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# planning for the rising tides

The Humber Flood Risk  
Management Strategy

March 2008



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# Aims and objectives

| Overall aims  |
|---|
| <p><b>To manage the risk of flooding around the Humber Estuary in ways that are sustainable for the people who live there, the economy and the environment, taking into account:</b></p> <ul style="list-style-type: none"> <li>– natural estuary processes; and</li> <li>– future changes in the environment (built or natural), sea levels or the climate.</li> </ul> |
| <p><b>To ensure that all proposals are:</b></p> <ul style="list-style-type: none"> <li>– technically feasible;</li> <li>– economically viable;</li> <li>– environmentally appropriate; and socially beneficial.</li> </ul>  |

Within these overall aims the strategy seeks to achieve the following objectives:

| Detailed objectives  | Subsidiary objectives  |
|--|--|
| To maintain and, where possible, enhance public <b>safety, health and security</b>   | To protect people and their property from the adverse effects (physical and psychological) of flooding                                     |
| To respond to <b>natural processes</b> and to avoid contamination and erosion  | To minimise adverse effects on wider estuarine processes   |
|  | To prevent ‘contaminated sites’ having an adverse effect on the estuary  |
| To protect and, where appropriate, provide opportunities for <b>economic development and employment</b> (including protection of existing land uses where appropriate) | To protect areas of employment from the adverse effects of flooding  |
|  | To provide, where appropriate, a secure environment for economic activity and development  |
|  | To minimise adverse effects on high quality agricultural land  |
| To protect existing <b>transport infrastructure</b> (land and sea)   | To minimise adverse effects on navigation (e.g. on channels, deepwater docks and beacons etc)  |
|  | To minimise adverse impacts on road and rail infrastructure  |
| To protect and, where appropriate, enhance <b>flora and fauna (biodiversity)</b>   | To minimise adverse effects on European Site(s) and ensure direct losses are compensated   |
|  | To address the adverse effects of ‘coastal squeeze’ on European Site(s)  |
|  | To support and, where appropriate, enhance biodiversity, including the delivery of national and local Biological Action Plan (BAP) targets |
| To protect the <b>historic environment</b>   | To minimise adverse effects on undiscovered or buried archaeology  |
|  | To protect designated archaeological and historic features within the floodplain   |
| To protect and, where appropriate, enhance <b>landscape, amenity and recreational</b> features   | To protect and, where appropriate, enhance the characteristics and local distinctiveness of all landscapes                                 |
|  | To protect and promote, where appropriate, regional and local recreational and amenity features  |



# Foreword

**This strategy sets out the Environment Agency's vision for managing the risk of flooding from the Humber Estuary as the climate changes and sea levels rise.**

Nearly 400,000 people living near the estuary are at risk, as are key industries, businesses, agriculture and the jobs they provide. Our Humber Strategy shows how we aim to limit the impact on people, property and industry in ways that won't damage the area's landscape character or its historical or wildlife importance. This will help safeguard the growth and prosperity of the Humber's communities and its economy, which are vitally important both to the Yorkshire and Humber and the East Midlands Regions, and to the country as a whole.

Overall, our Humber Strategy will ensure that more than 99 per cent of the people living round the estuary will continue to have a good standard of protection from tidal flooding. To achieve this, we will start a major programme of flood defence improvements this year. There will be losers as well as winners, however, since we will not be able to raise all the estuary's defences in line with sea levels, particularly where they protect only a few people or businesses. In due course any defences not raised are likely to fail and the land behind them to flood. This document identifies where these defences are and how long they're likely to last, so the people affected will have as much warning as possible about the consequences. It also describes what they can do to limit the impacts and what help will be available to them.

Flooding in the area doesn't only come from the estuary, as we know from the impact of the very heavy rain in June and July 2007 and again in January 2008. We can't stop all floods from happening and the water has to go somewhere, so we need to look closely at how we manage them when they do and how to help people take preventative action. We're working with the local authorities, the emergency services and the government to review what happened during the recent floods and will adjust our Humber Strategy in the light of any changes and lessons learned.

It has taken 10 years to develop our Humber Strategy and get it approved by the government. Doing so has involved much hard work from many people, not only the Environment Agency's staff and consultants but also those who have given their time to think and talk about the issues it raises. Our thanks to you all, and in particular to the members of the Steering Group (listed on page 55), who have met regularly since the work started and have been unstinting in their support and guidance.

**Jeremy Walker**

Chairman, Yorkshire Regional Flood Defence Committee

**Robert Caudwell**

Chairman, Anglian (Northern) Regional Flood Defence Committee

**Tim Farr**

Chairman, Severn-Trent Regional Flood Defence Committee

*Alkborough flood storage site*





# Introduction

**On the night of 31st January 1953, the most damaging storm surge on record in the North Sea struck, leading to the loss of 300 lives, damaging 24,000 homes and flooding almost 100,000 hectares of land between Yorkshire and the Thames Estuary.**

After 1953 the defences along the East Coast were improved and if the same event happened now the flooding wouldn't be as extensive, but would be tremendously damaging. Looking to the future, our climate is changing, causing sea levels to rise and severe storms to happen more often, and our defences are ageing. If they are not improved, they will become less and less effective and in due course they will fail. Furthermore, more of the land behind them has been developed, so more homes and more industry will be affected if it is flooded.

Currently about 90,000 hectares of land around the Humber is at risk of being flooded by a storm surge in the North Sea. This area, shown on the map opposite, contains the homes of about 400,000 people. Most of them are in cities such as Hull and Grimsby, or in smaller towns or villages, and the area also contains major industries, including power stations, refineries and the country's largest port complex, handling 80 million tonnes of cargo each year. Most of the remaining land, over 85 per cent of the total, is farmed and consequently has relatively few people living on it. The whole area has an important history and heritage while the importance of the estuary's wildlife and habitats has led to its designation under the Birds and Habitats Directives, which provides them with legal safeguards under the Conservation (Natural Habitats etc) Regulations 1994, otherwise known as the Habitats Regulations.

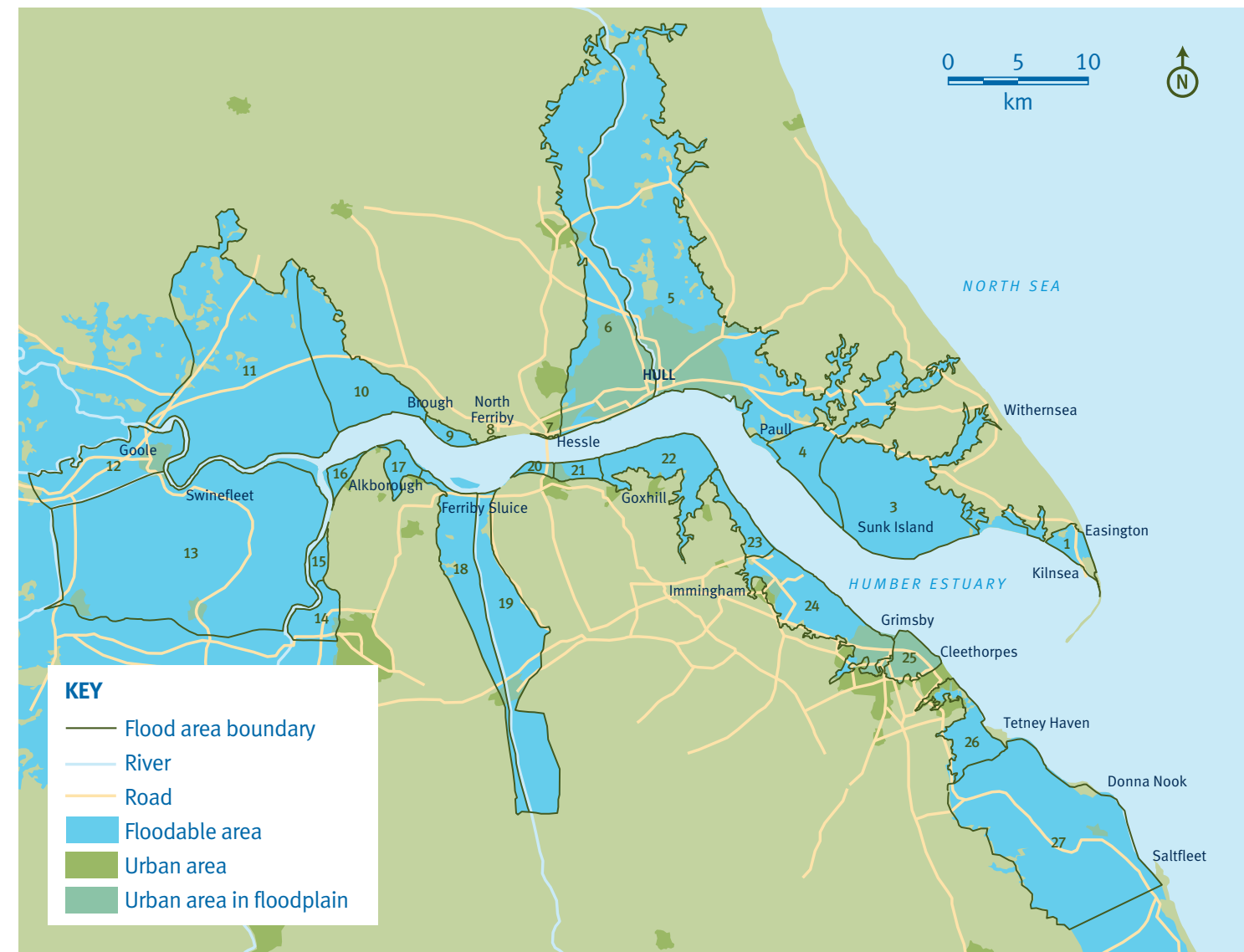
In 1997 we began developing a long-term strategy for managing flood risk around the Humber Estuary and the lower reaches of its main tributaries, the Ouse and the Trent. We published a consultation draft of our

proposals for the next 100 years in August 2005 and received approval for the first 25 years from the Department for Environment, Food and Rural Affairs (Defra) in March 2007. This document sets out the strategy that has resulted. It covers flooding from the estuary and the lower reaches of the Ouse and the Trent only; separate strategies are being developed for flooding from other sources. The first section gives a brief outline of how it was developed and is followed by a summary of the comments we received on the consultation draft and of recent developments in government policy, in particular its 'Making Space for Water' initiative, which is aimed at 'managing the risk from flooding and coastal erosion by employing an integrated portfolio of approaches which reflect both national and local priorities'. These are taken into account in the general description of our Humber Strategy and the summary of what will happen now it has been adopted, given in the third and fourth sections respectively. They are followed by more detailed descriptions of what will happen in different areas beside the estuary.

Although we have based our strategy on the best information we currently have, circumstances can change and better information may become available in the future. We will therefore review it regularly, generally every five years, and will carry out a detailed assessment before taking final decisions about any part of the estuary or its defences. During all reviews and detailed assessments we will consult widely.

**If you would like any more information please contact us using the details inside the back cover.**

## The floodplain of the Humber Estuary



# Section 1

## How we developed the strategy

### Strategy objectives

Our objectives for the Humber Strategy are set out on page 3. They are based on the objectives in our Humber Estuary Shoreline Management Plan (HESMP), published in September 2000, revised to take into account the government's developing policy on managing flood risk.

### Drawing up the strategy

The first step in drawing up the strategy was to define the problem; finding out about the people and property at risk in the area; about the defences protecting them; about the way the estuary behaves and how this influences the flooding that can occur; and about the natural and historic environment this flooding might affect. With this information we drew up our overall approach and set it out in the HESMP. We then looked at the implications in more detail, and in particular established what we must do to comply with the Habitats Regulations. This allowed us to draw up a programme of the work needed to maintain the defences for the next 100 years and to look in more detail at the works planned for the first 15 years. From this we produced the consultation draft for the full strategy.

We submitted our proposals to Defra in May 2006 and in March 2007 received approval in principle for the first 25 years at an estimated cost of just under £323 million. The approval drew attention to the changes in government policy that had occurred since the draft strategy was published, in particular through the 'Making Space for Water' programme and the publication of Planning Policy Statement (PPS) 25 'Development and Flood Risk', both of which had been strongly influenced by Foresight 'Future Flooding' report produced in April 2004. These changes are described in the next section and have been taken into account in the current Humber Strategy.

The main studies carried out as the strategy was developed are outlined on page 53 and a full list of reports is given on page 54.

### Keeping people informed

Consultation has played an important part in the strategy's development. As well as the consultation draft of the strategy itself, we published two consultation documents while the HESMP was being prepared, and two information documents about the managed realignment of existing defences. We circulated six newsletters before the strategy consultation document was produced and have distributed a further three since then. We have also held meetings throughout the project, either with individual stakeholders or open to the public. At every stage we have invited people to tell us about their concerns and have taken these into account as the strategy has developed.

We established a Steering Group when we began to develop the strategy and this has played a fundamental role ever since. It contains representatives from the key stakeholder organisations listed on page 55 and meets about three times a year to review progress and discuss the issues raised. We have also received advice from the Liaison Panel, a small group of people from outside the Environment Agency chosen for their knowledge of the area and understanding of local issues.



Flood defence at Brough

# Section 2

## What's happened since the consultation draft

### The public's reaction

In August 2005 we issued over 3000 copies of the consultation draft and subsequently held drop-in sessions around the estuary, for members of the public to come and talk about the strategy and the effect it could have on them. The main points raised and how we are addressing them are summarised in the table below.

| Points raised   | Response   |
|---|--|
| <b>Concern about the coastal defences near Kilnsea.</b>   | See page 11.   |
| <b>Too much emphasis placed on 'green' issues, in particular managed realignment. Concern that the strategy is more about protecting birds rather than people.</b>                  | The strategy includes managed realignment because this is the most cost-effective way of creating the new habitat needed to comply with the Habitats Regulations. If this wasn't included the strategy would not have been approved and none of the work it covers would go ahead.   |
| <b>Standards of protection will fall in some areas, blighting the people who live there and making flood insurance more difficult to obtain. There is no compensation for this.</b> | As explained later in the document, the national flood defence budget is limited, so we can only maintain or improve defences where there is a good business case for doing so. The defences we can't improve will deteriorate and in due course fail, unless others are willing to take on the responsibility of managing them and can obtain the appropriate approvals. Property owners will get no compensation in these circumstances but we will advise them about what they can do to minimise the impacts (see page 20). The availability of flood insurance will depend on individual circumstances, including the resilience of the property at risk. |
| <b>The role of Environmental Stewardship and related schemes is not properly set out.</b>   | The effects of rising sea levels are likely to be felt most in sparsely populated areas, as these are the areas where we may not be able to improve the defences. Many of the people living there are farmers, who may have not only their homes but also their livelihoods at risk if they can't continue working their land as before. Environmental Stewardship and similar schemes can help cushion the change from one type of agriculture to another (see page 21).  |
| <b>Lack of public awareness either about the strategy or about the drop-in sessions and other public meetings.</b>  | We will be placing more emphasis on contacts with parish councils and individual households, particularly in the areas likely to be most affected by our proposals. We will use the approaches tried out in our Coastal Futures research project (see page 11).  |
| <b>National policy needs to change from managing flood defences to managing flood risk. Important to work with planners (at regional and local levels) and developers.</b>          | This is happening through the government's 'Making Space for Water' initiative, discussed later in this section. We're now working more closely with both regional and local authority planners than before, as discussed in Section 3.  |



## The public's reaction (continued)

| Points raised  | Response   |
|--|--|
| <b>Need to consider potential as well as current land use (particularly near Immingham), economic importance of ports.</b> | We understand how important the Humber, its ports (with their deepwater access) and the land nearby are, both regionally and nationally. We will work closely with planners and others to make the best use of these assets while following the principle that the developer should pay for any new or improved defences needed for a development to go ahead. |
| <b>Important to consider impact on health</b>  | We are reviewing how the costs of flooding should be calculated and which ones to include when we assess whether a flood defence scheme is worthwhile. The impact on health is one of the issues being addressed.  |
| <b>Doubts that sea levels are rising, concerns about the future of Spurn</b>   | The tidal record confirms that sea levels are rising and the latest research confirms that the rate of rise will increase significantly in the future. We too are concerned about the future of Spurn and the pilot and lifeboat facilities there, so we have commissioned, with others, a study to look at the risks and implications.                        |
| <b>Importance of maintenance (of defences and drainage arrangements)</b>   | We agree it is vitally important that defences and drainage arrangements are properly maintained, provided the resulting benefits due to the reduced flood risk are greater than the cost. We describe in Section 3 how we will do this.   |
| <b>Links with other strategic initiatives</b>  | Again, we agree this is very important and describe in Section 3 what we will do about it.   |
| <b>Limited reference to historic environment, sports, recreation</b>   | We will look in more detail at these and other site-specific environmental issues through the Environmental Assessment procedures we will follow as normal when developing proposals for specific defences.  |
| <b>Need for Appropriate Assessment</b>   | We are preparing an Appropriate Assessment for the Humber Strategy and will produce supplementary assessments for individual schemes as we seek approval for them.   |

## What we have done since 2005

### Since we published the consultation draft we have:

- realigned the coastal defence at Kilnsea using funds partly raised by the local residents, as described in the adjacent panel;
- completed repairs to the defences at Saltmarshes, Goole and north of Keadby as set out in the consultation draft;
- realigned the defences at Alkborough to provide flood storage and create 170 hectares of new intertidal habitat, which we expect will allow us to comply with the Habitats Regulations in this part of the estuary for many years, with reedbed and other BAP habitat on the remainder of the site;
- developed our plans for the defence works we said we would carry out in the five years after the strategy had been approved, in particular at Brough; Halton Marshes and Stallingborough near Immingham; Swinefleet; and Donna Nook, where we are planning a managed realignment scheme to create new intertidal habitat to help us comply with the Habitats Regulations in the outer estuary;
- set up the Coastal Futures Humber Community Project with the RSPB, a scheme to support communities experiencing coastal change along the north bank of the estuary (further information can be obtained from the project website at [www.coastalfutures.org.uk](http://www.coastalfutures.org.uk));
- followed up the issues raised by coastal erosion at Easington, where the coastal lagoons in front of the defences are being threatened, and are looking at the long-term flood risk issues in the area at the same time; and
- reviewed our storm tide forecasting arrangements and installed new flood warning sirens at Grimsby.



### Improving the defences at Kilnsea

The consultation draft drew attention to the erosion taking place at Kilnsea (marked on the map on page 23), which was threatening to wash away the coastal defences protecting the village.

While preparing the consultation draft we had carried out a high-level appraisal, which suggested that we would not be able to spend money from the national flood and coastal defence budget on realigning the defences there. When we looked in more detail, however, we concluded that we could carry out the work provided a significant part of the funding was raised by others, since even though no money would be available from the national budget we could make up the balance using money raised locally by the Yorkshire Regional Flood Defence Committee.

The residents formed the Kilnsea and Spurn Flood Defence Group to raise the funds needed and the grants they obtained, together with a contribution from East Riding of Yorkshire Council for infrastructure protection, allowed us to go ahead and complete the work in time for the 2006/07 winter storms. The Group has taken on the responsibility for managing the new defence, which will protect the village for a further 30 years or so.

We have also been developing the strategy itself. In particular we have divided the large management units considered in the consultation document into smaller flood areas, where any flooding that occurs can generally be prevented from spreading to neighbouring areas, so we can assess the issues in more detail. These are shown on the map on page 13 and are listed in the accompanying table together with the references used in the consultation draft.

Although there have been some big storms since the consultation document was published, there has been no serious flooding from the estuary. The extensive flooding in June and July 2007 was caused by extremely heavy rainfall running off land already saturated by earlier rain, and was not affected by conditions in the estuary. We are working with the local authorities, the emergency authorities and the government to review what happened and will adjust the Humber Strategy in the light of any changes to our role as a result. In particular, we are looking at how we can integrate it with the strategy being developed for the River Hull, something Defra mentioned specifically when giving their approval.

## Local and regional initiatives

The Yorkshire and Humber Regional Assembly has published its Regional Spatial Strategy, a core component of which is that development should be located so as to secure urban and rural renaissance and to minimise both the need to travel and the development of greenfield sites. It highlights the importance of the Humber ports and the associated industry to the region while recognising our strategy and the need to take flood risk into account when planning future developments. Yorkshire Forward, the Regional Development Agency responsible for promoting economic development in the region, has an extensive programme of urban and rural regeneration and also regards the estuary as a vitally important economic asset.

Regeneration and development proposals have been produced or are being prepared for Hull, Grimsby, the South Humber Bank (near Immingham), Goole and Scunthorpe. The four local authorities around the estuary are all preparing or have produced Strategic Flood Risk Assessments to help them plan development in their areas. We are taking a stronger role in assessing proposals and recommending rejection for those that don't take flood risk into account properly.



Grey seal pup at Donna Nook

## Flood area boundaries

| Flood area ref. | Flood area name                     | Ref. used in consult. doc. |
|-----------------|-------------------------------------|----------------------------|
| 1               | Kilnsea and Easington               | 1/1                        |
| 2               | Skeffling                           | 1/2                        |
| 3               | Sunk Island                         | 1/3                        |
| 4               | Stone Creek to Paull Holme          | 1/4                        |
| 5               | Hull East                           | 2/1                        |
| 6               | Hull West                           | 2/2                        |
| 7               | Hessle                              | 2/3                        |
| 8               | North Ferriby                       | 2/4                        |
| 9               | Brough                              | 3/1                        |
| 10              | Brough Haven to Weighton Lock       | 3/2                        |
| 11              | Faxfleet to Saltmarshe              | 4a/1                       |
| 12              | Goole                               | 4b/1                       |
| 13              | Goole Fields and Crowle             | 4c&d/1                     |
| 14              | Gunness to Flixborough              | 4e/1                       |
| 15              | Flixborough Grange                  | 4e/2                       |
| 16              | Alkborough Flats                    | 4e/3                       |
| 17              | Whitton to Winteringham             | 5/1                        |
| 18              | Winteringham Ings                   | 5/2                        |
| 19              | South Ferriby                       | 5/3                        |
| 20              | Barton Cliff to Barton Haven        | 6/1                        |
| 21              | Barton Haven to Barrow Haven        | 6/2                        |
| 22              | Barrow Haven to East Halton Skitter | 6/3                        |
| 23              | Halton and Killingholme Marshes     | 7/1                        |
| 24              | Immingham to R Freshney             | 7/2                        |
| 25              | East Grimsby                        | 7/3                        |
| 26              | Cleethorpes and Humberston          | 8/1                        |
| 27              | Tetney to Saltfleet Haven           | 8/2                        |





## National guidance and government policy

In October 2006 the government issued new guidance on the likely effects of climate change, taking into account the latest output from the UK Climate Impacts Programme (UKCIP). This was incorporated in the Planning Policy Statement (PPS) 25, Development and Flood Risk, which was published in December 2006 to replace PPG 25 (published in 2001). PPS 25 confirms our role as the lead authority with regard to flood risk and flood defences, a role that is further strengthened by the government's 'Making Space for Water' initiative. We are now responsible for putting into practice the policies emerging from this initiative and have been working closely with Defra to determine what changes are needed to do this.

These changes will affect how we manage our defences in the future. In the past we have generally carried out routine maintenance (such as grass-cutting and minor repairs) each year and, when a defence's condition or standard is no longer acceptable, undertaken an improvement scheme. Each scheme has gone through a rigorous assessment process, comparing whole life costs and benefits, to determine whether it's worthwhile. Schemes passing this test have been funded through the national flood and coastal defence budget. Although this process will remain much the same as before, the policy changes will affect the way schemes are funded, how they are delivered and what happens if the costs of continuing to maintain a defence are greater than the potential benefits. The changes are summarised below while their effect on the strategy is discussed in the next section.

### Changes in national guidance and policy

#### (a) New guidance on climate change

The rate of sea level rise is now expected to be slower over the next 20 years than assumed before, but to get much faster after that. The implications are that in 50 years from now sea levels will be about 350 mm (slightly more than one foot) higher than they are now while in 100 years they will be more than one metre (over three feet) higher. New figures are also given for increases in peak rainfall intensity and river flow, and for extreme offshore wind speed and wave heights. The estimates are continually being reviewed as our understanding of climate change improves and the guidance will be updated regularly to reflect this. Further information can be obtained from Defra's website at [www.defra.gov.uk/environ/fcd](http://www.defra.gov.uk/environ/fcd)

#### (b) PPS 25, Development and flood risk

PPS 25 aims to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding and to direct any development away from areas at highest risk. Where, exceptionally, new development is necessary in such areas PPS 25 aims to make it safe without increasing flood risk elsewhere and, where possible, reducing flood risk overall. It emphasises that flood risk assessments should be carried out at all levels of the planning process, sets out the minimum requirements for them and confirms the Environment Agency's role as a statutory consultation body for all issues concerning flood risk and its management, including all applications for development in flood risk areas. Further information can be obtained from the Communities and Local Government website at [www.communities.gov.uk/planningandbuilding/planning](http://www.communities.gov.uk/planningandbuilding/planning)

#### (c) Affordability and spending priorities

The national flood and coastal defence budget (the amount of money the government provides for spending on the country's defences each year) is not enough to keep all our defences in good order. In view of this we now rank all the proposed defence schemes across the country on the basis of their value for money, the number of houses they protect and their impact on the environment, and direct the budget we have towards the ones at the top of the list as they have the highest priority. Any scheme falling below the point where the budget runs out won't be funded that year although it will remain on the list and be re-considered next time. If it has a very low priority, however, the chances are against it ever getting near the top so the work may never be carried out. Further information can be obtained by following the links under 'Grant Aid' on Defra's website at [www.defra.gov.uk/environ/fcd](http://www.defra.gov.uk/environ/fcd)

#### (d) National policy on withdrawing maintenance

Our national policy on managing uneconomic defences is described in 'Information for Owners and Occupiers of Land Adjacent to Sea Defences in England'. We will withdraw maintenance from a defence if the whole life cost of continuing to maintain it is greater than the value of the property it protects (i.e. it is an uneconomic defence), and there are no other reasons for carrying on. We will give property owners reasonable notice of our intentions, generally between six months and two years but possibly longer in special circumstances, and will continue routine maintenance during the notice period. We will not repair the defence if it is damaged, for example during a storm. No financial compensation will be payable as a result of our decision to withdraw but we will do our best to make

### Changes in national guidance and policy (continued)

sure all those affected are aware of the implications and what they can do in the circumstances. This could range from taking over and maintaining the defences themselves to making their property more flood-resilient, so it is easier to recover from a flood. Further information can be obtained by searching for 'sea defences' on our website at [www.environment-agency.gov.uk/](http://www.environment-agency.gov.uk/)

#### (e) Contributions from developers and major beneficiaries

PPS 25 makes it clear that all developers should take flood risk into account when making their decisions and, in particular, should expect to pay the full cost of any new works needed to protect their development. Other proposals, which could

involve seeking contributions that reflect the protection that developers and major beneficiaries receive from existing defences, are also being considered and policy guidance is being prepared.

#### (f) Delivery arrangements

We are keen to work with the government and others to explore different ways of delivering flood risk management that could lead to savings in time and money. In particular we will examine whether the private sector can be involved through public-private partnerships or similar private finance initiatives (known collectively as PPP/PFI arrangements), as have been used for other large infrastructure projects such as roads and hospitals.





# Section 3

## The Humber Strategy

### Overall approach

We have adapted our overall approach to managing flood risk around the Humber to take the changes described earlier into account. A summary of our Humber Strategy is given below and is followed by more information about its main features.

|          |  |
|----------|--|
| <b>1</b> | <p><b>We will manage flood risk round the estuary to protect people and property by:</b></p> <ul style="list-style-type: none"> <li>– continuing to maintain existing defences where this is sustainable;</li> <li>– identifying potentially unsuitable development in the floodplain;</li> <li>– providing targeted and timely flood warnings.</li> </ul> |
| <b>2</b> | <p><b>We will withdraw maintenance from defences that are uneconomic but will examine other ways of protecting people and property where this happens, including:</b></p> <ul style="list-style-type: none"> <li>– building secondary lines of defence;</li> <li>– advising people on how to prepare for flooding.</li> </ul>                              |
| <b>3</b> | <p><b>We will move defences where doing so will:</b></p> <ul style="list-style-type: none"> <li>– provide flood storage to help manage water levels during serious floods and so benefit others;</li> <li>– allow us to stop maintaining defences that are uneconomic;</li> <li>– replace inter-tidal habitat lost because of the strategy.</li> </ul>     |

Much of the August 2005 consultation draft was concerned with managing the estuary’s flood defences. While this remains a key part of our strategy, the overall aim is to manage flood risk within the floodplain. Accordingly we will also help prevent unsuitable development in the floodplain, taking on the role set out for us in PPS25, and help limit the amount of damage caused when a flood does occur, by issuing warnings and advising people on how to prepare for it.

### Managing the defences

The strategy sets the direction for managing the estuary’s defences but does not make the final decision about specific defence lengths. We will continue to maintain the estuary’s defences where this is sustainable, taking technical, economic, environmental and social issues into account, and will start a major programme of improvements this year. We will look at potentially more efficient ways of doing this, such as through a PPP/PFI arrangement. Where these are not suitable we will continue with our current practice of assessing a full range of options and the likelihood of getting funds from the national budget when a defence needs to be improved. If at any time we cannot get the funds to improve a defence that could fail very soon, we will stop maintaining it. The areas most likely to be affected as a result are shown on the map on page 23. More details about our approach to managing the defences are given at the end of this section.

### Links with the planning system

We are building links with planners at both regional and local levels, to make sure that flood risk is taken fully into account as their plans are drawn up. We have contributed to the recently published Regional Spatial and Economic Strategies for Yorkshire and the Humber and will work with Yorkshire Forward on any initiatives that may affect the estuary. We are also liaising with local planning authorities about the Local Development Frameworks and the supporting Strategic Flood Risk Assessments they are required to produce.

### Controlling development on the floodplain

We are working with the local planning authorities to make sure that applications for development in the floodplain take flood risk issues into account, as required by PPS 25, and are accompanied by a Flood Risk Assessment demonstrating this and identifying any measures proposed to deal with the problem. We will provide advice to those proposing developments and undertaking assessments and, where appropriate, will review the applications when submitted. While doing this we will pay particular attention to proposals in areas where we may withdraw maintenance from the defences in the future or that have already been identified as suitable for creating the new inter-tidal habitat we will need to comply with the Habitats Regulations. Further

information can be obtained by following the links to ‘Policy’ and ‘Planning’ on our website at [www.environment-agency.gov.uk/aboutus](http://www.environment-agency.gov.uk/aboutus)

### Responding to emergencies

We will continue to work closely with the emergency services during and after an extreme event, so we can bring our knowledge of the area to help manage flood flows, dispose of flood water and clear up afterwards. We have reviewed the flood warning arrangements around the estuary and will work on making them consistent and updating them as forecasting capabilities improve. We can give detailed advice about how to make buildings and their contents more resistant to flooding and more resilient in coping with flood incidents, and we are supporting government research into providing grants for doing this. Further information is given at the end of this section.

### Planning where the water goes

An important aspect of managing flood risk is directing floodwaters when and where they occur so as to minimise the damage that occurs. We will not be able to raise the estuary’s defences enough to prevent all flooding in the future, so we will look carefully at where they are likely to be overtopped first and where the water will go when this happens. When we improve the defences we will do it so that if any overtopping does occur, it will be where we can manage it most easily. We will look at the implications of this flooding, identifying the property and infrastructure most at risk, reviewing our flood warning arrangements and discussing the need for additional controls on development with the local planning authorities.

### Providing flood storage

If any defences in the areas 10 to 17 shown on the map on page 23 are overtopped during an extreme event, the water stored on the floodplain will result in lower river levels. When we assess options for raising defences upstream of the Humber Bridge we will take this effect into account. We will also look in more detail at the two sites we previously identified as possible flood storage schemes, also shown on the map, to determine whether we can make a good case for building them.

### Complying with the Habitats Regulations

We will meet our obligations under the Habitats Regulations by creating new inter-tidal habitat to replace the losses caused by the strategy, as set out in our Coastal Habitat Management Plan. We will do this by acquiring land where we can move the defences back when new habitat is needed in that part of the estuary.

We have already identified some sites for this purpose, shown on the map on page 23 and listed in the table below with an indication of the dates they are likely to be built. These dates are based on our current predictions of the losses that will occur and assume that no other defences fail or are re-aligned. If they do, either because we stop maintaining them or for any other reason, we will adjust the predictions taking into account any impact on the area of suitable inter-tidal habitat in the estuary. We are very willing to consider other sites as well, and any landowner who might be interested in making their land available should get in contact with us using the details given inside the back cover.

| Site for creating new inter-tidal habitat | Likely completion date* |
|---|-------------------------|
| Paul Holme Strays                         | Completed in 2003       |
| Alkborough                                | Completed in 2006       |
| Donna Nook                                | 2010                    |
| Skeffling                                 | Between 2010 and 2020   |
| Welwick                                   | After 2020              |
| Keyingham                                 | After 2030              |
| Goxhill                                   | Medium to long term     |

\* Actual completion dates will depend on actual habitat losses

### Supporting the environment

We will continue to monitor the environmental and social impacts of our strategy and to prepare all the assessments necessary to get the planning and other approvals needed to carry out our proposals. We will work to conserve and enhance both the natural environment, including the habitats behind the defences as well as those in front of them, and the historic environment (known and still buried). We will take account of the impact our work will have on the landscape and its character and will look for opportunities to improve the area’s amenity and recreational facilities, including access to the coast.

### Paying for the work

Initially we expect the bulk of the funding that will be needed to come from the national flood and coastal defence budget. We know this is limited, however, and will become increasingly difficult to obtain as the effects of climate change cause the demand from other parts of the country to increase. We will therefore look for funding from other sources and in particular will seek contributions to new defence works from major beneficiaries and developers, liaising with local and regional planners as appropriate.



## Links with other strategies

We will continue to keep in touch with the strategies and other plans, including Catchment Flood Management Plans, being developed for the rivers discharging into the Humber; the Ouse, Don, Aire, Trent, Ancholme, Freshney and the Hull. We will work particularly closely with the River Hull team as the flood risk in much of Hull City is strongly affected by a combination of events in the river and the estuary. We will also work closely with those responsible for land drainage to ensure that the impacts of changing sea levels and sedimentation patterns in the estuary are taken into account. In addition, we will work closely with the team reviewing the Humber Estuary Coastal Authorities Group (HECAG) Shoreline Management Plan (SMP) covering the coastline between Flamborough Head and Gibraltar Point including the outer estuary. The conclusions arrived at within the Humber Strategy may also be adopted within the SMP in the area where the strategies overlap (see map on page 23). This team will review our decisions for these frontages to confirm they are appropriate in the broader coastal context.

## Reviewing progress

We inspect the defences regularly and draw up our annual maintenance plans on the basis of these inspections. We will continue to do this and will also continue to monitor the estuary, recording in particular the area of inter-tidal habitat to show we are complying with the Habitats Regulations and the data needed to confirm our understanding of how the estuary behaves. The results will be used when we

review our strategy, which will be at intervals of about five years. We are currently producing a 'State of the Estuary' report, which will describe its condition and the changes that are taking place, and will produce another one in time for the next review. Every 15 years or so we will carry out a detailed review of the scientific studies that underpin our strategy, making full use of any improvements in estuary and flood modelling and forecasting techniques as well as any new data.

## Preparing for what's coming

We are the competent authority for implementing the Water Framework Directive in England and Wales, which requires all inland and coastal waters within the European Community to reach 'good status' by 2015. We will also be involved in implementing the Floods Directive, which is likely to come into effect within the next two years. The government's policy on flooding and flood risk management will develop as 'Making Space for Water' is put in place. We will follow all these initiatives to make sure our strategy takes them fully into account. Further information can be obtained by following the links at the following websites:

Water Framework Directive  
[www.environment-agency.gov.uk/subjects/waterquality](http://www.environment-agency.gov.uk/subjects/waterquality)

Floods Directive  
[www.defra.gov.uk/enviro/fcd/eufldir](http://www.defra.gov.uk/enviro/fcd/eufldir)

*Paull Holme Strays*



## Talking to others

We want to strengthen the links between our strategy and the community. We have a number of advisory groups with external representatives to review different aspects of our work and make sure our Humber Strategy continues to serve the needs of the country and the community. The key ones are listed on page 55 and further information about them can be obtained from the contact details given inside the back cover of this document. We will continue to keep in close contact with the local authorities around the estuary (East Riding of Yorkshire Council, Kingston upon Hull City Council, North Lincolnshire Council (North East), East Lindsey District Council) and, following the example of our Coastal Futures research project, will

also aim to work more closely with the Town and Parish Councils and to make direct contact with people who might be unfavourably affected by our strategy. These will include, for example, people living where we are planning to work on the defences, where we would like to create new inter-tidal habitat or where we may stop maintaining the defences. Some of the issues that might affect these people are summarised at the end of this section.

We are also keen to work with any others who think our Humber Strategy might affect them. In particular we would encourage any developers who are proposing to build in places where there might be a risk of flooding from the estuary, or from any other source, to get in touch with us as early as they can. Our contact details are given inside the back cover.

### Our approach to managing the defences

#### (a) General

We will continue carrying out routine maintenance to all the defences around the estuary for which we are responsible and where it is economically worthwhile. We will improve the defences as set out in the strategy programme subject to the review arrangements described below and the availability of funding from the national flood and coastal defence budget. We will review the standard and condition of defences for which we are not responsible and if they are below the required standard will seek to get them improved.

#### (b) Improving defences

Before we improve any defences we will carry out a detailed assessment of the case for doing so, considering a wide range of options and taking technical, social, environmental and economic issues into account. If this confirms that funding is likely to be available we will carry on to design the works, obtain the appropriate approvals and build them when the funding comes through. If it is not, we are likely to withdraw maintenance in the future so will start the withdrawal process described below.

#### (c) Withdrawing maintenance

We have looked at all the flood areas and identified those where, on the basis of the information currently available, we think we could have difficulty funding improvement work. If so, the risk of these defences failing will increase and, when it gets very high, we will generally stop maintaining them. At the appropriate stage we will write to all property owners in these flood areas, advising them about when we are likely to do this and the possible consequences. We will issue formal notice of our intentions to withdraw maintenance in accordance with our national policy for uneconomic sea defences,

although we will aim to provide up to five years notice where we can rather than between six months and two years as it states. Before giving notice we will assess the case for building secondary defences or cross-banks to protect part of the area and talk to property owners about what they can do to help themselves. Information about some of the options is given on the next page.

#### (d) Maintaining third party defences

We will tell everyone who owns or maintains a defence that their property is part of the protection system. We will check the condition of these defences to confirm they are safe and provide a suitable standard of protection. If they are not adequate, we will tell the owners and, if possible, agree what improvements they will make. If this is not possible we will take whatever steps we think are needed to make the risk of flooding acceptable and may take action to recover the costs.

#### (e) Repairing failed defences

The advisory letters about withdrawing maintenance from a flood area will set out what we will do if the defences deteriorate or fail earlier than expected. If this happens when we have not already sent a letter, we will carry out temporary repairs to make the defence safe, review the case for making permanent repairs and confirm that funding is likely to be available. If it is, we will carry on to design and build the work as quickly as we can. If it is not, we will issue formal notice of our intention to withdraw, setting out a timetable and describing the process we will go through. This will include looking at the possibility of building secondary defences or cross-banks to protect part of the area and talking to property owners about how they can help themselves.



## Information for property owners

The key issues affecting the owners of property in the estuary floodplain and the main ways they can manage flood risk are reviewed below. The information is particularly relevant where we may withdraw from maintaining the defences in the future.

### (a) Risk of flooding

All the areas shown in the map on page 13 are at risk of being flooded. The frequency and depth of flooding at a property depends on its level and location; the severity of the event; whether the area has any flood defences; and, if so, on their condition, standard and future management. Both the frequency and the depth of flooding will increase in the future as sea levels rise. More information about each area can be obtained from the descriptions following the next section or by contacting us using the details given inside the back cover.

### (b) Flood warning arrangements

We fund a national Storm Tide Warning System that uses information from the Meteorological Office to predict when a combination of high tides and storm surges might cause tidal flood conditions around the UK coastline. The results are fed into our Floodline Warnings Direct service, which is free to join and is available to everyone living in a flood risk area. It can be accessed by calling 0845 9881188 or if a warning is in place for your area, you can arrange to have flood warnings telephoned to you automatically. More information can be obtained from our website at [www.environment-agency.gov.uk/subjects/flood/floodwarning](http://www.environment-agency.gov.uk/subjects/flood/floodwarning)

### (c) Availability of flood insurance

Insurance companies look at the risk of flooding at the property being insured rather than at the standard of protection provided by the defences. They also consider the amount of damage likely to be caused if a flood does occur, so will take into account any flood resistance or resilience measures that have been installed. Property owners will therefore need to find out from their insurance company whether a new policy for their property is likely to be issued or an existing one renewed. The insurance industry has, however, agreed with the government to continue to renew existing policies where flood defences providing at least a 1.3 per cent standard of protection (one in 75 years) or better are in place or planned to be built within the next five years. Further information can be obtained by following the links on the Defra website at [www.defra.gov.uk/enviro/fcd](http://www.defra.gov.uk/enviro/fcd)

### (d) Developing or selling property

The Local Planning Authority is responsible for approving any applications to develop a property, although we advise each authority about the flood risk associated with an application. In doing this we will take into account the nature of the proposed development, the standard and condition of the defences and how we expect to manage them in the future. Inevitably the value of any property will be affected by the risk of it being flooded.

### (e) Standard of defence

The standard of a defence indicates the severity of the event it will protect against, so a defence with a 20 per cent standard will protect against all events with a 20 per cent chance or more of happening each year (i.e. likely to occur once or more every five years on average). If a more severe event occurs the structure will be overtopped and is likely to fail, flooding the area behind. A defence's standard will fall as sea levels rise unless it is raised or other improvements are carried out.

### (f) Consequences of withdrawing maintenance

If a defence is not improved the likelihood of it failing will increase with time and will accelerate once maintenance is withdrawn. If anyone else wishes to carry on maintaining it we will not object provided they comply with the Habitats Regulations and obtain all the other approvals necessary. If this doesn't happen and the defence fails, the risk of any property in the area behind it being flooded will increase significantly and may make it difficult to continue living there. Installing flood resistance or resilience measures might delay the need to leave some properties but will not be suitable for all cases. The areas that may be affected in this way are shown in the map on page 23.

### (g) Flood resistance and flood resilience measures

Flood resistance measures are aimed at preventing water getting into a property and include such things as flood boards (installed in doorways or to close off airbricks), plastic skirts surrounding a property, permanent earth bunds and free-standing flood barriers. Their suitability depends on a wide range of factors, such as ground level and emergency access, and so needs to be assessed for each property individually. Flood resilience measures do not prevent water from entering a property but limit the damage caused when it does. They include such things as having solid tiled floors rather than carpets at ground level, raising electrical sockets and circuits above flood level, using water-proof rather than conventional plaster, plans for

## Information for property owners (continued)

moving furniture and similar items upstairs. Again, their suitability needs to be assessed for each property individually. Further information can be obtained by following the link to 'Prepare for flooding' on our website at [www.environment-agency.gov.uk/subjects/flood](http://www.environment-agency.gov.uk/subjects/flood)

### (h) Changing land use

If the flood risk increases it may no longer be possible to continue the current land use. Environmental Stewardship and similar schemes

can help cushion the change from one type of agriculture to another. Further information can be obtained by following the link to 'Grants and funding' on Natural England's website at [www.naturalengland.org.uk/planning/](http://www.naturalengland.org.uk/planning/). We may be interested in buying land that can be used to create the new inter-tidal habitat we will need to comply with the Habitats Directive. Further information can be obtained by contacting us using the details inside the back cover.



Flood defences at Goole



# Section 4

## What happens next?

### Summary of programme and issues

Some important features of each flood area covered by the strategy are listed in the table overleaf together with an indication of when we expect its defences will need to be improved. The table also identifies the areas where:

- there may be habitat creation or flood storage opportunities;
- some of the defences are managed by others;
- it may be difficult to obtain funding to improve the defences;
- we may stop maintaining the defences in the future.

Further information about individual flood areas is given in the next section.

### Work in the next five years

Over the next five years we are planning to improve the defences at four sites around the estuary, review the need for improvements at a further site, create about 140 hectares of new inter-tidal habitat and sustain an internationally important conservation site, as detailed in the table below. We have already begun contacting the people who will be affected by three of these schemes (at Brough, Swinefleet and Donna Nook) and will contact those affected by the others in due course.

| Flood Area | Location               | Work planned  |
|------------|------------------------|---|
| 1          | The Lagoons, Easington | Re-create features and habitats being lost due to coastal erosion.  |
| 5          | Paull Village          | Review risk of waves overtopping sea wall and flooding adjacent properties, carrying out improvements if necessary. |
| 9          | Brough (BAe Works)     | Improve standard of protection to houses in Brough and to BAe works; withdraw from uneconomic defences.             |
| 13         | Swinefleet             | Improve standard of protection to houses in Swinefleet; prevent erosion from undermining defences.                  |
| 23         | Halton Marshes         | Prevent erosion from undermining defences; withdraw from uneconomic defences.                                       |
| 24         | Stallingborough        | Prevent erosion and channel movements from undermining defences.  |
| 27         | Donna Nook             | Create about 140 ha of new inter-tidal habitat; build new defences behind the area.                                 |

### Work in later years

We will soon begin preparing for the works that we expect will be needed in 10 to 15 years, in particular at Hull, Grimsby and near Immingham where the risks are high, some of the defences are managed by third parties and there are major development issues. We will work closely with those who manage the defences to make sure the improvements needed are carried out and with the local and regional authorities to confirm that all development plans take flood risk into account.

### Creating new inter-tidal habitat

We have already started acquiring the land we will need to develop our proposed habitat creation site at Skeffling and are in discussion about the land we will need for the site at Welwick. We will continue this process and are interested in any land that might be suitable for creating inter-tidal habitat in the areas where we will need it (marked in green on the table on page 25), or that could be exchanged for land that is suitable. Any landowner who might be interested in making their land available should contact us using the details inside the back cover.

## Habitat creation, flood storage and potential withdrawal of maintenance



### Opportunities for flood storage

We are beginning to look at the opportunities for managing flooding in Flood Area 13, which lies between the Trent and the Ouse, and in due course will do the same for areas 10 to 17. We will look at the potential gains to be made from leaving some lengths of defence lower than others so that they would overtop first, and then managing the flooding that would result. In doing this we will take into account any reduction in damage elsewhere because of the lower river levels (caused by losing the floodwater from the river). We will also review the potential benefits of the proposed flood storage schemes at Sandhall and Flixborough Grange and assess whether they are economically worthwhile. Once we have examined these opportunities and considered how any proposals might be implemented we will contact the people who may be affected by our findings.

### Withdrawing maintenance

We have looked at whether we might have difficulty funding the improvements needed to make it worthwhile continuing to maintain the defences where there are only a small number of houses at risk and few other assets. We will write to the property owners in the flood areas marked in pink on the map above and listed in the table overleaf, advising them that they might be affected. The way we will manage this process is described on page 19. At this stage we expect that very few, if any, properties are likely to be affected in the next 10 years, about 800 in the following 10 years and a further 1000 subsequently, although we anticipate being able to protect a significant proportion of them by building secondary defences.

# Management Proposals

## Key

### Habitat creation opportunities (managed realignment)

No suitable land or not needed in this area (unmarked)

Possible if land available ✓

Site already included in Strategy programme ✓

### Flood storage opportunities

No suitable land or not needed in this area (unmarked)

Possibly suitable ✓

Probably suitable (includes existing proposals) ✓

### Responsibility for managing defences

All defences managed by Environment Agency

Some defences managed by others

Most defences managed by others

All defences managed by others

### Other economic assets in flood cell

Limited value (e.g. agricultural land only)

Important value (e.g. major infrastructure etc)

Primary value (e.g. key industrial facilities etc)

### Case for improving defences

Probably not difficult to make

Possibly difficult to make

Probably difficult to make

### Withdrawal warnings (EA defences only)

Environment Agency will not issue warnings

Warnings may be issued in more than 20 years

Warnings may be issued in 10 to 20 years

Warnings may be issued in less than 10 years

N.B. Uncertainty about rate of sea level rise means timings are approximate

Notes: \*No EA defences, so no withdrawal warning. #Further study may show building secondary defences to protect some groups of properties is economically worthwhile. †Although all the defences will continue to be maintained, some of them are likely to be raised earlier and to a higher standard than others.

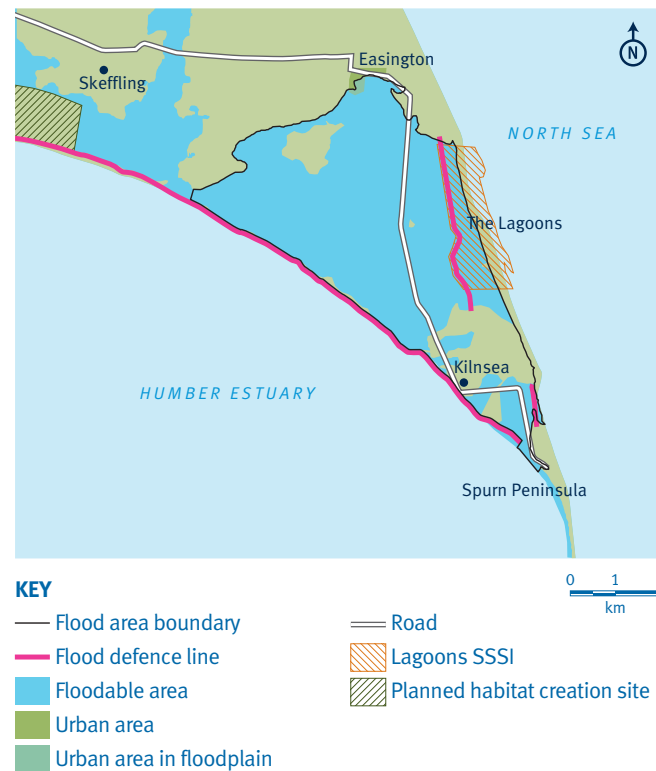
| Flood cell | Name                                  | Area (ha) | Length of defences (km) | Estimated residual life (years) | Works needed in years |      |       | Habitat creation | Flood storage | Currently managed by     | Residential properties (No) | Other economic assets | Case for improving defences | Withdrawal warnings may be issued | Number of properties affected |
|------------|---------------------------------------|-----------|-------------------------|---------------------------------|-----------------------|------|-------|------------------|---------------|--------------------------|-----------------------------|-----------------------|-----------------------------|-----------------------------------|-------------------------------|
|            |                                       |           |                         |                                 | 1-5                   | 5-15 | 15-25 |                  |               |                          |                             |                       |                             |                                   |                               |
| 1a         | Kilnsea (Spurn Road)                  | 97        | 2.0 (coast)             | 10-20                           |                       |      |       |                  |               | 9                        |                             | •••                   | 10-20 yrs                   | 9                                 |                               |
| 1b         | Kilnsea (Kilnsea Village)             | 17        | 5.3 (estuary)           | < 10                            |                       |      |       |                  |               | 14                       |                             | •••                   | None*                       | 14                                |                               |
| 1c         | Kilnsea (Easington)                   | 567       |                         | 10-20                           | ✓                     |      | ✓     | ✓                |               | 53                       |                             | •••                   | 10-20 yrs#                  | 53                                |                               |
| 2          | Skeffling                             | 411       | 4.8                     | 10-20                           |                       | ✓    |       | ✓✓               |               | 10                       |                             | •••                   | 10-20 yrs#                  | 10                                |                               |
| 3          | Sunk Island                           | 6,812     | 11.8                    | 10-20                           |                       | ✓    | ✓     | ✓✓               |               | 668                      |                             | ••                    | 10-20 yrs#                  | 668                               |                               |
| 4          | Stone Creek to Paull Holme            | 3,300     | 11.5                    | 10-20                           |                       |      |       | ✓✓               |               | 195                      |                             | ••                    | None*                       | 195                               |                               |
| 5a         | Hull East (Paull Village)             | 2,613     | 13.2                    | < 10                            | ✓                     |      |       |                  |               | 5,728                    | ■                           | •                     | None                        |                                   |                               |
| 5b         | Hull East (Victoria Dock Village)     | 12,355    |                         | 10-20                           |                       | ✓    |       |                  |               | 51,356                   | ■                           | •                     | None                        |                                   |                               |
| 6          | Hull West                             | 9,471     | 8.4                     | 10-20                           |                       | ✓    |       |                  |               | 79,974                   | ■                           | •                     | None                        |                                   |                               |
| 7          | Hessle                                | 35        | 2.4                     | < 5                             | ✓                     |      |       |                  |               | 24                       |                             | •••                   | None*                       | 24                                |                               |
| 8          | North Ferriby                         | 32        | 3.2                     | > 20                            |                       |      | ✓     |                  |               | 28                       |                             | ••                    | > 20 yrs#                   | 28                                |                               |
| 9a         | Brough (East)                         | 389       | 6.1                     | < 10                            | ✓                     |      |       |                  |               | 0                        |                             | •••                   | < 10 yrs                    | 0                                 |                               |
| 9b         | Brough (West)                         |           |                         | < 10                            | ✓                     |      |       |                  |               | 483                      | ■                           | •                     | None                        |                                   |                               |
| 10         | Brough Haven to Weighton Lock         | 4,259     | 6.5                     | < 10                            |                       |      | ✓     |                  | ✓             | 697                      | ■                           | •                     | None                        |                                   |                               |
| 11a        | Saltmarshe (Blacktoft to Yokefleet)   | 14,143    | 24.4                    | 10-20                           |                       | ✓    |       |                  | ✓             | 2,821                    | ■                           | •†                    | None                        |                                   |                               |
| 11b        | Saltmarshe (Sandhall)                 |           |                         | > 20                            |                       | ✓    | ✓     |                  | ✓             |                          | ■                           | •                     | None                        |                                   |                               |
| 12         | Goole                                 | 3,380     | 8.6                     | > 20                            |                       |      |       |                  |               | 9,960                    | ■                           | •                     | None                        |                                   |                               |
| 13a        | Goole Fields (Swinefleet)             |           |                         | < 10                            | ✓                     |      |       |                  | ✓             |                          |                             | •†                    | None                        |                                   |                               |
| 13b        | Goole Fields (Swinefleet to Reedness) | 19,626    | 28.7                    | 10-20                           |                       | ✓    |       |                  | ✓             | 10,654                   |                             | •†                    | None                        |                                   |                               |
| 13c        | Crowle (Amcotts to Keadby)            |           |                         | > 20                            |                       |      | ✓     |                  | ✓             |                          |                             | •                     | None                        |                                   |                               |
| 14         | Gunness to Flixborough                | 1,070     | 5.9                     | 10-20                           |                       | ✓    |       |                  | ✓             | 2,649                    | ■                           | •                     | None                        |                                   |                               |
| 15         | Flixborough Grange                    | 365       | 6.3                     | > 20                            |                       |      |       |                  | ✓             | 7                        |                             | •••                   | > 20 yrs#                   | 7                                 |                               |
| 16         | Alkborough Flats                      | 427       | 6.4                     | > 20                            |                       |      |       | ✓                | ✓             | Scheme completed in 2006 |                             | •                     | None                        |                                   |                               |
| 17         | Whitton to Winteringham               | 636       | 4.6                     | 10-20                           |                       |      | ✓     |                  | ✓             | 59                       |                             | •••                   | 10-20 yrs#                  | 59                                |                               |
| 18         | Winteringham Ings                     | 4,760     | 4.5                     | < 10                            |                       | ✓    | ✓     |                  |               | 536                      | ■                           | •                     | None                        |                                   |                               |
| 19         | South Ferriby                         | 6,170     | 3.2                     | > 20                            |                       |      | ✓     |                  |               | 1,107                    | ■                           | •                     | None                        |                                   |                               |
| 20a        | Barton Cliff to Barton Haven (West)   | 206       | 2.9                     | > 20                            |                       |      |       |                  |               | 10                       |                             | ••                    | > 20 yrs#                   | 10                                |                               |
| 20b        | Barton Cliff to Barton Haven (East)   |           |                         |                                 |                       |      |       |                  |               | 429                      |                             | •                     | None                        |                                   |                               |
| 21         | Barton Haven to Barrow Haven          | 442       | 3.3                     | > 20                            |                       |      | ✓     |                  |               | 958                      | ■                           | •                     | None                        |                                   |                               |
| 22         | Barrow Haven to East Halton Skitter   | 2,551     | 10.5                    | > 20                            |                       |      | ✓     | ✓✓               |               | 634                      |                             | ••                    | > 20 yrs#                   | 634                               |                               |
| 23a        | Halton Marshes                        | 876       | 7.3                     | < 10                            | ✓                     | ✓    | ✓     |                  |               | 0                        |                             | •••                   | < 10 yrs                    | 0                                 |                               |
| 23b        | Killingholme Marshes                  |           |                         | < 10                            |                       | ✓    | ✓     |                  |               | 26                       | ■                           | •                     | None                        |                                   |                               |
| 24         | Immingham to River Freshney           | 3,613     | 12.6                    | < 10                            | ✓                     | ✓    | ✓     |                  |               | 11,687                   | ■                           | •                     | None                        |                                   |                               |
| 25         | East Grimsby                          | 802       | 3.9                     | 10-20                           |                       | ✓    |       |                  |               | 18,909                   | ■                           | •                     | None                        |                                   |                               |
| 26         | Cleethorpes and Humberston            | 1,669     | 9.2                     | > 20                            |                       |      | ✓     |                  |               | 2,243                    | ■                           | •                     | None                        |                                   |                               |
| 27         | Tetney to Saltfleet Haven             | 13,138    | 17.4                    | > 20                            | ✓                     | ✓    | ✓     | ✓✓               |               | 2,928                    | ■                           | •                     | None                        |                                   |                               |



# Section 5 Proposals for each flood area

## Flood area 1 – Easington and Kilnsea

| Key information                    |   |
|------------------------------------|---|
| Size of flood area                 | 681 ha  |
| Number of properties in floodplain | 76  |
| Area of agricultural land          | 597 ha  |
| Length of defences (a) sea         | 2.0 km  |
| (b) estuary                        | 5.3 km  |
| Current standard of protection     | Varies, minimum 20% (1 in 5)  |
| Remaining life of defence          | Varies, generally 10 to 40 years  |
| Defences managed by                | Environment Agency, apart from new sea defences at Kilnsea which are managed by the villagers |



About 25 of the properties at risk are in Kilnsea but most of the rest are in Easington, at the edge of the floodplain. The area is used almost entirely for agriculture but contains important wildlife habitats, particularly at Spurn and The Lagoons. The habitats at The Lagoons are threatened by erosion, which is causing the coastline to retreat by two to three metres each year on average. Spurn Peninsula is a Heritage Coast site and the estuary's main pilotage and lifeboat facilities are at Spurn Head.

### Existing flood defences

The area is protected by two sets of defences, beside the estuary and the sea. The sea defences are threatened by the retreating coastline; those protecting Kilnsea have recently been replaced and are expected to last for between 20 and 30 years before the retreating coastline reaches them, while those protecting Easington are expected to last for between 30 and 40 years. The estuary defences are expected to need minor repairs every few years and major improvement in about 20 years.

### Proposed management approach

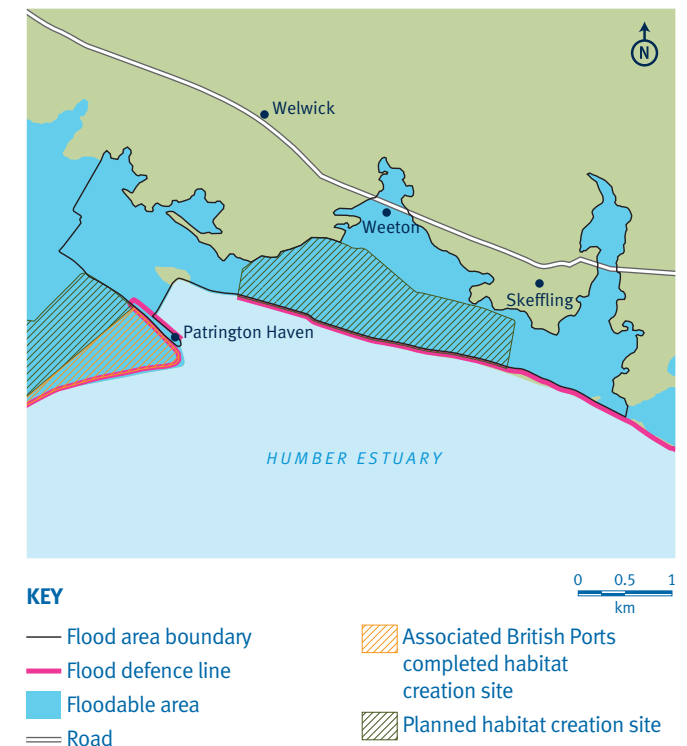
At present we are continuing to maintain the defences and are looking at how to provide replacement habitat

for The Lagoons. In the future we will not maintain the new flood defence embankment built near to the sea at Kilnsea. We are continuing to maintain the other defences. Uncertainty about the rate at which sea levels will rise and the defences deteriorate means we cannot say exactly when this might happen but currently we expect it to be in between 10 and 20 years. We will re-assess the situation each time we review the strategy and tell all property owners in the area about the outcome.

Although we may not be able to carry on maintaining the defences, others may wish to. Provided they can comply with the Habitats Regulations and obtain the approvals needed, we will provide all the advice and information we can to help them. If not, we will look at building a secondary bank to protect properties in Easington. Without further study we cannot confirm this will be possible or say exactly where the bank might be located. The owners of any property not protected may wish to consider other options, which in some cases might include flood-proofing individual houses. Again we will provide all the advice and information we can.

## Flood area 2 – Skeffling

| Key information                    |   |
|------------------------------------|---|
| Size of flood area                 | 411 ha  |
| Number of properties in floodplain | 10  |
| Area of agricultural land          | 403 ha  |
| Length of defences                 | 4.8 km  |
| Current standard of protection     | Varies, generally about 5% (1 in 20) but 50% (1 in 2) locally |
| Remaining life of defence          | Varies, generally 10 to 20 years                              |
| Defences managed by                | Environment Agency  |



Most of the properties at risk are in Weeton (at the edge of the floodplain), there are none in Skeffling itself. The area contains farms and high-grade agricultural land and is drained to the estuary, either by gravity or by being pumped. A large part of the area has been identified as suitable for creating the new inter-tidal habitat we will need to replace the losses caused by our flood defence improvements and sea level rise. We have already bought some of the land and plan to buy more so we can develop the site between 2010 and 2020.

### Existing flood defences

The defences are generally in good condition. They are expected to need minor repairs every few years and major improvement in about 20 years.

### Proposed management approach

At present we are continuing to maintain the existing defences. However, in the future the relatively small number of properties at risk means that we could find it difficult to justify spending public money on the existing defences and so may have to withdraw from them. Uncertainty about the rate at which sea levels will rise and the defences deteriorate means we cannot say exactly when this might happen but currently expect it to be in between 10 and 20 years. We will re-assess the situation each time we review the strategy and tell all property owners in the area about the outcome.

Withdrawing from the existing defences will not affect properties behind the habitat creation site, as this will include new defences to protect them. The defences either side of the site will not be improved, however, so once we withdraw they will deteriorate and in due course fail. Although we may not be able to carry on maintaining the existing defences, others may wish to. Provided they comply with the Habitats Regulations and can obtain the approvals needed, we will provide all the advice and information we can to help them. The owners of any property not protected may wish to consider other options, which in some cases could include flood-proofing individual houses. Again we will provide all the advice and information we can.

## Flood area 3 – Sunk Island (Winestead Drain to Stone Creek)

| Key information                    |   |
|------------------------------------|---|
| Size of flood area                 | 6812 ha   |
| Number of properties in floodplain | 668   |
| Area of agricultural land          | 6733 ha   |
| Length of defences                 | 11.8 km   |
| Current standard of protection     | Varies, generally about 10% (1 in 10) or better but 50% (1 in 2) locally  |
| Remaining life of defence          | Varies, generally 10 to 20 years  |
| Defences managed by                | Mostly Crown Estate but also Associated British Ports, Environment Agency |



Most of the properties are at the edge of the floodplain, in the villages of Keyingham, Ottringham, Pattrington or Pattrington Haven. It contains scattered farms and high-grade agricultural land. The land is drained to the estuary by a system of ditches leading either to the Winestead Drain (which is pumped) or to Keyingham Drain (which flows by gravity). Although this and the neighbouring area of Stone Creek to Paull Holme Strays (Flood Area 4) are separated by Keyingham Drain, flooding in one can affect the other. Therefore the two areas should be considered together.

Associated British Ports has created a new inter-tidal habitat at a site near Welwick to compensate for losses due to their development at Immingham. We have identified land behind this site for creating the inter-tidal habitat we will need to replace the losses caused by our flood defence improvements and sea level rise. We plan to develop it after 2020.

### Existing flood defences

Some work is needed to protect the defences against erosion and this will probably need to be repeated every few years. Major improvements are likely to be needed in 20 to 30 years.

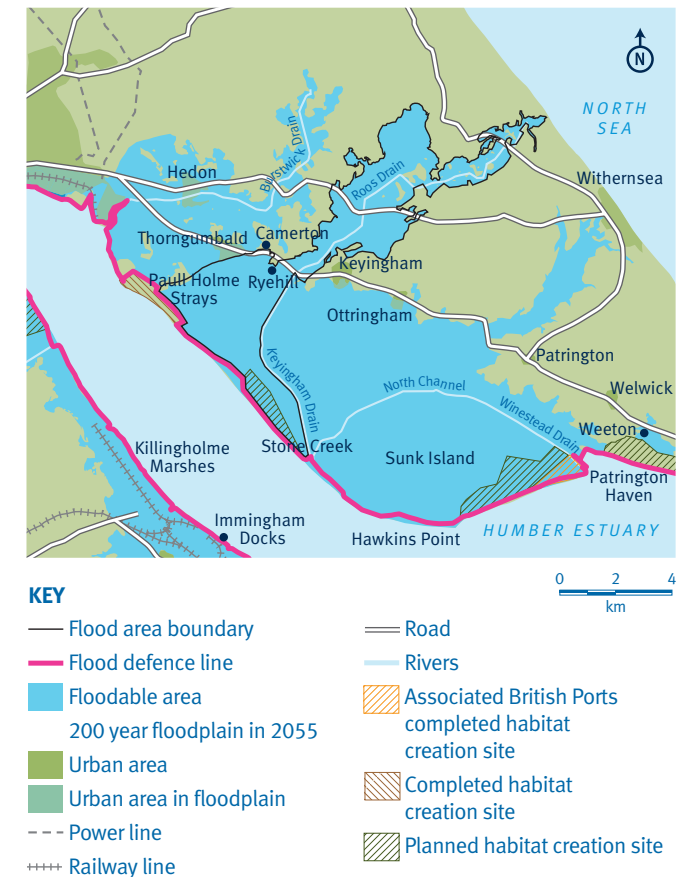
### Proposed management approach

Currently, the banks in this part of the estuary are mostly owned by the Crown. It will become increasingly expensive to maintain the existing defences in the future as sea levels rise and at some point the owners may decide it is not worthwhile carrying on. We think this is unlikely to be within the next 20 years.

If maintenance is withdrawn from the existing defences, we will look at building secondary banks to protect the villages at the edge of the floodplain. Without further study we cannot confirm this is possible or say exactly where the banks might be located. The owners of any property not protected may wish to consider other options, which in some cases might include flood-proofing individual houses. We will provide all the advice and information we can to help.

## Flood area 4 – Stone Creek to Paull Holme Strays

| Key information                    |   |
|------------------------------------|---|
| Size of flood area                 | 3300 ha   |
| Number of properties in floodplain | 195   |
| Area of agricultural land          | 3268 ha   |
| Length of defences                 | 11.5 km   |
| Current standard of protection     | About 12.5% (1 in 80) or better   |
| Remaining life of defence          | Varies, generally 10 to 20 years  |
| Defences managed by                | Environment Agency responsible for defences at Paull Holme Strays, other defences managed by Crown Estate |



Most of the properties at risk are at the edge of the floodplain, in the villages of Ryehill or Camerton (Thorngumbald, the village next door, is in Flood Area 5). It contains scattered farms and high-grade agricultural land. The land is drained to the estuary by a system of ditches leading to Keyingham Drain. Although this and the neighbouring area of Sunk Island (Flood Area 3) are separated by Keyingham drain, flooding in one can affect the other. Therefore the two areas should be considered together.

In 2004 we completed a scheme at Paull Holme Strays that created new inter-tidal habitat to replace the losses due to flood defence improvements and sea level rise. We have identified another site near Keyingham as suitable for creating additional habitat but are unlikely to develop it until after 2030.

### Existing flood defences

The defences are generally in good condition. Major improvements are likely to be needed in 40 years or so.

### Proposed management approach

We have looked at the costs and benefits of continuing to maintain the existing defences in the future and concluded that this will become increasingly expensive as sea levels rise. In the long term those responsible may decide it is not worthwhile carrying

on. Uncertainty about the rate at which sea levels will rise and the defences deteriorate means we cannot say when this might happen, although we think it is unlikely to be within the next 20 years. We will re-assess the situation when we review the strategy and keep in touch with those responsible for the defences.

If maintenance is withdrawn from the existing defences, we will look at building secondary banks to protect the villages at the edge of the floodplain. Without further study we cannot confirm this will be possible or say exactly where the banks might be located. The owners of any property not protected may wish to consider other options, which in some cases might include flood-proofing individual houses. We will provide all the advice and information we can to help.



## Flood area 5 – Hull East (including Paull Village)

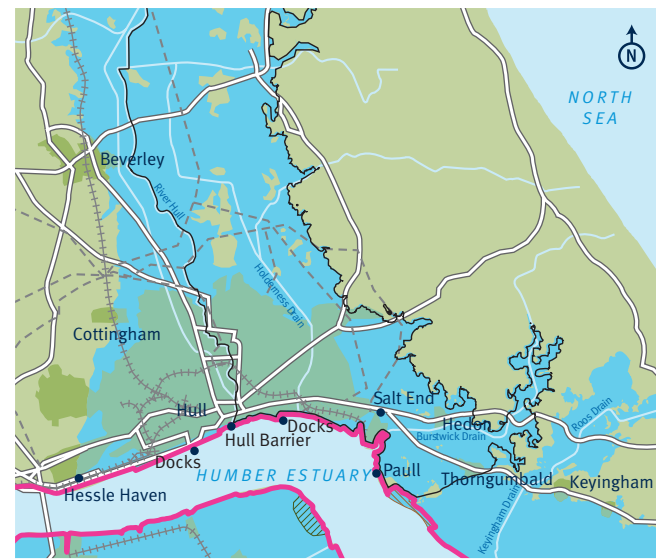
| Key information                    |   |
|------------------------------------|---|
| Size of flood area                 | 14,968 ha   |
| Number of properties in floodplain | 57,084  |
| Area of agricultural land          | 9,328 ha  |
| Length of defences                 | 13.2 km   |
| Current standard of protection     | Hull, 0.5% (1 in 200) or better. Paull, 1% (1 in 100)                     |
| Remaining life of defence          | 10 to 20 years  |
| Defences managed by                | Mixed; Hull City Council, Associated British Ports and Environment Agency |

Most of the properties at risk are in Hull, although there is a significant number in the smaller communities east of the city including Hedon, Burstwick, Thorngumbald and Paull. The area also contains major industrial and commercial facilities, including petro-chemical and port-related developments. Surface water is drained by a combination of sewers (mostly managed by Yorkshire Water) and open channels, all of which flow or are pumped to the estuary. An independent review of these arrangements has been carried out following the extensive flooding in June 2007. Hull City Council has prepared a Strategic Flood Risk Assessment to inform their planning decisions and the future development of the city.

### Existing flood defences

The estuary defences are in good condition. We are reviewing the standard provided at the Victoria Dock development and may improve the defences there in the next 10 years if necessary. We are also looking at the Paull defences, in particular how to manage the large volumes of spray from waves that can occur during severe storms.

The city of Hull is also at risk of flooding from the River Hull and from surface water overwhelming the drainage system. We are developing a separate strategy for the River Hull defences that takes into account the crucial role of the Hull Barrier and are working closely with the other relevant authorities to develop effective approaches for dealing with the complex flooding issues in the city.



| KEY                        |                                   |
|----------------------------|-----------------------------------|
| — Flood area boundary      | ++++ Railway line                 |
| — Flood defence line       | — Road                            |
| ■ Floodable area           | — River                           |
| ■ Urban area               | ▨ Completed habitat creation site |
| ■ Urban area in floodplain | ▨ Planned habitat creation site   |
| - - - Power line           |                                   |

### Proposed management approach

We will continue to protect this area and will work with the local and regional authorities, property owners and developers to make sure flood risk is taken into account at all stages of the planning process. The defences will need to be improved as sea levels rise. This will be expensive so we will seek to supplement public funds with contributions from major beneficiaries and from developers, who will be expected to pay the full cost of any new works needed to protect their development.

## Flood area 6 – Hull West (Hull Barrier to Hesse Haven)

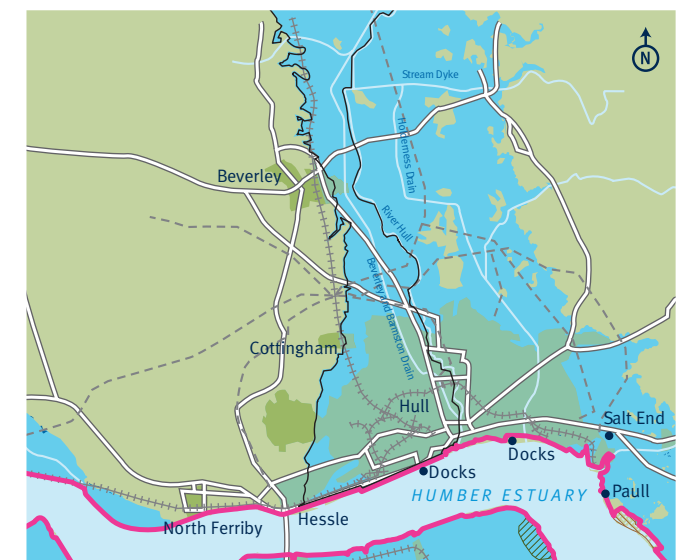
| Key information                    |   |
|------------------------------------|---|
| Size of flood area                 | 9,471 ha  |
| Number of properties in floodplain | 79,974  |
| Area of agricultural land          | 5,191 ha  |
| Length of defences                 | 8.4 km  |
| Current standard of protection     | Generally 0.5% (1 in 200) but locally 5% (1 in 20)                        |
| Remaining life of defence          | Generally 10 to 20 years, locally 5 years                                 |
| Defences managed by                | Mixed; Hull City Council, Associated British Ports and Environment Agency |

The properties at risk are in Hull and further inland (e.g. at Beverley). The area also contains major infrastructure, industrial and commercial facilities. Surface water is drained by a combination of sewers (mostly managed by Yorkshire Water) and open channels, all of which flow or are pumped to the estuary. An independent review of these arrangements has been carried out following the extensive flooding in June 2007. Hull City Council has prepared a Strategic Flood Risk Assessment to inform their planning decisions and the future development of the city.

### Existing flood defences

The estuary defences are generally in good condition and provide a good standard of protection, except from the Hull Barrier to Victoria Pier and from Albert Dock to St Andrews Quay, where the standard needs to be improved.

The area is also at risk of flooding from the River Hull and from surface water that overwhelms the drainage system. We are developing a separate strategy for the River Hull defences that takes into account the crucial role of the Hull Barrier and are working closely with the other relevant authorities to develop effective approaches for dealing with the complex flooding issues in the city.



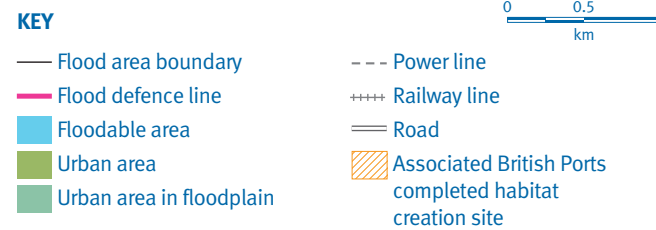
| KEY                        |                                   |
|----------------------------|-----------------------------------|
| — Flood area boundary      | - - - Power line                  |
| — Flood defence line       | — Railway line                    |
| ■ Floodable area           | — Road                            |
| ■ Urban area               | — River                           |
| ■ Urban area in floodplain | ▨ Completed habitat creation site |
|                            | ▨ Planned habitat creation site   |

### Proposed management approach

We will continue to protect this area and will work with the local and regional authorities, property owners and developers to make sure flood risk is taken into account at all stages of the planning process. The improvements needed to the defences will be expensive so we will seek to supplement public funds with contributions from major beneficiaries and from developers, who will be expected to pay the full cost of any new works needed to protect their development.

## Flood area 7 – Hesse Frontage (Hesse Haven To Hesse Country Park Hotel)

| Key information                    |                                      |
|------------------------------------|--------------------------------------|
| Size of flood area                 | 35 ha                                |
| Number of properties in floodplain | 24                                   |
| Area of agricultural land          | 8 ha                                 |
| Length of defences                 | 7.4 km                               |
| Current standard of protection     | Varies, locally 20% (1 in 5) or less |
| Remaining life of defence          | Varies, locally 5 years              |
| Defences managed by                | East Riding of Yorkshire and others  |



Clive Sullivan Way separates this small area from the main part of Hesse and Hull (which is included in Flood Area 6). As well as residential properties, it contains recreational areas and some commercial and industrial premises. Surface water is drained by a combination of sewers (mostly managed by Yorkshire Water) and open channels, all of which flow or are pumped to the estuary.

### Existing flood defences

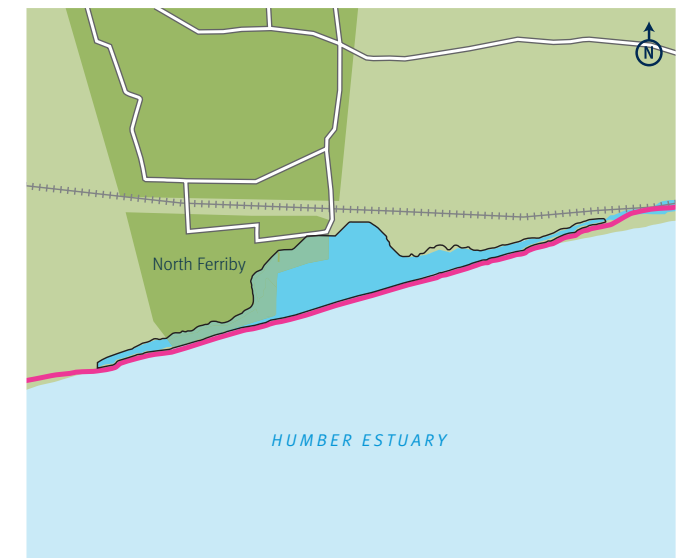
The defences are generally in a poor condition and provide a low standard of protection. The shoreline is being worn away by tides and waves in places, which in time will threaten some of the defences.

### Proposed management approach

We expect that continuing to maintain these defences in the future will become increasingly expensive as sea levels rise. In the long term those responsible may decide it is not worthwhile carrying on. Other ways of managing the flood risk may need to be considered. We will review the situation regularly and keep in touch with those responsible for the defences.

## Flood area 8 – North Ferriby

| Key information                    |   |
|------------------------------------|---|
| Size of flood area                 | 32 ha   |
| Number of properties in floodplain | 28  |
| Area of agricultural land          | 8 ha  |
| Length of defences                 | 3.2 km  |
| Current standard of protection     | Generally 1% (1 in 100) or better, locally 20% (1 in 5) |
| Remaining life of defence          | 10 to 20 years  |
| Defences managed by                | Environment Agency                                      |



The area is mainly residential, although there is some farmland and a old landfill site at the eastern end. The edge of this site is being eroded by tides and waves, which could release contaminants into the estuary. Part of the main railway to Hull is on the edge of the area but is above the level of flood risk.

### Existing flood defences

There are two lines of flood defences protecting this area both of which are in reasonable condition and provide a good standard of protection.

### Proposed management approach

At present we are continuing to maintain the defence along the edge of the estuary. As sea levels rise we may find it difficult to justify spending public money doing this, in which case we may have to withdraw. Before doing so we will consider other options for protecting the area. Uncertainty about the rate at which sea levels will rise and the defences deteriorate means we cannot say when this might happen, although we think it is unlikely to be within the next 20 years. We will re-assess the situation each time we review the strategy and tell all property owners in the area about the outcome.

We are reviewing the risk of allowing the erosion of the landfill site to continue. Any work needed as a result will be separate from the flood defence strategy.