

# Lower Tidal River Arun

## Draft flood risk management strategy

Consultation on draft recommendations for managing the risk of flooding  
from the tidal River Arun

December 2012



Aerial view of the River Arun and Arundel



## Introduction

The Environment Agency is preparing a long-term plan to manage the risk of flooding from the tidal River Arun between Pallingham and Littlehampton. The plan is called the Lower Tidal River Arun Flood Risk Management Strategy and this document summarises the draft recommendations.

We want to hear your views and answer your questions on our draft recommendations. We are holding a public consultation between 10th December 2012 and 15th March 2013.

These are draft recommendations and no final decisions have been made yet. We want you to tell us what you think about our draft recommendations and any problems or opportunities that we may not have considered.

Where the draft recommendations propose works, these will need to be funded through a combination of local contributions and central Government funding. We will work with the local community and other organisations with an interest in the area to identify potential sources of funding and agree how to take the draft recommendations forward.

### Do you know what we are proposing in your local area?

Come to one of our public exhibitions to talk to the project team and give us your views.

We will be holding public exhibitions where you can talk to the team and give us your feedback. There are lots of ways you can contact us and these are listed at the end of this document.

We will hold public exhibitions:

12th January 2013

5th February 2013

Pulborough Village Hall

Arundel Town Hall

11am to 6pm

1pm to 8pm



The River Arun, upstream from South Stoke Bridge

## The lower tidal River Arun

The map on page 5 shows the area covered by this plan.

The River Arun is tidal from Pallingham to the sea at Littlehampton. This strategy considers the tidal River Arun from Pallingham downstream to Ford Railway Bridge (on west bank) and A259 road bridge (on the east bank). It also includes the major tributary of the Black Ditch. We have chosen these boundaries as they join up to adjacent coastal strategy boundaries.

The Arun valley is predominantly a rural area with land used for agriculture and recreation. The majority of the population is located within the town of Arundel, and many villages including Pulborough and Angmering. Important infrastructure within the floodplain could be affected by flooding including: the A27, A29, the railway embankments, other roads, and footpaths including the South Downs Way and bridleways. There are several environmentally important areas that are nationally and internationally protected for the habitats and the species they support. Much of the area is also part of the South Downs National Park.

### Did you know...?

There are 76 properties at risk of flooding in this area right now with defences in place.

We estimate there will be 867 properties at risk of flooding and erosion in this area in 100 years if we do nothing to manage those defences\* and as sea and river levels rise with climate change



The River Arun through Arundel

Throughout this document, we describe flood events by their frequency of occurrence. For example, a 1 in 100 year chance event has a 1 in 100 chance (or 1 per cent) of occurring in any one year.

*\* Total number of properties in 1 in 100 fluvial and 1 in 200 tidal flood events.*

## Change is all around us

We recognise that it may feel like there will be a lot of potential change in the Arun valley because we have several different projects happening at the same time. This document is about the flood risk management strategy. It sets out our recommendations for managing flood risk from the tidal River Arun over the next 100 years and explains why we have suggested certain actions at specific locations.

### Did you know...?

There are other Environment Agency projects happening within the Arun valley:

The way the Arun Internal Drainage Board is run will be changing. The Arun Internal Drainage Board maintains many of the smaller ditches in the area on behalf of the local authority and landowners.

We are also looking at local initiatives to make the river more natural, which is a requirement of the Water Framework Directive.

We are committed to working with you on all of these projects and supporting you in making choices for your local area now and in the future. You can find more information on these projects at the end of this document.

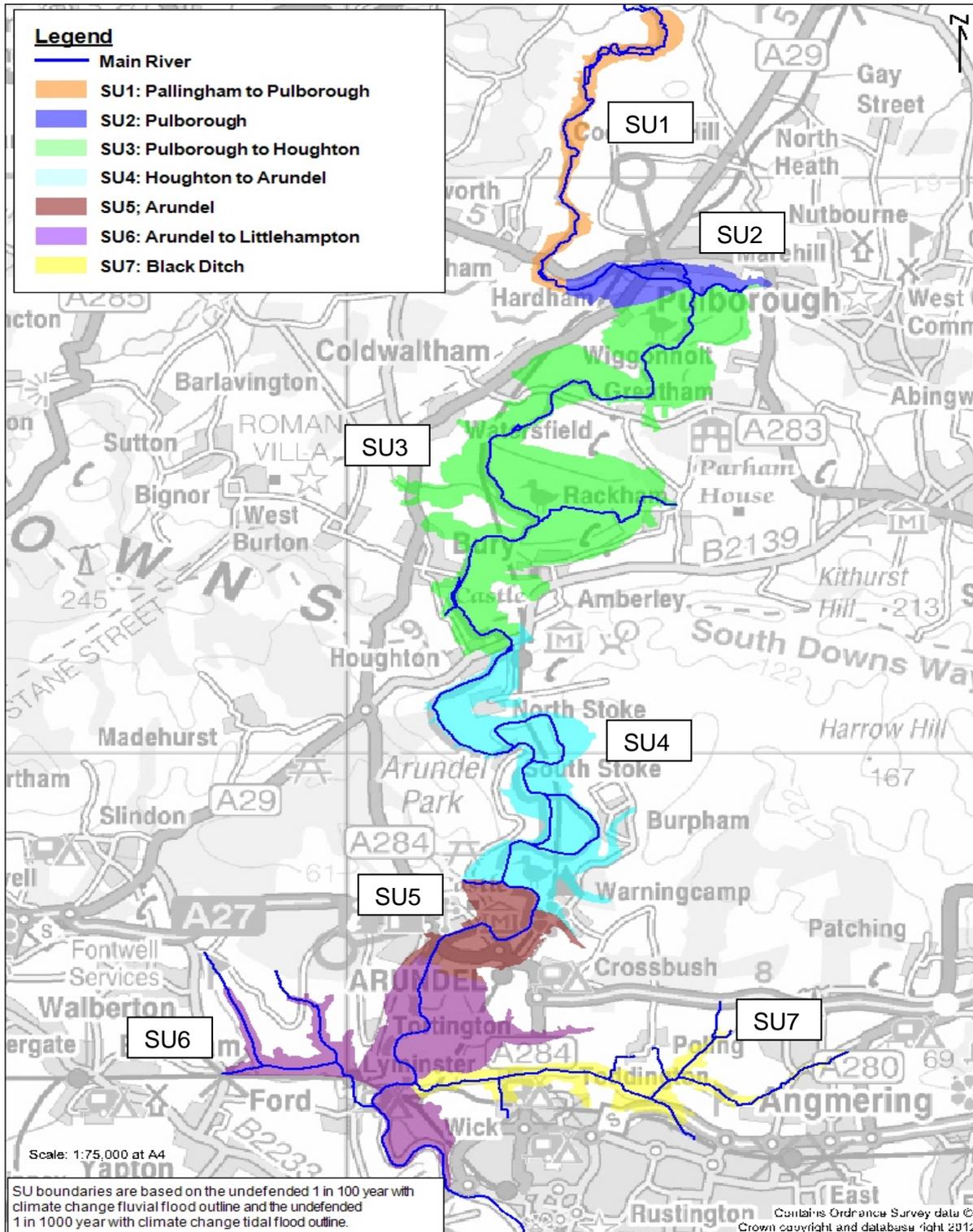
At our public exhibitions, you will be able to talk to Environment Agency officers about any of our projects. We have worked with other Environment Agency teams to understand how our projects overlap and where we can work together but we need your input too.

On pages 31 and 32, you can find details of the other Environment Agency projects that are happening now in your local area.

If you have any concerns or questions please get in touch with us, our contact details are on the back page.

## Map of the strategy area

The strategy area has been divided into seven 'strategy units' (SU). These are shown on the map below. The areas are based on land use, topography, natural and manmade features and similarities. These units provide us with a structure for managing and communicating information about the strategy area and for identifying appropriate management practices.



customer service line  
03708 506 506

incident hotline  
0800 80 70 60

floodline  
0845 988 1188

## What is a flood risk management strategy?

A flood risk management strategy is a long term plan that sets out the most cost effective and environmentally preferred way to manage the risk of flooding from 'main river' over the next 100 years.

We do this by looking at what is at risk from flooding today and how we manage this risk. For example, what defences exist and what condition they are in. We then look at how this risk might change in the future with climate change. We consider the impacts of these risks on people and the environment. We then look at the different ways to manage that risk of flooding and assess how cost effective each of these options might be.

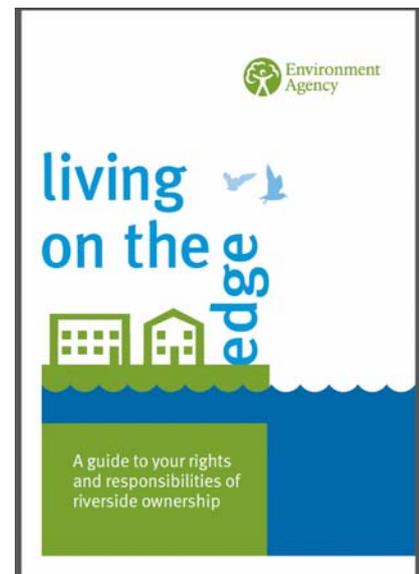
The Lower Tidal River Arun Strategy has five main objectives.

- Develop a strategic approach to managing the risk of flooding to people, property and other assets over the next 100 years.
- Involve and consult with communities, organisations and interested parties to ensure that we consider all views as the strategy is developed.
- Raise awareness of the flood risk management works recommended within the strategy area and the external financial contributions required to enable these works to proceed.
- Secure continued compliance with international environmental legislation in relation to the 'Arun Valley' Special Protection Area (SPA), RAMSAR, and candidate Special Area of Conservation (cSAC) sites within the strategy area.
- Comply with our statutory obligations under the Water Framework Directive and national and local conservation designations relevant to the strategy.

### Did you know...?

The Environment Agency has no legal duty to build and maintain flood defences. We have permissive powers that allow us to protect both people and property where economically, technically and environmentally viable and where affordable within national budgets.

Riparian landowners are people who own land adjoining a river. They have certain legal rights and responsibilities regarding maintenance of the river bed and bank. They must ensure the free flow of the river water. Find out more in our "Living on the Edge" booklet, which is available from our webpage.



## Your involvement

During the summer of 2010, we identified a wide range of different options to manage flood risk. We asked for your ideas and if there was anything we had missed. You made some suggestions and told us what was important to you. We carried out high level assessments of all of these initial ideas to see if they were viable. Some ideas had to be ruled out straight away because they were too expensive compared to the benefits, or they had a significant impact on the environment.

We then identified a number of options to be assessed in more detail. We held drop in sessions in January and February 2011 to discuss these with you.

At the drop in sessions, we asked you what you thought of the options. You told us that:

- The positive benefits of using the floodplain should be clearer.
- You needed more information on the legal implications of draft recommendations to 'Withdraw Maintenance'.
- You wanted more information on what work we do at the moment to allow easy comparison with our proposals.



A drop in session in 2011 for the Lower Tidal River Arun Flood Risk Management Strategy

As we started to complete our technical work, it became clear that for some areas our investigations were leading us to a draft recommendation to do less and eventually stop maintenance works. During the autumn of 2012, we invited land and property owners in these areas to speak to us about this. We asked what information they wanted during the public consultation period and what support they might like to help manage their environment in the future.

During this autumn when we met with land and property owners, you told us:

- You wanted more information on insurance and flood risk
- You wanted more information and support on how communities can work together to protect themselves
- You wanted more information on how flood risk will change in the future when the draft recommendations have been finalised

We have produced a detailed set of Frequently Asked Questions on these topics.



Consulting with the local community

## Strategic management options

We have now completed the detailed technical assessment of the options, and these are summarised in the following pages.

For each option, we considered:

- How it would manage flood risk to people and properties;
- Whether it is going to work for the short, medium and long term given the latest climate change predictions;
- The benefit of each option, including how much land, properties, roads or infrastructure it might protect from flooding;
- How much it would cost to be built or maintained in the long term (if it is a structure);
- How it could impact on people who live in, work in and visit the area;
- Environmental effects, both positive and negative;
- Feedback from public and professional partners.

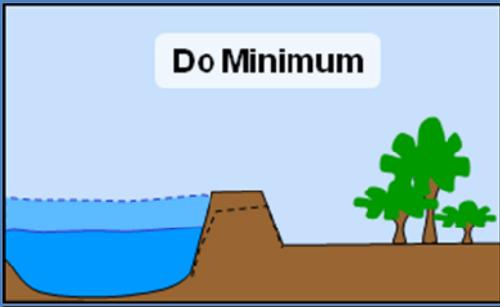
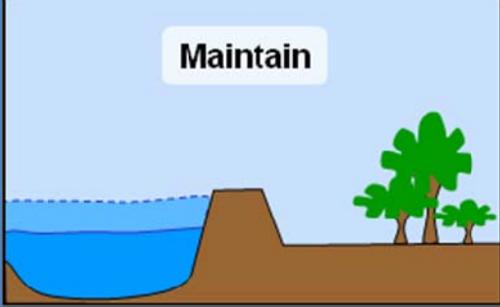
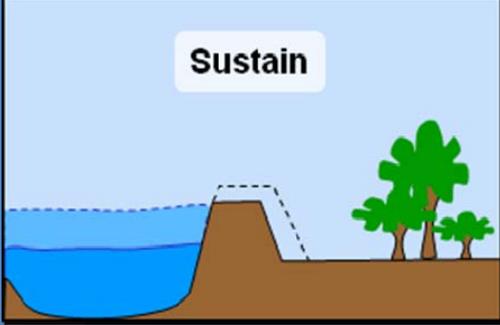
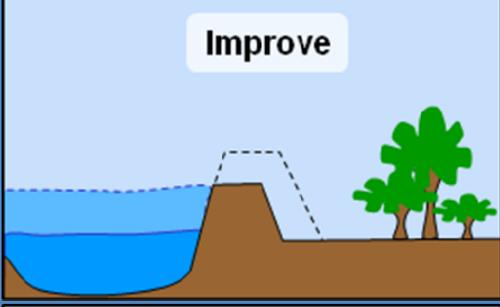
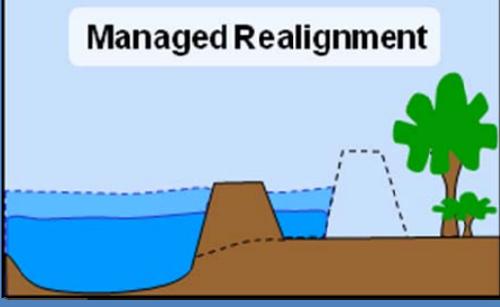
We compare all the benefits with all the costs of each option, which gives us a 'benefit cost ratio'. The option with the highest benefit cost ratio which has no negative environmental effects, is generally selected as the preferred option, called our 'draft recommendation'.



The River Arun through Arundel

On the next page we describe the generic options in more detail.

Where the 'Do Minimum' works will cost more than the benefits we cannot justify spending public money and the Environment Agency will stop maintenance work to the defence. This is called 'Withdrawal of Maintenance'. This means that, after an agreed period, we will stop maintenance works. We recognise that this change can cause concern and we will work with and support local people and communities where this option is proposed.

Option	Description
 <p data-bbox="268 286 475 331"><b>Do Minimum</b></p>	<p data-bbox="630 219 1519 510">The minimum amount of action or intervention necessary to maintain the defence. No work is carried out to replace defences should they fail. This means that over time, the defences will deteriorate and eventually fall down and the natural floodplain will be reinstated. How long a defence will last with the minimal maintenance work before it fails depends on how good the condition of the defence is today. The better the defence condition, the longer it is likely to last.</p>
 <p data-bbox="276 600 419 645"><b>Maintain</b></p>	<p data-bbox="630 564 1519 846">Work is done to the existing defences to keep them in good condition and prevent them from falling down. As the sea levels rise and rainfall becomes more extreme, flood risk increases over time which means the amount of protection from flooding provided to the land and property behind the defence today will gradually decrease. When the defences reach the end of their life, it is recommended they be replaced to the same height as the existing defence.</p>
 <p data-bbox="284 929 411 974"><b>Sustain</b></p>	<p data-bbox="630 891 1519 1102">In general, the same works are done as the 'Maintain' option, but in the future the defences would be built higher as the sea levels rise and rainfall becomes more extreme. This means over time the amount of protection from flooding provided to the land and property behind the defence today stays the same.</p>
 <p data-bbox="292 1272 427 1317"><b>Improve</b></p>	<p data-bbox="630 1258 1519 1326">Defences are improved to increase the protection provided to land and properties behind them.</p>
 <p data-bbox="188 1572 531 1617"><b>Managed Realignment</b></p>	<p data-bbox="630 1579 1519 1758">A new line of defence will be created, set back from the existing defences and then the current defence would be deliberately removed. This option is often used to provide a better and stronger line of defence, or to allow land to flood to create a new environmental habitat.</p>

**Key:** Solid Line — Current Scenario; Dashed Line --- Future Scenario considering climate change  
*Note: The diagrams are not to scale and are for generic illustrative purposes only.*

## How will the works be paid for?

Our strategy does not guarantee funding for the draft recommendations but it gives us the information with which we can bid for money. Securing funding for building and maintaining defences is an important aspect of delivering our recommendations.

Instead of meeting the full costs of a limited number of projects, central Government funding is now available to contribute to any worthwhile scheme. The amount of central Government funding available for each scheme will relate directly to the benefits delivered. The remainder of the required funding will need to be found locally, from local authorities, the local community or other sources.

If external contributions and funding cannot be sourced for major works we will continue to maintain the defences subject to maintenance funding being available. However the condition of the existing defences is likely to worsen, and maintaining what is left of these defences will eventually no longer be possible.

This new approach is called 'Partnership Funding'. You can find further information on our website:

<http://www.environment-agency.gov.uk/research/planning/134732.aspx>

### Did you know...?

Government spending on flood and erosion risk management has more than doubled over the last ten years rising from £312 million in 1999 to £800 million in 2011.



The River Arun, upstream of Houghton Bridge

## Summary of draft recommendations

The recommended approach will vary for each strategy unit based upon the benefits and costs.

We propose to 'Sustain' the current level of flood risk in the urban area of Arundel and 'Maintain' the current level of risk along the Black Ditch. These are the places where there are most homes and businesses at risk from flooding.

In some rural areas, we recommend prolonging, for as long as we can, the life of the defences that are already in place.

In other rural areas, we recommend that we stop all maintenance works. Where we do this, we will work with and support the people who are affected.

We propose to 'Sustain' the defences which line the 'Arun Valley' sites, for the next ten years while we investigate the best way to manage flood risk to these internationally important environmental sites.

The table below summarises our draft recommendations and we explain these in more detail in the following pages.

Strategy Unit		Our draft recommended option	Benefit Cost Ratio	Approximate number of properties at risk from flooding if the existing defences were to fail	
				Now 2012	Future 2112
1	Pallingham Weir to Pulborough	Withdraw Maintenance	0	2	4
2	Pulborough	Do Minimum and Withdraw Maintenance	2.1	9	10
3	Pulborough to Houghton Bridge (includes 'Arun Valley')	Sustain for 10 years	0.5	16	19
4	Houghton Bridge to Arundel	Withdraw Maintenance	0	9	55
5	Arundel	Sustain to 1 in 75 with new inland defences	2.8	168	457
6	Arundel to Littlehampton	Maintain for 50 years	2.1	24	38
7	Black Ditch	Maintain with a new inland defence	37.3	208	284

# Pallingham to Pulborough - Strategy Unit 1

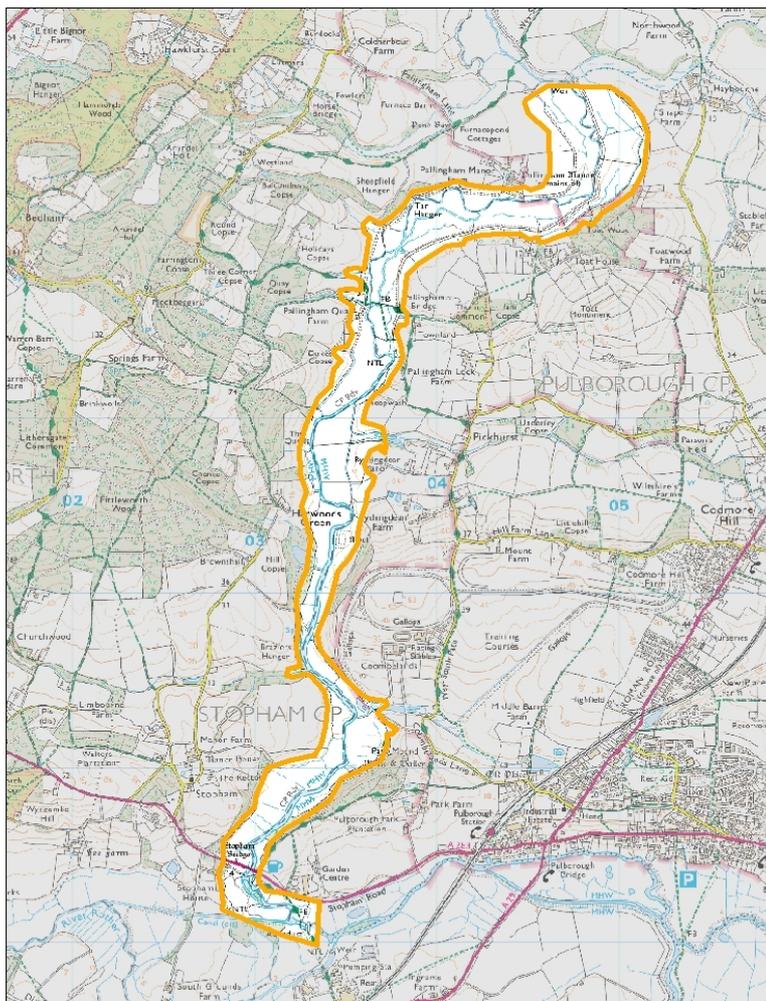
## The River Arun from Pallingham Weir to the confluence with the River Rother upstream of Pulborough

### Our recommended option

#### *Withdraw 'Maintenance'*

The Environment Agency would stop the current limited maintenance activity. The natural floodplain would be flooded slightly more often. However, riparian landowners can continue this maintenance to protect themselves. We will work with landowners to find the best way of doing this.

We will work with landowners to agree a timescale to prepare for this change before we cease maintenance activities, but expect it to be within two years. During the public consultation, we would welcome the opportunity to talk to landowners about this change.



The floodplain of the River Arun north of Pulborough is very rural with no man made flood defences. The floodplain is narrow and constrained by the local topography. There are several cultural heritage sites including Stopham Bridge. The River Arun channel in this strategy unit is environmentally designated as a Site of Special Scientific Interest (SSSI).

Map of Strategy Unit 1

customer service line  
03708 506 506

incident hotline  
0800 80 70 60

floodline  
0845 988 1188

[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

**What do we currently do?**

We currently do little maintenance work in this SU. We manage flood risk by removing any fallen trees and blockages in the channel that could increase flood risk. We also clear any vegetation that builds up at Stopham Bridge which may restrict river flow.

**What would change or happen?**

We will stop our current maintenance activities. We will talk to you about the timescale for this change but expect this to happen within the next two years.

The landowner living next to the river (the riparian landowner) is responsible for maintaining the riverbanks and not causing obstruction to flow. These landowners may wish to continue the current flood risk management activities to manage flood risk. However, if they do not manage flood risk, over time, the riverbanks would become overgrown and bridges could occasionally become blocked with floating debris. This, together with anticipated affects of climate change, may mean that four properties and land could be affected by flooding in the future.

The frequency of flooding may also increase. We do not expect the extent of flooding to increase significantly with this draft recommendation.

Costs of the draft recommended option	£1,000
Benefit cost ratio	0
Other options assessed	Do Minimum Maintain

**What is at risk of flooding during a 1 in 100 year chance event?**

Now (2012)	Future (2112)
1 residential property	2 residential properties
1 commercial property	2 commercial properties
250ha of agricultural farmland	250ha of agricultural farmland

**Key facts**

We currently carry out limited maintenance in this area, so there will be little change in the way we maintain the river from what we do today.

Our activities would not change until we have established a timescale with you.

Over time with climate change, flood risk would increase to four properties. We would work with you on managing this change and advise you on how you can protect yourselves.

Our proposals would allow the river to reconnect with the floodplain, bringing a more natural environment.

## Pulborough - Strategy Unit 2

The River Arun from its confluence with the River Rother to its confluence with the River Storr and adjacent to the town of Pulborough

### Our recommended option

*Do 'Minimum'* at Pulborough for the pumping station and masonry wall.

*Withdraw 'Maintenance'* from the earth embankments.

We will work with landowners to agree a timescale to prepare for this change before we cease maintenance activities, but expect it to be within two years. During the public consultation, we would welcome the opportunity to talk to landowners about this change.

*'Sustain' in the short term (10 years)* at the southern embankments.

The floodplain on the south side of this strategy unit, towards Hardham, is linked to downstream areas in SU3. We recommend continuing our maintenance activities in this area for up to ten years and then it is likely we will withdraw maintenance. We will review this again after we have completed further studies in SU3 regarding the future of the defences which front this site (see page 18).

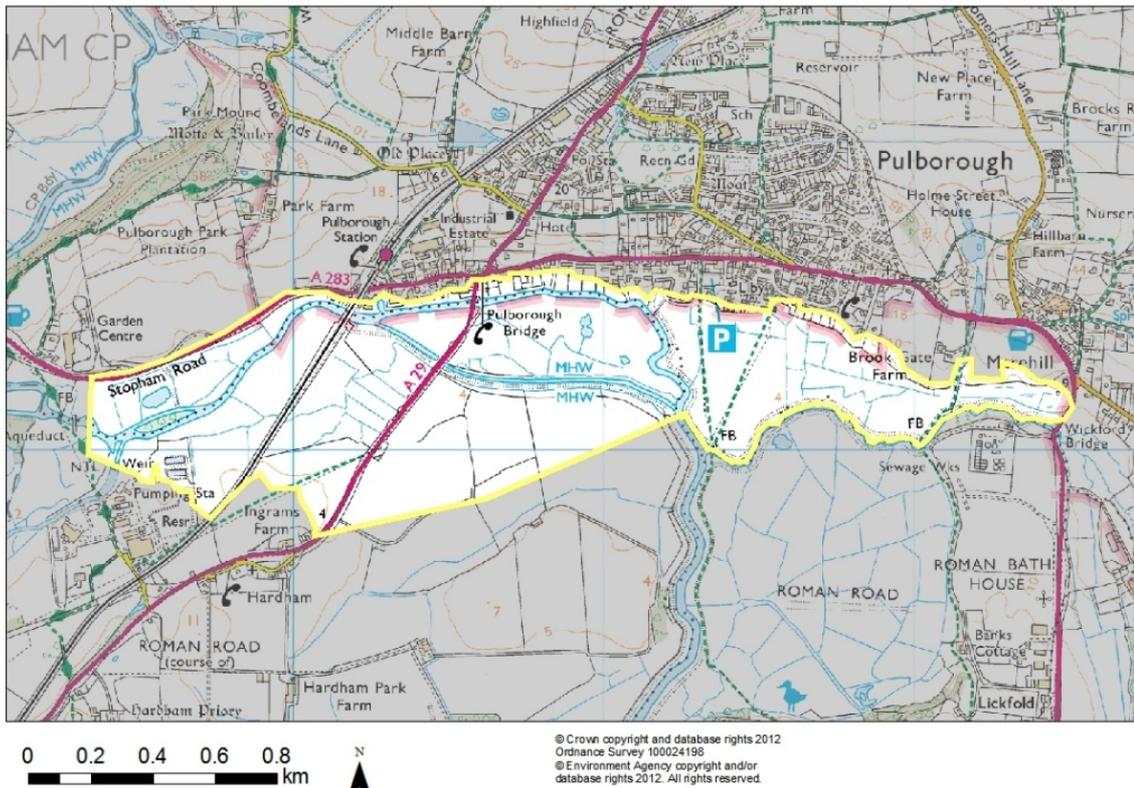
Please look at Figure 1 to understand where each option would apply.

The village of Pulborough is on a hill sloping down towards the river. This means that it is only the properties and land at the bottom of the hill which are directly affected by flooding from the river. The A29 road goes through Pulborough and is sometimes flooded as it crosses the floodplain during periods of high river flows or from water running off the land. Parts of Pulborough are designated as Conservation Areas and there are a number of Scheduled Monuments and listed buildings, including Swan Bridge.



The River Arun at Swan Bridge, Pulborough

## Map of Strategy Unit 2



### What do we currently do?

We manage flood risk by periodically cutting the vegetation on the riverbanks and within the channel. How often we currently do this varies according to how much the vegetation has grown.

In Pulborough a masonry wall, which was not built as a flood defence, provides some protection from flooding to properties during small flood events. Some water can seep through this wall and flood water can get trapped behind it during times of very heavy rainfall or river flow. The pumping station near Swan Bridge pumps some of this trapped water back into the River Arun to alleviate flooding. During big flood events the pumping station becomes overwhelmed. The Environment Agency currently manages and operates this pumping station.

### What would change or happen?

Subject to funding, we will continue to operate the pumping station and carry out minor repairs to the masonry wall. If the wall fails or the pumping station needs significant refurbishment we would not repair them. Since the pumping station has recently been refurbished, it may last for about 30 years.

Other than operating the pumping station and minor repairs to the masonry wall, the Environment Agency would stop current maintenance activities. We will talk to you about the timescale for this change but expect this to happen within the next two years. Unless riparian landowners wish to continue this maintenance, the condition of the riverbanks would deteriorate over time. The riverbanks are currently in quite good condition and are not expected to fail for around 20 years. Flood risk would increase and up to ten properties or businesses would be affected by flooding in the future. We would work with you on managing this change and advise you on how you can protect yourselves.

We will not withdraw maintenance from the southern embankments until further work has been completed on the future of the 'Arun Valley' site, located in the adjacent strategy unit 3.

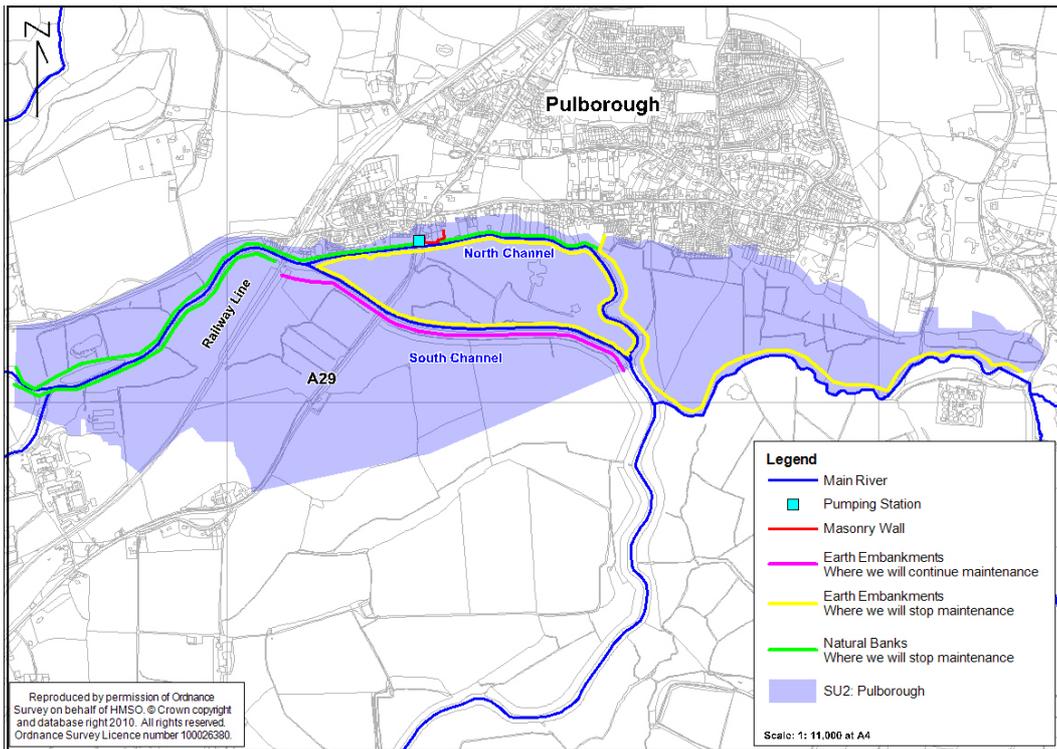


Figure 1: Draft recommended options in Strategy Unit 2

Costs of the draft recommended option	£126,000
Benefit cost ratio	2.1
Other options assessed	Maintain for the Pump and Wall Do Minimum everywhere Maintain everywhere

**What is at risk of flooding during a 1 in 100 year chance event if the defences stop working?**

Now (2012)	Future (2112)
5 residential properties	6 residential properties
4 commercial properties	4 commercial properties
A29	A29
100 ha of agricultural farmland	100 ha of agricultural farmland

**Key facts**

There is a pumping station next to Swan Bridge that we use to pump flood water back into the river. It was refurbished in 2010. We propose to carry on operating it, funding allowing, for as long as we can without carrying out any significant repairs or refurbishments.

On the south side of the river we will continue with the existing maintenance so there will be little change from what we do now (see map).

For all other areas in this SU we're not going to do any work here and we are going to let nature take its course.

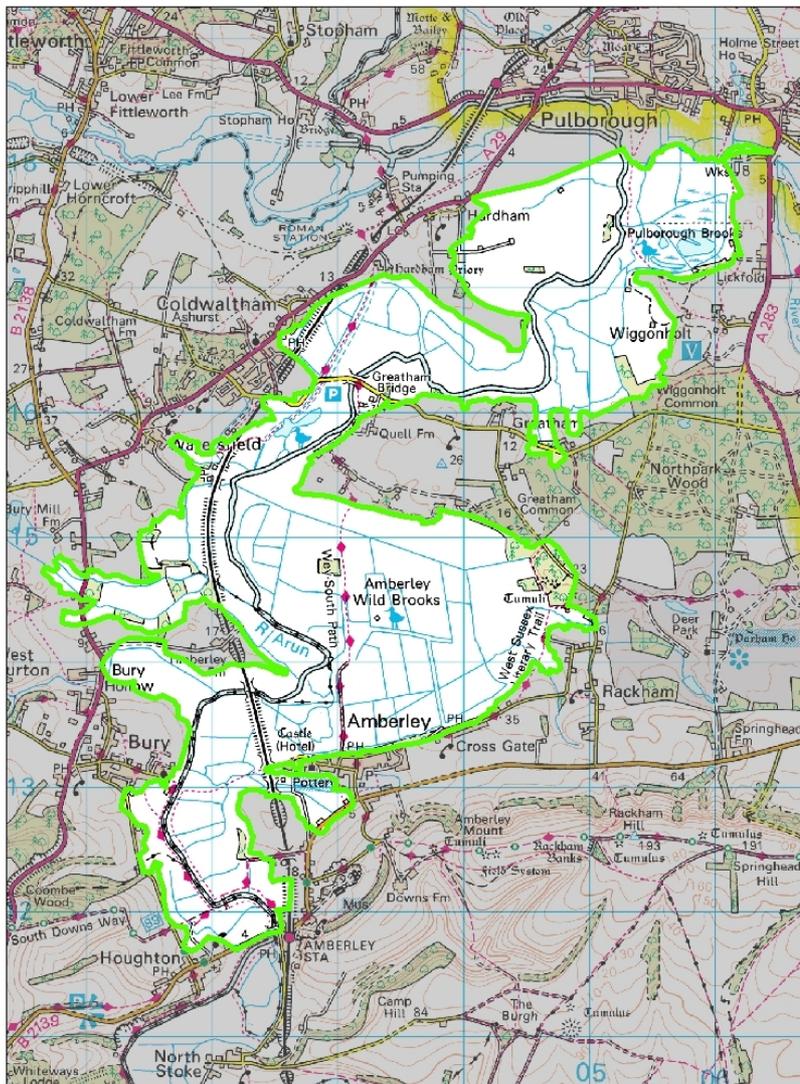
# Pulborough to Houghton - Strategy Unit 3

The River Arun from the confluence of the River Stor to upstream of the village of Houghton

## Our recommended option

### *Sustain in the short term (10 years)*

The 'Arun Valley' nature conservation site is highly valued and is protected by law. We have worked out that the risk of flooding to the site is going to change under every proposed option. We need to do more to understand which changes would be legally acceptable and how these should be implemented. We are recommending that we continue work to ensure that the site is maintained in its current form whilst these further studies are carried out.



This strategy unit is largely rural with earth embankments next to the river on both sides. The floodplain in this area is wide and in places extends to 1km from the main river. Villages of Coldwaltham, Watersfield, Bury and Amberley and hamlets of Wiggonholt, Hardham, Greatham and Timberley are all partially located within the floodplain. There are a number of listed structures, most notably Greatham Bridge and Houghton Bridge.

The 'Arun Valley' SPA/Ramsar/cSAC site is located in this strategy unit. It is located behind raised riverbanks which currently manage the risk of flooding. The 'Arun Valley' site is made up Amberley Wild Brooks, Pulborough Brooks and Waltham Brooks. These nationally and internationally important wetland sites are dissected by a network of ditches which support a rich community of invertebrates, birds and other species.

Map of Strategy Unit 3

### What do we currently do?

Raised riverbanks line the river from Pulborough to Houghton Bridge. We carry out routine maintenance of the riverbanks; this includes inspection, grass cutting and repairing the bank if it settles or slips. We also clear the outfalls of debris that allow local ditches to flow into the River Arun.

### What would change or happen?

We would continue the existing flood risk management activities outlined above until more work is completed. It is possible that the output of the study would result in a change in the management activities for this strategy unit.

Costs of the draft recommended option	£2,456,000
Benefit cost ratio	0.5
Other options assessed	<p>Allow the riverbanks that line the sites to deteriorate over time and provide compensatory habitat elsewhere.</p> <p>Managed adaptation of the sites and allow them to naturally adapt to the changing conditions.</p> <p>Sustain the designated sites in isolation by building new inland banks to reduce flood risk and stopping maintenance on defences in non-designated areas.</p>

### What is at risk of flooding during a 1 in 100 year chance event if the defences stop working?

Now (2012)	Future (2112)
8 residential properties	9 residential properties
8 commercial properties	10 commercial properties
'Arun Valley' SPA/Ramsar/cSAC	'Arun Valley' SPA/Ramsar/cSAC
Railway embankment	Railway embankment
1,000ha of agricultural farmland	1,050 ha of agricultural farmland

#### Key facts

Over time, the flooding regime will change because of climate change, even if we carry on the existing maintenance. We need to adapt to that so this means we will need to do something differently in the future.

Over the next ten years, we want to work with you and Natural England to find the best way to manage the 'Arun Valley' site into the future.

Until then there will be no change to the way we maintain the defences in this strategy unit.

# Houghton to Arundel - Strategy Unit 4

## The River Arun from Houghton village to Swanbourne Lake, Arundel

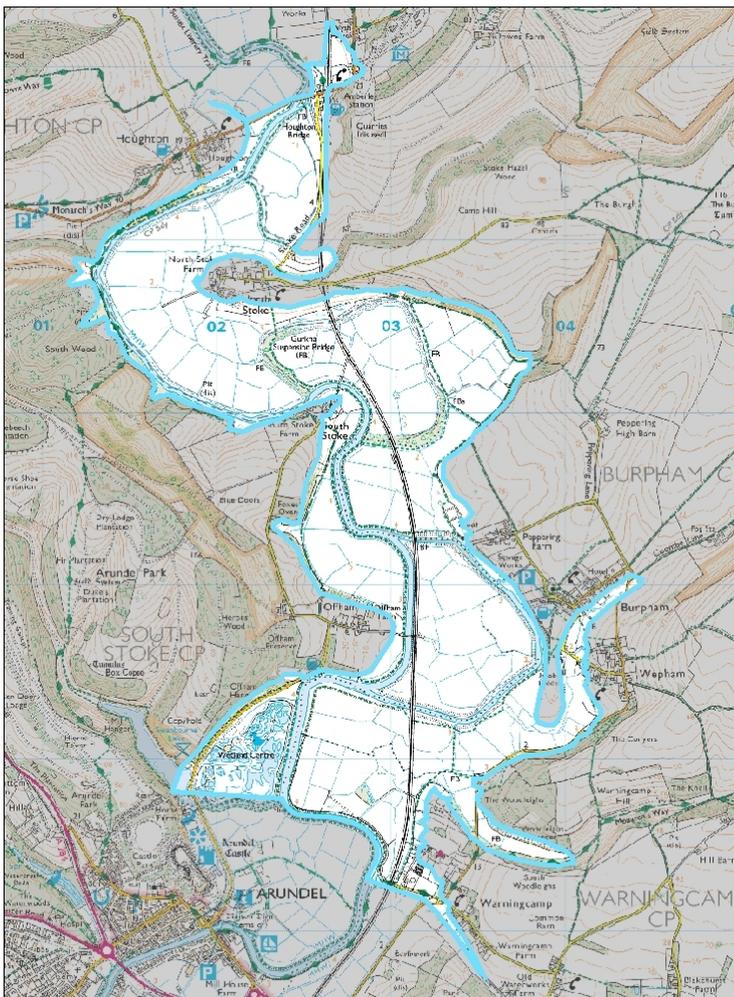
### Our recommended option

#### *Withdraw 'Maintenance'*

The Environment Agency would stop our current maintenance activities and, unless riparian landowners wish to continue this maintenance, the condition of the riverbanks would deteriorate over time and eventually the natural floodplain would be restored.

We will work with landowners to establish a timescale to prepare for this change before we cease maintenance activities, but expect it to be within two years. During the public consultation, we would welcome the opportunity to talk to landowners about this change.

We would continue to uphold our legal obligation at South Stoke Bridge.



This strategy unit is largely rural with earth embankments next to the river on both sides. The floodplain on the east side of the river is wide and extends to roads and properties in North and South Stoke, Burpham and Wepham. On the majority of the west side of the river, the steep hills of Arundel Park rise away from the river. The floodplain is designated as Flood and Coastal Grazing Marsh Biodiversity Action Plan Habitat and there are two Sites of Special Scientific Interest (SSSI) in the floodplain. The main railway line dissects the floodplain.

This section of the Arun valley is where the influence of the tide becomes evident and flooding can be driven by both the river and sea.

Map of Strategy Unit 4

**What do we currently do?**

Raised riverbanks line the river from Houghton Bridge to Arundel. We routinely maintain the riverbanks. This includes inspection, grass cutting and repairing the bank if it moves or slips. We also clear the outfalls of debris that allow local ditches to flow into the River Arun.

**What would change or happen?**

We will no longer do any flood risk management activities on the riverbanks, outfalls and sluices. We will talk to you about the timescale for this change but expect this to happen within the next two years.

Landowners living next to the river (the riparian landowners) are responsible for maintaining the riverbanks and not causing obstruction to flow. These landowners may wish to continue the current flood risk management activities. The riverbanks are currently in quite good condition and are not expected to fail for around 20 years. However, if no further action is taken to manage flood risk, over time, the riverbanks would become overgrown and bridges could occasionally become blocked with floating debris.

The frequency and extent of flooding may increase, which would cause disruption to access roads. The railway embankment may need additional protection as flood water laps against this more often. Due to sea level rise it is expected that salty water from the sea will reach further upstream than currently. This might affect the freshwater habitats and species in the SSSI. We consider these possible changes to be acceptable by relocating any freshwater habitats and species that may be affected.



The River Arun floodplain, looking from Bury Hill to Greatham Hill

Costs of the draft recommended option	£479,000
Benefit cost ratio	0
Other options assessed	Do Minimum Maintain Managed Realignment Meet Legal obligations

**What is at risk of flooding during a 1 in 100 year chance event (from the river) and a 1 in 200 year chance event (from the sea) if the defences stop working?**

	Now (2012)		Future (2112)	
	River	Sea	River	Sea
<b>Residential</b>	6	1	22	9
<b>Commercial</b>	3	3	33	28
<b>Agricultural land</b>	300ha	300ha	400ha	350ha
	Railway embankment		Railway embankment	
	Arun Banks SSSI		Arun Banks SSSI	
	Arundel Park SSSI		Arundel Park SSSI	

### Key facts

Our proposals will allow the river environment to become more natural with for potential for broader fauna and flora.

Our activities would not change until we have established a timescale with you.

Over time with climate change and with no works undertaken, flood risk will increase to up to 55 properties. We will work with you on managing this change and advise you on how you can protect yourselves.

# Arundel - Strategy Unit 5

## The River Arun through the town of Arundel

### Our recommended option

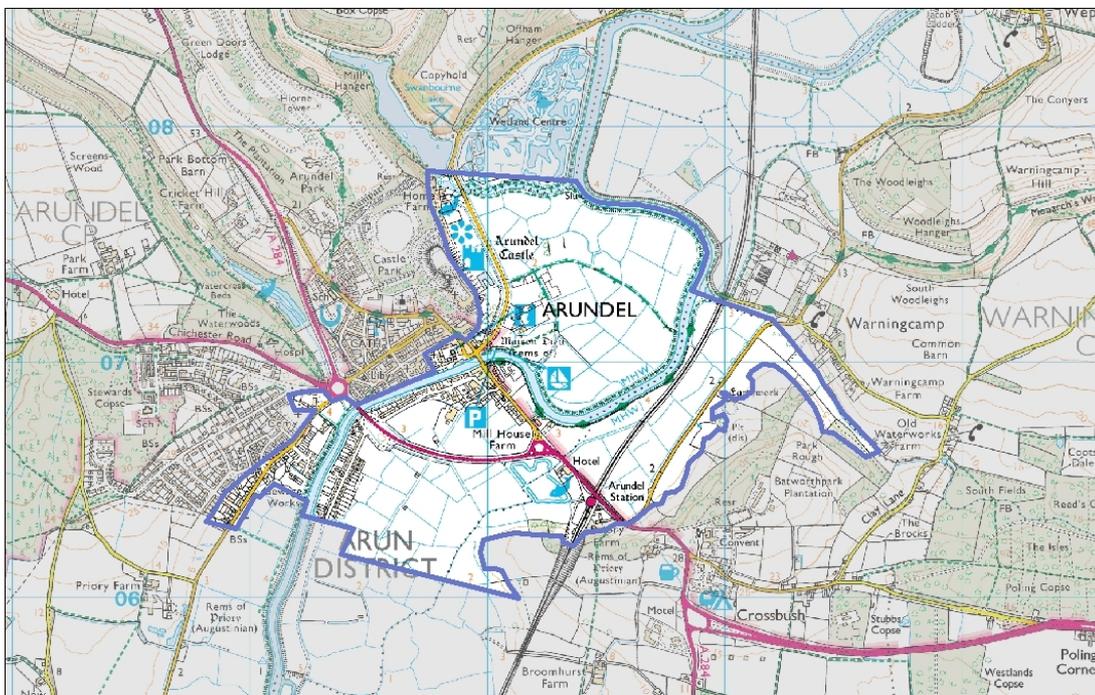
**Sustain to 1 in 75** with new inland defences built on the outskirts of Arundel town centre, firstly in 20 years time and then again to make them higher and, in new areas, in about 50 year's time.

This would create a consistent standard of protection throughout Arundel. The new inland defences would protect Arundel from flood water that comes out of bank downstream.

In Arundel, the ground rises steeply on the west bank of the River Arun but on the east bank the ground slopes down, meaning that more properties are at risk of flooding on this side of the river. The river defences vary in type and include steel sheet piles, masonry walls, reinforced riverbanks and in some places the properties themselves form part of the defence.

The town is historic in character and has a number of scheduled monuments and listed buildings.

Flooding to Arundel can occur from overtopping of the defences in Arundel. However, flooding can also occur where water could come out of bank downstream of Arundel and flow behind the defences into the town. The defences through the town are already at a sufficient height, so there is a low likelihood of these being overtopped through Arundel town centre.



Map of Strategy Unit 5

customer service line  
03708 506 506

incident hotline  
0800 80 70 60

floodline  
0845 988 1188

## What do we currently do?

Riparian owners or the Environment Agency maintain the defences. The Environment Agency clears the river and bridges of debris, maintains defences and some outfalls.

## What would change or happen?

By implementing our draft recommendations, the flood risk in Arundel would not significantly increase over the next 100 years. The Environment Agency would continue with its regular maintenance subject to funding.

We recommend raising the height of some of the defences to provide a minimum consistent defence standard of protection of 1 in 75. The works will provide a 1 in 200 standard of protection to begin with, and this will deteriorate to 1 in 75 by year 20.

We would replace the wall at the back of Fitzalan Road and we would start planning for the work in 2015. If you have an interest in the local area, we will consult you during the planning and design stages.

We recommend two new defences be constructed to the south of Arundel on both sides of Ford Road. We recommend that these should be constructed in approximately 2032 and raised again in around 2062. We would propose to construct a third new flood defence next to the A27 in 2062. If you have an interest in the local area, we will consult you during the planning and design stages.

Our recommended option would not qualify to be fully funded by central Government. We will work with you, the town and district councils and businesses to raise the money to ensure the work could go ahead.



The River Arun, upstream of Arundel

Costs of the draft recommended option	£23,065,000
Benefit cost ratio	2.8
Other options assessed	'Improve' 'Sustain' to 1 in 200 with new inland defences 'Maintain' river frontage with new inland defences 'Maintain' river frontage only 'Do Minimum'

### What is at risk of flooding during a 1 in 200 year chance event if the defences stop working?

Now (2012)	Future (2112)
139 residential properties	366 residential properties
29 commercial properties	91 commercial properties
A27	A27
Railway embankment	Railway embankment
100 ha agricultural land	150 ha agricultural land

#### Key facts

We currently recommend that work is carried out to ensure that flood risk does not significantly increase in Arundel over the next 100 years.

If we do this work, it will mean that the standard of protection will not fall below 1 in 75 – this is the standard that is currently needed to get insurance against flooding.

We recommend replacing the flood defence wall on Fitzalan Road, starting planning for the work in 2015.

The work in Arundel will not qualify to be fully funded by central Government. We will work with you to help raise the money so these works can all go ahead within our recommended timescales. If not enough money is raised we will work with you to adapt to changes in flood risk.

# Arundel to Littlehampton - Strategy Unit 6

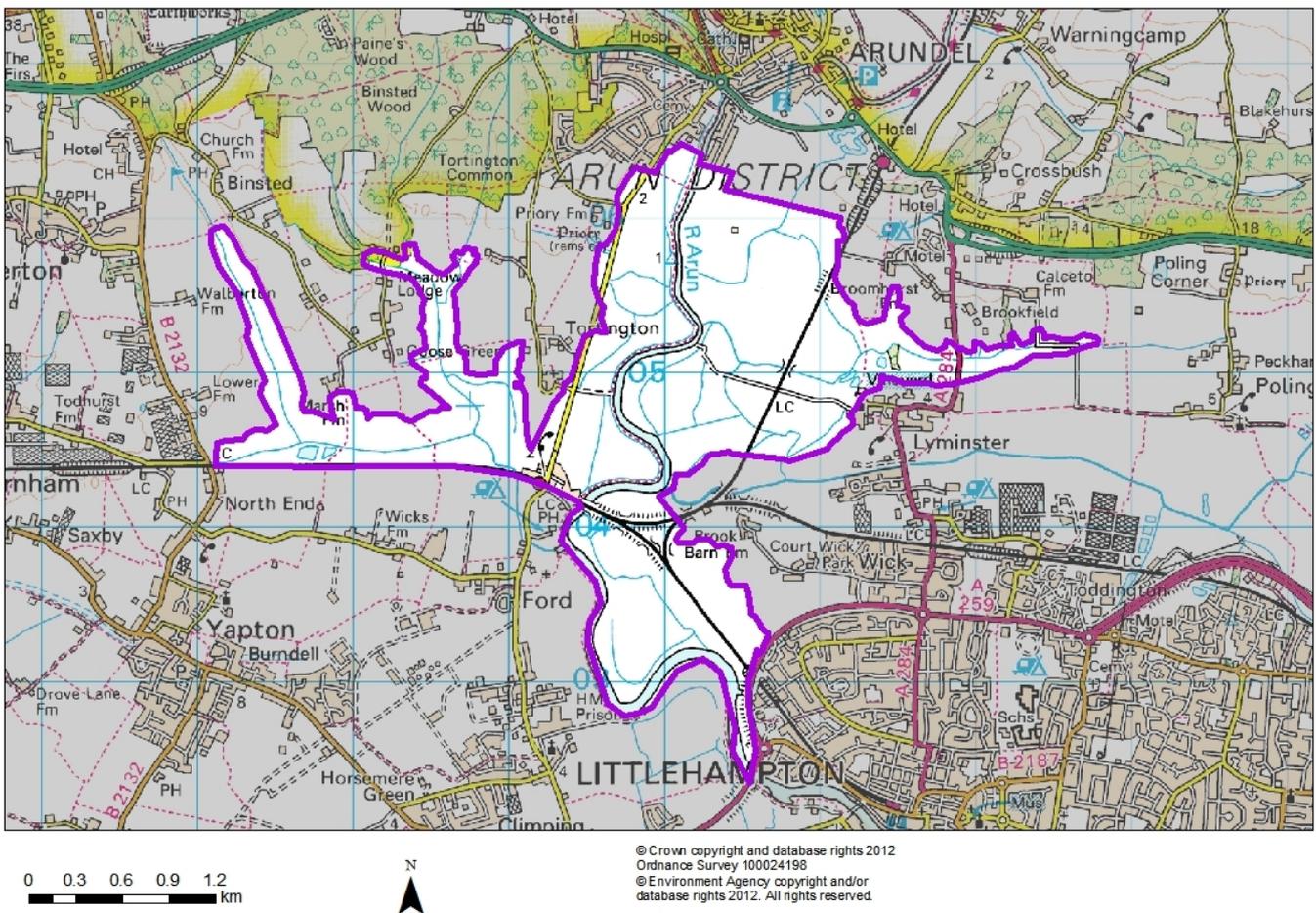
## The River Arun from the south of Arundel to the Ford Railway Bridge and the A259

**Our recommended option**

*'Maintain' for 50 years*

This option includes the routine maintenance that we currently carry out, as well as occasional repair of the concrete protection, maintenance and repair of outfalls.

Downstream of Arundel the river valley opens out into a broad floodplain and the River Arun becomes a wide meandering channel. This area is largely rural and agricultural. The raised defences along the river are primarily earth embankments with concrete protection. The railway line crosses the floodplain on a raised embankment which floodwater can pass under at certain locations. There are no key environmental features in this area but the floodplain is classified as Biodiversity Action Plan (BAP) habitat for Floodplain Grazing Marsh.



Map of Strategy Unit 6

### What do we currently do?

We carry out routine maintenance of the earth embankments; this includes inspection, grass cutting, localised topping up and occasional slip repairs.

### What would change or happen?

For the next 50 years, there wouldn't be any change in the way we manage the river in this strategy unit, subject to funding. This would ensure that Arundel and Lyminster are protected from flooding from this part of the River Arun.

After 50 years, we would stop maintenance works as the funding required to keep the banks in good condition would be too great. At that time, we would plan to construct new inland defences that would protect properties in Arundel and Lyminster from flooding.

Costs of the draft recommended option	£1,670,000
Benefit cost ratio	2.1
Other options assessed	Do minimum Maintain for 100 years Sustain

### What is at risk of flooding during a 1 in 200 year chance event if the defences stop working?

Now (2012)	Future (2112)
22 residential properties	36 residential properties
2 commercial properties	2 commercial properties
Ford Road	Ford Road
Railway	Railway
300 ha agricultural land	350 ha agricultural land

#### Key facts

We recommend carrying on with the work that we are doing now to ensure that the flood defences remain in good condition for the next 50 years.

If we don't maintain this section of river, flooding from here would find its way into homes and businesses in Arundel and the Lyminster area.

The work in this strategy unit will not qualify to be fully funded by central Government. We will work with you to help raise the money so these works can all go ahead within our recommended timescales. If not enough money is raised we will work with you to adapt to changes in flood risk.

# Black Ditch - Strategy Unit 7

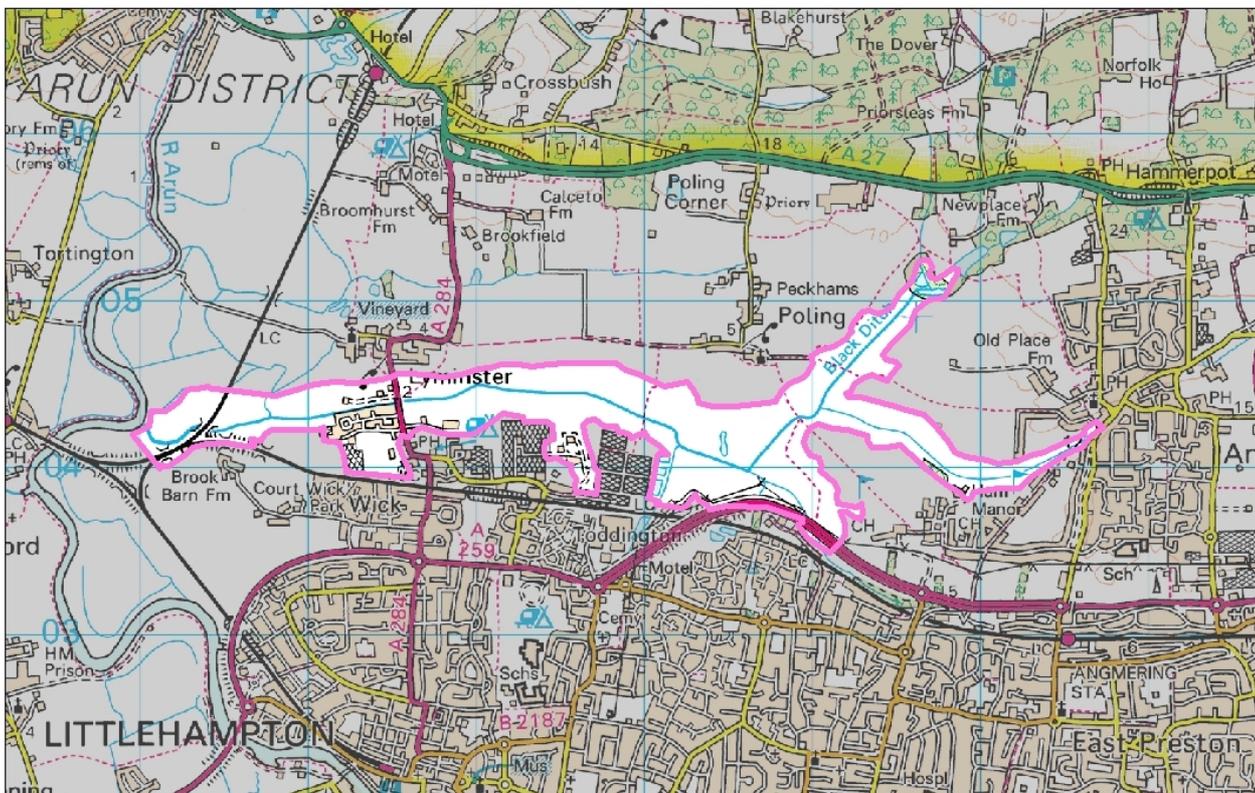
A tributary of the River Arun from upstream of Angmering to the River Arun

## Our recommended option

'Maintain' with a new inland defence in approximately 2052 subject to funding being available.

We recommend continuing regular channel maintenance. This includes a regular programme of inspection and bank vegetation management to maintain the river channel capacity. We would remove debris from the main culvert under Angmering, and ensure it is regularly inspected and minor repairs made. We would remove debris from Lyminster Bridge.

The Black Ditch is a small river with vegetated banks along much of its length apart from when it flows through a culvert (large pipe) under the village of Angmering. Upstream of Angmering, the river channel is steep and there is a fluvial flood risk. Downstream of Angmering the valley widens out and water levels fluctuate with the tides. There are no environmentally designated sites in this strategy unit. Parts of Angmering are classified as Conservation Areas and there are a number of listed buildings within the area at risk of flooding.



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Map of Strategy Unit 7

customer service line  
03708 506 506

incident hotline  
0800 80 70 60

floodline  
0845 988 1188

**What do we currently do?**

We regularly check and clear the trash screens to ensure there is no debris stopping the flow of water in and out of the main culvert under Angmering. We also currently cut the vegetation on the banks once every other year. The culvert is managed and operated by Arun District Council.

**What would change or happen?**

We would continue our maintenance work. Over time, flood risk would increase due to the effects of climate change and sea level rise. This would increase the width of the floodplain. After approximately 50 years, we recommend constructing a new inland bank to protect land and properties from flooding from the River Arun.

It is likely that our recommended option would qualify to be funded by Government. However, we would still like to work with you, the District Council and businesses to raise additional money to support the works and possibly improve them even further.



The Black Ditch

Costs of the draft recommended option	£997,000
Benefit cost ratio	37.3
Other options assessed	Improve with a new upstream flood storage area 'Maintain' without an inland defence 'Do minimum'

**What is at risk of flooding during a combined fluvial and tidal event if the defences along the River Arun stop working?**

Now (2012)	Future (2112)
187 residential properties	228 residential properties
21 commercial properties	56 commercial properties
Brook Barn Farm Landfill site	Brook Barn Farm Landfill site
	Thornlea Park caravan site
200 ha of agricultural land	300 ha of agricultural land

**Key facts**

Subject to funding being available, we will carry on with the work that we are doing now to ensure that the river channel is able to carry flood water.

After 50 years, we recommend constructing a new inland bank to protect the Black Ditch before maintenance of the main river embankments in the Arundel to Littlehampton strategy unit is withdrawn.

## What's next?

We want to know what you think about our draft recommendations. We are consulting you on our draft recommendations between 3rd December 2012 and 8th March 2013.

Please provide your comments to us as soon as possible and no later than 8th March 2013

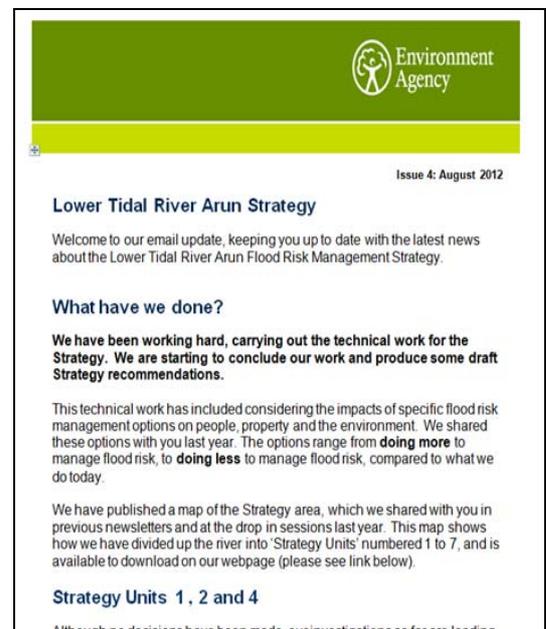
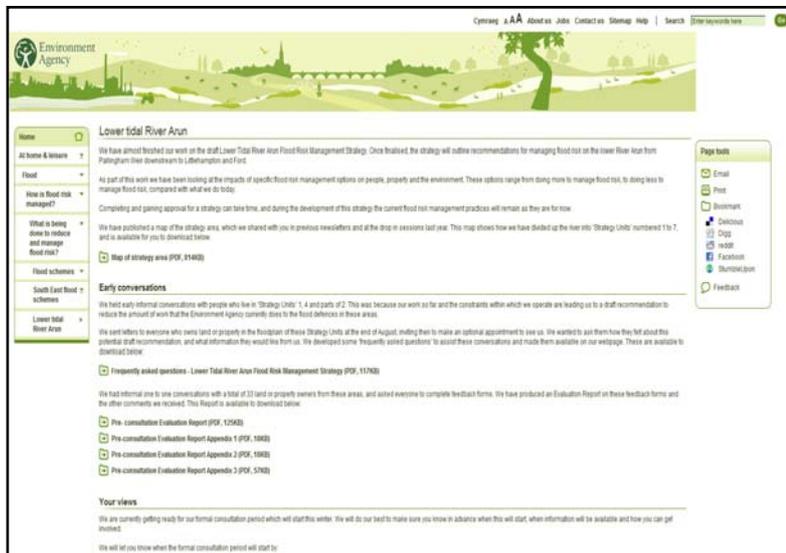
We will consider all of your comments before making our final decisions.

We will keep you informed of our progress as we conclude this work during 2013. We will share the outcomes of this consultation with you on our webpage.

We have completed a Strategic Environmental Assessment (SEA) of our draft recommendations to record how environmental effects have been taken into consideration and influenced decision making in selecting the draft preferred options. We have documented this in an Environmental Report. You can view copies of this report at our offices and at local libraries (details on page 33).

### Did you know...?

There are lots of ways that you can find out more about our draft proposals. Come to one of our exhibitions or visit our website.



## Other projects in the area 1: Internal Drainage Boards

An internal drainage board (IDB) is a Risk Management Authority, which is established in areas of special drainage need. It has permissive powers to do work on ordinary watercourses within its district (not on the main river) to manage local drainage and water levels within the districts. The area of an IDB is not determined by county or local authority boundaries, but by water catchment areas.

As the River Arun Internal Drainage Board (IDB), the Environment Agency currently manages water levels in the Internal Drainage District (IDD).

Changing legislation means it is no longer appropriate for us to continue in this role. As a result, we are planning to stop acting as the IDBs for works on ordinary watercourses in the district (this will not affect our current responsibilities for main rivers). This presents an opportunity for all stakeholders to work together to agree and implement new affordable and sustainable ways to manage land drainage.

As the first part of the process, the Internal Drainage Board project team is writing to all landowners, ratepayers, parish councils and other interested parties to ask for their views on options for the future management of drainage in the River Arun Internal Drainage District. They will consider these views at a series of stakeholder workshops. The first workshop is likely to take place in early 2013 and will aim to agree a way forward.

The decisions for managing land drainage in the long term for the ditches within the IDD will need to take account of the likely future of the tidal River Arun embankments.

**If you want to find out more or have any questions please contact the IDB Project Manager at:**

Environment Agency

Guildbourne House, Chatsworth Road

Worthing, West Sussex, BN11 1LD or Email [Teresa.willway@environment-agency.gov.uk](mailto:Teresa.willway@environment-agency.gov.uk)

If you are a member of the NFU, you may also contact John Archer, NFU Regional Environment and Land Use Advisor on 01730 711950 or [john.archer@nfu.org.uk](mailto:john.archer@nfu.org.uk)

## Other projects in the area 2: Water Framework Directive

The Water Framework Directive (WFD) came into force in December 2000. It gives us an opportunity to plan and deliver better water environments including streams, rivers and estuaries. The aim of the WFD is to ensure that highest priority water bodies meet good ecological status by 2015.

The WFD is being delivered through 'River Basin Management Plans' (RBMP), which set out the current status of water bodies, and the actions we need to take to bring them to a 'good' ecological status. We are continually working on delivering these plans to improve the water environment. In any plan or project, we have a requirement to ensure there is no further deterioration in the ecology of our rivers. We should also be seeking opportunities to re-naturalise our rivers where possible.

The River Arun does not have the wildlife living in and around it that it should. The river has been widened and deepened for navigation purposes and for historical flood defence management. This means that the size and shape of the river channel is the same all the way through, with limited connection to its floodplain due to earth embankments. This reduces the variety of wildlife able to live in and around the river and prevents the river and floodplain from functioning naturally.

At the Environment Agency, we want to improve the River Arun but recognise that we cannot do this on our own. We want to talk to people about the potential opportunities in the catchment, to make sure we do the right things for the river and for those who live, work and manage the surrounding land. We recognise that there are many interested parties keen to have their say. These include; landowners and farmers, The Rivers Trust; water companies; angling clubs; and boaters and our aim is to work in partnership with those interested in the River Arun to make sure we get it right.

We assessed WFD issues for all options for each strategy unit. We do not expect the draft recommendations to cause deterioration in any water body or prevent it from achieving its objectives. This assessment has been clearly set out in the Lower Tidal River Arun Strategy WFD Assessment June 2012. You can access this report from the strategy website at:

<http://www.environment-agency.gov.uk/homeandleisure/floods/122196.aspx>

## Further information

### Visit us:

Saturday 12 January 2013  
From 11am to 6pm  
at Pulborough Village Hall, Swan View, Lower Street, Pulborough, RH20 2BF

Tuesday 5 February 2013  
From 1pm to 8pm  
at Arundel Town Hall, The Town Hall, Maltravers Street, Arundel, BN18 9AP

### Go to our webpage:

<http://www.environment-agency.gov.uk/lowertidalriverarun>

### Complete our e-consultation through the link on our webpage:

<http://www.environment-agency.gov.uk/lowertidalriverarun>

### Read our documents at:

- ~ Pulborough Library, Brooks Way, off Lower Street, Pulborough, RH20 2BP
- ~ Arundel Library, Surrey Street, Arundel, BN18 9DT
- ~ Angmering Library, Arundel Road, Angmering, Littlehampton, BN16 4JS
- ~ Arun Civic Centre, 1 Maltravers Road, Littlehampton, West Sussex, BN17 5LF
- ~ Environment Agency, Guildbourne House, Chatsworth Road, Worthing, BN11 1LD

### Call us:

08708 506506

### Email us:

[ltras@environment-agency.gov.uk](mailto:ltras@environment-agency.gov.uk)

### Write to us:

Lower Tidal River Arun Strategy 2012,

Environment Agency

Guildbourne House

Chatsworth Road

Worthing West Sussex BN11 1LD

NOTES:

NOTES:

**Would you like to find out more about us,  
or about your environment?**

**Then call us on**

**03708 506 506** (Mon-Fri 8-6)

Calls to 03 numbers cost the same as calls to standard geographic numbers  
(i.e. numbers beginning with 01 or 02).

**email**

**[enquiries@environment-agency.gov.uk](mailto:enquiries@environment-agency.gov.uk)**

**or visit our website**

**[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)**

**incident hotline 0800 80 70 60** (24hrs)

**floodline 0845 988 1188**



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