(ERYC maintained)
- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Policy Unit boundaries
- Scheduled Monuments
- Internationally Designated Sites

There are listed buildings within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit F

Preferred policy to implement Plan	
From present day to 2025	The defences will be held in their current position and their flood defence function will be maintained. If monitoring supports it, defence works may need to be considered to manage outflanking to protect the town of Withernsea.
Medium term 2025 - 2055	The defences will be held in their current position and their flood defence function will be maintained. If monitoring supports it, defence works may need to be considered to manage outflanking to protect the town of Withernsea.
Long term 2055 - 2105	The defences will be held in their current position and their flood defence function will be maintained. If monitoring supports it, defence works may need to be considered to manage outflanking to protect the town of Withernsea.

Policy Unit G



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
No Active Intervention	No Active Intervention	No Active Intervention

The current policy of No Active Intervention will continue through all epochs. In the medium-term, assessment of options for maintaining a strategic north-south transport link is likely to be neccesary.

Legend

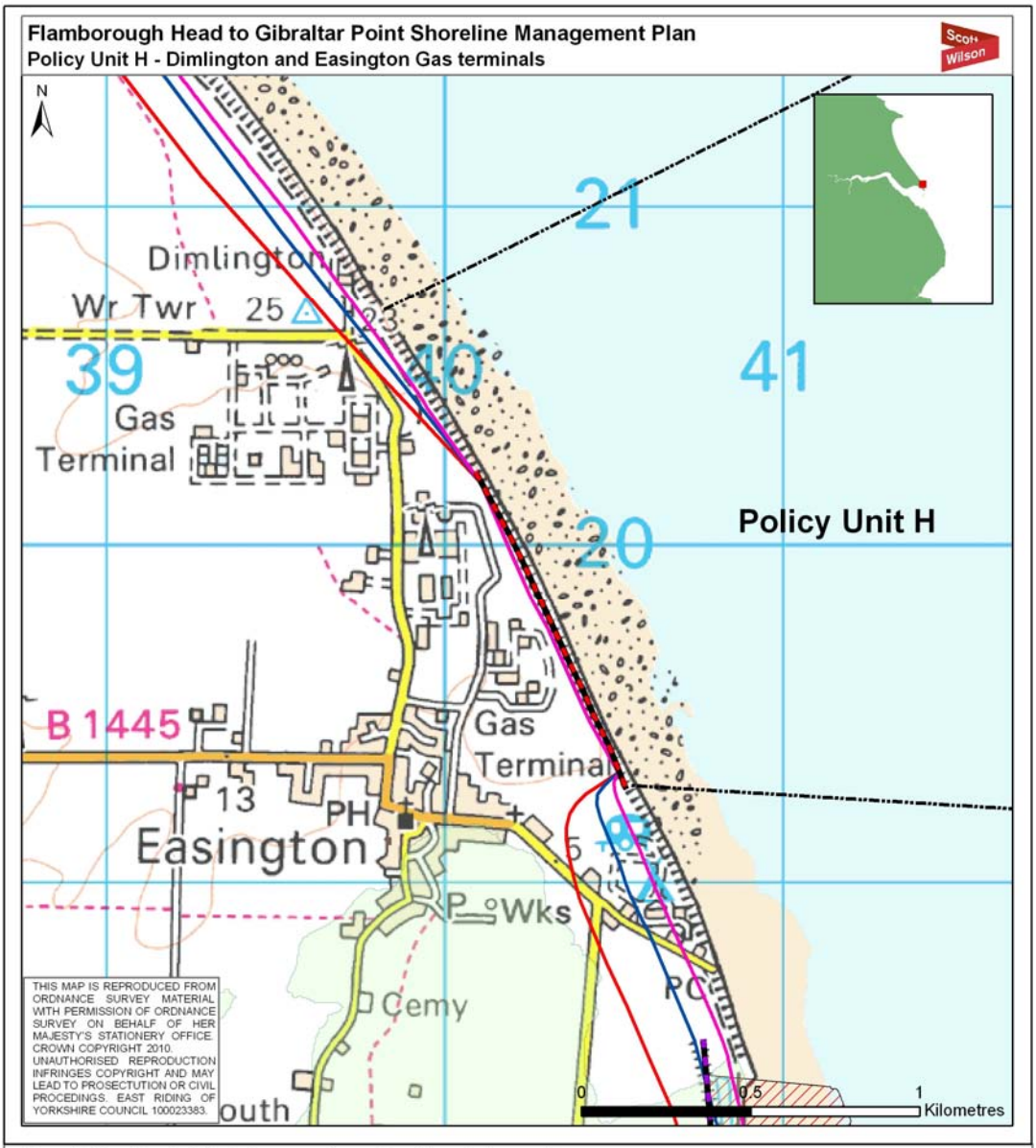
- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Policy Unit boundaries
- Scheduled Monuments

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit G

Preferred policy to implement Plan	
From present day to 2025	There will be no management intervention or defences constructed.
Medium term 2025 - 2055	There will be no management intervention or defences constructed. Assessment of options for maintaining a strategic north-south transport link is likely to be necessary.
Long term 2055 - 2105	There will be no management intervention or defences constructed.

Policy Unit H



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold The Line for current defences. No Active Iintervention elsewhere.	**No Active Intervention or Hold the Line for currently defended areas. No Active Intervention elsewhere.**	**No Active Intervention or Hold the Line for currently defended areas. No Active Intervention elsewhere.**

Management policy will be to continue to protect the Gas Terminals in line with the existing planning permission for the Gas Terminal site and as long as the planning status allows defences. No Active Intervention for currently undefended areas, however management of outflanking may be permitted, subject to necessary approvals to protect the nationally important gas supplies and while there is a strategic need for the site.

Legend

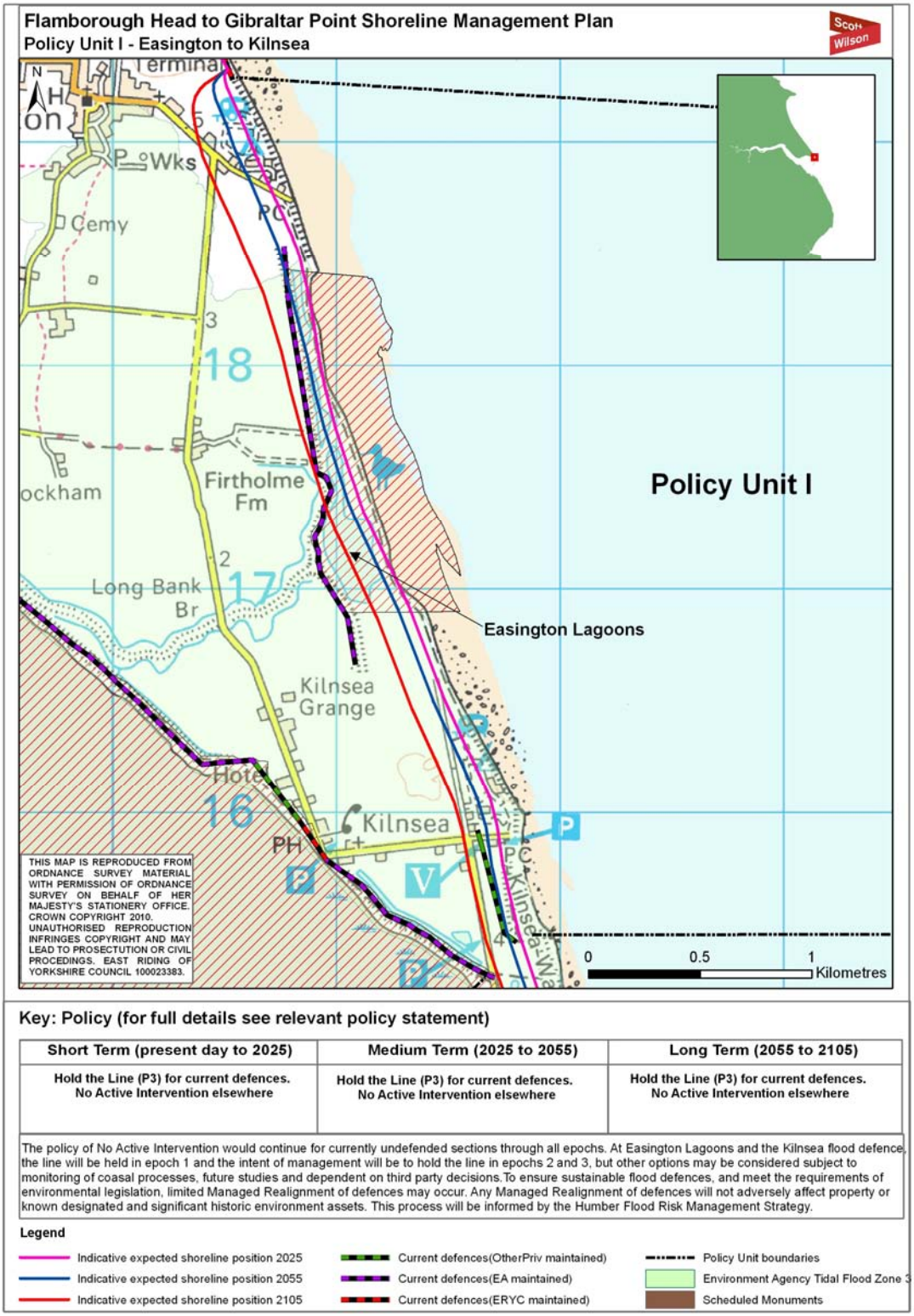
- Current defences(ERYC maintained)
- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3

N.B. Mapping shows a Hold the Line Policy for the Gas Terminal defences in all 3 epochs. There are no listed buildings or conservation areas within this policy unit.

Policy Unit H

Preferred policy to implement Plan	
From present day to 2025	The defences will be held in their current position, subject to a review of planning status for the Gas Terminals in 2020. No Active Intervention elsewhere, however management of outflanking may be permitted, subject to necessary approvals, in order to protect the nationally important gas supplies.
Medium term 2025 - 2055	Future decisions will need to be made in regard to the protection of the site. No Active Intervention for currently undefended areas, however management of outflanking may be permitted, subject to necessary approvals, in order to protect the nationally important gas supplies, while there is a strategic need for the site.
Long term 2055 - 2105	Future decisions will need to be made in regard to the protection of the site. No Active Intervention for currently undefended areas, however management of outflanking may be permitted, subject to necessary approvals, in order to protect the nationally important gas supplies while there is a strategic need for the site.

Policy Unit I



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P3) for current defences. No Active Intervention elsewhere	Hold the Line (P3) for current defences. No Active Intervention elsewhere	Hold the Line (P3) for current defences. No Active Intervention elsewhere

The policy of No Active Intervention would continue for currently undefended sections through all epochs. At Easington Lagoons and the Kilnsea flood defence, the line will be held in epoch 1 and the intent of management will be to hold the line in epochs 2 and 3, but other options may be considered subject to monitoring of coasal processes, future studies and dependent on third party decisions.To ensure sustainable flood defences, and meet the requirements of environmental legislation, limited Managed Realignment of defences may occur. Any Managed Realignment of defences will not adversely affect property or known designated and significant historic environment assets. This process will be informed by the Humber Flood Risk Management Strategy.

Legend

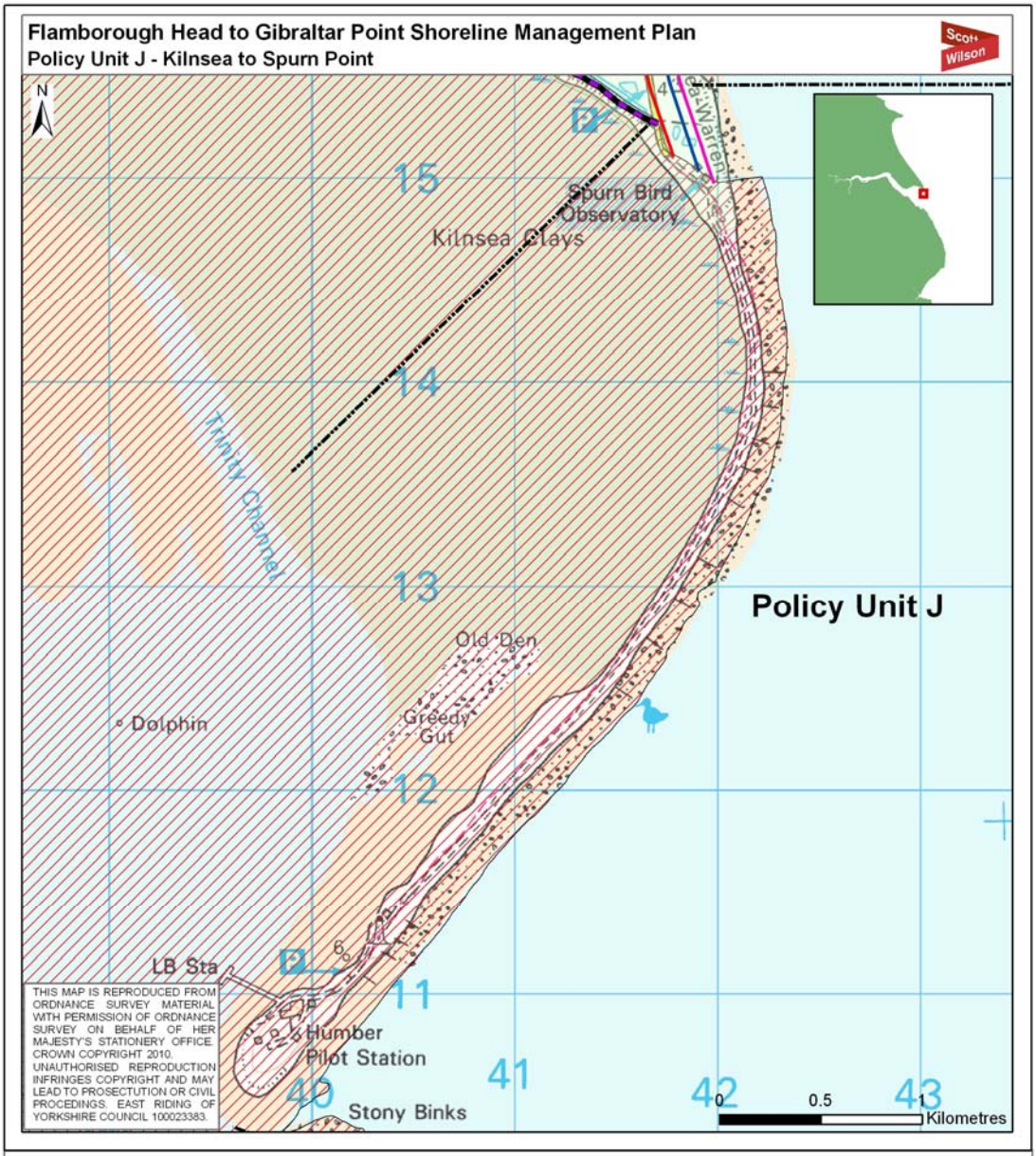
- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Current defences(OtherPriv maintained)
- Current defences(EA maintained)
- Current defences(ERYC maintained)
- Policy Unit boundaries
- Environment Agency Tidal Flood Zone 3
- Scheduled Monuments

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit I

Preferred policy to implement Plan	
From present day to 2025	The conservation value provided by the Easington lagoons European site needs to be maintained. The intent of management is for the Easington Lagoons flood defences to be held in their current position. Limited Managed Realignment may be required to ensure defence sustainability and compliance with applicable environmental legislation by creating habitats to compensate for losses due to coastal squeeze. The Kilnsea flood defence will be held in its current position. No Active Intervention elsewhere allowing undefended cliffs to erode. The detailed approach for the above will be informed by the Humber Flood Risk Management Strategy.
Medium term 2025 - 2055	The conservation value provided by the Easington lagoons European site needs to be maintained. The intent of management is for the Easington Lagoons flood defences to be held in their current position. Limited Managed Realignment may be required to ensure defence sustainability and compliance with applicable environmental legislation by creating habitats to compensate for losses due to coastal squeeze. The way the Kilnsea flood defence will be managed will be decided by third parties and informed by future studies and monitoring. No Active Intervention policy elsewhere allowing undefended cliffs to erode. The detailed approach for the above will be informed by the Humber Flood Risk Management Strategy.
Long term 2055 - 2105	The intent of management is to continue to hold the line. Other options may be considered if a hold the line policy is becomes unsustainable. The way the Kilnsea flood defence will be managed will be decided by monitoring, future studies and third party decisions. No Active Intervention elsewhere allowing undefended cliffs to erode. The detailed approach for the above will be informed by the Humber Flood Risk Management Strategy.

Policy Unit J



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Managed Realignment	**Managed Realignment or No Active Intervention**	**Managed Realignment or No Active Intervention**
The intention is to intervene only when necessary to maintain access to the facilities and Spurn Point. The integrity of the barrier will be maintained until it becomes unsustainable to do so.		

Legend

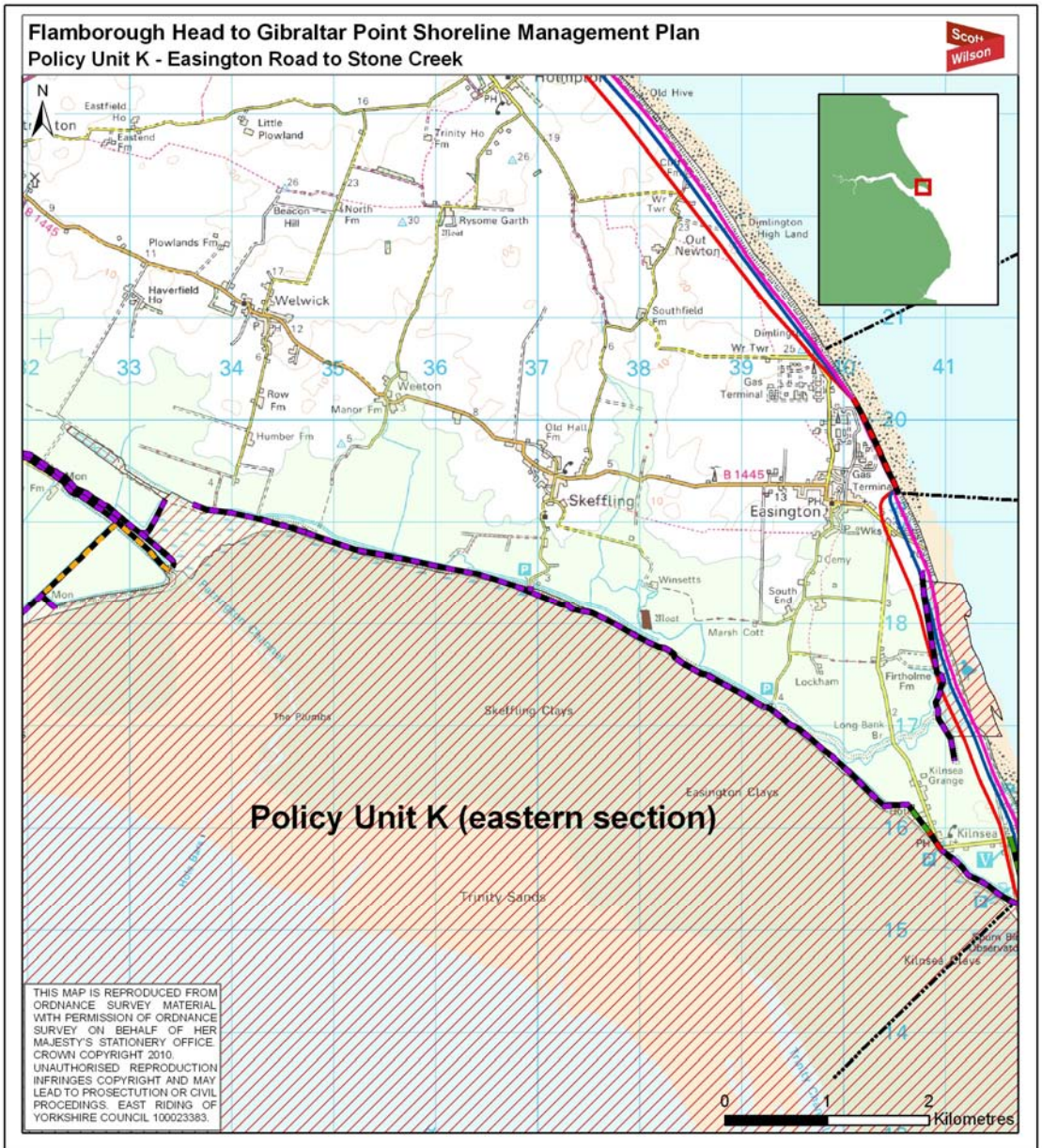
- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites

There are listed buildings within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit J

Preferred policy to implement Plan	
From present day to 2025	Allow the Spurn barrier to evolve largely naturally with limited intervention to maintain the barrier's integrity and access to Spurn Point as long as this is sustainable.
Medium term 2025 - 2055	Allow the Spurn barrier to evolve largely naturally with limited intervention to maintain the barrier's integrity and access to Spurn Point as long as this is sustainable. If this becomes unsustainable, management intervention will be withdrawn.
Long term 2055 - 2105	Allow the Spurn barrier to evolve largely naturally with limited intervention to maintain the barrier's integrity and access to Spurn Point as long as this is sustainable. If this becomes unsustainable, management intervention will be withdrawn.

Policy Unit K



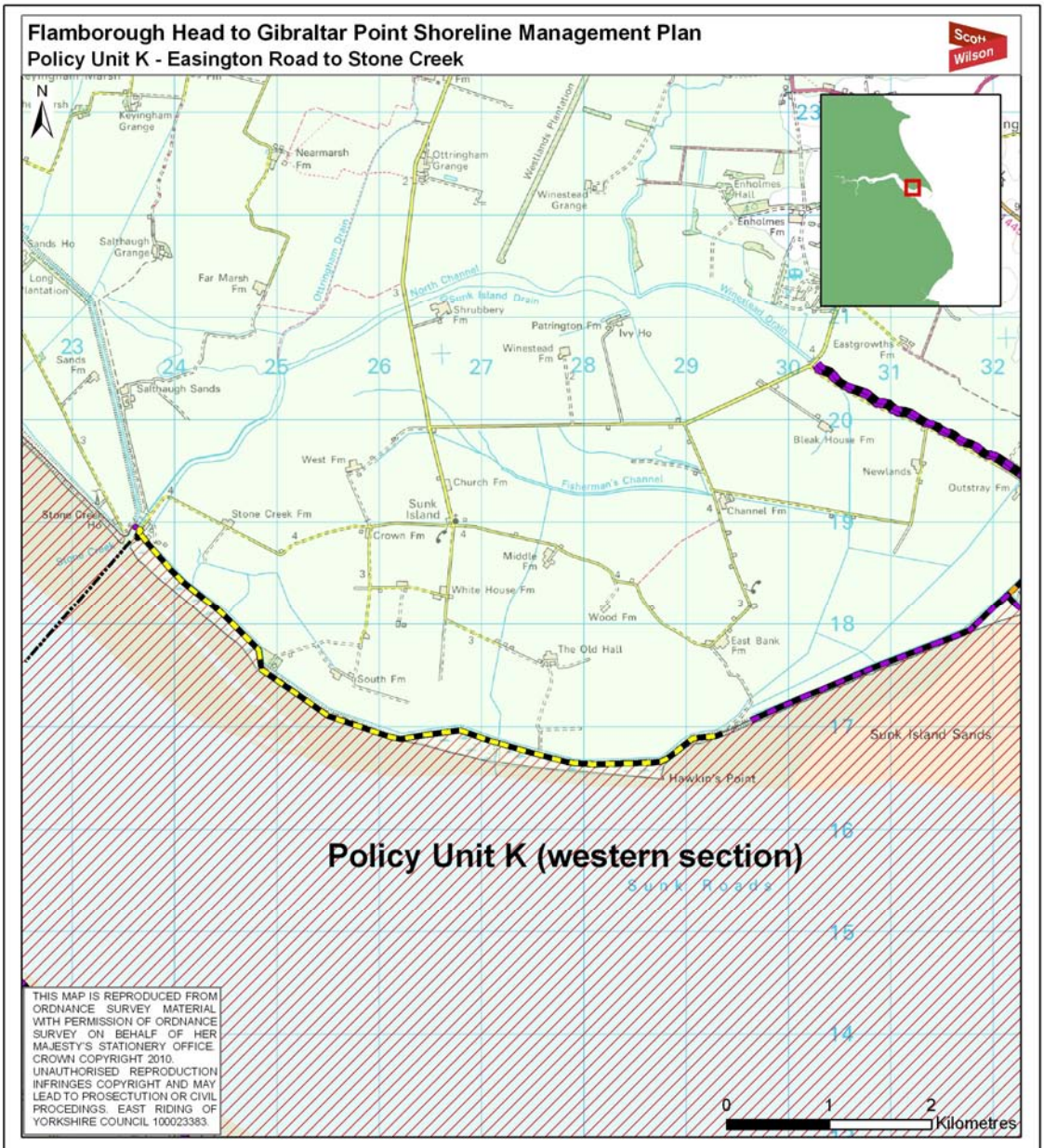
Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4)**

The overarching policy is to Hold the Line and maintain the standard of flood protection in all 3 epochs. To ensure sustainable flood defence, and meet the requirements of environmental legislation, detailed studies will identify sites for Managed Realignment in the order of 100 hectares on the north bank of the Humber Estuary. Any Managed Realignment of defences will not adversely affect property or known designated and significant historic environment assets. This process will be informed by the Humber Flood Risk Management Strategy.

Legend

- Current defences(OtherPriv maintained)
- Current defences(ERYC maintained)
- Current defences(EA maintained)
- Current defences(ABP maintained)
- Internationally Designated Sites
- Indicative expected shoreline position 2025
- Indicative expected shoreline position 2055
- Indicative expected shoreline position 2105
- Policy Unit boundaries
- Scheduled Monuments
- EA Tidal Flood Zone 3



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	Hold the Line (P4)	Hold the Line (P4)
The overarching policy is to Hold the Line and maintain the standard of flood protection in all 3 epochs. To ensure sustainable flood defence, and meet the requirements of environmental legislation, detailed studies will identify sites for Managed Realignment in the order of 100 hectares on the north bank of the Humber Estuary. Any Managed Realignment of defences will not adversely affect property or known designated and significant historic environment assets. This process will be informed by the Humber Flood Risk Management Strategy.		

Legend

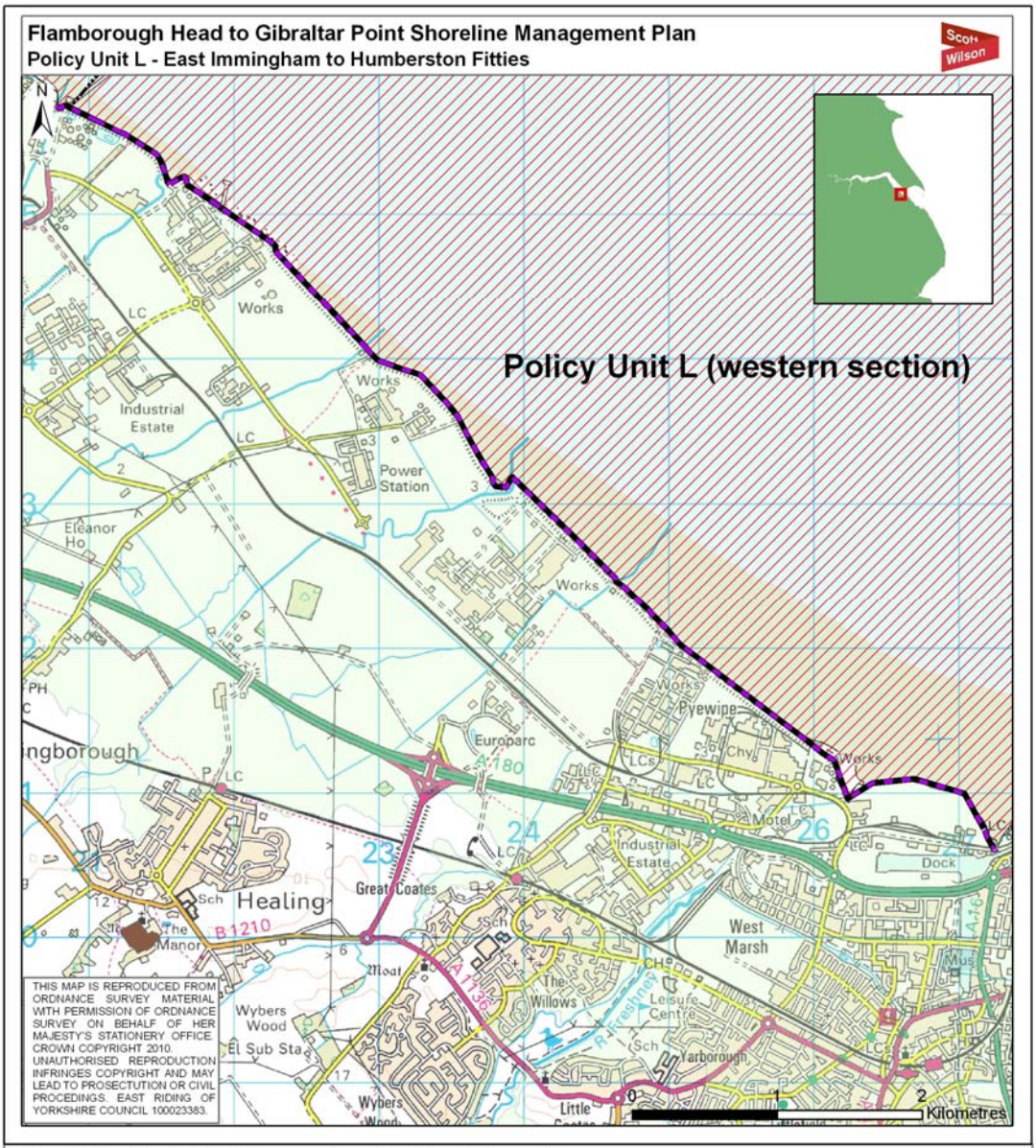
- Current defences(EA maintained)
- Current defences(CrownEst maintained)
- Current defences(ABP maintained)
- Policy Unit boundaries
- EA Tidal Flood Zone 3
- Internationally Designated Sites

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit K

Preferred policy to implement Plan	
From present day to 2025	The intent of management is for the flood defences to be held in their current position. The defences will maintain the present standard of protection against flooding. Limited Managed Realignment may be required to ensure defence sustainability and compliance with applicable environmental legislation by creating habitats to compensate for losses due to coastal squeeze. The detailed approach for the above will be informed by the Humber Flood Risk Management Strategy.
Medium term 2025 - 2055	The intent of management is for the flood defences to be held in their current position. The defences will maintain the present standard of protection against flooding. Limited Managed Realignment may be required to ensure defence sustainability and compliance with applicable environmental legislation by creating habitats to compensate for losses due to coastal squeeze. The detailed approach for the above will be informed by the Humber Flood Risk Management Strategy.
Long term 2055 - 2105	The intent of management is for the flood defences to be held in their current position. The defences will maintain the present standard of protection against flooding. Limited Managed Realignment may be required to ensure defence sustainability and compliance with applicable environmental legislation by creating habitats to compensate for losses due to coastal squeeze. Other options may be considered if a hold the line policy becomes unsustainable. The way the flood defence will be managed will be decided by monitoring, future studies and third party decisions. The detailed approach for the above will be informed by the Humber Flood Risk Management Strategy.

Policy Unit L

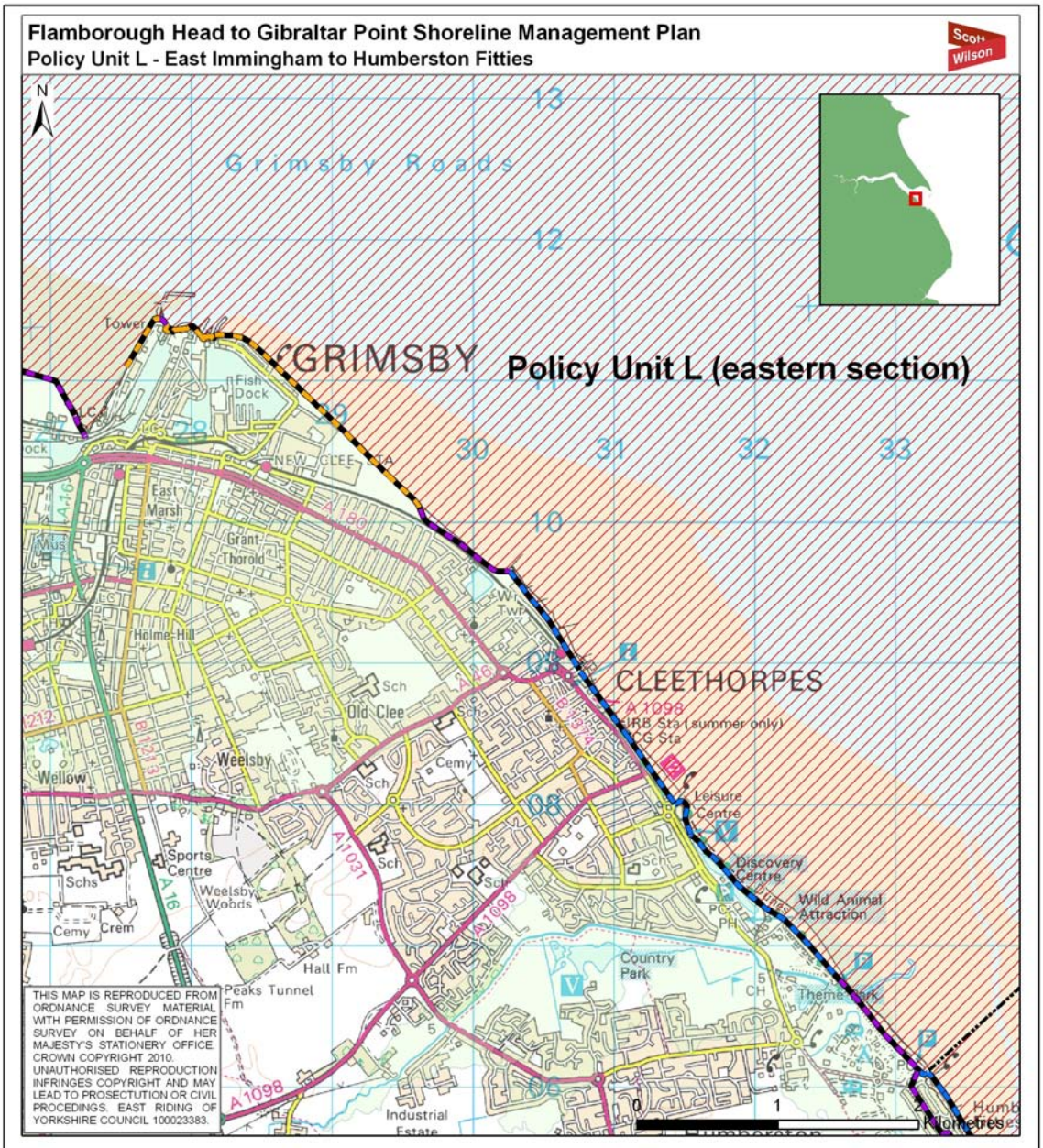


Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4)**
The defences will be held in their current position and their function will be maintained.		

Legend

- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- EA Tidal Flood Zone 3
- Internationally Designated Sites



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4)**
The defences will be held in their current position and their flood defence function will be maintained.		

Legend

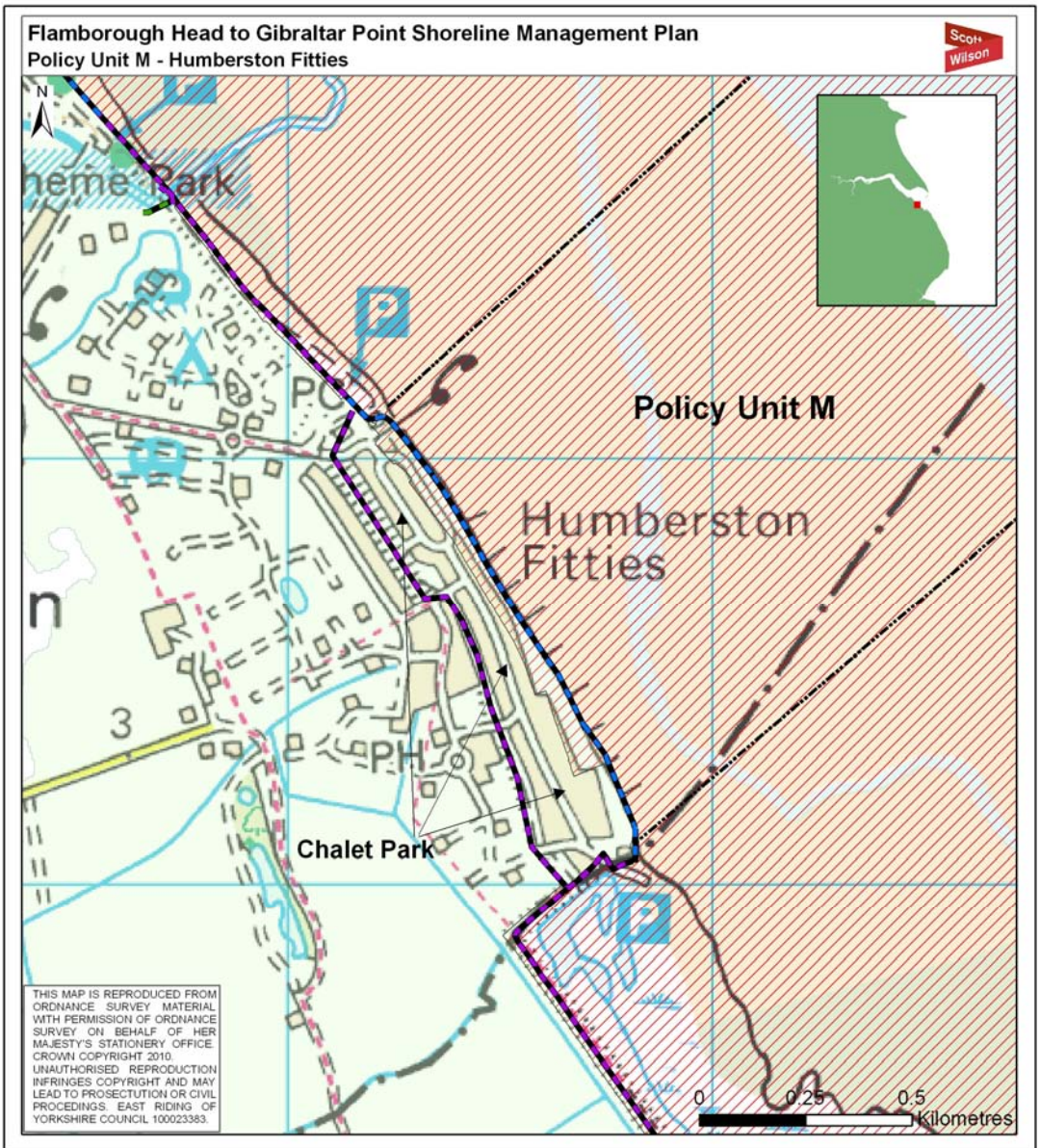
- Current defences(EA maintained)
- Current defences(NELC maintained)
- Current defences(ABP maintained)
- Policy Unit boundaries
- Scheduled Monuments
- EA Tidal Flood Zone 3
- Internationally Designated Sites

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit L

Preferred policy to implement Plan	
From present day to 2025	The defences will be held in their current position and their function will be maintained.
Medium term 2025 - 2055	The defences will be held in their current position and their function will be maintained.
Long term 2055 - 2105	The defences will be held in their current position and their function will be maintained.

Policy Unit M



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P3) for the front line and P4 for the second line.	Hold the Line (P3) for the front line and P4 for the second line.	Hold the Line (P4) for the second line of defence
The Policy for the Chalet Park will be subject to further policy evaluation.		

Legend

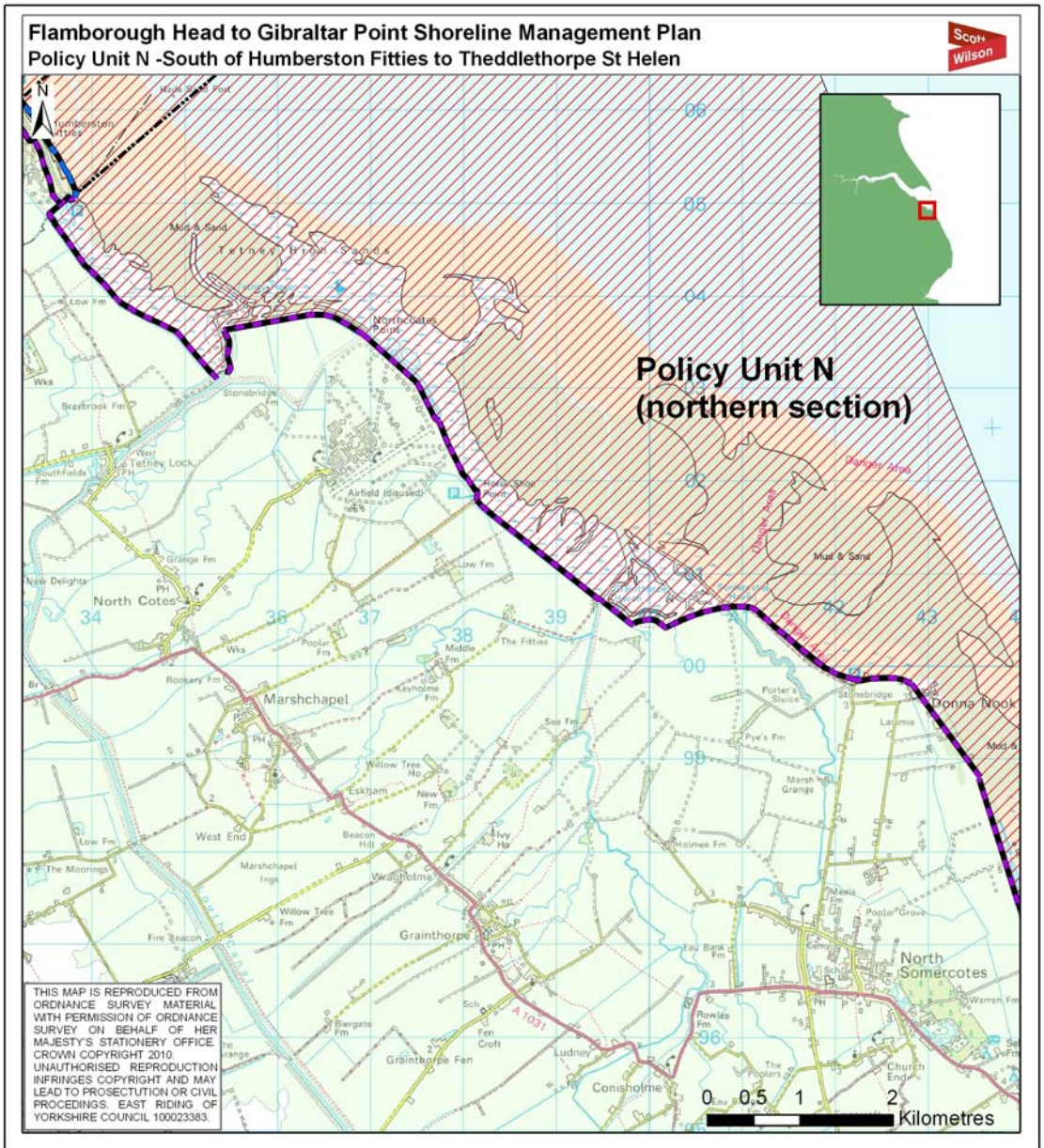
- Current defences(NELC maintained)
- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Internationally Designated Sites
- EA Tidal Flood Zone 3

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit M

Preferred policy to implement Plan	
From present day to 2055	The defences will be held in their current position. The first line of defences will be maintained at current crest levels. The second line of defence in the Chalet Park will be improved as necessary to counter potential sea level rise. During this period the overall feasibility of maintaining into the long term the current standards of defence for the Fitties between the first and second lines of defence will be reviewed. Alternatives to the current approach of maintaining these defences will be discussed and evaluated through partnership working with those immediately affected and those public bodies responsible for bringing about practical solutions.
Long term 2055 - 2105	The second line of defences will be held in their current position and their function and the standard of protection against flooding will be maintained. The future strategy for the Fitties Chalet park will have been decided.

Policy Unit N

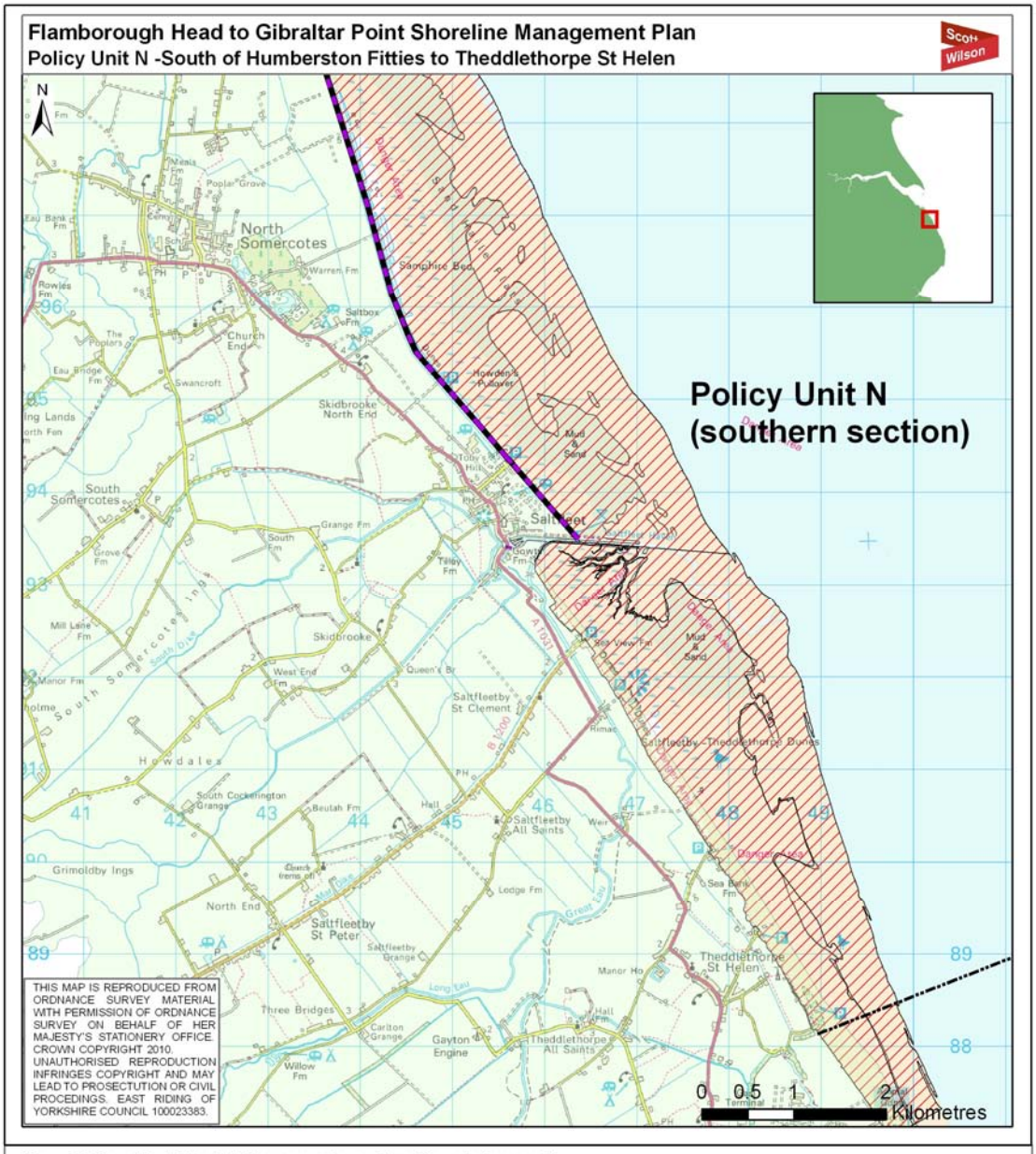


Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4)**
The overarching policy is to Hold the Line and maintain the standard of flood protection in all 3 epochs. To ensure sustainable flood defence, and meet the requirements of current environmental legislation, detailed studies will identify sites for limited Managed Realignment in the order of 100 hectares on the south bank of the Humber Estuary. Any Managed Realignment of defences will not adversely affect property or known designated and significant historic environment assets and will be informed by the Humber Flood Risk Management Strategy.		

Legend

- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4)**
The overarching policy is to Hold the Line and maintain the standard of flood protection in all 3 epochs. To ensure sustainable flood defence, and meet the requirements of current environmental legislation, detailed studies will identify sites for limited Managed Realignment in the order of 100 hectares on the south bank of the Humber Estuary. Any Managed Realignment of defences will not adversely affect property or known designated and significant historic environment assets and will be informed by the Humber Flood Risk Management Strategy.		

Legend

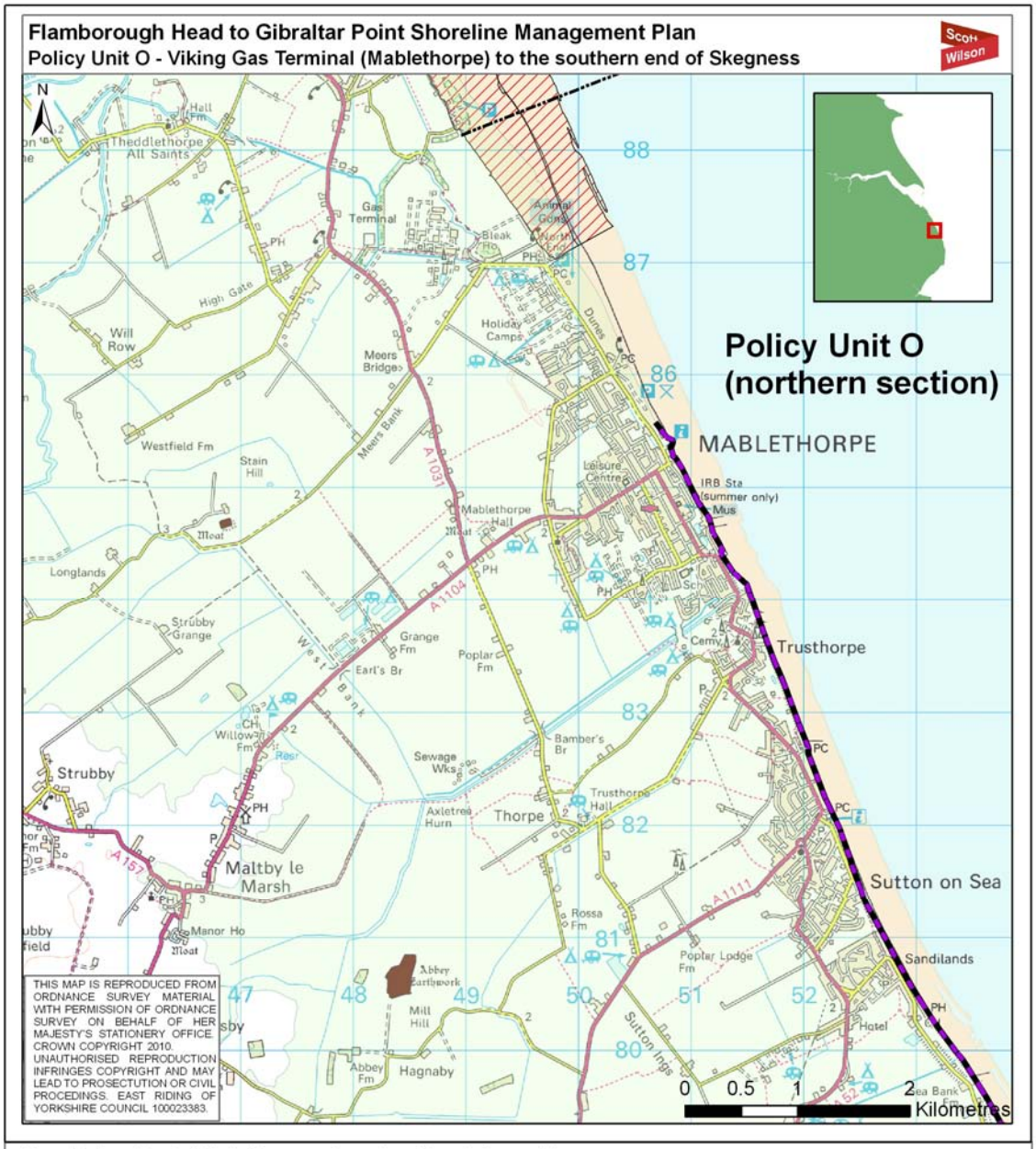
- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites

There are listed buildings within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit N

Preferred policy to implement Plan	
From present day to 2025	The defences will be held in their current position and their flood defence function will be maintained. Dunes will continue to provide natural flood protection supplemented by flood embankments. Embankments may be raised and improved to counter sea level rise as required, to maintain the standard of protection. Intertidal habitat balances will need to be maintained.
Medium term 2025 - 2055	The defences will be held in their current position and their flood defence function will be maintained. Dunes will continue to provide natural flood protection supplemented by flood embankments. Embankments may be raised and improved to counter sea level rise as required, to maintain the standard of protection. Intertidal habitat balances will need to be maintained.
Long term 2055 - 2105	The defences will be held in their current position and their flood defence function will be maintained. Dunes will continue to provide natural flood protection supplemented by flood embankments. Embankments may be raised and improved to counter sea level rise as required, to maintain the standard of protection. Intertidal habitat balances will need to be maintained.

Policy Unit O



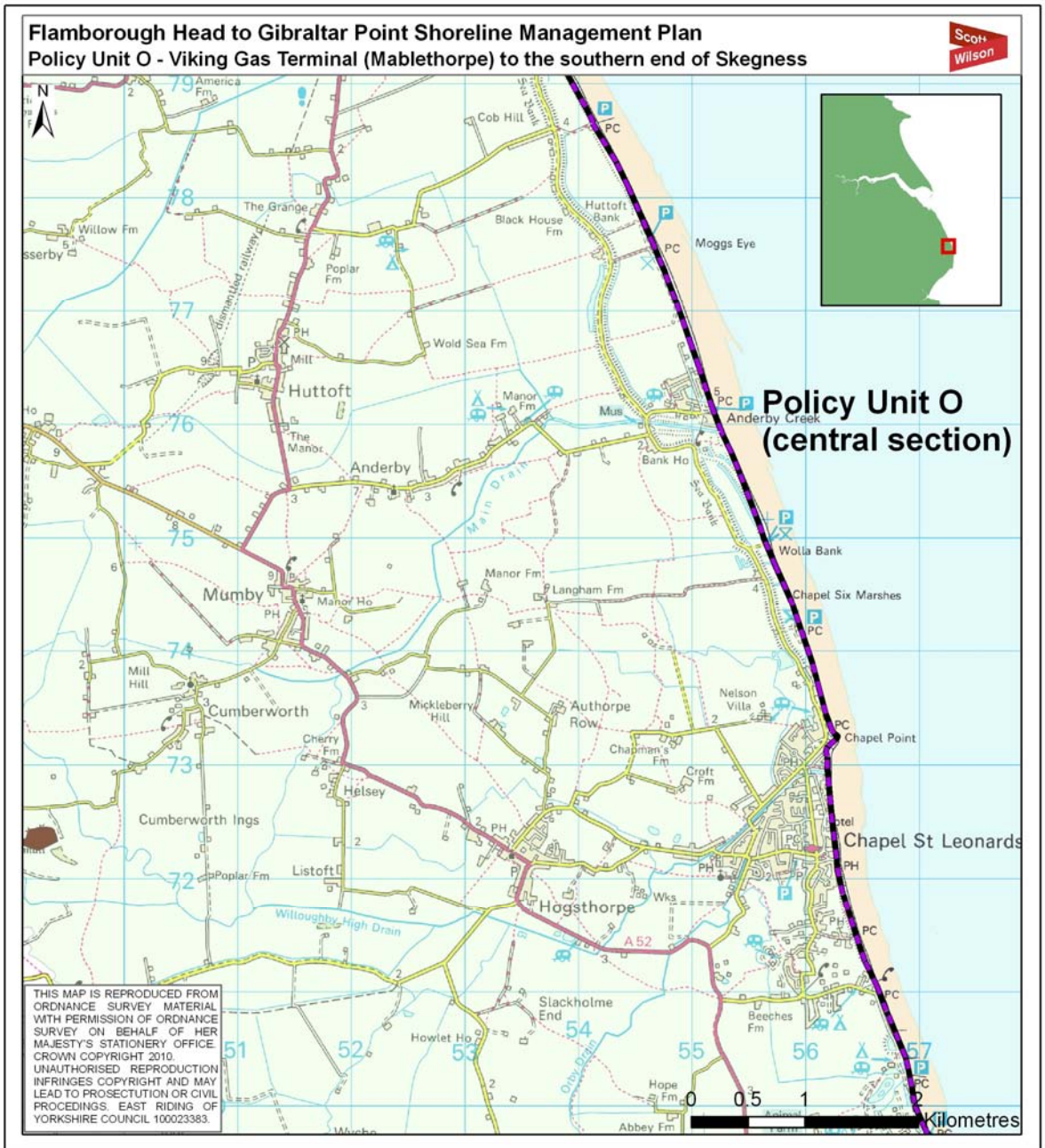
Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line (P4) with localised Managed Realignment considered where appropriate.**

The management intent will be to hold the line for all epochs continuing the present day standard of protection against flooding. In epoch 3, localised Managed Realignment could be considered in appropriate areas to increase defence sustainability. Specific sites have not been identified, but further detailed studies in the future should investigate potential sites.

Legend

- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites



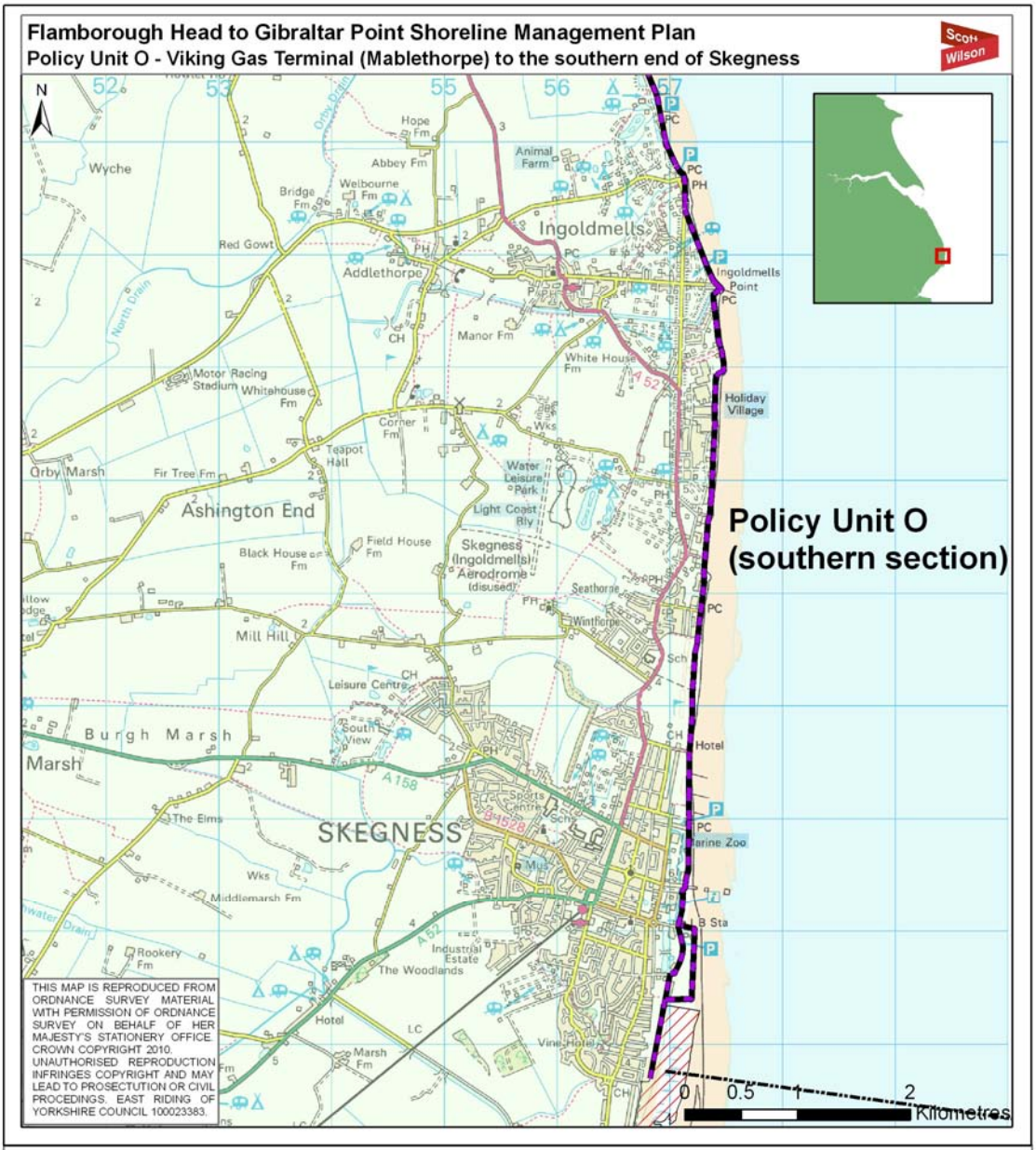
Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	Hold the Line (P4)	Hold the Line (P4) with localised Managed Realignment considered where appropriate.

The management intent will be to hold the line for all epochs continuing the present day standard of protection against flooding. In epoch 3, localised Managed Realignment could be considered in appropriate areas to increase defence sustainability. Specific sites have not been identified, but further detailed studies in the future should investigate potential sites.

Legend

- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	Hold the Line (P4)	Hold the Line (P4) with localised Managed Realignment considered where appropriate.

The management intent will be to hold the line for all epochs continuing the present day standard of protection against flooding. In epoch 3, localised Managed Realignment could be considered in appropriate areas to increase defence sustainability. Specific sites have not been identified, but further detailed studies in the future should investigate potential sites.

Legend

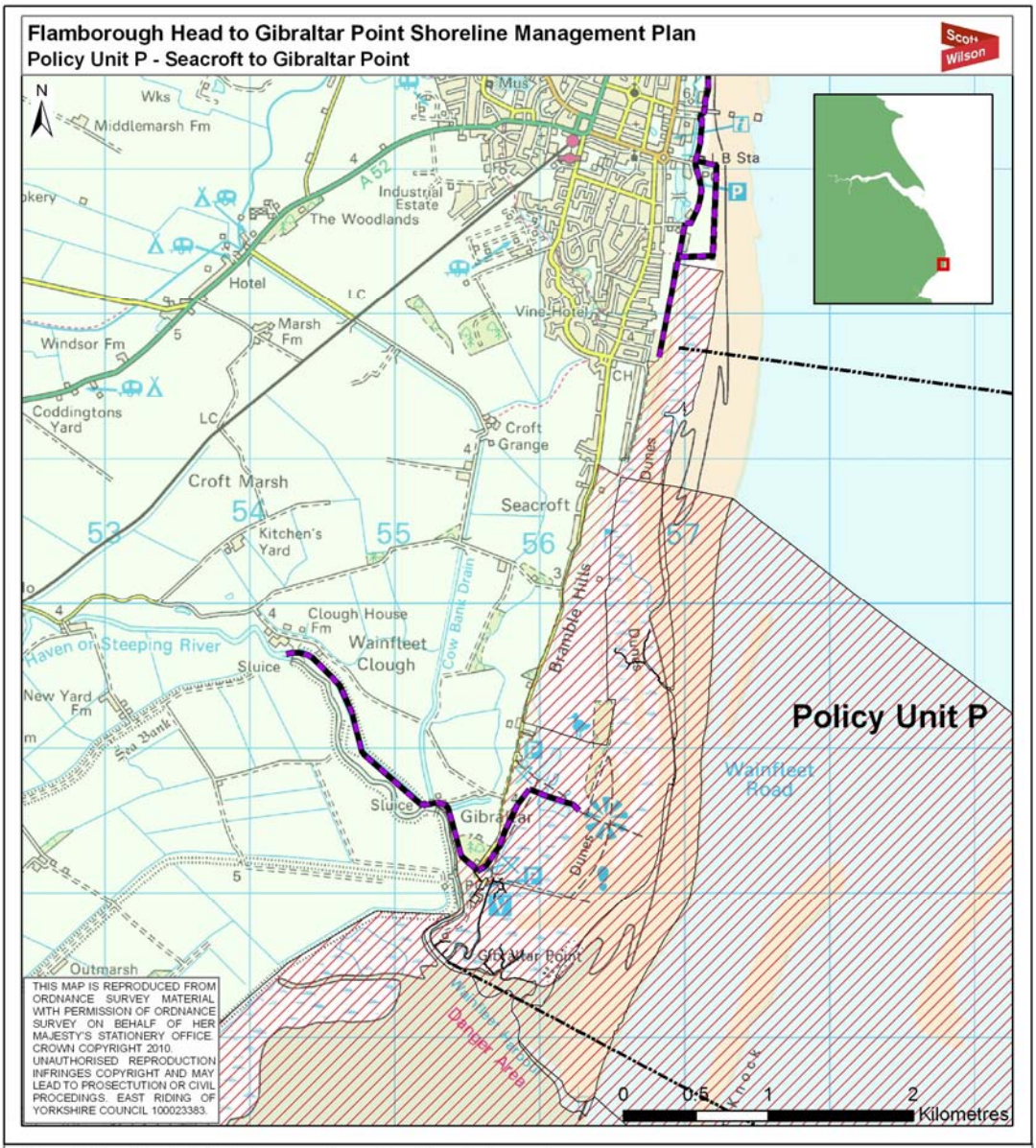
- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites

There are listed buildings and conservation areas within this policy unit, but for clarity, these have not been shown on the mapping.

Policy Unit O

Preferred policy to implement Plan	
From present day to 2025	The defences will be held in their current position and their flood defence function will be maintained. Defences will be raised and improved to counter sea level rise as required.
Medium term 2025 - 2055	The defences will be held in their current position and their flood defence function will be maintained. Defences will be raised and improved to counter sea level rise as required.
Long term 2055 - 2105	The defences will be held in their current position and their flood defence function will be maintained. Defences will be raised and improved to counter sea level rise as required. Localised managed realignment could be considered to increase defence sustainability, in areas where appropriate.

Policy Unit P



Key: Policy (for full details see relevant policy statement)

Short Term (present day to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
Hold the Line (P4)	**Hold the Line (P4)**	**Hold the Line or Managed Realignment (P4)**
The policies for the long term are conditional. They depend on the results of monitoring and research into climate change, shoreline response and the role of defences.		

Legend

- Current defences(EA maintained)
- Policy Unit boundaries
- Scheduled Monuments
- Environment Agency Tidal Flood Zone 3
- Internationally Designated Sites

There are no listed buildings or conservation areas within this policy unit.

Policy Unit P

Preferred policy to implement Plan	
From present day to 2025	The defences will be held in their current position and their flood defence function will be maintained. Dunes will continue to provide natural flood protection supplemented by flood embankments. Embankments will be raised and improved to counter sea level rise as required, to maintain the standard of protection.
Medium term 2025 - 2055	The defences will be held in their current position and their flood defence function will be maintained. Dunes will continue to provide natural flood protection supplemented by flood embankments. Embankments will be raised and improved to counter sea level rise as required, to maintain the standard of protection.
Long term 2055 - 2105	It is possible that the current alignment can be held, but it is also possible that landward realignment will be needed for part of this frontage. If realignment is needed, the timing, location and extent will be determined to optimise defence sustainability, to provide time for adaptation, and to compensate for the potential deterioration of designated habitat at Gibraltar Point.

9 Implications of the Plan

This section summarises the impacts resulting from the Plan. The main implications of the Shoreline Management Plan are summarised below by coastal area.

Chalk cliffs (Policy Unit A)

Within Policy Unit A, natural processes will be allowed to continue, meaning that Flamborough Head will continue to erode. Due to the slow erosion rate within this area, there are no settlements or individual properties at threat from coastal erosion over the lifetime of the SMP. This policy ensures that natural coastal processes will continue uninterrupted in this area, meaning that sediment will continue to be supplied to other coastlines from this area. The policy has benefits for the natural environment, landscape and tourism, since the character of Flamborough Head will not be adversely affected by the policy. There may be some impacts due to erosion on historic environment assets, such as the Scheduled Monument at Danes Dyke.

Holderness cliffs (Policy Units B – I)

Within this area, the policies will ensure the continued protection from coastal erosion and coastal flooding of the towns of Bridlington, Hornsea and Withernsea. These policies will also ensure that infrastructure associated with these towns, historic environment assets behind the defended area and agricultural land at the rear of the towns continue to be protected from coastal erosion and flooding. The decision to continue to hold the line means that erosion of each of these frontages is prevented and there may be some interruption to the sediment supplied to downdrift coastlines by the end of the SMP timeframe, as the defended areas increasingly become promontories as the undefended areas either side of the defences continue to erode. The interruption of natural processes may result in narrowing of the beaches, which has the potential to adversely affect the landscape and tourism value of these coastal towns. The defended frontages are likely to require increasingly sizeable defences as they become more exposed to wave attack (due to loss of beach as well as sea level rise).

The policy for Mappleton will ensure continued protection from coastal erosion for the village in the short and medium term at least. This policy will also ensure that infrastructure associated with the village, historic environment assets behind the defended area and agricultural land at the rear of Mappleton continue to be protected from coastal erosion and flooding. The decision to continue to hold the line means that erosion of this frontage is prevented and there may be some interruption to the sediment supplied to downdrift coastlines by the end of the SMP timeframe, as the defended area increasingly becomes a promontory as the undefended areas either side of the defences continue to erode. The interruption of natural processes may result in narrowing of the beach, which has the potential to adversely affect the landscape value of Mappleton. Increasingly sizeable defences are likely to be required as they become more exposed to wave attack (due to loss of beach as well as sea level rise). The SMP has identified the need to continue monitoring of coastal processes in this area to determine whether continuing to hold the line at Mappleton is still sustainable in epoch 3 and options may be considered.

The policy at the Dimlington and Easington gas terminals will ensure continued protection from coastal erosion of the gas terminals while there is a strategic need for the sites. This policy will also ensure that historic environment assets behind the defended area and agricultural land at the rear of the gas terminals continue to be protected from coastal erosion. The decision to continue to hold the line means that erosion of this frontage is prevented and there may be some interruption to the sediment supplied to downdrift coastlines by the end of the SMP timeframe, as the defended area increasingly becomes a promontory as the undefended areas either side of the defences continue to erode. The interruption of natural processes may result in narrowing of the beach, which has the potential to adversely affect the landscape value in this

area. Increasingly sizeable defences are likely to be required as they become more exposed to wave attack (due to loss of beach as well as sea level rise).

The policies recognise that works may be necessary to maintain the functionality of Barmston Drain.

The policies recognise that works may be necessary to maintain a sustainable flood defence in the vicinity of Tunstall Drain.

The policy south of Easington ensures sustainable coastal flood and erosion protection to assets in the floodplain. The policy recognises that the replacement of Easington Lagoons habitat is likely to be required in epoch 2. The SMP has identified the need to continue monitoring coastal processes in this area, with a review of the sustainability of the Kilnsea defences likely to be needed in epoch 2 or 3.

Between the defended areas of Bridlington, Hornsea, Mappleton, Withernsea and Easington, the policy of 'no active intervention' means that the cliffs of Holderness will continue to erode (with the exception of the intervention mentioned above at Barmston Drain). This policy ensures that natural coastal processes will continue uninterrupted in this area, meaning that sediment will continue to be supplied to other coastlines from this area. The policy has benefits for the natural environment, landscape and tourism, since the character of the undefended sections of coast will not be adversely affected by the policy. There will be some impacts to historic environment assets due to continued erosion.

Although the majority of the coastal villages (Including Wilsthorpe, Fraisthorpe, Barmston, Ulrome, Skipsea, Atwick, Rolston, Cowden, Aldbrough, Grimston, Hilston, Tunstall, Hollym, Holmpton, Out Newton, and associated infrastructure and services) will not be at risk of erosion over the lifetime of the SMP, there are a number of individual properties at risk of erosion over the timescale of the SMP. Based on the mapping showing erosion lines (above), it is estimated that over the length of undefended frontage, approximately 37 residential properties are at risk of erosion by 2025, approximately 73 properties between 2025 and 2055, with further property at risk of erosion by the end of the Plan period in 2105.

In addition to the residential properties, there will be loss of or damage to a number of buildings associated with campsites and holiday parks along the cliff top, as well as farm outbuildings, a number of boat compounds and part of an industrial estate. There is some uncertainty in the actual future position of the shoreline so the exact number of properties that will be lost in each epoch may be less than or greater than the predicted figures. In addition to properties, the decision not to protect the currently undefended areas means that agricultural land will continue being lost to erosion. Based on the mapping showing erosion lines (Chapter 8), it is estimated that over the length of undefended frontage, almost no grade 2 agricultural land will be lost to erosion by 2025, approximately 10 hectares between 2025 and 2055, with further grade 2 agricultural land lost by the end of the Plan period in 2105. It is estimated that over the length of undefended frontage, approximately 160 hectares of grade 3 and 4 agricultural land will be lost to erosion by 2025, approximately 280 hectares between 2025 and 2055 with further losses of grade 3 and 4 agricultural land by the end of the Plan period in 2105. The preferred policies will have an adverse impact on some of the infrastructure within this area, particularly the B1242 to the north of Mappleton, Holmpton Road to the south of Withernsea and the Hollym wastewater treatment works which are all at risk of erosion within the lifetime of the SMP. There is also the potential for some loss of or damage to historic environment assets in this area, including the Scheduled Monument at Grimston Garth comprising two moated sites and associated features.

Spurn Head (Policy Unit J)

Within Policy Unit J, Spurn Head will be allowed to evolve largely naturally with as limited intervention as is required to maintain the integrity of the barrier, as long as this is sustainable. This policy ensures continued access to the key facilities and assets at Spurn Point whilst causing minimal interruption to the

natural environment, coastal processes and the presence and functioning of Spurn and the Humber Estuary. As a result of the great degree of uncertainty over how Spurn will evolve, particularly in the longer term as the climate changes, there is some uncertainty over how much intervention will be required to maintain access and what the consequent impact will be on the landscape value of Spurn. In the longer term, there is also the potential for some damage to historic environment assets along Spurn, including the World War I and World War II features and Spurn Head lighthouse; this is likely to be caused by natural evolution of the barrier but historic environment features could also be affected by intervention.

Outer Humber Estuary (Policy Units K – M)

The policy for the north bank of the Humber will ensure continued protection from coastal erosion and coastal flooding for assets in the floodplain. All property, all known designated and significant historic environment assets and the majority of agricultural land will continue to be protected. However, in order to ensure sustainable defences and meet the requirements of environmental legislation, limited managed realignment of defences may be required. Detailed studies will identify sites which will be in the order of 100 hectares for epochs 1 and 2 combined. Property and known designated and significant historic environment assets will not be affected by any realignment schemes, however some grade 2 agricultural land is likely to be lost as part of the realignment. The process will be informed by the Humber Flood Risk Management Strategy.

The policy for the south bank of the Humber will ensure continued protection from coastal erosion and coastal flooding for assets in the floodplain, including the significant industry, port and residential areas between Immingham and Cleethorpes. This policy will also ensure that infrastructure associated with Grimsby, Cleethorpes and the villages within the area, historic environment assets and agricultural land at the rear of the towns continue to be protected from coastal erosion and flooding. The decision to continue to hold the line means that erosion of this frontage is prevented resulting in a reduction in supply of sediment to the beaches and intertidal and subtidal habitats. The interruption of natural processes as well as coastal squeeze caused by sea level rise is likely to result in loss of intertidal habitat within the Humber Estuary, which has the potential to adversely affect the landscape as well as the designated environmental sites of the Humber Estuary. The defended frontages are likely to require increasingly sizeable defences as they become more exposed to wave attack (due to removal of material at the base of the defence structures as well as sea level rise).

At Humberston Fitties, further studies will investigate the overall feasibility of maintaining into the long term the current standards of defence for the chalet park, and this will inform the policy for this area. There may need to be planning and sufficient time for adaptation and/or relocation of the Chalet Park.

Lincolnshire coast (Policy Units N – P)

The policy for the area to the south of Humberston Fitties to Theddlethorpe St Helen is to ensure continued protection from coastal erosion and coastal flooding for assets in the floodplain. All property, all known designated and significant historic environment assets and the majority of agricultural land will continue to be protected. However, in order to ensure sustainable defences and meet the requirements of applicable environmental legislation, limited managed realignment of defences may be required (see diagrams on page 73). Detailed studies will identify sites which will be in the order of 100 hectares for epochs 1 and 2. Property and known designated and significant historic environment assets will not be affected by any realignment schemes, however some high grade agricultural land is likely to be lost as part of such a realignment. The process will be informed by the Humber Flood Risk Management Strategy.

The policy for Mablethorpe to the southern end of Skegness will ensure continued protection against coastal flooding and coastal erosion at the same standard as the present day. This policy will ensure all people and property, including the two principal towns of Mablethorpe and Skegness and their associated

infrastructure and services, as well as historic environment assets and agricultural land at the rear of the towns continue to be protected from coastal erosion and flooding. The interruption of natural processes may result in narrowing of the beaches, which has the potential to adversely affect the landscape and tourism value of these coastal towns. Increasingly sizeable defences are likely to be required as they become more exposed to wave attack (due to loss of beach as well as sea level rise). In the longer term (epoch 3), accelerating sea level rise could begin to cause problems for defence sustainability. Managed Realignment could be considered locally, in areas where appropriate, to ensure sustainable flood risk management for the future. The landward extent of any new defence line would be the minimum required to ensure sustainable defences; minimising the impacts on agricultural land, people, property and the historic environment. In addition to protecting against tidal inundation, increased drainage pumping may also be required to provide flood protection as sea levels rise. There will need to be sufficient planning and time allocated for adaptation if this is undertaken.

The policy for the area to the south of Skegness to Gibraltar Point will ensure continued protection against coastal flooding and coastal erosion at the same standard as the present day. This policy will ensure all people and property as well as historic environment assets and agricultural land continues to be protected from coastal erosion and flooding. Except for an area of erosion south of Lagoon Walk, the majority of this area is currently accreting, partly dependent on material from the Holderness cliffs and this trend is likely to continue in the short and medium term at least. In the longer term (epoch 3), increased management activity may be required to carry out this policy as the accretion trend is expected to slow and potentially change to an erosional trend. Currently, there is not enough evidence to be able to firmly predict if and when this may happen. As a result, the policy for the long term (epoch 3) is conditional. It depends on the results of monitoring and research into climate change, shoreline response and the role of defences. In the future, a landward realignment of defences may need to be considered as an alternative to holding the line. A realignment would come at the expense of agricultural land directly behind the defences, but it would provide more sustainable flood defence for both the people and the high quality agricultural land further inland. It would also support intertidal habitats with associated benefits, such as for fisheries, and provide compensation for intertidal habitat loss caused by coastal squeeze, as required under applicable legislation.

Managed realignment for sustainable flood protection

The schematics and text below explains why managed realignment may be considered in some appropriate areas to ensure sustainable flood protection in the future as sea levels rise.

1. Present day situation for many parts of Lincolnshire

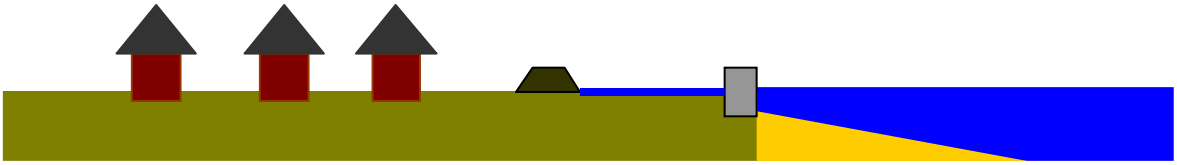
There is a beach in front of hard defences. The combination of these two features protects the assets in the floodplain from flooding during storms.

2. **Future situation holding the current defence line and maintaining standard of flood protection as sea levels rise**

If defences continued to be held in position, beaches would tend to erode and lower, and the hard defences would need to be significantly upgraded (both in height and width) to maintain the current standard of protection against flooding as sea levels rise.

This situation would have increasing negative impacts on landscape (large defences and obscuring of coastal views), tourism (lack of beaches), the environment (loss of habitats for wildlife) and the cost of trying to maintain defences would get increasingly large and difficult to sustain.

3. **Future situation to maintain sustainable flood protection using secondary line of defence as sea levels rise**



In appropriate areas, this option may offer a sustainable option to continue protecting people and assets against flooding. In the future, in some areas where there is no property, no significant or designated historic environment assets, and no critical infrastructure, a secondary defence line could be built behind the current defences. The existing defences would remain for a while and would continue to provide some protection against flooding. However as sea levels rise, some water would come over the top of the front line of defences during storms, but this water would be prevented from flooding assets in the floodplain by the new second defence line. This combination of defences would maintain the current standard of protection against flooding, without the need for such frequent and expensive works, and the increasingly large structures that are required with a single line of defence. This approach would not be suitable in all areas, and investigations and consultation would be required before implementation.

Economics

An SMP is an aspirational, broad scale plan for the future, and consequently the SMP guidance (Defra, 2006b) recognises that the justification of a particular policy does not depend purely on whether or not benefits outweigh costs; other factors such as environmental issues, and the impacts of policies on the coastline elsewhere must also be evaluated. However a high level economic assessment was carried out as an integral part of the Plan development to ensure that the preferred policies are not economically nonsensical.

The high-level economic assessment was undertaken based on the best available information for each Policy Unit The details of this assessment are provided in Appendix H. For the preferred policy of each Policy Unit the economic assessment identified whether:

- The benefits clearly outweigh the costs;
- The benefits marginally outweigh the costs; or
- The costs clearly outweigh the benefits.

The findings of the economic assessments are summarised below:

Holderness cliffs

Along the currently undefended areas of Holderness, the policy of 'no active intervention' has no costs associated with its implementation. However, it should be noted that some asset losses will occur over the lifetime of the SMP due to erosion.

To lesser and greater extents the benefits outweigh the costs of continuing to protect the towns of Bridlington, Hornsea and Withernsea. For the village of Mappleton, the economic benefits of continuing to hold the line are similar to the costs.

Due to the strategic nature of the Dimlington and Easington gas terminals and substantial assets behind the defences, the benefits of the policy were shown to clearly outweigh the costs.

For the area south of Easington, the benefits are similar to the costs for the preferred policy.

Outer Humber Estuary including Spurn

There are minimal costs associated with the policy of allowing Spurn to evolve with as limited intervention as possible.

Within the Humber Estuary, the analysis shows that the benefits of the policies outweigh the costs because of the size of the flood plain and the significant number of assets within the floodplain.

Lincolnshire coast

Along the Lincolnshire coast, the analysis shows that the benefits clearly outweigh the costs because of the size of the floodplain and the significant number of assets within the floodplain.

Funding

Implementing SMP policies will require funding, which may be national, local and / or third-party.

Funding has not been a key driver of policy development as it is not the scope of an SMP to account for the current funding system as it is a forward looking aspirational Plan. Neither is it the role of an SMP to prescribe precisely how policies should be funded in the future; however, the economic assessments undertaken provide a broad indication of the potential funding that maybe needed to put the preferred policies into practice on the ground.

This SMP acknowledges that funding issues will provide a major hurdle in the implementation of some aspirational policies. It is wise to recognise that in some instances Government funding may not always be

available (especially where benefits only marginally outweigh, or are similar to, the costs), and funding maybe required from other sources, otherwise policy delivery may be at risk.

It is the role of coastal strategies to provide to consider the economics and funding issues in greater detail and consider the options available to carry out the SMP policies. In 2009 the Environment Agency issued a long term investment strategy which sets out the best available evidence on the choices the people of England face about how much should be invested in managing the increasing risk of flooding and coastal erosion, and how the Environment Agency should deliver a long-term programme of investment. This document provides a useful insight into potential funding sources, and how much funding is likely to be required in the future; this document can be viewed at: http://publications.environment-agency.gov.uk/pdf/GEHO0609BQDF-E-E.pdf

10 Next Steps

The final SMP is submitted to all partner authorities to consider formal adoption. From that point on, the SMP will be the basis for the sustainable management of the shoreline, and a source of information for all organisations and people with an interest in the shoreline.

An Action Plan has been developed to enable management of the actions in the period up to the next SMP review, which is expected in 5 to 10 years time. This sets out what the Local Authorities and other partner organisations need to do to implement the plan. The actions cover the development of flood and erosion defence strategies and schemes. It will also include actions for the Local Authorities, for example to incorporate the plan into the land use planning system or support adaptation of affected people, businesses and organisations. Specific elements of the SMP Action Plan concern the monitoring and study required to improve knowledge and certainty. These actions will require strong involvement from the local authorities and other organisations.