



Drainage and Wastewater Management Plan

Level 2 - River Basin Plan
Arun and Western Streams



from
**Southern
Water** 

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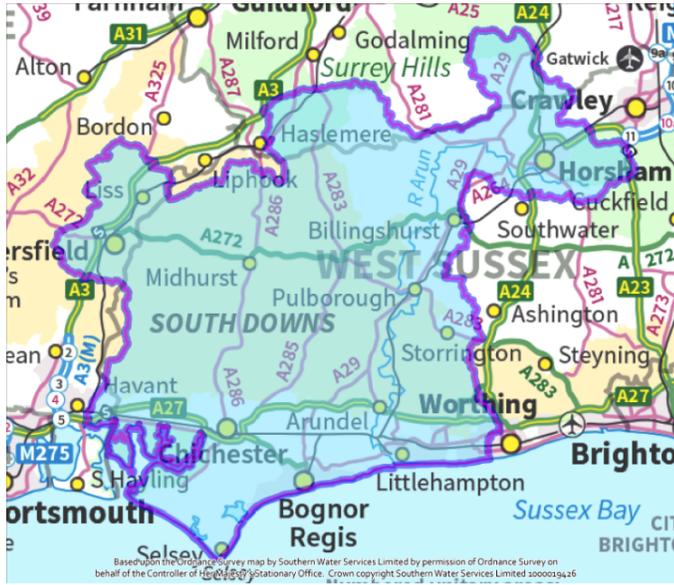
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Arun and Western Streams River Basin Catchment



We have developed the first Drainage and Wastewater Management Plan (DWMP) for the Arun and Western Streams River Basin Catchment.

We have 59 wastewater systems in this catchment, with 434 pumping stations and 4,001 km of sewers. We cover 12% of the geographical area (mainly the urban areas and villages of Horsham, Arundel and Littlehampton, Bognor Regis and Chichester) with 93% of the homes in the catchment connected to our wastewater systems.

Across Arun and Western Streams we have:



59
sewerage
catchments



4,011
kilometres
of sewers



56
wastewater
treatment
works



434
wastewater
pumping
stations



12%
of region
connected to
a mains
sewer



93%
of homes
connected
to a mains
sewer



83%
of businesses
connected
to a mains
sewer

Our DWMP sets out our priorities for the Arun and Western Streams River Basin Catchment. These include:

- Reducing the number of spills from the 90 storm overflows which together currently spill around 2600 times per annum
- Separating or attenuating excess rainwater in the sewer networks to reduce the risks of flooding and frequency of storm overflow discharges, especially in Fittleworth, Loxwood, Chiddingfold, Northchapel and Billingshurst
- Investigating the potential impact of wastewater discharges on Good Ecological Status at the Aldingbourne Rife and the River Arun
- Planning for potential significant developments at Bersted, Horsham, the old Ford Airfield, Arundel, Southleigh, Southbourne, Tangmere, Bracklesham, Barnham and Littlehampton
- Considering the Manhood Peninsular (Sidlesham and Pagham systems) for a catchment approach to tackle multiple water related issues including climate change, sea level rise, flooding, water resources, water quality, new development, biodiversity and habitat loss
- Improving the resilience of our networks and treatment works to prevent pollution incidents, particularly in Bosham, Horsham, Barnham (Lidsey) and Siddlesham
- Reducing the risk of sewer blockages by increasing sewer jetting and targeting customer campaigns to reduce the amount of FOG (fats, oils and grease) and unflushables in the sewer network around Horsham, Littlehampton, Bognor Regis, Nutbourne and Emsworth.

All the stages we followed in developing the DWMP for the Arun and Western Streams are set out in the subsections below. Please explore these pages to find out more. You can find detailed investment needs in the tables on the Arun and Western Streams [Options Development and Appraisal page](#).

Working with others – Arun and Western Streams catchment

We have worked with a wide range of organisations with responsibilities for drainage, flooding and protection of the environment whilst developing our DWMP. The organisations we worked with in the Arun and Western Streams River Basin Catchment include:

- West Sussex County Council
- Surrey County Council
- Chichester District Council
- Adur and Worthing Councils
- Mid Sussex District Council
- Arun District Council
- Horsham District Council
- Waverley Borough Council
- The Environment Agency
- The South Downs National Park Authority
- The Arun and Rother Catchment Partnership and member organisations including:
 - The Arun and Rother Rivers Trust
 - The Sussex Wildlife Trust
 - The Royal Society for the Protection of Birds
- Thames Water
- Portsmouth Water

Working together to co-create the DWMP is important. Our drainage and wastewater systems are often inter-connected with the systems managed and operated by others and affect the natural environments within the catchment.

A wide range of issues and concerns have been raised and discussed throughout the development of the DWMP for the Arun and Western Streams. These include

- Some of the wastewater systems in the RBC are approaching their permit and capacity limits as a result of new development, so the permits will need to be reviewed with the Environment Agency
- There are numerous environmentally designated sites in the Arun Valley, including internationally designated sites. The water quality needs to be protected and improved so the species and habitats these sites support can be protected from further deterioration and enhanced
- Data sharing between multiple organisations is needed to promote closer working and co-create more sustainable, natural solutions to land drainage
- Private sewers are likely to be causing issues with infiltration and leakage
- Effluent reuse must be considered as a solution to reduce discharges to Langstone and Chichester Harbours
- West Sussex Council and other organisations are actively looking for potential natural flood management sites and ways to slow the flow of rainfall run off, including the use of Horsham Pond as a storage facility.

We are progressing these issues through the development of the DWMP as set out in our investment needs for the Arun and Western Streams. Further, we commit to working with others to co-develop and co-deliver schemes that meet multi-organisational objectives and which benefit the environment, our customers and communities.

We developed and ran a series of activities between 2020 and 2022 as we prepared our DWMP for the Arun and Western Streams. The dates and purpose of the various webinars, workshops, meetings on individual wastewater systems and interim consultation were as follows:

The dates and purpose of the webinars and meetings

The regionally based webinars presented and discussed issues and information relevant across the whole or our operating region. You can view the presentations used in the webinars on our [Who we're working with](#) page.

The presentations we discussed at the Arun and Western Streams workshops are below:

Workshop 1

Held in September 2020, participants discussed the findings of the risk based catchment screening and proposed additional planning objectives for the DWMP. [Workshop Slides](#).

Workshop 2

Held in May 2021, participants:

1. discussed the results from the BRAVA risk assessments and the proposed investment strategy for the wastewater catchments within the River Basin
2. identified the generic options that should be explored to address the identified risks, and
3. discussed which wastewater catchments to progress through the Options Development and Appraisal stage of the DWMP. [Workshop Slides](#).

Workshop 3

Held in March 2022, we reviewed and discussed the draft investment programme for the River Basin Catchment. This included the types of investment, priorities and timing for investment needs and the wider opportunities arising from the proposed investment in terms of partnership projects and catchment wide solutions providing multiple benefits. [Workshop Slides](#).

You can view the findings from our [interim consultation](#).

Risk based catchment screening for the Arun and Western Streams catchment

Risk based catchment screening (RBCS) is a process where existing, readily available data is used to identify where there is a current and/or potential risk or vulnerability in the sewer catchment to future changes, such as new residential development or changes in climate. This enables effort to be focused on these catchments during the development of the DWMP in order to understand these risks in more detail and why they are likely to occur.

The RBCS involves the assessment of each sewer catchment against 17 indicators set out in guidance published by Water UK. Water companies can add additional indicators to ensure that other important issues are highlighted at this early stage in the development of the DWMPs. We have included an additional metric on customer complaints as this provides a flag for catchments with ongoing or outstanding concerns.

Find out more about the [risk based catchment screening](#) process.

The results for the RBCS for the Arun and Western Streams river basin catchment can be downloaded here:

[RBCS – Arun and Western Streams catchment](#)

BRAVA for the Arun and Western Streams catchment

The Baseline Risk and Vulnerability Assessment (BRAVA) is an important step in the development of our DWMP in order to understand current system performance and future vulnerabilities. Understanding the current and future risks means that we can identify the investment needed to manage and reduce the risks to Band 0 (not significant level of risk).

A BRAVA assessment has been completed for each of the wastewater systems in the Arun and Western Streams that were flagged during the [Risk Based Catchment Screening \(RBCS\)](#). A risk assessment was completed for all 14 planning objectives.

The output of the BRAVA shows

- the current risks and issues in each wastewater system within the Arun and Western Streams catchment – providing a baseline from which we can assess future risks
- the future risks in 2030, 2035, 2045 and 2050 (where the methodology currently allows us to assess the future risks) so we can understand how the current risks may change without additional investment
- the key issues behind the future changes in risk including:
 - a deterioration in the condition in our wastewater systems
 - climate change – including the increasing frequency and severity of droughts and storms
 - growth and urban creep
 - a combination of any or all of these that are relevant in the catchment being assessed.

Results for the BRAVA for the Arun and Western Streams river basin catchment

[BRAVA Summary – Arun and Western Streams](#)

Notes

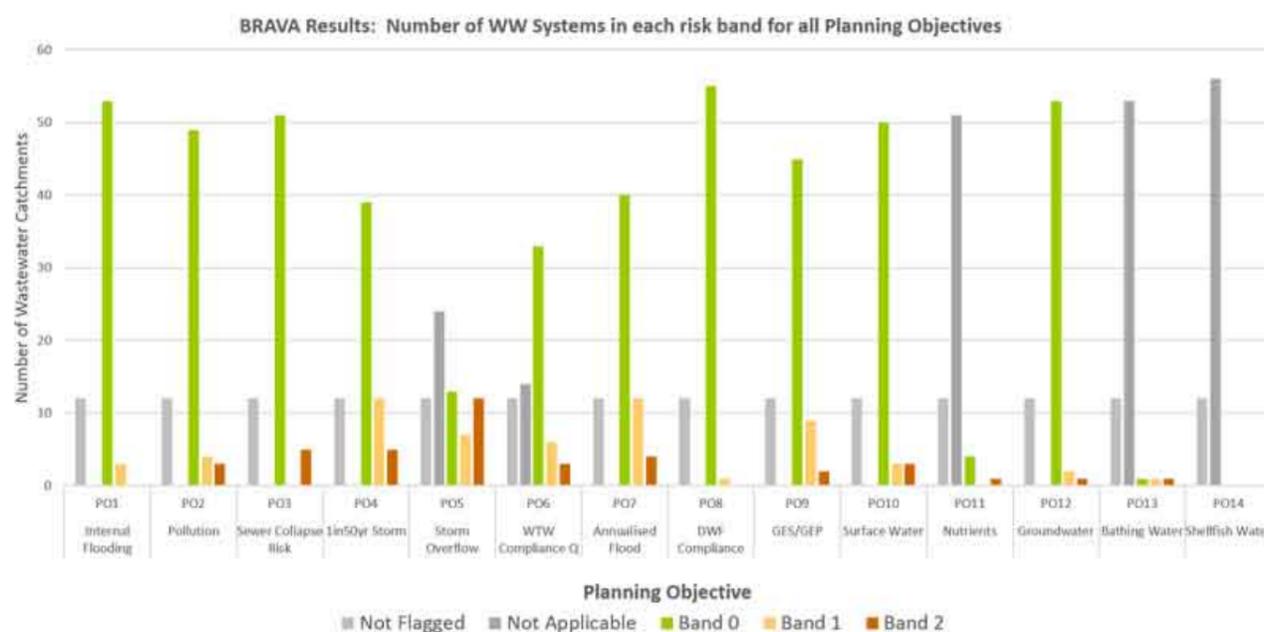
1. In the BRAVA results table, “not flagged” means no risks were identified in the initial Risk Based Catchment Screening using the nationally set criteria. Wastewater systems not flagged were screened out and did not progress to the BRAVA stage. “Not applicable” means the Planning Objective was not relevant within the wastewater system. For example, where a system has no Storm Overflows, this will be marked as “Not applicable”.
2. Please check the [DWMP glossary](#) for any unexplained acronyms.

Problem characterisation – Arun and Western Streams

The Problem Characterisation stage of the DWMP uses the results from the Baseline Risk and Vulnerability Assessment (BRAVA) to explore the causes of risks and the primary drivers. A [technical summary](#) provides information on our approach to the problem characterisation.

Current risks in the Arun and Western Streams Catchment

The graph below illustrates the combined results of the 2020 BRAVA assessment for all 60 wastewater systems in the Arun and Western Streams river basin catchment. It shows how many wastewater systems have a risk under each of the 14 planning objectives. For example, for the risk of internal flooding, 48 wastewater systems are in band 0 (not significant), 3 are in band 1 (moderately significant), 2 in band 2 (very significant) and 7 were 'not flagged' for inclusion (i.e. screened out at the risk based catchment screening stage of the DWMP).



The graph illustrates that **storm overflows** and **nutrients** are the main concerns in this river basin based on the BRAVA results for 2020. This is illustrated by the brown bars being the highest for planning objectives 5 and 11.

The wastewater systems with the highest number of planning objectives in band 2 (very significant) are **Chichester, Siddlesham, Chiddingfold, Lidsey, Ford, West Marden, Warnham** and **Billingshurst**, all with 4 objectives in band 2 for 2020. **Loxwood** and **Thornham** both have 2 band 2 risks. All other catchments have 2 or fewer risks.

The specific risks and the causes of risk for each of the wastewater systems are explained in the summary of the problem characterisation for each system. These are available to download from the link next to the name of each system in the table below.

Future risks in the Arun and Western Streams Catchment

The 2050 BRAVA results help us to identify the future challenges for drainage and wastewater management in the Arun and Western Streams river basin catchment. These are:

(a) Population Growth

There are several wastewater catchments where new homes, businesses, roads and other infrastructure is planned to provide for the increasing population. The main areas identified for potential new development in the Arun and Western Streams catchment are:

- Ford
- Lidsey
- Horsham
- Chichester

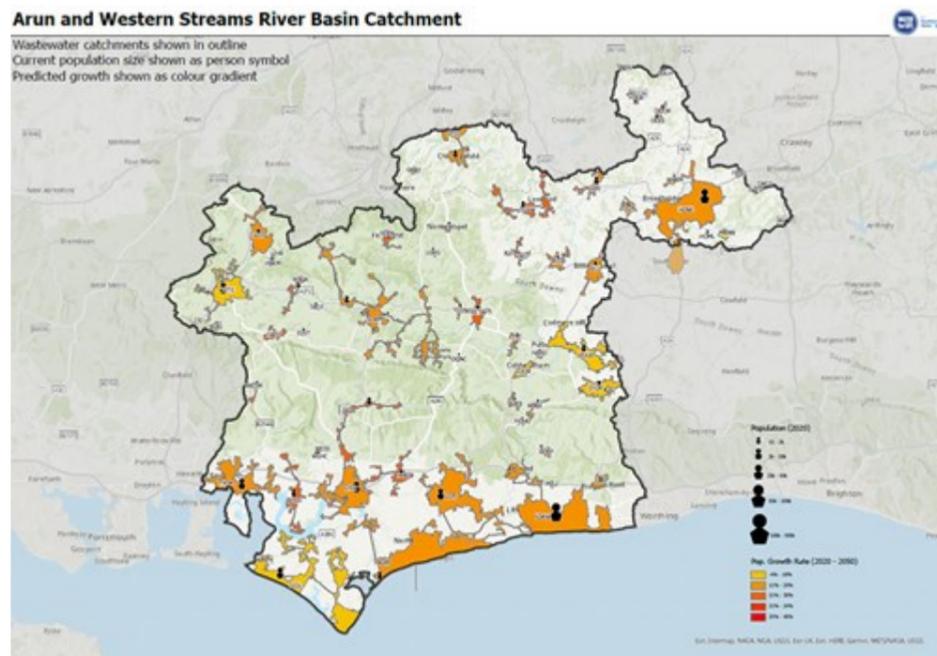
The BRAVA results show that the additional homes and businesses will increase the risks of non-compliance with our Dry Weather Flow (DWF) permits from the Environment Agency in 19 of the 60 wastewater systems, including **Ford, Chichester, Siddlesham, Lidsey, Petersfield, South Ambersham,**

Pulborough and **Billingshurst**. This means further investment will be needed in the future to increase the capacity of our treatment works to accommodate the new homes and businesses.

The additional development may mean that our current permits for wastewater treatment quality might be exceeded by 2050 (without further investment) in 3 wastewater systems, **Warnham, Faygate** and **Liss Hillbrow**.

New development in the Adur and Ouse catchment might put additional pressure on internationally designated habitat sites such as **Arun Valley** and **Solent areas**, so solutions will need to be found to ensure that development is nutrient neutral.

A map of the Arun and Western Streams catchment showing the estimated future growth in each wastewater system is shown below. The [technical summary](#) explains how we have considered population growth and urban creep in our DWMP.



(b) Climate change

Climate change will bring greater variability of our weather with warmer wetter winters and hotter drier summers. The impacts we will see will be more intense summer storms that exceed the capacity of the drainage and wastewater networks and cause localised flooding. Hence, the risk of flooding from sewer systems is increasing due to climate change. The [technical summary](#) explains how we have considered climate change in our DWMP.

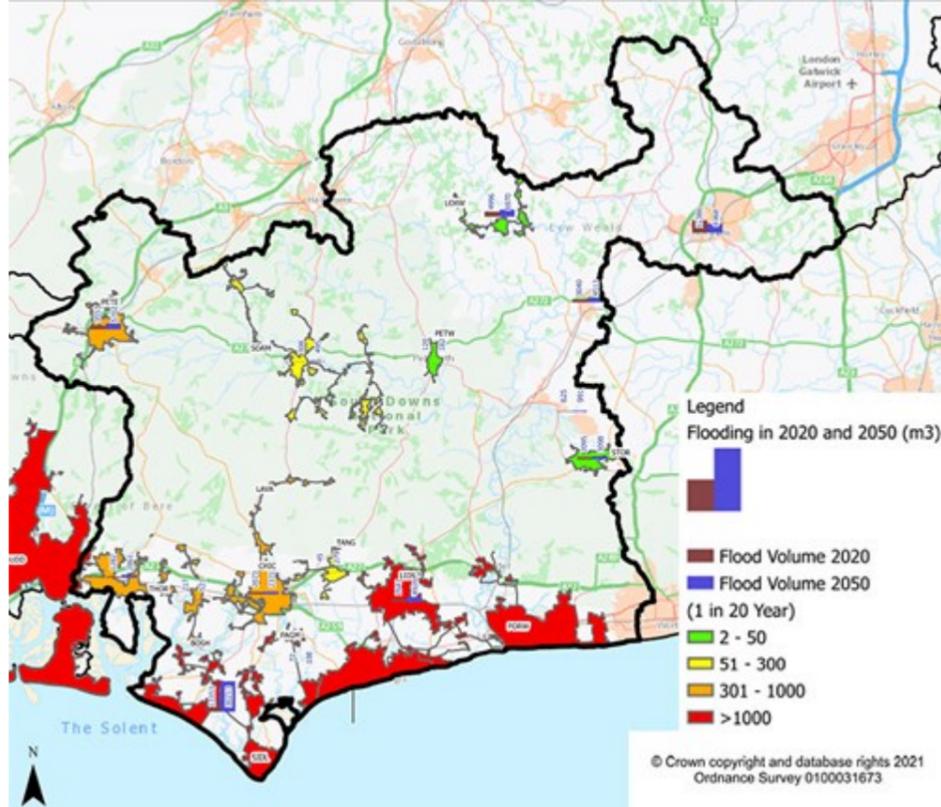
We will work with partner organisations, such as West Sussex County Council and the Environment Agency, who have responsibilities for flooding and drainage to consider options and develop opportunities to find solutions that reduce the risks from flooding.

We will need to adapt our wastewater systems to operate in future climates. There will be an increasing need to slow the flow entering our sewer networks so the systems can carry the water without flooding homes and businesses and/or without causing discharges from storm overflows. Preventing additional rainfall entering foul sewer networks, including combined sewer networks where possible, could delay the need to upgrade and enlarge the vast underground network of sewers.

Climate change is expected to have an impact on the risk of flooding in several wastewater systems, especially **Ford, Horsham New, Sidles ham, Petersfield, Billingshurst, Chephurst Copse Rudgwick** and **Fernhurst** where there is already a very significant risk from rainfall related flooding. The flooding risks will increase in other wastewater systems by 2050 unless measures are taken to manage and reduce these risks. The risk assessment indicates that storm overflow discharges might increase for **Bosham** wastewater system, unless further action is taken, although 16 systems already have a very significant risk of discharges from storm overflows.

The map below shows the potential impact of climate change, urban creep and growth on the risk of flooding in a 1 in 20 year storm for the wastewater systems. We followed Water UK's capacity assessment framework to apply a 20% uplift to rainfall forecasts to assess the potential increases in flood volumes shown on the map. Urban creep was estimated using the approach developed by the UK Water Industry Research (UKWIR) report on Urban Creep in sewerage systems (2010).

The map highlights that we will need to adapt to climate change. Adaptation will mean considering better long-term sustainable options, such as reducing the volume of rain water entering the sewer network. This approach may provide the capacity within the wastewater system to allow for future growth and therefore reduce both the need for significant increases in the capacity of the existing wastewater systems and reduce discharges from storm overflows.



Investment planning for each wastewater system

We used the BRAVA results and our understanding of the causes of risks and drivers to propose an **investment strategy** for each of the wastewater systems. Find out more information on [how we determined the investment strategies](#). The strategies help us to target the wastewater systems that need further investment to reduce the potential risks to customers and the environment. We have produced a table that lists the [proposed investment strategy for each catchment](#).

We used a risk based approach to identify the wastewater systems that we need to progress in this first round of DWMPs. For these systems we will develop an investment plan. Our technical summary sets out [how we have selected the systems to take forward](#).

The table below lists the wastewater systems in the Arun and Western Streams river basin catchment that we're progressing further during this first round of the DWMPs into the investment planning stage. We have included a catchment map and an explanation of the causes of risks for these systems (see links in the table below).

The maps and causes of risks for the remaining wastewater systems in the Arun and Western Streams will be published when available.

System Ref	Wastewater system	Wastewater system map	Information on causes of risks
BOSC	Bosham	Bosham Map	Bosham Causes of Risks
CHIC	Chichester	Chichester Map	Chichester Causes of Risks
FORW	Ford	Ford Map	Ford Causes of Risks
HONE	Horsham New	Horsham New Map	Horsham Causes of Risks
LAVA	Lavant	Lavant Map	Lavant Causes of Risks
LIDS	Lidsey	Lidsey Map	Lidsey Causes of Risks
LOXW	Loxwood	Loxwood Map	Loxwood Causes of Risks
PAGM	Pagham	Pagham Map	Pagham Causes of Risks
SIDL	Sidlesham	Sidlesham Map	Sidlesham Causes of Risks
SOAM	South Ambersham	South Ambersham Map	South Ambersham Causes of Risks
TANG	Tangmere	Tangmere Map	Tangmere Causes of Risks

Options development and appraisal for Arun and Western Streams

Our approach to options development and appraisal (ODA) is explained in the [technical summary](#).

We commenced the ODA process at the river basin catchment (RBC) scale (level 2 planning). This enabled us to look across all the wastewater systems in the river basin and consider generic options that could work at the catchment scale, as well as those specific to a wastewater system.

The generic options are grouped into those that help tackle the risks at 'source', those that help to improve the wastewater system, 'the pathway', and those that protect or mitigate the impacts on the receiving waterbodies, 'the receptors'. This process helped to identify the types of options that could be used individually or in combination with other options to address the risks.

We held meetings with partner organisations to build upon the list of generic options relevant to each wastewater system. As a group we identified and proposed 'unconstrained' options to tackle the drivers and causes of risks identified during the Problem Characterisation stage of the DWMP. These unconstrained options were then progressed by us through the options development and appraisal.

The options appraisal involved evaluating each of the options in two stages, firstly to screen out unviable options to leave a set of 'constrained' options, and then a second stage to reduce the list further to leave only potentially 'feasible' options (see the Options Development and Appraisal technical summary for full details of this process). The process for evaluating the benefits and how we have taken the environment into account is set out in our [Strategic Environmental Assessment \(SEA\) Scoping Report](#) and the SEA Progress Report.

Only feasible options with positive benefits proceeded to the costing stage and this resulted in the selection of the preferred options and confirmed whether each was 'least cost' or provided 'best value'.

The feasible options column in the table below shows how we applied the process within each wastewater system. Beginning with the generic options through the appraisal stages, the table shows the point at which some options were rejected and why. If an option was not rejected, it was costed and became either the final best value or the least cost preferred option (see [ODA technical summary for details](#) of this process).

Our final preferred options are set out in the Investment Needs tables for each wastewater system. The accompanying maps show the location of the proposed options within the wastewater system.

Please check the [DWMP glossary](#) for any unexplained acronyms.

The options and investment needs are not committed funding but an identification of the needs for funding. We will include these options in our future business plans as part of the Ofwat periodic review of water company funding to secure the investment needed to implement these options.

System ref.	Wastewater system	Generic options screening	Feasible options	Investment needs	Investment needs map
BOSC	Bosham	Options Screening	Feasible options screening	Investment needs	Map
CHIC	Chichester	Options Screening	Feasible options screening	Investment needs	Map
FORW	Ford	Options Screening	Feasible options screening	Investment needs	Map

System ref.	Wastewater system	Generic options screening	Feasible options	Investment needs	Investment needs map
HONE	Horsham New	Options Screening	Feasible options screening	Investment needs	Map
LAVA	Lavant	Options Screening	Feasible options screening	Investment needs	Map
LIDS	Lidsey	Options Screening	Feasible options screening	Investment needs	Map
LOXW	Loxwood	Options Screening	Postponed	Postponed	Postponed
PAGM	Pagham	Options Screening	Feasible options screening	Investment needs	Map
SIDL	Sidlesham	Options Screening	Feasible options screening	Investment needs	Map
SOAM	South Ambersham	Options Screening	Postponed	Postponed	Postponed
TANG	Tanmere	Options	Feasible	Investment	Map

Note: The areas highlighted for customer education in the investment needs maps are indicative areas of likely focus, as they were derived from historical incident data.

Programme appraisal

The Programme Appraisal stage of the DWMP follows the Options Development and Appraisal (ODA) process. The ODA process identified the preferred options for investment in our wastewater systems to reduce the current risks as well as the risks up to 2050.

The Programme Appraisal brings the investment needs for each wastewater system together into an investment needs programme for the Arun and Western Streams. We look across the river basin catchment to review the investments needed, the timing of these needs and how they combine to reduce the risks to our customers and the environment.

We also look at the wider risk reduction that each option provides across all the planning objectives. Some actions, like separating rainwater from wastewater sewers, could reduce risks under several planning objectives such as storm overflows, external flooding, bathing water quality, shellfish water quality and good ecological status. The details of the method for prioritisation can be found in our Technical Summary on Programme Appraisal.

The investment needs in the Arun and Western Streams River Basin Catchment include

- Reducing the number of spills from the 90 storm overflows which together currently spill around 2600 times per annum
- Separating or attenuating excess rainwater in the sewer networks to reduce the risks of flooding and frequency of storm overflow discharges, especially in Fittleworth, Loxwood, Chiddingfold, Northchapel and Billingshurst
- Investigating the potential impact of wastewater discharges on Good Ecological Status at the Aldingbourne Rife and the River Arun
- Planning for potential significant developments at Bersted, Horsham, the old Ford Airfield, Arundel, Southleigh, Southbourne, Tangmere, Bracklesham, Barnham and Littlehampton
- Considering the Manhood Peninsular (Sidlesham and Pagham systems) for a catchment approach to tackle multiple water related issues including climate change, sea level rise, flooding, water resources, water quality, new development, biodiversity and habitat loss
- Improving the resilience of our networks and treatment works to prevent pollution incidents, particularly in Bosham, Horsham, Barnham (Lidsey) and Siddlesham
- Reducing the risk of sewer blockages by increasing sewer jetting and targeting customer campaigns to reduce the amount of FOG (fats, oils and grease) and unflushables in the sewer network around Horsham, Littlehampton, Bognor Regis, Nutbourne and Emsworth.

Investment Needs for the river basin catchment

We progressed 10 wastewater systems through the ODA stage in the first cycle of the DWMP. These 10 wastewater systems serve a population of around 323 000 which is approximately 78% of customers in this river basin catchment.

We extrapolated the investment needs for these 10 systems to the other 49 systems in the Arun and Western Streams river basin catchment. This provides an estimate of the total investment needs required to reduce the risks in all our wastewater systems in the catchment to Band 0 (not significant). This concept of “Band Reduction” and full details of the process for extrapolation is explained in the Technical Summary on Programme Appraisal.

A graph to illustrate the extrapolation of investment needs across the whole river basin catchment is shown in figure 1.

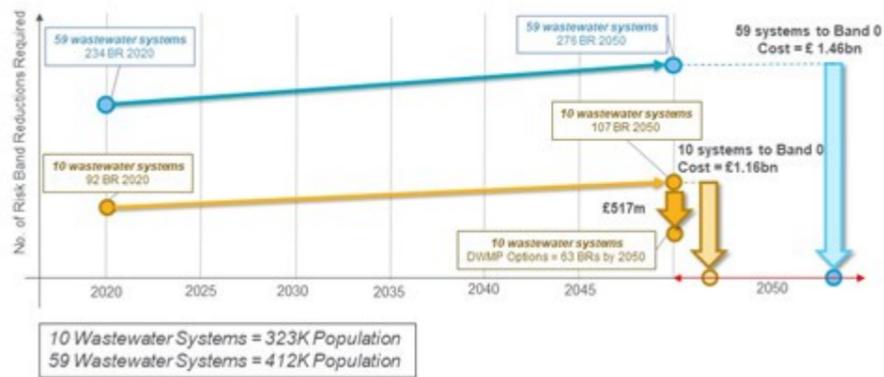


Figure 1: Arun and Western Streams: Extrapolated Investment Needs and Risk Band Reduction

The programme appraisal for the Arun and Western Streams has identified the following:

- A total of 92 band reductions are required in 2020 to reduce the risks across the 14 planning objectives in the 10 wastewater systems
- By 2050, this requirement will increase to 107 band reductions due to the impact of climate change, growth and creep.
- The options identified to date would cost around £517 million for the 10 systems and is expected to provide 44 Band reductions in 2050 (the options do not result in a band zero for all risks).
- The Arun and Western Streams River Basin consists of 59 wastewater systems, which require 234 band reductions in 2020 and 276 band reductions by 2050 in order to achieve band 0 across 14 planning objectives.
- Extrapolating the investment needs for all the systems in the Arun and Western Streams will cost around £1.46 billion for a population of 412,000. This illustrates the scale of investment needed to get to Band 0 by 2050 for all 14 planning objectives.

These investment needs provide indicative costs that allow us to understand the level of funding required to reduce the risks. The funding has not been secured at this stage. The DWMP informs the development of our 5 yearly Business Plan which is submitted to our economic regulator, Ofwat, to agree how we should invest the money received from our customer bills.

Consultation on the Arun and Western Streams river basin catchment

We held a preliminary consultation on our draft DWMP in September and October 2021. The purpose of the consultation was to gain feedback and advice from our customers and organisations on our developing Plan.

We specifically asked about:

- Our Strategic Environmental Assessment Scoping Report
- Our selection of wastewater systems to take forward into the Options Development and Appraisal stage of the DWMP in the first cycle, and
- Our developing plans on each of the 11 river basin catchments.

Our report on the [initial DWMP consultation](#) is now available.

When we consulted on the developing plans for the Arun and Western Streams River Basin Catchment you told us that the key issues we needed to take into consideration were:

- Chichester, Thornham, Sidlesham, Lavant and Bosham should be prioritised for investment to prevent storm overflow spills and improve effluent quality as they discharge into the highly sensitive Chichester and Pagham Harbours.
- Clean bathing waters are a key economic consideration in the Arun Catchment so routine discharges from storm overflows must be addressed.
- The capacity of our wastewater systems to manage current and future growth should be clarified, particularly at Thornham, Pagham and Loxwood where the number of new homes permitted or proposed already exceeds the estimates of remaining headroom. Consideration should be given to a 'change' investment strategy rather than 'improve'.
- Redundant plant / equipment and infrastructure for pumping, treatment or storm storage could be recommissioned as short to intermediate term remedies to capacity issues.
- High groundwater levels and infiltration impacts headroom in the networks. Nature based water storage which delivers both biodiversity net gains and carbon sequestration must be considered as solutions to surface water flooding and inundation of the sewer networks.
- The resilience of the wastewater systems to climate impacts, sea level rise and tide locking need to be improved and operations should be decarbonised and substituted with renewables.
- Proactive action is needed on blockages.

How we responded to the issues raised during the workshops and the preliminary public consultation is set out in our [Register of Stakeholder Comments](#).

We held a full 12 week public consultation on the draft Regional (Level 1) DWMP between Monday 13 June and Monday 05 September 2022. Our [Statement of Response](#) to the issues raised is published on the home page of our website, and a report and analysis on the consultation is published on the [Have your say page](#).