

Grimsby and Ancholme Catchment Flood Management Plan

Summary Report December 2009

managing
flood risk



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Introduction



I am pleased to introduce our summary of the Grimsby and Ancholme Catchment Flood Management Plan (CFMP). This CFMP gives an overview of the flood risk in the Grimsby and Ancholme catchment and sets out our preferred plan for sustainable flood risk management over the next 50 to 100 years.

The Grimsby and Ancholme CFMP is one of 77 CFMPs for England and Wales. Through the CFMPs, we have assessed inland flood risk across all of England and Wales for the first time. The CFMP considers all types of inland flooding, from rivers, ground water, surface water and tidal flooding, but not flooding directly from the sea (coastal flooding). This is covered by Shoreline Management Plans (SMPs). Our coverage of surface and groundwater flooding is however limited due to a lack of available information.

The role of CFMPs is to establish flood risk management policies which will deliver sustainable flood risk management for the long term. This is essential if we are to make the right investment decisions for the future and to help prepare ourselves effectively for the impact of climate change. We will use CFMPs to help us target our limited resources where the risks are greatest.

This CFMP identifies flood risk management policies to assist all key decision makers in the catchment. It was produced through a wide consultation and appraisal process, however it is only the first step towards an integrated approach to flood risk management. As we all work together to achieve our objectives, we must monitor and listen to each others progress, discuss what has been achieved and consider where we may need to review parts of the CFMP.

There are different sources of flood risk in the catchment. River flooding from the River Rase, River Ancholme, River Freshney and other drains and rivers can affect Grimsby, Cleethorpes, Humberston, Market Rasen, Brigg and the Humber trade zone industrial area. Tidal flooding can occur from the Humber overtopping the tidal defences.

This could affect Grimsby, Cleethorpes, Humberston and the Humber trade zone industrial area. Surface water and sewer flooding can affect Grimsby, Cleethorpes, Humberston and Brigg. Areas between Barrow and Cleethorpes, including Grimsby and the Humber trade zone, are susceptible to groundwater flood risk.

We cannot reduce flood risk on our own. We will therefore work closely with all our partners to improve the co-ordination of flood risk activities. For example, in parts of the catchment Internal Drainage Boards (IDBs) have an important role in managing flood risk. We will work in partnership with the IDBs to agree the most effective way to manage flood risk in the future. We also work with many other organisations, groups and individuals with an interest in how flood risk is managed. This includes local authorities, water companies, conservation bodies such as Natural England and the public.

This is a summary of the main CFMP document. If you would like to see the full document an electronic version can be obtained by emailing enquiries@environment-agency.gov.uk or telephoning 08708 506 506. Alternatively, paper copies can be viewed at any of our offices in Anglian Region.

A handwritten signature in black ink that reads "Paul Woodcock". The signature is written in a cursive, flowing style.

Paul Woodcock
Regional Director Anglian Region

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↑ Moorings, River Ancholme

The purpose of a CFMP in managing flood risk

CFMPs help us to understand the scale and extent of flooding now and in the future, and set policies for managing flood risk within the catchment. CFMPs should be used to inform planning and decision making by key stakeholders such as:

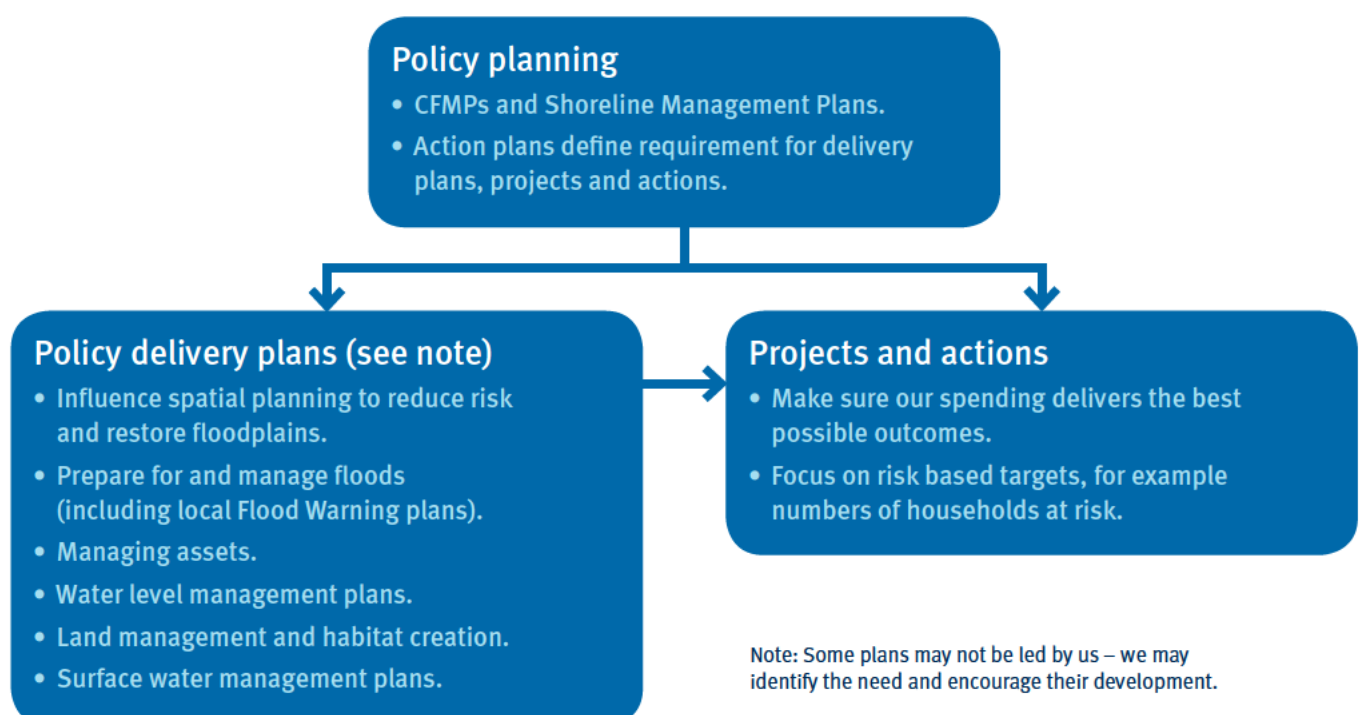
- the Environment Agency, who will use the plan to guide decisions on investment in further plans, projects or actions;
- regional planning bodies and local authorities who can use the plan to inform spatial planning activities and emergency planning;

- Internal Drainage Boards (IDBs), water companies and other utilities to help plan their activities in the wider context of the catchment;
- transportation planners;
- land owners, farmers and land managers that manage and operate land for agriculture, conservation and amenity purposes;
- the public and businesses to enhance their understanding of flood risk and how it will be managed.

CFMPs aim to promote more sustainable approaches to managing flood risk. The policies identified in the CFMP will be delivered through a combination of different approaches. Together with our partners, we will implement these approaches through a range of delivery plans, projects and actions.

The relationship between the CFMP, delivery plans, strategies, projects and actions is shown in Figure 1.

Figure 1 The relationship between CFMPs, delivery plans, projects and actions



Catchment overview

The Grimsby and Ancholme CFMP area, as shown in Map 1, lies to the south of the Humber estuary, between Whitton in the west and Humberston in the east. It extends to the south as far as Market Rasen and includes Brigg, Grimsby, Immingham, Barton upon Humber, Barrow upon Humber and the north Lincolnshire Wolds. The River Ancholme drains approximately half of the CFMP area and has the River Rase as its tributary. Other main rivers are Winterton Beck, Butts Drain, Barrow Beck, East Halton Beck, Stallingborough North Beck, Oldfleet Drain, River Freshney and Buck Beck. All rivers discharge to the Humber estuary for which the HECAG (Humber Estuary Coastal Authorities Group) Shoreline Management Plan (SMP) and Humber Flood Risk Management Strategy deal with coastal flood risk management along this coastline.

The CFMP covers an area of around 1,000 km², and has a population of around 228,000 people. It is predominantly rural, with the majority of the catchment used for arable crop production. The highest quality agricultural land is situated on the higher ground on the Lincolnshire Wolds and the North Lincolnshire Edge. The main urban areas are Grimsby, Cleethorpes, Immingham and Brigg. The Humber trade zone, an industrial area centred around the port terminals, is also within the CFMP area.

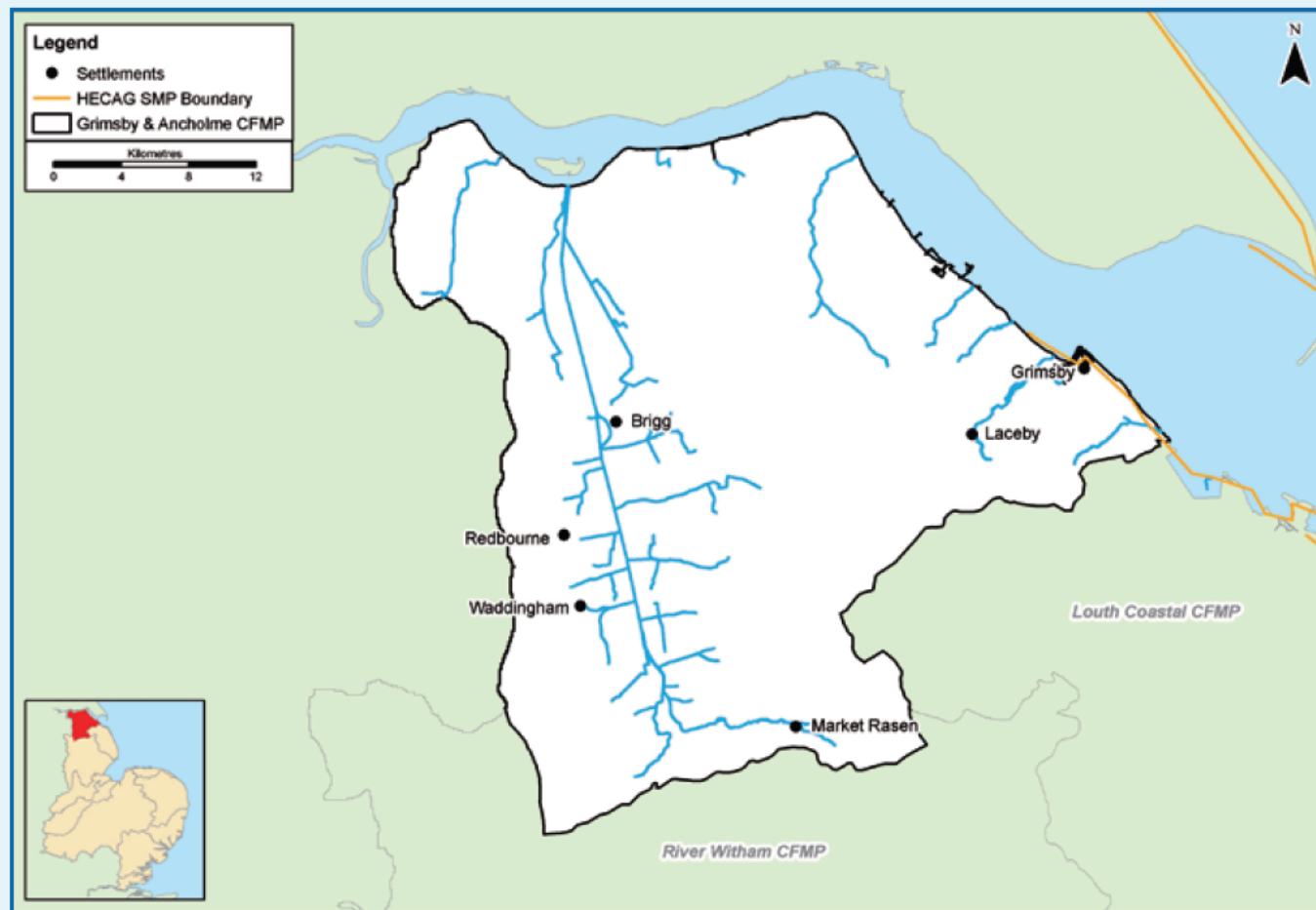
The landscape of the catchment varies significantly. There are two ridges of relatively high ground: the Lincolnshire Wolds dividing the area north to south roughly in the centre of the CFMP area, from Market Rasen to Barton upon Humber, and the North Lincolnshire Edge which forms the full western boundary of the CFMP. Apart from these ridges, the remainder of the CFMP area is primarily made up of low-lying land in the River Ancholme Valley and along the coast. In the low-lying land the River Ancholme and many of the drains are embanked. Drainage of these watercourses is influenced by the tidal cycle. When the tide is high, water cannot flow freely out to sea and the rivers and drains become tide-locked. Internal Drainage Boards (IDBs) have an important role in managing land drainage within these low-lying areas. Some watercourses have pumped drainage.

The underlying geology of the region runs in bands from north to south. To the west, just north of Scunthorpe, the geology broadly comprises of ironstone. East of this, to the west of the River Ancholme and underlying Redbourne and Waddingham, the geology is

mudstone and limestone. Mudstone underlies the CFMP area to the east of the River Ancholme from Market Rasen to the coast, and chalk underlies the eastern half of the area, east of the Lincolnshire Wolds. Where the underlying rock is non-porous mudstones and ironstone, there are higher rates of rainfall runoff which can lead to high river flows. There is also greater risk from surface water flooding in these areas. In the areas where there is limestone or chalk bedrock, runoff may infiltrate the rock delaying the response of rivers to rainfall and reducing peak flood flows. There is also a risk from groundwater flooding in these areas.

There are a number of sites designated for their environmental importance including an Area of Outstanding Natural Beauty (AONB) and 20 Sites of Special Scientific Interest (SSSIs). The Humber Estuary, an internationally protected Ramsar site, Special Protection Area (SPA) and a Site of Community Importance (SCI) is located along the northern and eastern boundaries of the CFMP area. Scheduled Monuments (SMs) and listed buildings, designated for their heritage value, are also distributed across the CFMP area.

Map 1 Location and extent of the Grimsby and Ancholme CFMP area



↑ South Ferriby Lock

Current and future flood risk

Overview of the current flood risk

Flood risk has two components: the chance (probability) of a particular flood and the impact (or consequence) that the flood would have if it happened. The probability of a flood relates to the likelihood of a flood of that size occurring within a one year period, it is expressed as a percentage. For example, a 1% annual probability flood has a 1% chance or 0.01 probability of occurring in any one year, and a 0.5% annual probability flood has a 0.5% chance or 0.005 probability of occurring in any one year. The flood risks quoted in this report are those that take account of flood defences already in place.

The catchment has a history of flooding, the most significant events in recent years occurred in June/July 2007. River flooding and surface and groundwater flooding affected Middle Rasen, West Rasen, Waddingham, Brandy Wharf and Grimsby.

Currently the main sources of flood risk for people, property, infrastructure and the land are:

- river flooding from the River Freshney in Grimsby, Buck Beck in Humberston, The River Rase in Market Rasen, the River Ancholme in Brigg and Oldfleet Drain in the Humber trade zone industrial area;
- the impacts of rivers not being able to flow freely to the sea at high tide (called tide locking), such as at South Ferriby (River Ancholme) and Grimsby (New Cut Drain);
- breaching/failure of embankments that carry the River Ancholme and other drains and watercourses across the low-lying parts of the CFMP. This type of flooding is difficult to predict but could cause the rapid flooding of the areas immediately behind the embankments, and the potential severe risk of loss of life;
- flooding from the network of lowland drains;
- surface water and sewer flooding which has occurred in Grimsby, Cleethorpes, Humberston, the industrial areas around Immingham, Middle Rasen and Market Rasen. Although Brigg has the potential to be at risk from surface water flooding there have been few recorded occurrences;
- groundwater flooding. Land from Barrow upon Humber to Cleethorpes, including Grimsby and the Humber trade zone, is susceptible to flood risk if groundwater levels are high in the underlying rock.

What is at risk?

At present there are around 700 people and 300 commercial and residential properties at risk in the whole catchment from a 1% annual probability river flood, this does not include flooding from IDB drains. These estimates take into account current flood defences. This means that only 0.3% of the total population living in the catchment are currently at risk from flooding. The highest quality agricultural land is situated on the higher ground outside of the floodplain, on the Lincolnshire Wolds and the North Lincolnshire Edge. The majority of the agricultural land in the floodplain is grade three.

It is difficult to assess the current impact of flooding to environmental features. Only a small part of the Humber Estuary (Ramsar, SPA, SCI, SSSI) is anticipated to be at risk of river flooding. River flooding may have a negative impact on two other SSSIs (Normanby Meadow SSSI and Conesby Quarry SSSI). Five additional SSSIs within the catchment are tolerant to flooding or only have a very small area flooded. One Scheduled Monument and 19 listed buildings are also at some flood risk. There is also one Scheduled Monument (SM) and 19 listed buildings at some flood risk.

Where is the risk?

The distribution of properties at risk from a 1% annual probability river flood, taking into account current flood defences, but not flooding from IDB drains, is illustrated in Map 2. Table 1 summarises where there is flood risk to more than 25 properties. Around 25% of the people and properties that are at risk within the catchment from a 1% annual probability river flood, (taking into account current flood defences, but not flooding from IDB drains) are located in Waddingham, and a further 17% are located in Redbourne. Table 2 shows the critical infrastructure at risk in the CFMP area.

We recognise that there is also a potential risk from surface water and groundwater flooding. However, further studies following on from the CFMP are needed by us and our partners to quantify this potential risk.

Table 1 Locations of towns and villages with 25 or more properties at risk in a 1% annual probability river flood

Number of properties at risk	Locations
50 to 100	Waddingham, Redbourne
25 to 50	Middle and Market Rasen, Brigg

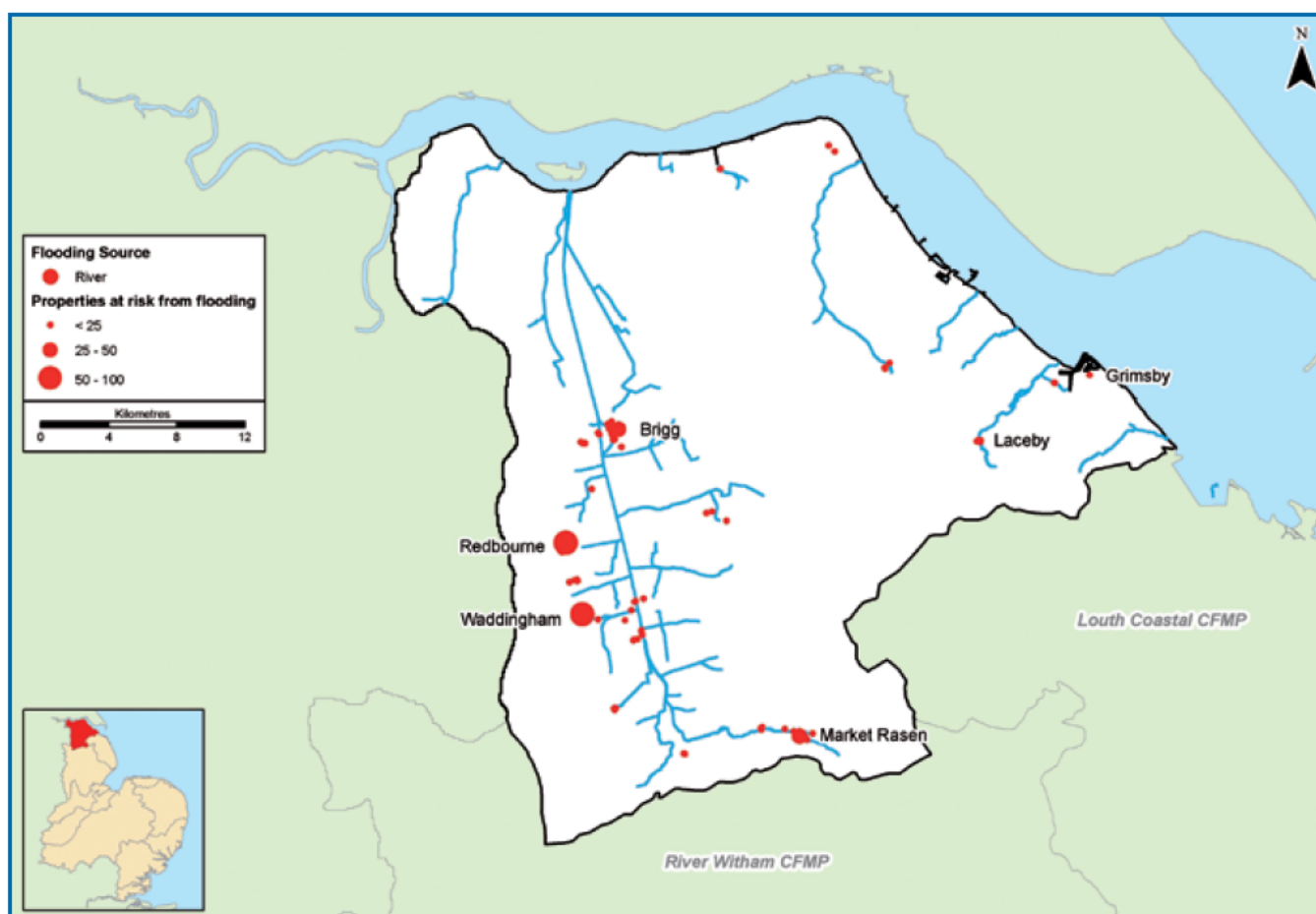
Table 2 Critical infrastructure at risk in the CFMP area

	Risk from a 1% annual probability river flood
Critical Infrastructure at risk	Railway lines M180 motorway Sections of A-road One Electricity Sub-station Two Wastewater Treatment Works



↑ Bishopbridge, River Ancholme

Map 2 Flood risk to property from the 1% annual probability river flood, taking into account current flood defences



How we currently manage the risk in the catchment

The CFMP area has a history of flood risk, generally due to the high rainfall that can lead to extensive flooding of the river valleys and the breaching and/or overtopping of flood defences. Over the last 100 years numerous engineering schemes have been implemented to reduce flood risk in the catchment, including:

- the widening, straightening and embanking of rivers. Embankments along the River Ancholme channel provide protection from the 1% to 2% annual probability river flood.
- Embankments at Barton upon Humber, Barrow upon Humber and East Halton provide protection from the 10% to 50% annual probability river flood. Embankments along Stallingborough North Beck, Buck Beck and Oldfleet Drain provide protection from the 1% annual probability river flood;
- pumping stations. Pumping stations discharge flows from the River Freshney at Grimsby, Butts Drain in Barton upon Humber and a number of IDB managed watercourses;
- IDB pumping stations. IDB pumping stations provide protection typically from the 10% annual probability river flood in agricultural areas and between the 2% and 1% annual probability river flood in urban areas;
- Flood Storage Reservoirs (FSRs). The FSR on the River Rase at Market Rasen provides protection from the 1.3% annual probability river flood;

- A flood alleviation scheme. The Freshney Bogs FSR, floodwalls, embankments and pumping station in Grimsby provide protection from the 1% annual probability river flood¹;
- tidal sluices, doors and pumping stations at river/drain outfalls. Tidal doors control flows from the River Ancholme to the Humber at South Ferriby, with similar installations at New Cut Drain in Grimsby and other gravity outfalls.

These measures have all reduced flood risk and around 30% of the total catchment population currently live in areas that benefit from flood defences.

In addition to these engineering schemes, other flood risk management activities are carried out in the catchment. These include activities which help to reduce the probability of flooding and those that address the consequences of flooding.

Activities that reduce the probability of flooding include:

- maintaining and improving existing flood defences and structures;
- maintaining river channels;
- maintenance of drainage networks by Internal Drainage Boards (IDB) and landowners;
- maintenance of road drainage and sewers.

Activities that reduce the consequences of flooding include:

- working with local authorities to influence the location, layout and design of new and redeveloped property and ensuring that only appropriate development is allowed on the floodplain through the application of Planning Policy Statement 25 (PPS25);

- understanding where flooding is likely by using flood risk mapping;
- providing flood forecasting and warning services;
- promoting awareness of flooding so that organisations, communities and individuals are aware of the risk and are prepared to take action in time of flood;
- promoting resilience and resistance measures for those properties already in the floodplain.

Combinations of engineering and other flood risk management activities are used to reduce the probability or consequences of flooding. Investigations are ongoing to identify which activities are likely to be most effective and appropriate in different parts of the catchment area in the future.



↑ Winterton Beck Outfall

¹ The CFMP has considered the current standard of protection to be up to the 1% annual probability river flood but there are current studies investigating this further.

The impact of climate change and future flood risk

In the future, flooding can be influenced by climate change, changes in land use (for example urban development) and rural land management. Using river models we tested the sensitivity of the rivers in the CFMP area to these drivers.

For urbanisation, we tested the sensitivity of the rivers in the catchment to urban growth by increasing the urban extent by 100% up to 2100. Increasing urbanisation had an impact on flood risk.

For climate change we tested the following changes up to 2100:

- 20% increase in peak flow in all watercourses. This will increase the probability of large-scale flood events;
- a total sea level rise of 905 mm by the year 2100. This will increase the probability of tidal flooding and increase the length of time watercourses will be tide locked.

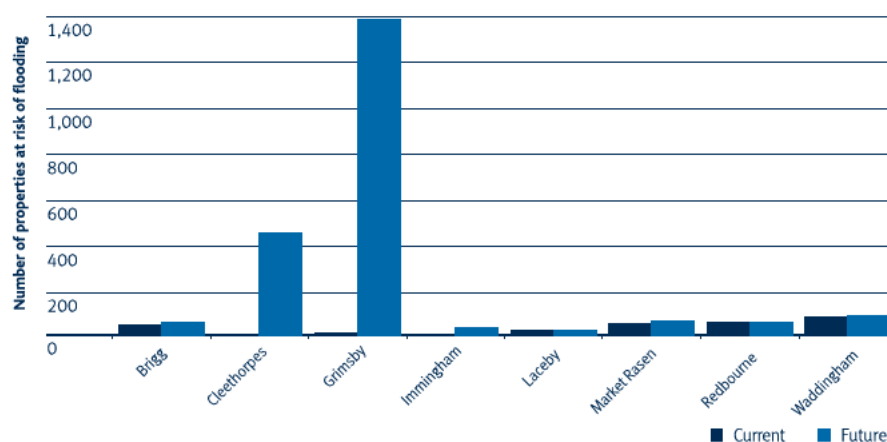
For rural land management, we adjusted the river models to represent the effect of reducing and increasing intensive farming practices. At a catchment scale this had a limited impact on flood risk. Therefore, changes in rural land management were not taken forward into the final future scenario.

In the Grimsby and Ancholme CFMP area, climate change and urbanisation were shown to have the greatest impact on flood risk. Therefore, the scenario used to model future flood risk was based on urbanisation and climate change as described.

Using river models we estimate that by 2100, around 5,000 people and 2,200 properties across the CFMP area may be at risk from a 1% annual probability river flood, this does not include flooding from IDB drains. These figures take into

account current flood defences. Flood risk from rivers increases mainly in Grimsby; however, there is also a significant increase in Cleethorpes and Humberston. Figure 2 shows the difference between current and future flood risks from a 1% annual probability river flood at key locations in the catchment. Following on from the CFMP, organisations need to work together to investigate flood risk from other sources (for example, surface water and ground water flooding) in more detail.

Figure 2 Current and future (2100) flood risk to property from a 1% annual probability river flood, taking into account current flood defences



Flood risk to infrastructure and community services also increases in the future, most notably in Grimsby and Cleethorpes. In the future 1% annual probability river flood, across the whole CFMP area,

there is risk to sections of main railway lines, the M180 motorway, sections of A-road, 25 electricity sub-stations, two wastewater treatment works, two schools and a telephone exchange.

In general, it is unlikely that the impact of flooding on environmental sites will change significantly in the future.



↑ Barrow Haven Sluice

Future direction for flood risk management

Approaches in each sub-area

We have divided the Grimsby and Ancholme catchment into five distinct sub-areas which have similar physical characteristics, sources of flooding and level of

risk. We have identified the most appropriate approach to managing flood risk for each of the sub-areas and allocated one of six generic flood risk management policies, shown in Table 3.

To select the most appropriate policy, the plan has considered how social, economic and environmental objectives are affected by flood risk management activities under each policy option.

Map 3 Sub-areas and flood risk management policies

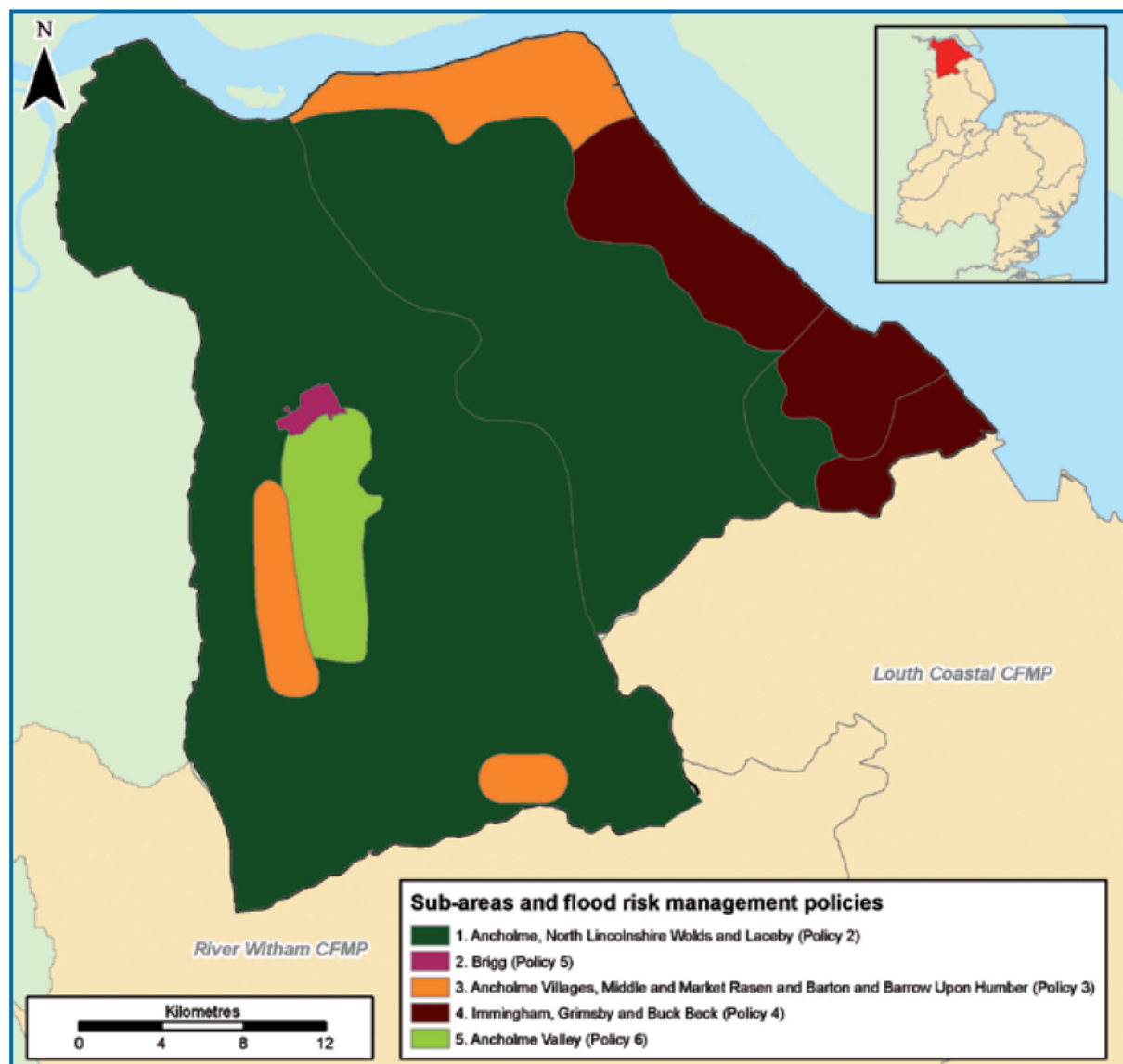


Table 3 Flood risk management policy options

→ Policy 1

Areas of little or no flood risk where we will continue to monitor and advise

This policy will tend to be applied in those areas where there are very few properties at risk of flooding. It reflects a commitment to work with the natural flood processes as far as possible.

→ Policy 2

Areas of low to moderate flood risk where we can generally reduce existing flood risk management actions

This policy will tend to be applied where the overall level of risk to people and property is low to moderate. It may no longer be value for money to focus on continuing current levels of maintenance of existing defences if we can use resources to reduce risk where there are more people at higher risk. We would therefore review the flood risk management actions being taken so that they are proportionate to the level of risk.

→ Policy 3

Areas of low to moderate flood risk where we are generally managing existing flood risk effectively

This policy will tend to be applied where the risks are currently appropriately managed and where the risk of flooding is not expected to increase significantly in the future. However, we keep our approach under review, looking for improvements and responding to new challenges or information as they emerge. We may review our approach to managing flood defences and other flood risk management actions, to ensure that we are managing efficiently and taking the best approach to managing flood risk in the longer term.

→ Policy 4

Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change

This policy will tend to be applied where the risks are currently deemed to be appropriately-managed, but where the risk of flooding is expected to significantly rise in the future. In this case we would need to do more in the future to contain what would otherwise be increasing risk. Taking further action to reduce risk will require further appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options.

→ Policy 5

Areas of moderate to high flood risk where we can generally take further action to reduce flood risk

This policy will tend to be applied to those areas where the case for further action to reduce flood risk is most compelling, for example where there are many people at high risk, or where changes in the environment have already increased risk. Taking further action to reduce risk will require additional appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options.

→ Policy 6

Areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits

This policy will tend to be applied where there may be opportunities in some locations to reduce flood risk locally or more widely in a catchment by storing water or managing run-off. The policy has been applied to an area (where the potential to apply the policy exists), but would only be implemented in specific locations within the area, after more detailed appraisal and consultation.

Ancholme, North Lincolnshire Wolds and Laceby

Our key partners are:

North Lincolnshire Council

North East Lincolnshire Council

West Lindsey District Council

Ancholme Internal Drainage Board

North East Lindsey Drainage Board

The issues in this sub-area

There are few people and properties at risk in this large rural sub-area. People and properties at risk are located in isolated towns and villages scattered throughout the rural region. River flooding is infrequent and the consequences of flooding are low.

Currently, there are 41 properties within this sub-area at risk from the 1% annual probability river flood. This does not include flooding from IDB drains. The properties at risk are concentrated within Ancholme and Laceby. There is no grade two agricultural land at risk, but 8% of the grade three agricultural land is at risk from river flooding within this sub-area. Sections of the M180, A18, A631, A1077, A46, some railway, an electricity sub-station and two Sewage Treatment Works (STW) are also at risk. Tables 4, 5, and 6 detail flood risk to people and property in this sub-area.

Table 4 Risk to people and property within the Ancholme during a 1% annual probability river flood, taking into account current flood defences. This does not include flooding from IDB drains

	Current	Future (2100)
Number of people at risk	35	35
Number of properties at risk	15	15

Table 5 Risk to people and property within the North Lincolnshire Wolds during a 1% annual probability river flood. This does not include flooding from IDB drains. There are no formal flood defences in this sub-area

	Current	Future (2100)
Number of people at risk	3	3
Number of properties at risk	4	4

Table 6 Risk to people and property within Laceby during a 1% annual probability river flood, taking into account current flood defences. This does not include flooding from IDB drains

	Current	Future (2100)
Number of people at risk	55	55
Number of properties at risk	22	22

The vision and preferred policy

Policy option 2: Areas of low to moderate flood risk where we can generally reduce existing flood risk management actions.

In these rural reaches the current activity to manage flooding is out of proportion with the level of flood risk, or is not effective. In general, overall flood risk management activities will be reduced within the sub-area, however where flood risk is more concentrated (for example in towns and villages) existing actions to manage flooding may be continued.

The preferred approach is to reduce bank and channel maintenance in some locations. This will enable limited resources to be targeted to other areas of the catchment where the risks are greater, to ensure value for money. The preferred approach will also help improve the flow between the river and its floodplain and so improve wetland and aquatic habitats.

Flood warning is an important way of managing the consequences of flooding throughout the catchment. Therefore, the local flood warning infrastructure (such as river flow gauging stations) needs to be maintained.

The key messages

- Where feasible, flood risk management activities will be reduced as the current activity to manage flooding is out of proportion with the level of flood risk.

- Reducing bank and channel maintenance will help naturalise rivers and improve the flow between the river and its floodplain.
- Maintain flood warning infrastructure (such as river flow gauging stations) to ensure that an effective flood warning service can be provided throughout the catchment.

Proposed actions to implement the preferred policy

- Investigate options to cease or reduce current bank, channel and flood defence maintenance. In addition, changes in land use, development of sustainable farming practices and environmental enhancement should be investigated to mitigate an increase in flooding in the future.
- Continue with the flood warning service including the maintenance of flood warning infrastructure (such as river flow gauging stations) and public awareness plans.
- Work with partners to develop emergency response plans for critical infrastructure and transport links at risk from flooding.
- Work with the IDBs to gather information on IDB maintenance costs and activities and to re-assess the policy options after the inclusion of these costs and activities.



↑ River Ancholme

Brigg

Our key partners are:

North Lincolnshire Council

Ancholme Internal Drainage Board

The issues in this sub-area

The probability of flooding from the river has been reduced in many places by defences along the River Ancholme. The Ancholme IDB also manage the Scrawby Brook which discharges into the River Ancholme in Brigg. Currently there are 49 properties at risk from the 1% annual probability river flood. This does not include flooding from IDB drains. The settlement is highly urbanised and there is development behind the defences. There is no grade two or three agricultural land at risk from river flooding. There is some railway line and an electricity sub station at risk in the 1% annual probability river flood. Table 7 details flood risk to people and property in this sub-area.

Table 7 Risk to people and property within the Brigg sub-area during a 1% annual probability river flood, taking into account current flood defences. This does not include flooding from IDB drains

	Current	Future (2100)
Number of people at risk	103	130
Number of properties at risk	49	60

We currently manage the risk of river flooding through embankments and flood walls along the River Ancholme. The benefits of the current approach to manage flood risk will reduce in the future as storms are expected to become more frequent and intense. Sea level rise will also result in increased tide locking at South Ferriby outfall, which will increase periods of high water levels through Brigg.

The vision and preferred policy

Policy option 5: Areas of moderate to high flood risk where we can generally take further action to reduce flood risk.

In this densely populated urban sub-area the preferred approach to manage flood risk in Brigg, is to raise awareness of the flood risk and the actions people can take to protect themselves and their property. A flood awareness plan should be produced to encourage people to sign up to and respond to the flood warnings. The flood awareness plan should also inform people about the risk of defences breaching and the actions they can take to protect themselves and their property.

The risk of flooding cannot be completely removed and other measures need to be taken to reduce the flood risk. A Flood Risk Study should be developed for Brigg to gain further understanding of the risk with a view to looking at further options to reduce risk. In the long term, flood risk management planning needs to be linked closely with regeneration and redevelopment, so that policies can be put in place to create green corridors, and to incorporate flood resilience measures into the location, layout and design of development.

The key messages

- Flood awareness plans will be used to manage the consequences of flooding.
- Develop a study for Brigg to aid our understanding of flood risk in the town.
- Flood risk management planning needs to be linked closely with regeneration and redevelopment so that the location and layout of development can help to reduce flood risk.

Proposed actions to implement the preferred policy

- Develop a flood awareness plan to encourage people to sign up to, and respond to flood warnings. The flood awareness plan will inform people about the risk of defences breaching and the actions they can take to protect themselves and their property.
- Develop a Flood Risk Study for Brigg for further investigation into understanding the risk with a view to looking at further options to reduce risk.
- In the short term, continue with the current flood risk management activities.

- Flood forecasting and warning study to improve the current flood warning service.
- Encourage planners to develop policies for new development and regeneration (including commercial sites) to incorporate resilience measures so that the location, layout and design of development can help to reduce flood risk. Planners should prevent inappropriate development in the floodplain using measures set out in Planning Policy Statement 25 (PPS25), and ensure that any new development does not increase the risk to existing development. Any new development or regeneration should provide opportunities to improve the river environment and make space for water.
- Work with partners to develop an emergency response plan for critical infrastructure and transport links at risk of flooding.
- Work with the IDBs to gather information on IDB maintenance costs and activities and to re-assess the policy options after the inclusion of these costs and activities.



↑ Brigg

Ancholme Villages, Middle and Market Rasen and Barton and Barrow-upon-Humber

Our key partners are:

North Lincolnshire Council

West Lindsey District Council

Ancholme Internal Drainage Board

North East Lindsey Drainage Board

The issues in this sub-area

This sub-area contains settlements located in and around river floodplains. There are 200 properties at risk from the 1% annual probability river flood. This does not include flooding from IDB drains.

The Ancholme Villages include a number of settlements at risk of flooding from rivers and drains, some of which are embanked in their lower reaches before entering the River Ancholme. Rapid run-off during severe storms can cause flooding issues due to the size of the watercourses in some villages. In Middle and Market Rasen, the probability of flooding has been reduced by the construction of two upstream flood storage reservoirs. Some agricultural land, railway line and parts of the A631 are also at risk from the 1% annual probability river flood. Tables 8, 9 and 10 detail flood risk to people and property in this sub-area, this does not include flooding from IDB drains.

Table 8 Risk to people and property within the Ancholme Villages during a 1% annual probability river flood, taking into account current flood defences

	Current	Future (2100)
Number of people at risk	343	350
Number of properties at risk	146	151

Table 9 Risk to people and property within Middle and Market Rasen during a 1% annual probability river flood, which includes protection from the River Rase flood storage reservoirs

	Current	Future (2100)
Number of people at risk	118	150
Number of properties at risk	50	64

Table 10 Risk to people and property within Barton and Barrow upon Humber during a 1% annual probability river flood, taking into account current flood defences

	Current	Future (2100)
Number of people at risk	10	10
Number of properties at risk	4	5

There is a risk to people and properties from surface water flooding with in Middle and Market Rasen. Barton and Barrow Upon Humber is at risk from a combination of localised surface water and groundwater as well as flooding from rivers and drains.

The benefits of the current maintenance for this sub-area and the flood storage reservoirs in the Middle and Market Rasen will reduce in the future as storms are expected to become more frequent and intense.

The vision and preferred policy

Policy option 3: Areas of low to moderate flood risk where we are generally managing existing flood risk effectively.

These settlements have been built in the floodplain and as a result have a history of flooding. In the past flood defences have been constructed in Middle and Market Rasen and Barton and Barrow-upon-Humber and maintenance work carried out on the rivers to reduce flood risk. Although flood risk is not expected to increase significantly in the future, as there is a concentration of people and property within the floodplain, it is still feasible and effective to continue with the current level of flood risk management. For the majority of this sub-area this will be achieved by continuing existing flood risk management activities. However, for some places there may be alternative, more appropriate ways to manage flood risk at the current level.

Alternative measures may include reducing flood risk maintenance in parts of the sub-area where there is a low flood risk.

The key messages

- The current level of flood risk management should be continued.
- In some areas there may be alternative, more appropriate ways to manage flood risk at the current level.
- Any new development or re-development should be resilient to all sources of flooding.

Proposed actions to implement the preferred policy

General actions across the area:

- Continue with the flood warning service including the maintenance of flood warning infrastructure (such as river flow gauging stations) and public awareness plans.

- Work with planners to influence the location, layout and design of new and redeveloped property. Ensure that only appropriate development is allowed on the floodplain through the application of Planning Policy Statement 25 (PPS25).
- Work with the IDBs to gather information on IDB maintenance costs and activities and to re-assess the policy options after the inclusion of these costs and activities.

Actions specific to Ancholme Villages:

- In the short term, work with partners to continue with the current flood risk management activities.
- In the longer term, develop a flood risk study to confirm the level of risk in these villages and investigate alternative flood risk management actions.

Actions specific to Middle and Market Rasen:

- Continue current maintenance activities through these settlements.
- Work with partners to develop emergency response plans for critical infrastructure and transport links at risk from flooding.
- Work with our partners to develop a Surface Water Management Plan for Immingham.
- Work with partners to develop an emergency response plan to manage flood risk from the defences failing or being overwhelmed.

Actions specific to Barton and Barrow upon Humber:

- Continue current maintenance activities through these settlements.
- Work with partners to develop emergency response plans for critical infrastructure and transport links at risk from flooding.
- Carry out an investigation into the extent and impact of groundwater flooding and identify possible mitigation measures to reduce the current risk and raise awareness.

Immingham, Grimsby and Buck Beck

Our key partners are:

North Lincolnshire Council

North East Lincolnshire Council

North East Linsey Drainage Board

The issues in this sub-area

The probability of river flooding has been reduced in many places through the construction of embankments, flood storage areas and the pumping of drainage channels. There are no people or properties in Immingham and Buck Beck at risk in the current 1% annual probability river flood. There are currently ten properties at risk in Grimsby from the 1% annual probability river flood. This does not include flooding from IDB drains. There is no grade two agricultural land at risk but there is 3% of the grade three agricultural land in Grimsby at risk. Some railway and parts of the A1136 and A16 are at risk in the 1% annual probability river flood. There is also significant risk in Grimsby from the 0.1% annual probability river flood, with over 2,000 properties at risk.

However in the future the number of properties at risk from the 1% annual probability river flood increases to 1,861. The majority of these are located in Grimsby and Buck Beck. Tables 11, 12, and 13 detail flood risk to people and property in this sub-area.

Table 11 Risk to people and property within the Immingham sub-area during a 1% annual probability river flood, taking into account current flood defences. This does not include flooding from IDB drains

	Current	Future (2100)
Number of people at risk	0	0
Number of properties at risk	0	35

Table 12 Risk to people and property within the Grimsby sub-area during a 1% annual probability river flood, taking into account current flood defences. This does not include flooding from IDB drains

	Current	Future (2100)
Number of people at risk	25	3,063
Number of properties at risk	10	1,375

Table 13 Risk to people and property within the Buck Beck sub-area during a 1% annual probability river flood, taking into account current flood defences. This does not include flooding from IDB drains

	Current	Future (2100)
Number of people at risk	0	1,128
Number of properties at risk	0	451

Currently flood risk is managed in these areas by maintenance of the watercourses, raised embankments and pumping stations. The benefits of these approaches will reduce in the future as storms are expected to become more frequent and intense. Increased

tide-locking in the future will prevent drainage and require additional pumping. There is also the risk from groundwater and surface water flooding.

The vision and preferred policy

Policy option 4: Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change.

Historically, flood defences have been constructed to reduce the probability of river and tidal flooding. In the future the standard of protection offered by existing defences may decline. For these coastal settlements, the preferred approach to manage flood risk is to do a flood risk study. This study should investigate how we can take further action to manage flood risk into the future, by combination of increasing the pumping capacity and improving the existing defences. Within some of these densely populated coastal settlements investigation into the impacts of surface water flooding, urban drainage issues and groundwater flooding may identify the need for further management.

For this approach to be sustainable it must be recognised that flood defences cannot completely remove the flood risk. There will be risk to people and property behind the defences, as they could fail or be overwhelmed. With people at risk from several sources of flooding, organisations will need to work together to develop flood awareness and emergency response plans.

The key messages

- Develop flood risk studies to consider the combination of increasing the pumping capacity and improving the existing defences.
- Manage the consequences of flooding through flood awareness and emergency response plans.
- Within many of these settlements organisations need to take an integrated approach to managing river, tidal and surface water flooding.
- Work with planners to influence the location, layout and design of new and redeveloped property.
- Undertake groundwater flood risk studies to investigate the extent and impact of groundwater flooding.

Proposed actions to implement the preferred policy

General actions across the area:

- In the short term, continue with the current flood risk management activities.
- Undertake groundwater flood risk studies to investigate the extent and impact of groundwater flooding.
- Reduce the consequences of flooding by improving public awareness of flooding and encouraging people to sign up to, and respond to, flood warnings. Flood awareness plans will inform people about the risk of defences breaching and the actions they can take to protect themselves and their property.
- Develop emergency response plans to manage flood risk from the defences failing or being overwhelmed, and work with partners to manage flood risk to critical infrastructure.
- Work with planners to influence the location, layout and design of new and redeveloped property. Ensure that only appropriate development is allowed on the floodplain through the application of Planning Policy Statement 25 (PPS25).
- Carry out an investigation into the extent and impact of groundwater flooding and identify possible mitigation measures to reduce the risk.
- Work with the IDBs to gather information on IDB maintenance costs and activities and to re-assess the policy options after the inclusion of these costs and activities.

Actions specific to Immingham, Grimsby and Buck Beck:

- Work with our partners to develop flood risk studies for Immingham, Grimsby and Cleethorpes to investigate how we can take further action to manage flood risk in the future.

Ancholme Valley

Our key partners are:

North Lincolnshire Council

West Lindsey District Council

Ancholme Internal Drainage Board

The issues in this sub-area

Within this rural area there is a low risk to people and property located in villages, or in isolated areas scattered throughout the sub-area. Currently there are 14 properties at risk from the 1% annual probability river flood. This does not include flooding from IDB drains. There is 50% of the grade two agricultural land and 60% of the grade three agricultural land at risk. There are some sections of railway and an electricity sub-station are also at risk from flooding within this sub-area. Table 14 details flood risk to people and property in this sub-area.

Table 14 Risk to people and property within the Ancholme Valley sub-area during a 1% annual probability river flood, taking into account current flood defences. This does not include flooding from IDB drains

	Current	Future (2100)
Number of people at risk	33	38
Number of properties at risk	14	16

The vision and preferred policy

Policy option 6: Areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits.

In these largely rural areas the aim is to manage flood risk by maximising the potential of the floodplain to retain water to benefit locations elsewhere in the catchment. Storing water on these floodplains can reduce flood risk to settlements downstream. This approach may involve:

- restoring river channels, water meadows and the natural floodplain;
- reducing runoff from agricultural land;
- structural measures to control water levels and retain more water on the floodplains.

Locally, the floodplain storage areas may provide long-term benefits for the river environment and wetland habitats.

Within this sub-area reducing bank and channel maintenance will increase the ability of the floodplain to store water by improving the flow between the river and its floodplain. However, where flood risk may be more concentrated, such as in towns and villages, existing actions to manage flooding may be continued.

To be able to use the floodplain for flood risk management, planners must prevent development that affects the ability of the floodplain to retain water.

The key messages

- Development that affects the ability of the floodplain to retain water should be prevented.
- Maintenance work on rivers should aim to increase the capacity of the floodplain to retain water.

Proposed actions to implement the preferred policy

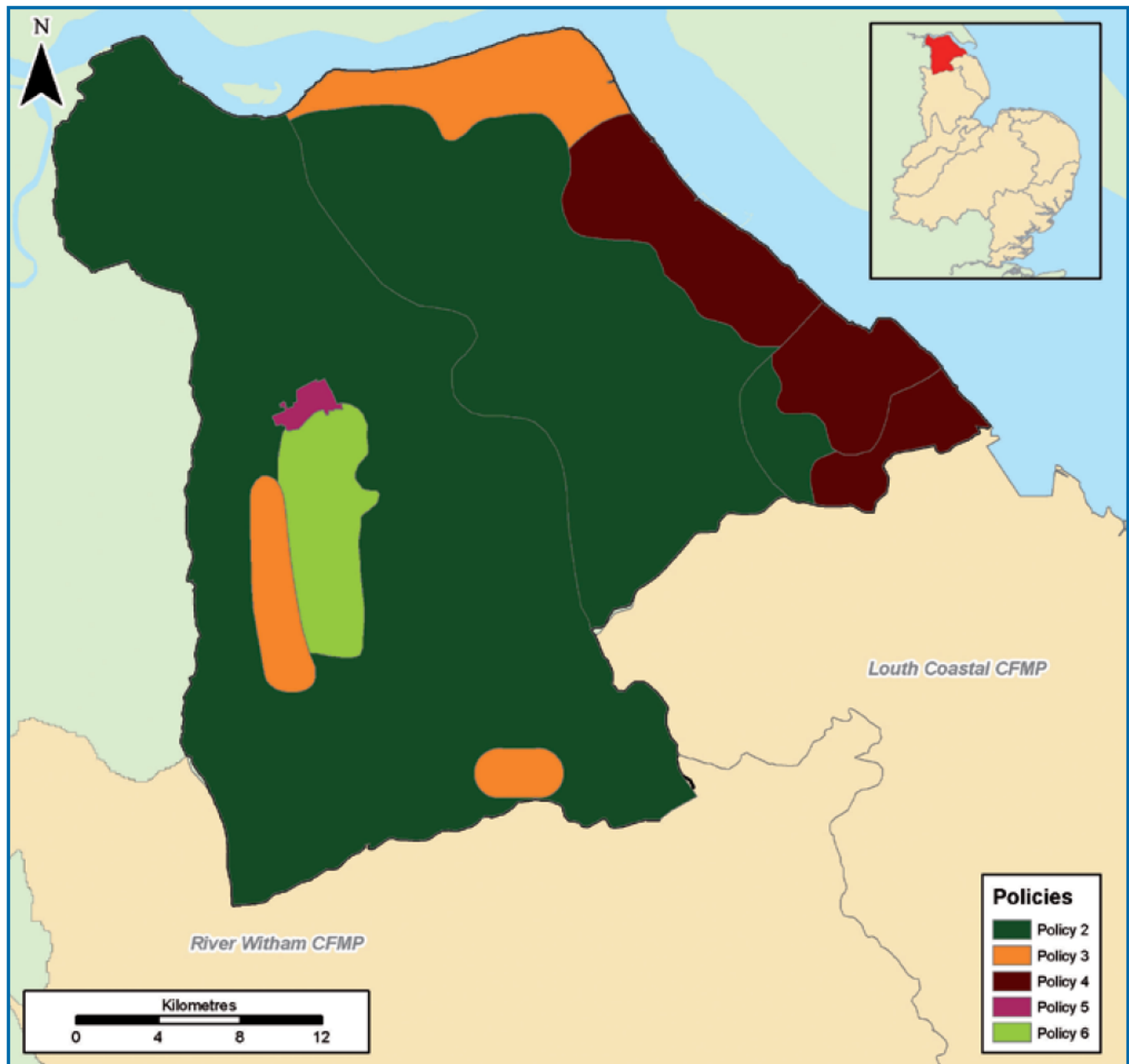
- Identify opportunities where bank and channel maintenance can be reduced to improve the flow between the river and its floodplain to increase water storage on the natural floodplain.
- Continue with the flood warning service including the maintenance of flood warning infrastructure (such as river flow gauging stations) and flood awareness plans.
- Encourage planners to prevent new development within the floodplain. The floodplain should be maintained as an asset to make space for water.
- Work with partners to develop emergency response plans for critical infrastructure and transport links at risk from flooding.
- Work with the IDBs to gather information on IDB maintenance costs and activities and to re-assess the policy options after the inclusion of these costs and activities.



↑ North Kelsey Beck

Map of CFMP policies

Map 4 The flood risk management policies for the Grimsby and Ancholme CFMP area



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