Water Resource Management Plan 2019: Technical Overview

Securing a resilient future for water in the South East
Draft for Consultation 5 March to 28 May 2018

HAVE your Say

Southern Water

Contents

1. Summary

1.1. Our Water Resources Management Plan

Our draft Water Resource Management Plan (referred to as our draft WRMP) sets out how we propose to ensure that there is a secure and reliable supply of water for our customers over a 50 year planning period.

Our WRMP contains detailed proposals that take account of challenges we know already exist, and a range of future uncertainties. We identify a number of improvements and new developments in the WRMP that we propose in response to these challenges and uncertainties, to ensure water supplies are available in the future. Our WRMP will be updated at least every five years to take account of new information. Our last plan was published in 2014.

This document provides a technical overview of our draft WRMP. Our draft proposals are being published for public consultation during Spring 2018. Following the consultation we may need to change the draft WRMP in light of comments received, including feedback from our regulators. We then intend to publish a revised WRMP in 2019, or earlier if directed to do so.

Following publication of the plan we will seek to deliver those interventions that are set out in the WRMP over the next five years.

1.2. WRMP structure

We have designed the structure of our draft WRMP to be accessible for our customers, stakeholders and regulators. The draft WRMP is presented on three levels, as shown in Figure 1.1.

- **Level 1: Non-Technical Summary** – setting out a high level outline of our WRMP, with a focus on how we plan to meet the demand for water over the next 50 years.
- **Level 2: Technical Overview** – setting out our approach to the WRMP, the outcomes of our plan and the strategy for the next 50 years. This document signposts where further detail and explanation can be found in the WRMP Annexes (Level 3).
- **Level 3: Draft WRMP Annexes and supporting documents** – a series of Annexes that comprise our WRMP, setting out the methodology we have followed in preparing it and the results of our work, along with the Strategic Environmental Assessment (SEA), Habitat Regulations Assessment (HRA) and Water Framework Directive (WFD) assessments of the WRMP.

1.3. Our challenges and opportunities

In planning to provide resilient supplies for customers we face a number of challenges and opportunities. The greatest challenge is changes to our abstraction licences to protect and improve the environment. Known changes to our licences in Hampshire could result in us losing half of our currently available water in a drought. There are further potential reductions in resource availability in Hampshire, and potential reductions in Sussex and Kent. The full scale of the reductions is not yet certain as further investigations are required, but the scale of the potential challenge cannot be underestimated. We need to investigate, design and secure permissions to build a number of large scale solutions over the next few years, particularly in Hampshire, but also keep our plans flexible so we can adapt to the final scale of the Environment Agency's further licence changes that will become clear in 2023.

In addition to this, we also plan for future climate change uncertainty, and increasing levels of households and population within the area we serve. We need to continue to reduce the demand for water, reduce leakage, and help our customers with water efficiency measures.

Figure 1.1 WRMP structure

- **Level 1: Non technical summary** - Customer and stakeholder focused, high level outline of our WRMP, with a focus on how we plan to meet the demand for water over the next 50 years.

- **Level 2: Technical Overview** - this sets out our approach to the WRMP, details the outcomes of our plan and the strategy for the next 50 years. This document signposts where further detail and explanation can be found in the WRMP technical annexes (Level 3).

- **Level 3: WRMP and supporting documents** - a series of technical annexes that comprise our WRMP, along with the Strategic Environmental Assessment (SEA), Habitat Regulations Assessment (HRA) and Water Framework Directive (WFD) assessments of the WRMP.

1.4. Our proposed draft WRMP strategies

With an uncertain and very variable future, we believe that traditional approaches to water resource planning are not adequate to ensure we have a robust plan to meet the challenges we are facing. For our draft WRMP we have used complex models to help us to plan for a series of potential futures, based on different assumptions about the future, in particular relating to abstraction licence changes, growth and climate change. By planning to meet a number of different futures, our plans will be more resilient to change, and we will avoid making investment choices now that later prove to be unnecessary.

Our draft WRMP identifies strategies to balance the demand for water with the supply of water over the period of 2020 to 2070. We consider this balance across a number of different potential water futures. The range of schemes that may be required over the long term varies significantly depending whether we face more or less challenging futures. We will initially investigate and seek permissions to implement the schemes that are required in the period up to and including 2027.

Our WRMPs are subject to regular 5 year reviews, and we will update our forecasts and account for changes in uncertainties and risks in future WRMPs. This will include us reconsidering the need for longer term schemes identified in this WRMP.

In this draft WRMP we are proposing a broad range of interventions including leakage reductions, significant demand management and new resource developments, and water trading across our Eastern, Central and Western areas of supply. The need for these is due to a combination of changes to our abstraction licences, increasing demand, the effects of climate change, and expected further reductions in the water available for use from our existing sources as a result of licence changes to protect and enhance the environment. The most significant driver for our proposed strategies in this WRMP is the licence changes.

The strategies for the three supply areas are summarised below, focused on the next 10-15 years only. Further schemes will be required beyond that, and further details of the full strategies are set out in Section 7 of this document and related Annexes.

Eastern area strategy

Over the next 10-15 years, the Eastern area strategy seeks to maintain levels of service for customers through the strategic development of a shared resource with South East Water, in addition to continued drive for greater efficiency in how we use water. This approach also utilises a minor raising for the retained water level in Bewl Reservoir by 40cm. This does not require the existing dam to be raised, but it will require minor modifications around the edge of the reservoir.

Our detailed plans include:

- Extend the universal metering programme, and enhance meter reading frequency. Develop trials of customer offerings or propositions to encourage more efficient use of water
- Media and engagement water efficiency campaign as part of the first phase of our Target 100 vision
- Increased leakage reduction activity
- Medway WwTW water reuse scheme, working jointly with South East Water
- Sittingbourne water trading scheme, potentially with a linked industrial water reuse scheme
- Infrastructure to allow the full capacity of the existing Selling-Fleete main to be available for transfer from Medway to Thanet
- A small bulk supply from South East Water to Kent Thanet in the Birchington area
- A scheme to raise the water level in Bewl reservoir by 40cm
- A licence variation for the West Sandwich and North Deal sources, including developing and undertaking a monitoring programme

- Catchment management and infrastructure solutions to reduce nitrates and pesticides and increase resilience at a number of sources as part of our Catchment First initiative.

Central area strategy

Over the next 10-15 years the strategy for the Central supply area is dominated by the potential future sustainability reductions, the full extent of which remains uncertain at this time. We have assessed and highlighted the potential differences to our WRMP strategy by comparing the two real option strategies with and without the potential sustainability reductions. We will need to investigate the potential sustainability reductions, and the feasibility / design of the potential solutions to resolve any deficits caused by the sustainability reductions, at the same time. However, we will only develop those solutions that are required once the sustainability reductions have been confirmed.

Our detailed plans include the following schemes that potentially need to be developed depending on the future sustainability reductions:

- Extend the universal metering programme, and enhance meter reading frequency. Develop trials of customer offerings or propositions to encourage more efficient use of water
- Media and engagement water efficiency campaign as part of the first phase of our Target 100 vision
- Increased leakage reduction activity
- An indirect water reuse scheme from Littlehampton WwTW
- A desalination scheme on the tidal River Arun
- A coastal desalination scheme at Shoreham
- An indirect water reuse scheme from Brighton WwTW, working jointly with South East Water
- An aquifer storage and recovery scheme north of Worthing
- Rehabilitation and enhancement of three existing sources in Sussex North
- Implement planned infrastructure development to allow the existing Sussex Worthing to Sussex Brighton main to be enhanced and reversed, and to deliver the Pulborough Winter transfer scheme phase 2
- Catchment management and infrastructure solutions to reduce nitrates and pesticides and increase resilience at a number of sources as part of our Catchment First initiative.

Western area strategy

The Western supply area will see the most significant changes to its supply arrangements over the next ten years. The draft WRMP sets out a series of interventions that will be required to meet the future challenges within this area. Whilst there are some core solutions that feature in a number of strategies there is also some key choices that could influence the scale of some of the solutions, such as desalination.

With the proposed notified licence changes affecting the Test, Itchen and Candover sources, and accounting for other future challenges, the following schemes would be required:

- Extend the universal metering programme, and enhance meter reading frequency. Develop trials of customer offerings or propositions to encourage more efficient use of water
- Media and engagement water efficiency campaign as part of the first phase of our Target 100 vision
- Increased leakage reduction activity
- Work with Portsmouth Water to secure additional bulk supplies in a phased manner – additional supplies by 2023, and then further supplies by 2029 or earlier if available
- A large scale desalination scheme on the Solent, potentially in combination with an indirect water re-use scheme to the Itchen

- Develop increased transfer capacity from Southampton West to Southampton East, with a pipeline from the Test to Lower Itchen, and the investigation of smaller scale transfer options by 2027
- Develop the Hampshire grid pipeline transfer scheme between the Lower Itchen and Andover in two phases
- A water reuse scheme at Sandown (Isle of Wight), and consider the potential for a small desalination plant in combination
- Catchment management and infrastructure solutions to reduce nitrates and pesticides and increase resilience at a number of sources as part of our Catchment First initiative.
- Increased reliance on Drought Orders to secure supplies, until new resources are available
- Work with regulators and stakeholders to identify and implement (where possible) river restoration measures on the Test and Itchen that may help to mitigate the potential impacts of Drought Orders in low flow conditions

1.5. Consultation on this draft WRMP

This draft WRMP is being published for a 12-week period of public consultation, to provide the opportunity for our customers, partner organisations, regulators and other stakeholders to comment on our Plan.

The consultation period will run from Monday 5th March 2018 until midnight on Monday 28th May 2018.

Copies of all our consultation documents are available on our website at southernwater.co.uk/haveyoursay/wrmp. Hard copies of the draft WRMP can also be viewed by appointment at our offices in Sussex, Kent, Hampshire and the Isle of Wight. Please email wrmp@southernwater.co.uk to arrange a day and time.

A series of consultation questions are posed through this document, and also copied in a separate consultation feedback form and on our website.

Comments can be submitted three ways:

- through our website, at southernwater.co.uk/haveyoursay or southernwater.co.uk/wrmp
- by emailing the feedback form or your written comments, putting Southern Water WRMP Consultation in the subject line to water.resources@defra.gsi.gov.uk
  (please copy your response to us at wrmp@southernwater.co.uk , the Environment Agency at water-company-plan@environment-agency.gov.uk and Ofwat at wrmp@ofwat.gsi.gov.uk)
- by posting your completed feedback form, or written comments, to

Secretary of State (Defra)
Water Resources Management Plan Consultation (Southern Water)
Water Resources
Department for the Environment, Food and Rural Affairs
Area 3D
Nobel House
17 Smith Square
London
SW1P 3JR

The full version of our draft WRMP including our consultation summary and 16 technical annexes can be found at **southernwater.co.uk/wrmp**

Find out more and get involved at **southernwater.co.uk/haveyoursay.**

Southern Water

2. Introduction

2.1. Purpose and basis of this draft WRMP

This document provides an overview of how we propose to ensure that there is a secure and reliable supply of water to meet the anticipated demands of all our customers over the 50-year planning period from 2020/21 to 2069/70. All water companies must produce a WRMP and update it every five years, reviewing the proposals to reflect the latest information, technology and the views of customers and communities. We published our last adopted WRMP in 2014, and so we are now reviewing our plan in order to adopt a revised and updated version in 2019.

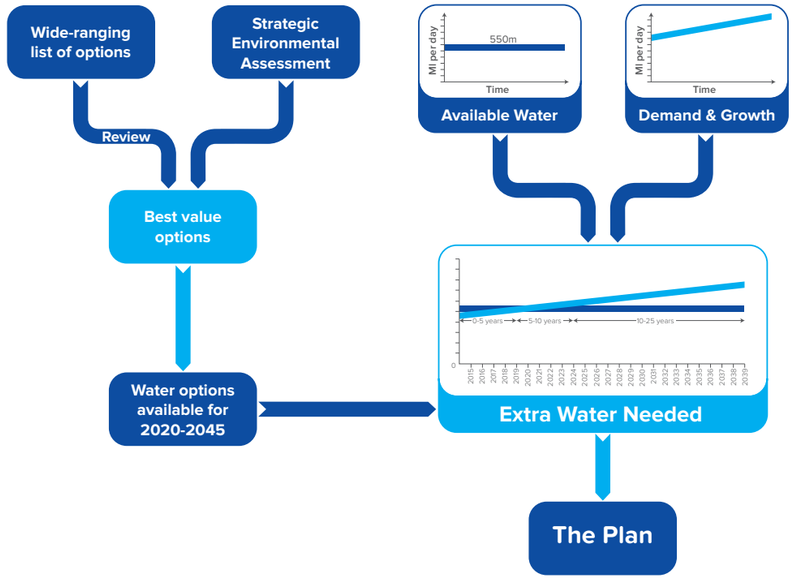
The WRMP process requires us to look ahead over the next 50 year period to assess what the balance between supply and customer demand might be if it were a ‘dry’ or ‘very dry’ year, where supplies are stretched and demand for water tends to be higher than normal. In doing this we need to take account of the likely effects of climate change, population growth, and changing environmental legislation.

In a normal or wet year, or a succession of such years, we generally have plenty of water resource capacity to supply customer demand. Average or higher than average rainfall gives rise to correspondingly average or high river flows and groundwater levels, with plenty of water available for abstraction from rivers or groundwater. Customer demand also tends to be lower.

By contrast, in a ‘dry year’ the ability of our resources to supply customer demand can be significantly reduced. Not only does customer demand for water tend to be higher, particularly in summer months, river flows and groundwater levels tend to be much lower. In these dry years, the spare water resource capacity starts to reduce and the risk that we may have a shortfall of water to supply demand starts to increase.

The primary objective of our WRMP is therefore to ensure that there are always enough supplies available to meet anticipated demands in our area of supply, even under ‘dry’ and ‘very dry’ conditions. Figure 2.1 provides an overview of the process for developing a WRMP.

Figure 2.1 – Overview of process for developing a WRMP



Southern Water

Through our WRMP we identify strategies across our supply area for developing new water resources, reducing demand and using our existing water resources more efficiently. We prepare these strategies for each of the areas that we supply water to.

We summarise our water resource strategies in terms of the following key periods:

The next five years: from 2020/21 to 2024/25 – also known as AMP7
Years five to ten: from 2025/26 to 2029/30 – also known as AMP8
The medium term: from 2030/31 to 2044/45 – also known as AMP9-AMP11
The longer term: from 2045/46 to 2069/70

Our strategy for the next five years (2020/21 to 2024/25) is critical as it is the one where we obtain funding through the Business Plan process to implement our strategy. We are already undertaking preparatory work for some of our schemes now, to ensure we can deliver them in time.

The following five-year period (AMP8) is also important, as options which are required from 2025-30 are likely to require some form of investigation to be carried out during AMP7, to ensure that any required planning permissions are, or can be, obtained, and any environmental issues can be addressed and mitigated. A large number of potential licence changes to protect and improve the environment could be implemented in 2027, and so there is a considerable number of investigations for us to complete in AMP7 so that we can implement licence changes and promote new water resources schemes that may be required in AMP8.

The proposals identified in the medium term (2030-2045) and longer term (2045-2070) are identified now to help us and our stakeholders to understand the nature of schemes which may be required in the future. However, these are options planned for the long term, and the precise need for them and their timing will be reviewed in subsequent WRMPs prior to their implementation being confirmed.

This future work will include reviewing climate change and population growth assumptions, and take account of actual changes to our available resources resulting from environmental legislation. As a result of this work it is entirely possible that different medium and longer term options may be identified.

2.2. Our progress so far

Through working closely with our customers and investing in our infrastructure, we currently put less water into supply than we did in the early 1990s despite a growing population.

Household demand for water has decreased over time, driven by changes in lifestyle, development of more efficient devices such as washing machines and dishwashers, the implementation of our leakage reduction, metering and water efficiency programmes and our campaigns to increase customers' awareness of water as a precious resource. We have installed water meters for most of our customers, with nearly 90% of our customers now having a water meter and paying for the volume of water they use. Together with leakage and the water efficiency measures, we've seen water use fall by 16% in the past 7 years.

Alongside this, we have improved the resilience of our water supply network through the development of service reservoirs and strategic main schemes which allow us to share water with neighbouring water companies.

As proposed in our last WRMP in 2014, we have introduced water efficiency and leakage reduction schemes across our supply area. We have also implemented other changes to our existing water resources network, including new transfers to share resources with neighbouring companies.

Our work to implement the strategies agreed in the last WRMP will continue either through the period up to 2020 or until that plan is replaced with an updated plan. In some of our supply areas however, particularly in Hampshire, we have experienced some difficulties implementing all of the proposals in our last WRMP as a result of environmental investigations and abstraction licensing issues. As a result, we have reviewed the previously proposed schemes in preparing this draft WRMP, and included options as appropriate.

2.3. Our approach for this draft WRMP

Our strategy for the future is about securing a resilient future for water in the South East by transforming the way we work and innovating to meet the challenges ahead.

Water is our most precious resource and the water environment is facing enormous pressure from climate change and increasing episodes of severe flooding and drought. Our plan aims to capture the true value of water in our daily lives. Environmental legislation is already requiring us to make changes to some of our existing sources of water, restricting the water available in dry and very dry years. These and other licences are predicted to continue to be restricted into the future, to protect and improve rivers, aquifers, reservoirs and coasts for the future.

We need to ensure our environment is protected, and also to provide water to support a resilient South East economy. So, we are embarking on a journey to transform the way we provide services to our customers, the role we play in our communities and the value we place on water and the natural environment.

The WRMP process allows us to undertake long term planning of our water supplies, work collaboratively with customers and stakeholders, and ensure that we deliver clean, safe and sustainable water and make sure bills are affordable for our customers. Our draft WRMP will ensure that the infrastructure and services we provide are effective and fit for the future.

Given the challenges we face we are forecasting our demand and supply of water over a 50 year period so we can take a longer term view and build resilience into our plan.

Our customers have told us that we should invest in new technology and infrastructure to ensure supplies for future generations. We can innovate to create sustainable communities through reducing leakage and improving water efficiency, together with recycling more water.

Our approach for the draft WRMP is to address these challenges head on, in particular, to plan to meet and overcome uncertainties. Our draft WRMP presents robust, flexible and resilient water demand and supply strategies for our supply areas. We believe our approach is the right one at this time, and capable of adapting to cope with whatever the future may bring.

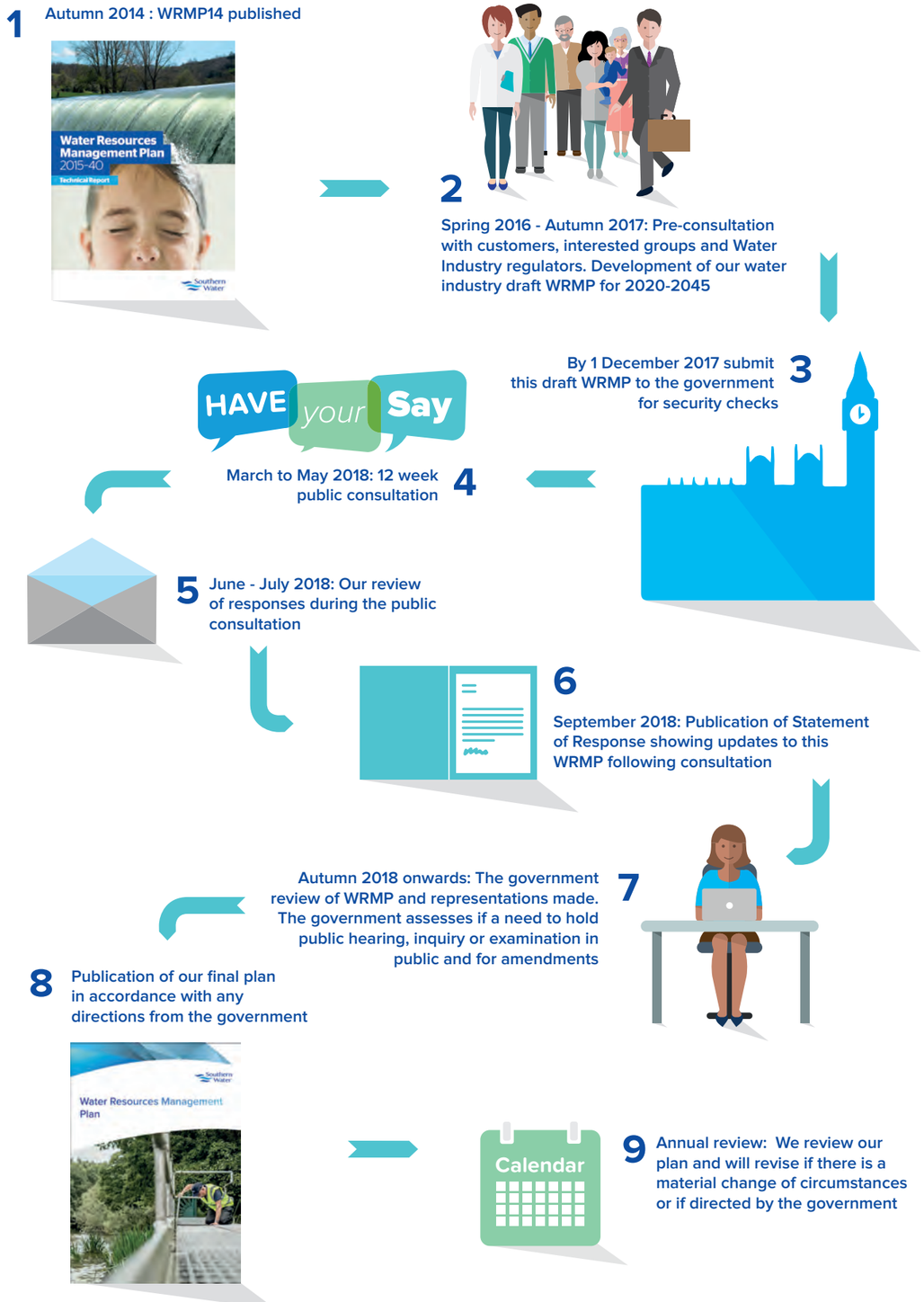
2.4. Overview of the regulatory process

Our draft WRMP has been prepared in accordance with the statutory requirements of section 37A to 37D of the Water Industry Act (WIA) 1991 (as amended by the Water Act 2003) and the Water Resources Management Plan (England) Direction 2017. We have followed government guidelines and the instructions issued by the Environment Agency, Ofwat and Defra.

We are required to pre-consult, publish and consult upon our draft WRMP. We will consult upon the draft WRMP for a 12 week period and then publish a 'Statement of Response' to explain how we have taken account of matters raised by consultees and customers. Following Secretary of State approval we will be able to publish our final WRMP. Figure 2.2 provides an overview of the regulatory process.

In accordance with Section 37B(10) of the WIA 1991, our draft WRMP does not include any information that is considered commercially sensitive, nor does it include any information that is adjudged to be contrary to the

Figure 2.2: Overview of the regulatory process



interests of national security. We are required to 'anonymise' the names of our existing sources of water for security reasons, but have tried to use readily understandable names for them so that our proposals can be easily understood.

2.5. Links to other plans

Our WRMP is one of a number of plans we prepare to plan for the future. Together with our Strategy and Vision, Business Plan and Drought Plan, the documents set out a co-ordinated strategy for meeting our statutory duties as shown in Figure 2.3 and 2.4.

Figure 2.3: Links to our other plans

Let's Talk Water
Let's Talk Water sets out our company's strategy and vision for how we will deliver great customer service and resilient services for the next 25 years.
development.southernwater.co.uk/have-your-say

Business Plan
Our current Business Plan sets out how much we are spending to maintain and improve services for customers between 2015 and 2020, and the level of customer bills. It includes the first five years of the options in our WRMP and investigations we need to carry out for options to secure water in later years. We are currently working on our next plan for 2020-25, which is due to be published in September 2018.
southernwater.co.uk/five-year-business-plan

Drought Plan
Our Drought Plan shows how we manage the security of our supplies in the event of impending or actual drought, which are normally of short duration and outside the conditions we typically plan for in our WRMPs. Our current Drought Plan was published in 2013. We will be publishing and consulting on our updated Drought Plan alongside this dWRMP.
southernwater.co.uk/our-drought-plan

Our plans are prepared in a joined up way within our business, and in close partnership with our regulators, customers and other stakeholders.

In planning for the future, we take account not only of our own regulatory duties, but also those policies and proposals in the plans and strategies of government and other partners, all of which relate to and affect our own Plans. These plans inform us about levels of growth we can expect to see in the future, and the locations where development and economic activity is forecast to increase. We take account of the

Environment Agency's list of environmental investigations that need to be undertaken to inform decisions on existing and future licences. A close working relationship also exists with other water companies in the South East, in which we exchange information on existing and possible new ways to share available resources, to benefit the environment and customers.

These other plans and strategies all provide essential inputs to our draft WRMP preparation, as shown in Figure 2.4.

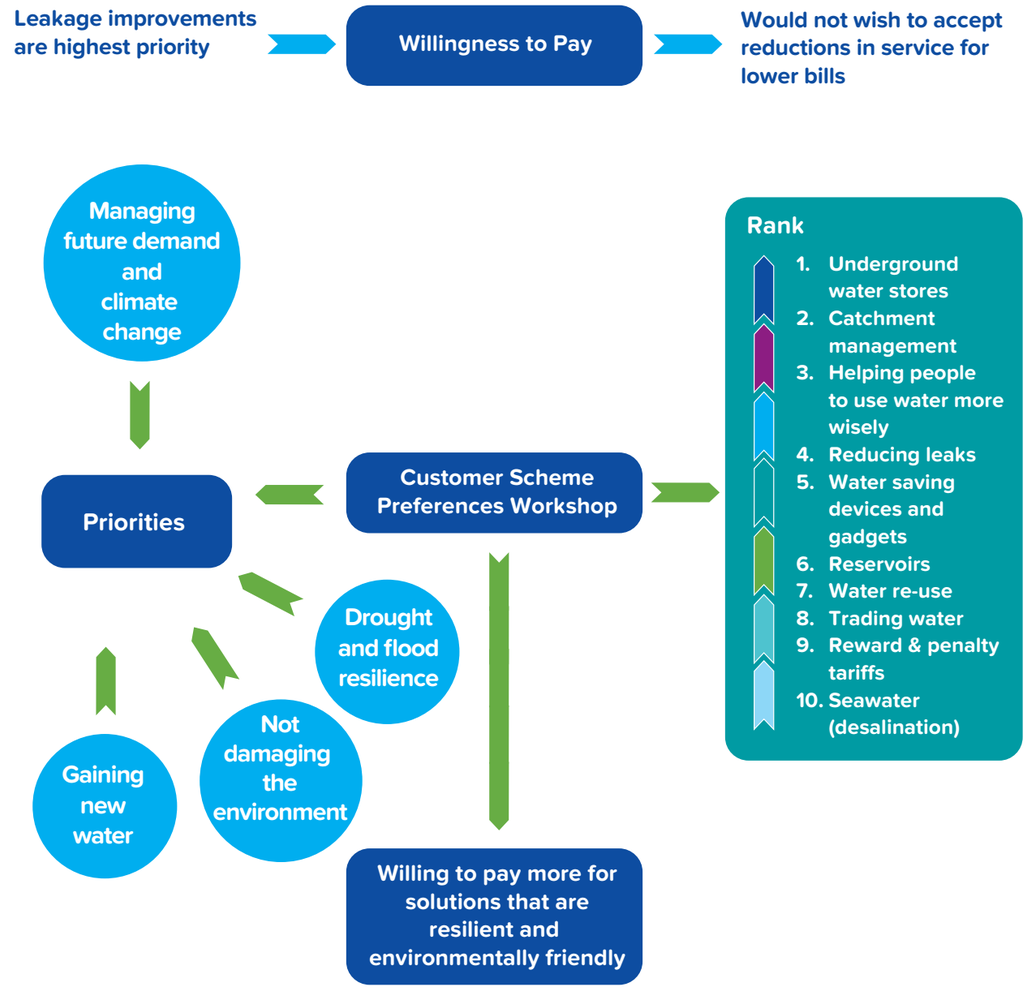
Figure 2.4: Links to other plans and programmes

2.6. Summary of customer & stakeholder engagement

We have been engaging with our regulators since summer 2014, and with customers and stakeholders since November 2015 (see Annex 1). Our engagement has focused on identifying their priorities, and seeking views on the development and delivery of our water resource strategies.

Building on the customer preferences established during the preparation of our previous plan, we revisited these preferences with our customers, and collected more data through online surveys, willingness to pay research and workshops. The outcomes of the customer engagement are shown in Figure 2.5.

Figure 2.5: Outcomes of customer engagement



We have established the views of stakeholders through county-specific stakeholder workshops (Kent, Sussex, Hampshire and the Isle of Wight), stakeholder panels and pre-consultation notification to stakeholders. During the pre-consultation phase, we met with the Environment Agency, Natural England and Ofwat to report progress with developing our plan, explain our approach and report results. The outcomes of the stakeholder and regulator engagement are shown in Figure 2.6.

The views of customers, stakeholders and our regulators during this pre-consultation phase has been critical to the development and formulation of the draft WRMP. This includes understanding customers'

views on levels of service and stakeholder and customer expectations on the supply and demand management options contained within our strategies.

We have also established an independent panel, the CAP (Customer Advisory Panel) to work with us to ensure we deliver our customer priorities and promises. The CAP is acting as the Customer Challenge Group for our business plan, ensuring that customer and engagement outcomes are reflected in the future strategies we take forward to balance future water supply and demand.

Figure 2.6: Outcomes of Regulator and Stakeholder Engagement

We will continue to engage with our regulators, customers and other stakeholders as part of the consultation on this draft WRMP, and in preparing our Statement of Response to the comments that we receive. The views of customers, stakeholders and the regulators are all helpful in shaping the content of our final WRMP.

Further information on our consultation and engagement is in Annex 1.

Southern Water

Find out more about our consultation and engagement in Annex 1

3. Overview of our supply area and water resources planning

3.1. Our supply area

We supply water to just over 2.4 million customers across an area of 4,450 square kilometres, extending from Kent, through parts of Sussex, to Hampshire and the Isle of Wight in the west. Our supply area is shown on Figure 4.1.

Our water supplies are predominantly reliant on the transmission and storage of groundwater from the widespread chalk aquifer that underlies much of the region. This extends throughout parts of Kent, Sussex, Hampshire and the Isle of Wight and makes up 70% of our total water supply.

River abstractions account for 23% of our water supplies, most notably: the Eastern Yar and Medina on the Isle of Wight; the Rivers Test and Itchen in Hampshire; the Western Rother and Arun in West Sussex; the River Eastern Rother and River Brede in East Sussex; and the River Teise, River Medway and Great Stour in Kent.

Four surface water impounding reservoirs provide the remaining 7% of our water supplies: Bewl Water, Darwell, Powdermill and Weir Wood. The total storage capacity of these four reservoirs amounts to 42,390 million litres. South East Water is entitled to 25% of the yield from the River Medway Scheme, which incorporates the storage within Bewl Water reservoir.

We share borders with eight other water companies and water is shared between us and a number of these companies through existing pipeline transfers. There are potentially opportunities to increase the sharing of water in this way.

3.2. Water Resource Zones

Our area of supply is divided into 14 water resource zones (WRZs) as shown on Figure 3.1.

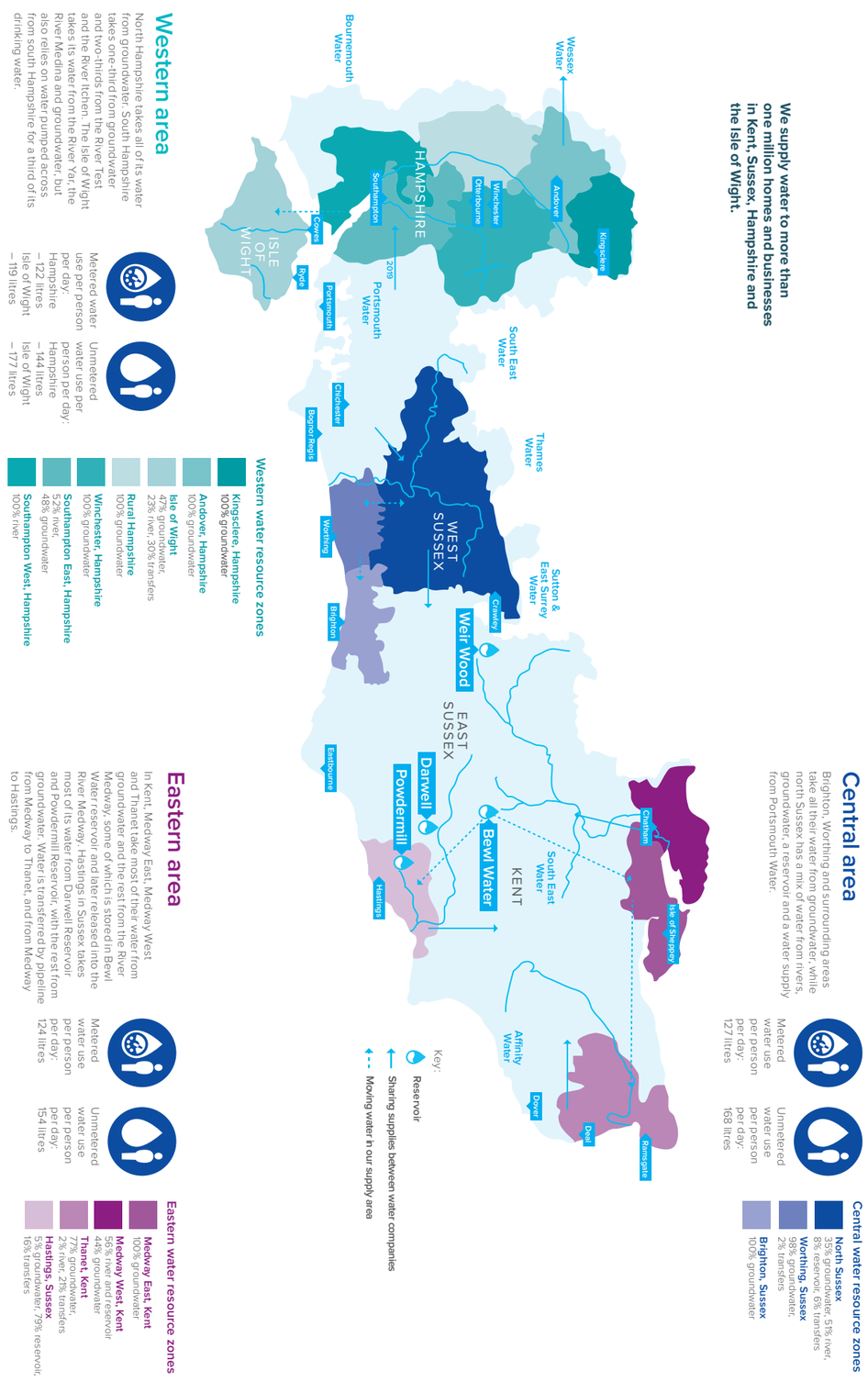
The WRZs are drawn to include large groupings of customers who all have the same risk of loss of supplies. The 14 WRZs are then amalgamated into three larger, sub-regional supply areas: Western, Central and Eastern areas. This approach helps us to plan to meet the demand for water for customers within these WRZs both individually, and collectively at a sub-regional level.

We have changed the way we have drawn our WRZs since our last WRMP, to better represent the sources of water supplying the individual WRZs and the network connectivity with them. This increases the number of WRZs, and so means we can plan at a finer level of detail. We can now highlight smaller areas which may be at risk of experiencing shortages of water, and then plan schemes to address this, such as transferring water from another WRZ.

Our WRZs face a number of pressures, some common to all WRZs and some unique to that specific area. This can include existing water resources becoming vulnerable as a result of climate change or licence changes due to environmental legislation. In addition, some geographic areas are predicted to experience significant growth over the coming decades, increasing the demand for water. Section 4 of this document summarises the challenges we face

Southern Water

Figure 3.1: Our supply area and water resources zones



3.3. Planning scenarios

The balance between available supplies and the demand for water can fluctuate throughout the year, and from year to year. However it is important that we ensure that we can supply customers both in an average year and years in which we experience a drought. This variability means that in assessing the future need for water we need to consider different periods or 'planning scenarios'.

The Environment Agency requires us to assess two planning scenarios in our WRMP – the dry year annual average (DYAA) and dry year critical period (DYCP). We have added to these scenarios to ensure that our plan is robust to other water resources situations that we face. Our planning scenarios we have considered are therefore as follows:

- The demand for water expected under normal conditions – **the Normal Year Annual Average (NYAA);**
- the annual average demand in a year with low rainfall, but without any demand restrictions in place – the **Dry Year Annual Average (DYAA);**
- the peak demand over a 7-day rolling period – the **Dry Year Critical Period (DYCP)**; and
- the demand during the autumn period in a dry year (when groundwater levels and river flows are generally at their lowest and sources are operating at their minimum deployable outputs) – the **Dry Year Minimum Deployable Output (DYMDO)**

Each of our WRZs has its own mix of water supply sources and each source reacts differently to weather conditions. Some sources are therefore more susceptible to certain planning scenarios than others. This is considered and explored within the draft WRMP. In our Eastern area it is the annual average demand in a dry year (DYAA) against available supplies that is critical. In the Central area it is the autumn minimum deployable output (DYMDO) period. In the Western area the autumn minimum deployable output (DYMDO) is currently critical, but in the longer term peak demand (DYCP) will also be critical.

3.4. Levels of service

Levels of service set out the standard of service that customers can expect from their water company. The objective of our plan is to ensure that there is enough water available to meet anticipated demands in all WRZs up to our defined level of service and resilience.

We express our levels of service in terms of the frequency of restrictions **(temporary use bans and non-essential use bans)** that our customers are willing to accept **(Customer target levels of service)** and the frequency of Drought Permits and Orders allowing modified abstraction regimes at some of our sources **(Environmental target level of service).**

Our current target levels of service are set out in Table 3.1.

Our pre-consultation research looked at willingness to pay for changes to our previous levels of service, specifically the frequency of Temporary Use Bans (TUBs), and of Emergency Drought Orders leading to rota cuts in supply. Our customers appear to disfavour any reduction in level of service relative to water supply and only weakly prefer an improvement to levels of service. We consider this to be a strong signal that there is limited customer support to change our current levels of service.

A key stated preference by customers and current guidance is that the water supply system should be 'resilient'. We have assessed our water supply system against a range of drought scenarios, including low probability droughts (1 in 500 year). The use of these low probability droughts is designed to ensure that there is no unacceptable risk that the supply system might fail to balance supply and demand given the drought intervention measures and levels of for each supply area.

Table 3.1: Target levels of service

Type of restriction or measure	Annual probability	Frequency (Return period)	Probability of at least 1 occurrence within	
			The first 25 years of our plan	Our 50 year plan
Customer target level of service				
Advertising to influence water use	20%	1 in 5 year	99%	100%
Temporary Use Ban on different categories of water use	10%	1 in 10 year[1]	92%	99%
Apply for Drought Order to restrict water use (non- essential use ban)	5%	1 in 20 year[1]	71%	92%
Apply for Emergency Drought Order to restrict water use	0.2%	Only in civil emergencies (1 in 500 years)	5%	10%
Environmental target level of service				
Drought Permit/Order to increase supplies through relaxation of licence conditions, increase in licensed quantities, or other measures[2]	0.5%	1 in 200 year	12%	22%

[1] *Frequency of first implementation but would be introduced via a phased approach*
[2] *For Hampshire Southampton East and West Water Resource Zones we expect the short term level of service for these Drought Permits and Orders to be less than our target*

Through our draft WRMP we have sought to achieve the target levels of service set out in Table 3.1. We have adopted a 'fully risk based' methodology to test the drought resilience of our plan.

We are confident that in the longer term on average, we will only have to apply Temporary Use Bans for fewer than 6 periods in the next 50 years. We are also confident that on average, we will only have to apply Non Essential Use bans 2 or 3 times in the next 50 years.

Given our proposed approach to make our water supplies to customers more resilient, if we deliver our preferred strategy over the next 50 years, we are confident that in the long term, on average, we may only need apply for temporary abstractions beyond normal environmental safeguards (Drought Permits or Drought Orders) once during the lifetime of our 50 year plan. Our prediction though, is that there is almost an 80% chance that we will not actually need to implement these measures.

Our proposed resilient approach means we expect there to be a less than 10% chance that we will have to resort to restrictions such as rota cuts or standpipes over the 50 year planning period of our plan. Our exploration of the impact of severe droughts has suggested that in the longer term we will not require use of environmental Drought Permits and Orders to increase abstractions beyond licenced quantities out to at least a 1 in 200 year drought (0.5% annual probability). Although such Drought Orders and Permits may be required for more extreme events (out to 0.2% annual probability, or 1 in 500 year droughts), Emergency Drought Orders for standpipes and rota cuts will not. This drought resilience means that we plan to meet and exceed the requirements of current guidance.

However, notwithstanding this planned long term resilience, in the short term the situation is potentially very different, particularly in the Western area. Our customers in the Western area will therefore experience a reduced level of service for a period of up to 10 years as a result of the Environment Agency's proposed changes to our abstraction licences (sustainability reductions). There is an increased risk that we will need to implement Temporary Use Bans, and to apply for and implement measures secured through Drought Orders until we have been able to develop new sources of water.

As soon as these are in place, our commitments will return to the ones above. But in the short term imposition of restrictions could be as below, caused especially by the proposed changes to our Test surface water abstraction licence, if implemented immediately:

1. We'll be likely to need to implement water restrictions, such as Temporary Use Bans (hosepipe bans), once every two or three years on average. Once implemented, they could need to stay on for a long duration.

2. We'll likely need to apply for a Drought Permit or Order to continue to take water from the environment in droughts one or two times every 10 years on average. There is reasonable likelihood of encountering a ten year period that would require this more often.

Provided our Drought Permits or Orders are approved and can be implemented, we'll only need to resort to extreme water saving, such as rota cuts or standpipes in the street, once every 500 years on average. If the Drought Permits or Orders are not approved, or if they are significantly delayed, we have enhanced risk of need to resort to extreme water saving measures.

Q

Consultation Question:

This plan includes using water restrictions (hosepipe bans) during a drought once every 10 years on average. (In Hampshire and the Isle of Wight this is likely to be once every two or three years on average until at least 2027). Do you support this?

4. Water Futures

We have commissioned an independent view of the challenges in the South East of England entitled 'Water Futures'. This document sets out a number of challenges for the South East of England. We reflect on some of these challenges in the next few sections.

4.1. Our challenges and opportunities

We are facing significant challenges that our WRMP will need to meet and overcome, but also a number of major opportunities. These are summarised below.

Abstraction licence changes to protect and enhance the environment

We supply water in a part of the country that has been classified as water stressed by the Environment Agency, and also an area where the sustainability of future water abstraction is being continually re-assessed. We already know that we will be facing further limitations on how much water is available from our sources, and this will increase the gap between supply and demand in parts of our supply area. Our existing asset base will need to be transformed to cope with these challenges. The difficulty we face is planning for these changes, as the timing and extent of these could vary considerably, both over time and between WRZs.

Some licence changes, particularly in Hampshire, are already being proposed by the Environment Agency. Others are being driven by the Environment Agency's application of the Water Framework Directive, a European directive which aims to protect and improve the water environment. The Directive defines a list of mitigation measures (referred to as environmental improvements) which need to be implemented by a set deadline, the next one being 2027, to improve the water environment. The application of a set deadline of 2027 across our supply area means that many of our sources could face new limitations all at the same time, the scale of which could be very significant. We also have sustainability reductions which are driven by water quality deterioration trends at individual sources. These tend to be spread across our planning period.

Our WRMP will need to respond to these known and currently uncertain licence changes by identifying both demand management and new resource developments to enable us to meet our statutory duty to supply customers. The uncertainty of when these future reductions will come into play and the extent of the reductions does make planning for the future difficult. Our work to date, and discussions with the Environment Agency, has however enabled us to plan for a number of different possible outcomes from the investigations in the Eastern, Central and Western areas, and to ensure our Plan is flexible as a result. The scale of potential licence changes represents one of the most significant challenges we face. We know that we will need to find innovative solutions to address deficits in our supplies.

Consultation Question:

Q Do you think it's a good idea to plan for future changes to our abstraction licences which could mean we need to invest in new sources?

Climate change

Climate change is likely to lead to a generally drier and warmer climate with an increased frequency of extreme events (storms, floods, droughts etc.). We need to ensure that we account for this, along with uncertainties in predicting climate change effects, in our assessment of water supply and demand.

We need to ensure that our strategies are adaptable to possible climate change effects, and that we consider not just possible climate change effects on our existing sources of water but on potential new schemes as well. We achieve this by investigating different climate change outcomes, and ensuring our proposed strategy is resilient to the different potential futures.

Playing our part to support a resilient South East economy

We supply water to an area that is officially identified as an area of significant population and economic growth. Our forecasts indicate that population within our supply area is expected to grow to over 3 million people by 2045; representing a 22% increase. Total connections to our water supply system are expected to increase by 27% to just over 1.4 million.

We need to have effective, integrated water infrastructure that is fit for purpose to meet the needs of a growing population. We innovate to create sustainable communities, to manage the increased demand for water, and work with government, local authorities and developers to make new homes more water efficient. We work closely with other water companies to share resources, as part of the Water Resources in the South East group. This helps us to develop integrated plans for a resilient water supply network.

Consultation Question:

Q Do you think it's a good idea to trade water with neighbouring water companies in a 'regional grid' as part of the Water Resources in the South East group?

Making sure our bills are affordable for all our customers

It costs a lot to maintain and run our water supply network. We must balance day-to-day costs with investing for the future, whilst keeping bills affordable for our customers. The approach we have adopted to developing our WRMP is to invest to ensure our supplies to customers are resilient, but to ensure that we carefully phase that investment over time in response to our forecasts of supply and demand. We use complex computer modelling techniques to assess a range of possible futures, including different scenarios for growth, licence changes and climate change. From these we can be confident that investment we plan to make now, and in the next 5-10 years, will be appropriate under any future we face.

Some of the new technologies that we will need to use in the future, for example water re-use or desalination, can be expensive to build and operate. Many of these options would only need to be fully operated in a dry or very dry year, and so we are designing them to be used at a much lower capacity for most of the time. In this way we can keep ongoing operational costs to a minimum.

Target 100

With the support of our customers and regulators, over the last decade we have focused on reducing the demand for water to improve resilience. Our universal metering programme continues to be successful in driving down the demand for water. We are however mindful that metering may not continue to influence water demand to the same degree in the future.

We have set ourselves the target of reducing water use to 100 litres per person per day by 2040 – a reduction of 25%. Some of our metered households achieve this level of water use already. For others to achieve this, water will need to be used more wisely and we will need to innovate. Recycling rainwater for toilet flushing and investing in the latest technology to re-use wastewater to supply industry, farming and drinking water, will help the South East become more resilient.

Q Consultation Question:
Do you support our Target 100 to reduce personal water use to 100 litres per day by 2040?

Drought resilience

Droughts are naturally occurring events and are typically characterised by a prolonged period of abnormally low rainfall, leading to a shortage of water.
Droughts can be of differing lengths and intensities, for instance a short event caused by a hot, dry summer, or a drought over several years where persistent low rainfall over the winter can seriously affect groundwater and river sources. The spatial extent of droughts can also vary widely, from being concentrated in a few catchments, to covering wider areas, such as South East England.

While there is no technical reason why sufficient water supplies cannot be provided to cover all but the most extreme droughts, there is a need to balance the costs to our customers of providing the required infrastructure to maintain supplies in severe droughts, and the potential impact on the environment. To manage droughts of differing severity, we plan to use a range of drought management interventions, which include demand restrictions, supply-side measures and operational management of our sources. The licence changes in our Western area means that we will require permanent solutions to improve our drought resilience, and these will form part of our WRMP. In addition, for the first time, we will be including drought options described in our Drought Plan within the WRMP as this will help us clearly show which events the WRMP will cover and which events the Drought Plan will cover. Depending on environmental conditions, we may need to rely on Drought Orders until we can develop alternative sources of water.

Use of new and innovative sources of supply

Given the scale of known and potential future licence changes, the options for new resources for the future will need to include new and innovative sources of supply, including water reuse and desalination. We have investigated these options extensively, assessing their costs and potential benefits, environmental impacts, and undertaken research with customers on their potential acceptability.

In relation to water re-use, we currently recycle approximately 17% of the water we abstract from catchments. However, we release over 700 million litres a day (Ml/d) of treated wastewater to the estuary and coast. As part of this WRMP we have explored whether options to re-use this water could be cost effectively and sustainably delivered in locations across the Eastern, Central and Western areas.

Similarly, we have assessed the potential for developing desalination plants in each of our three areas, either on the coast or tidal rivers. Both water re-use and desalination plants are expensive to build and operate, but like reservoirs they can provide a reliable source of water for customers. Further innovations and new technology are actively being investigated, including use of graphene as part of the desalination process, which could significantly improve efficiency of this potential water source.

Q Consultation Question:
Do you agree with our plan to start investigating new options for water recycling, desalination and reservoirs now, in case they are needed in the future?

Q Consultation Question:
Do you think water recycling (from wastewater) has a role to play in securing water supplies for the future?

Q Consultation Question:
Do you think desalination has a role to play in securing water supplies for the future?

Catchment solutions

Groundwater and rivers within our supply area can be placed under environmental stress from a range of factors, affecting our ability to utilise sources for supplies to customers. Rising nitrate levels within some sources mean that we are actively pursuing catchment management initiatives to ensure that we can continue to make use of existing sources of supply. Additional treatment of water may be required alongside the management measures in some locations. We employ staff who work exclusively on catchment based solutions with landowners, farmers and other stakeholders across our supply area. We are committed to continuing and extending this approach through our ‘Catchment First’ initiative.

A number of our abstractions are facing known or potential future licence changes due to concerns about the environmental impacts of low flows on protected habitats or species. These are continuing to be investigated, but there is growing support amongst stakeholders, particularly in Hampshire, for catchment based solutions, including river restoration measures, to be implemented for these rivers. These solutions could bring long term environmental benefits to the rivers, and improve their resilience to low flow conditions. However, it has not yet been possible to reach agreement with the Environment Agency and other stakeholders that these solutions would avoid or reduce the need for licence changes. This makes it

difficult for us to include these solutions as water resources options within our WRMP, and for us to secure funding for them in our Business Plan. We will continue to work with the Environment Agency, Natural England and other stakeholders to try to overcome this issue.

Consultation Question:

Q Do you support our Catchment First approach, to work with landowners, farmers and river trusts to improve the health of rivers and groundwater sources before investing in new solutions such as water recycling or desalination?

Other challenges

Following the 2016 EU referendum result, the UK is currently working towards leaving the EU in March 2019. Leaving the EU brings uncertainty, in particular for our demand forecasts, but it could also provide an opportunity for us to shape the future value of the water in the UK. For the time being EU legislation is being incorporated into UK law, and it will be some time before we will know if any changes are then made to the many EU Regulations that we are subject to. The implications of any changes would be incorporated into our next, or subsequent, WRMP.

The scale of potential licence changes we are facing is driving a significant amount of investment in planned new resources. Whilst we have been investigating these schemes as part of the preparation of this WRMP, we will need to complete extensive environmental assessments and secure planning and other permissions before we can build and operate them. Within Hampshire in particular, where a large number of schemes need to be developed by 2027, and also potentially in the Central area, there are risks and challenges to us being able to secure all of the necessary permissions and to build all of the new resources by that date. We will need to continue to work closely with our regulators, local planning authorities and other stakeholders in the planning and delivery of these schemes to respond to licence changes and environmental conditions.

4.2. Key objectives for our draft WRMP

Drawing together the challenges and opportunities outlined above, our Draft WRMP needs to set out a robust strategy to deliver:

Long term resilience and sustainability

We need to develop an effective plan that will provide a reliable water supply now and in the future. Our aim is to:

- reduce the amount of water we need on a daily basis and the amount of water we lose to leaks;
- adapt to risks and uncertainties surrounding sustainability reductions, drought and climate change to achieve a resilient natural environment;
- harness technology to secure new supplies from wastewater seawater, particularly for agriculture and industry;
- recycle used water as a valuable resource;
- collaborate with business and agriculture to achieve sustainable economic growth.

Innovation

We need to embrace new and better ways of doing things. Everything we do is about making sure our services, community and environment are protected, secure and reliable. This is not about keeping things the same, but always looking at innovative ways to improve. We need to embrace new technologies where they deliver solutions that are cost effective and benefit the environment. Innovation includes the way we secure power for our water supply network, potentially increasing our reliance on renewable sources of energy.

Consultation Question:

Q How important is it to you that we use renewable energy (by buying or developing it) to power our water network?

Affordable bills

We need to ensure that everyone can afford to pay for their water services. Our plan needs to be affordable for our customers whilst being environmentally and socially sustainable.

Great customer service

We need to go beyond the basics and serve customer's different needs. We need to ensure that our WRMP is prepared with increased customer engagement, and that we reflect customer preferences in the selection of our proposals.

Best value

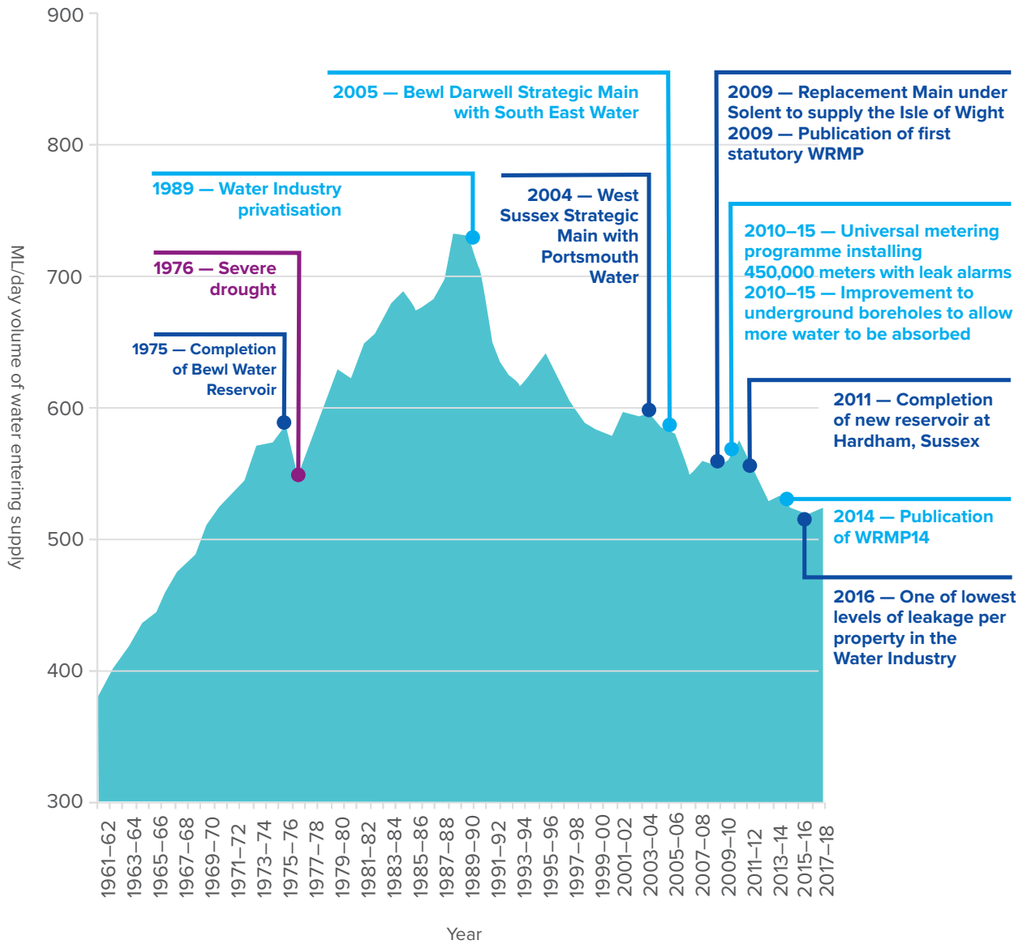
We need to develop a best value plan that takes account of the challenges and uncertainties that we face. Our plan needs to represent the best solution for us, our customers and the environment.

5. Balancing future supply and demand

5.1. Levels of water supplied in the past

Before looking ahead to the future demand and supply of water, it is important to reflect on the changes that have been experienced in the past. There is a widely held view that the amount of water being supplied, and the abstractions that provide the water, have been steadily increasing over time. However, in our supply areas, the reverse is true. Figure 5.1 below provides a summary of how the amount of water that we put into supply each day has changed over the last 50-60 years. It has reduced since the late 1980s, despite an increasing population over the same period.

Figure 5.1 How the amount of water we supply has changed



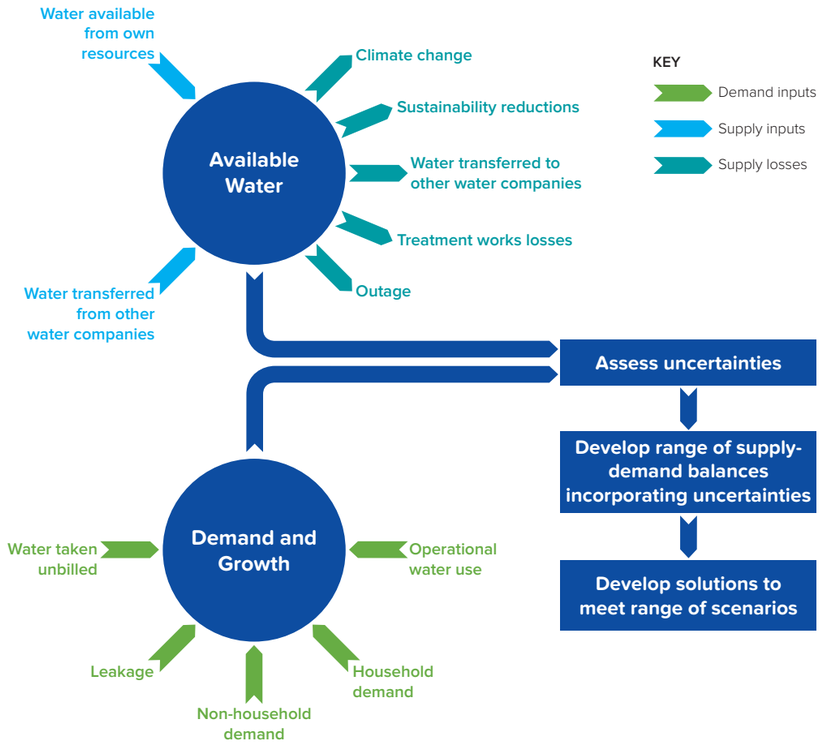
We are proud of the work that we have completed to date, working closely with our customers and other stakeholders to reduce the volume of water we supply each day. Working together we can provide clean, safe and sustainable water, and also protect and improve rivers, reservoirs and coasts for the future.

5.2. An overview of how we balance supply and demand

We need to assess how much water will be needed in the future, so we can make sure the services we provide are effective and fit for the future.

We set out our best estimate predictions of the future supply and demand for water, accommodating risks and uncertainties within the different futures we plan for, and from this derive our supply demand balance. Where the demand for water is greater than supply, this indicates that we will have a deficit in our supply demand balance. An overview of the elements that feed into our supply demand balance are included in Figure 5.2.

Figure 5.2: How we balance supply and demand



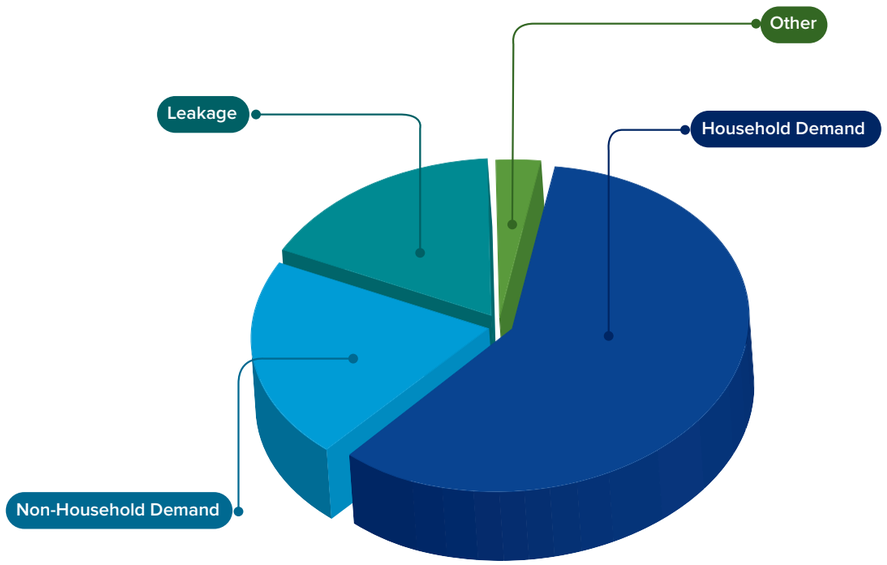
5.3. Our demand forecast

Our current demand and determining the 'base year' of the forecast

For our 50 year WRMP we need to forecast the future demand for water from 2020 to 2070. Our process for determining future demand follows guidance issued by the Environment Agency and recommendations from UK Water Industry Research.

As we explained in section 5.1, the amount of water we put into the water distribution system has steadily declined since the 1980s, despite an increase in population over this time. In 2016/17 we put a total of 532.3 Ml/d (million litres of water a day) into our water distribution system. This can be broken down into various demand components as shown in Figure 5.3.

Figure 5.3: Breakdown of demand components in 2016/17



The starting point for our demand forecast is to select a base year and use this to forecast future demand. Our base year is 2016/17. Summer weather is the main influence on household demand, which is the largest component of our total demand. The summer of 2016 was warmer and drier than the long term average but not sufficiently to classify it as a dry year. By comparison the summer of 2015 reflected the long term average for temperature and rainfall. We therefore combined the 2016/17 domestic demand, using per capita consumption figures for 2015/16.

Components of our demand forecast

To forecast demand we assess each of the components of demand, as shown in Figure 5.3, and determine how likely they are to change over the planning period, and by how much, as summarised below.

Household Demand - Population growth and changes in household composition are key drivers for demand. We have forecast this growth based primarily on housing projections by Local Authorities in our supply area. Population is forecast to grow to over 3 million people by 2044/45; representing a 22% increase. Total connections to our water supply system are forecast to increase by 27% to just over 1.4 million. The combined effect of population and housing growth results in an overall estimated 6% drop in average household occupancy from 2.36 to 2.21. This is in line with expected demographic trends.

We use micro-component analysis (assessing expected water use within the home – e.g. showers, baths, washing and dishwasher machines etc) to forecast domestic demand. We forecast that the total household demand for water in our supply area in the period from 2020 to 2045 will grow by 7%; much lower than the 22% growth in population forecast over the same period. We forecast that people will use less water each, and there will be a reduction in per capita consumption (pcc) by 12 litres/person/day from 124.7 litres/person/day to 112.7 litres/person/day. This partly offsets the increase in demand due to population increase. We have collected data, which includes surveying our customers, and we anticipate that this reduction will be as a result of more water efficient behaviour in the home as well as replacement of older devices such as WCs, washing machines and dishwashers by more water efficient models.

Non-household demand - For non-household demand, we consider a range of sectors and forecast demand for each sector. Total non-household demand is forecast to increase by 15% to 123.0Ml/d by 2044/45. Growth is primarily driven by the financial and business services sector; all other sectors have negligible increases or decreases.

Leakage – Managing leakage is an important part of our water resources strategy. A low level of leakage is desirable, both for the environment, and because it defers the need to invest in new resources which would otherwise be required to meet increases in demand over time. However, it is not necessarily economic to reduce leakage to very low levels, because to do so could involve very large additional costs for relatively small savings of water.

Our approach, and that of our regulators, is to set leakage at a level that is optimal for our customers and society as a whole.

Leakage is comprised of two components:

- **Distribution losses** - losses from trunk mains, distribution mains, service reservoirs and communications pipes which we are responsible; and
- **Underground supply pipe** - losses which are losses occurring between the point of delivery at the property boundary and the point of consumption. These are the responsibility of our customers but following our metering programme and installation of alarms, are much easier to detect.

This plan looks at a combined strategy of further active leakage control in the short term followed by mains replacement programs in the medium to longer term to ensure that we continue our drive down on leakage.

Q

Consultation Question:

Should we do more to reduce leaks, even if it pushes your bills higher?

Other components of demand – We do not anticipate any change to operational water use or water taken unbilled, and these will therefore be constant at the 2016/17 base-year values.

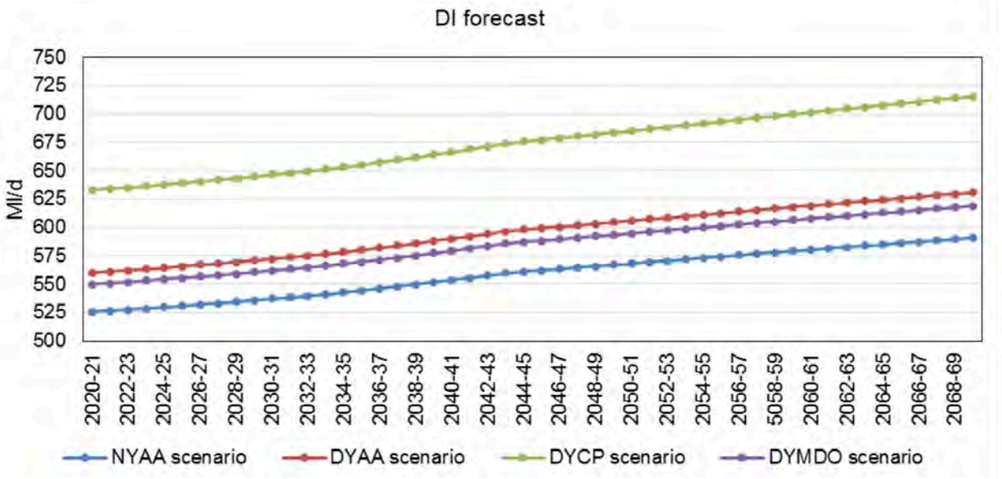
Our demand forecast

Taking all of the above into consideration, we calculate how we expect the demand for water to change over the planning period. Our forecasts are that we expect demand for water to increase by the following amounts under each of the four planning scenarios.

Planning scenario	Increase up to 2044-45 (Ml/d)	Increase up to 2069-70 (Ml/d)
Normal Year (NYAA)	35.5	29.8
Dry Year (DYAA)	37.8	32.8
Peak Demand (DYCP)	42.7	40.2
Minimum DO (DYMDO)	37.1	31.8

Figure 5.4 shows this increase in demand for each of the planning scenarios we evaluate, described in section 3.3 of this document.

Figure 5.4: Demand forecast up to 2069-70 for the four planning scenarios



5.4. Supply forecast

How we forecast future supply

In order to effectively prepare our draft WRMP we need to forecast what water supplies will be available over the planning period. This is our water available for use (WAFU), which is calculated based on:

- **Water available from our resources** – Known as our deployable output, this is the water that will be available from our resources in the future, taking into account various factors, such as, quality and treatment constraints and will relate to a specific severity of drought. We also take into account that the amount of water available will be different depending upon the time of year e.g. groundwater and river flow levels are typically at their lowest during the autumn.

- **Bulk imports and exports** - We transfer water into and out of our supply area. Again, water availability can vary depending upon the time of year and we take this into account.

- **Climate change** – We assess the impact of climate change on water supplies. Current projections of climate change impacts on the UK forecast a general rise in temperature and sea level and changes to the pattern of rainfall.

- **Sustainability reductions** – A number of our sources will definitely be affected by sustainability reductions (licence changes) over the period of the WRMP, and others face investigations and potential changes. All abstractions are operated within the terms of an abstraction licence. Many of these licences were issued in 1965 and the Environment Agency considers that the terms of some of these licences could cause environmental damage, or could have an impact on sites with environmental designations. Our licences are reviewed, and if they are identified as having an unacceptable risk to the environment, the Environment Agency requires that we find and implement solutions to the problem. This may include placing restrictions and controls on the way the licence can be used in future. We have assessed the impact of these changes on our sources.

- **Process Losses** – When we treat water, there are some limited process and operational losses. We account for these in our supply forecast.

- **Outage** – Unplanned outages can occur for a variety of reasons, such as mechanical failures or quality issues. Planned outages occur where we need to undertake maintenance or improvement works. We include provision for outages within our supply forecast.

Traditionally WRMPs assessed the future based on the environmental conditions that have been experienced in the past. For this WRMP we are utilising a method of forecasting, called stochastic modelling, that allows us to select statistical data over 2,000 years from a master set of 100,000 years. This improved data set allows us to plan for a wider range of possible futures. We have re-assessed the deployable output of our sources since our last WRMP using this approach.

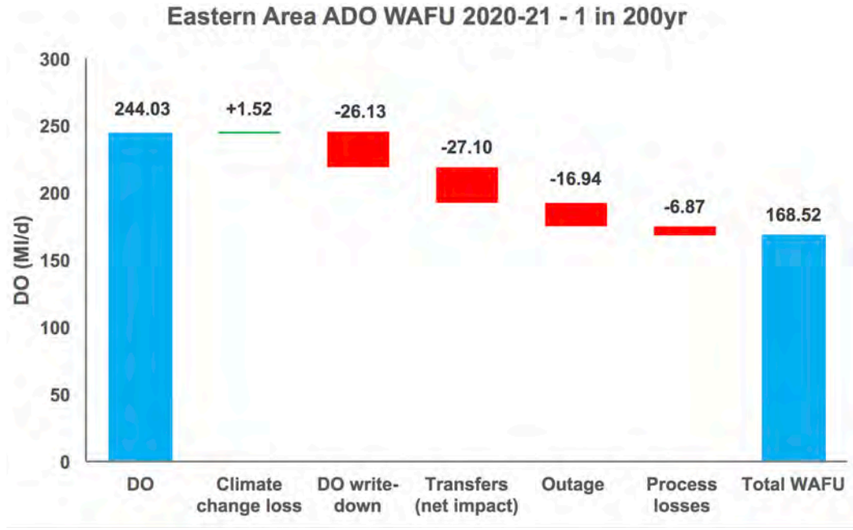
Supply forecasts for the areas we supply

Our assessment of our supplies, based on various different scenarios, is set out below for each of the supply areas in turn. The charts (figures 5.5 to 5.11) tell us the following about our regions:

Eastern area

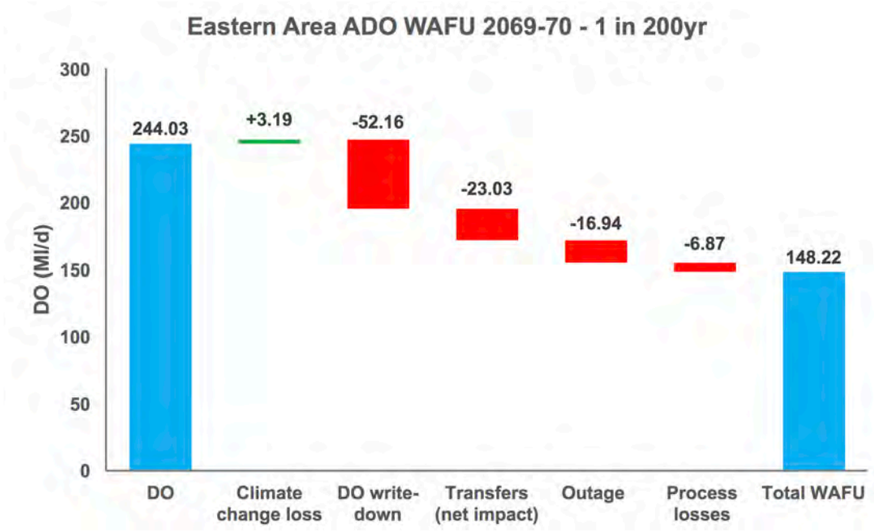
At the start of the planning period (2020-21) in a 1 in 200 year drought, our WAFU in the Eastern area is as shown in Figure 5.5 below. We calculate WAFU as being 168.5 Ml/d (million litres / day).
During the planning period in the Eastern area, our available supplies (deployable output) for the region are expected to rise as a result of an increased yield from the River Medway Scheme. However we are anticipating water quality issues within our Kent Thanet WRZ due to the level of nitrates within the water, reducing the amount of water available from our sources.

Figure 5.5 Eastern area WAFU for 1 in 200 year drought (ADO) at start of planning period



Whilst we have not yet been notified of any certain sustainability reductions, it is possible that we will need to make changes to some licences by 2027 to protect and enhance the environment. We have allowed for different levels of reductions in the different estimates in our forecasts.

Figure 5.6: Eastern area WAFU for 1 in 200yr drought (ADO) at end of planning period



Climate change impacts vary substantially between WRZs. In Kent Medway West WRZ we are predicting an increase in water available from climate change due to improved inflows into the reservoir system and the influence of wetter winters. Kent Medway East is relatively insensitive to climate change and in the groundwater dominated Kent Thanet WRZ, there is climate change uncertainty that could lead to a gain or loss of deployable output.

On the above basis, our forecast is that by the end of the planning period, the WAFU is calculated as 148.2 Ml/d) in the Eastern area, as shown in Figure 5.6.

Central area

At the start of the planning period (2020-21) in a 1 in 200 year drought, our WAFU in the Central area is as shown in Figure 5.7 below. We calculate WAFU as being 157.7 Ml/d (million litres / day) at MDO. We are not expecting significant changes to our overall deployable output in the Central area however we have reduced the amount of water we expect to obtain from some of our sources due to water quality and treatment capacity. Drought vulnerability across the area varies depending upon the type of source within each WRZ.

Whilst we have not yet been notified of any certain sustainability reductions, it is possible that we will need to make significant changes to our licences by 2027 to protect and enhance the environment. The potential scale of these could be significant. We have allowed for this in our estimates. The Sussex North WRZ shows the greatest vulnerability to climate change. This reflects the reliance on large surface water resources in this zone and licence constraints that limit abstraction at low flows. We estimate WAFU at the end of the planning period as 86.4 Ml/d.

Figure 5.7 Central area WAFU for a 1 in 200 year drought (MDO) at start of the planning period

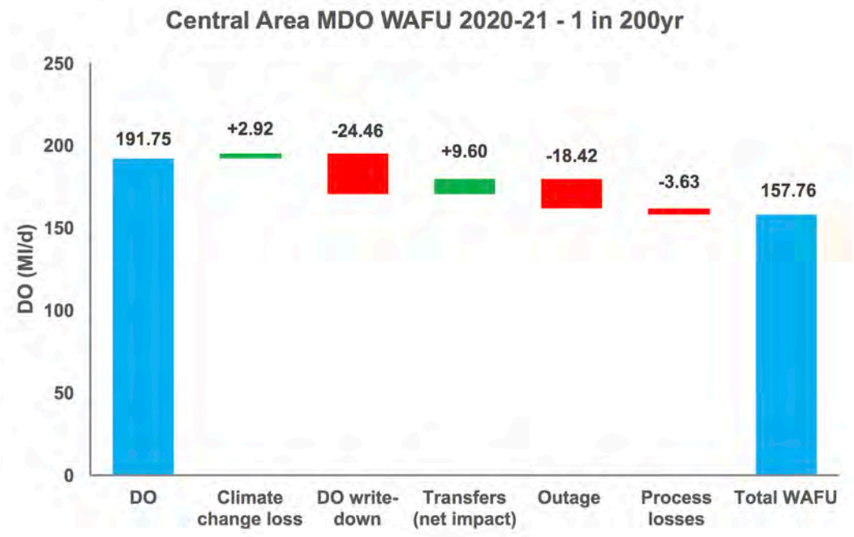
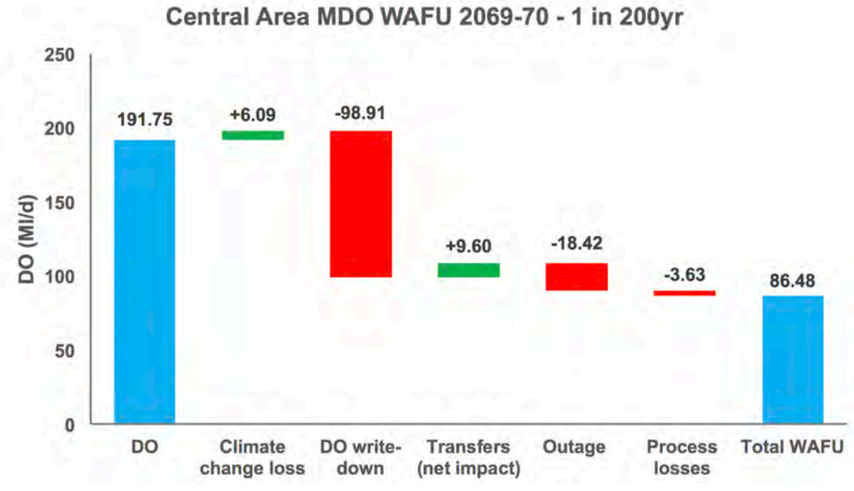


Figure 5.8: Central area WAFU for 1 in 200yr drought (MDO) at end of planning period



Western area

Our current WRMP included a number of major schemes in response to the Environment Agency's changes to our Itchen ground and surface water licences, to seek to maintain the supply-demand balance. We planned to implement these schemes in advance of the licence changes coming into effect, to protect supplies to customers, and have undertaken significant investigation and assessment of those schemes since 2007. Whilst one of these major schemes will be operational from early 2018, we have however been unable to implement two of the major schemes due to changing circumstances relating to licences.

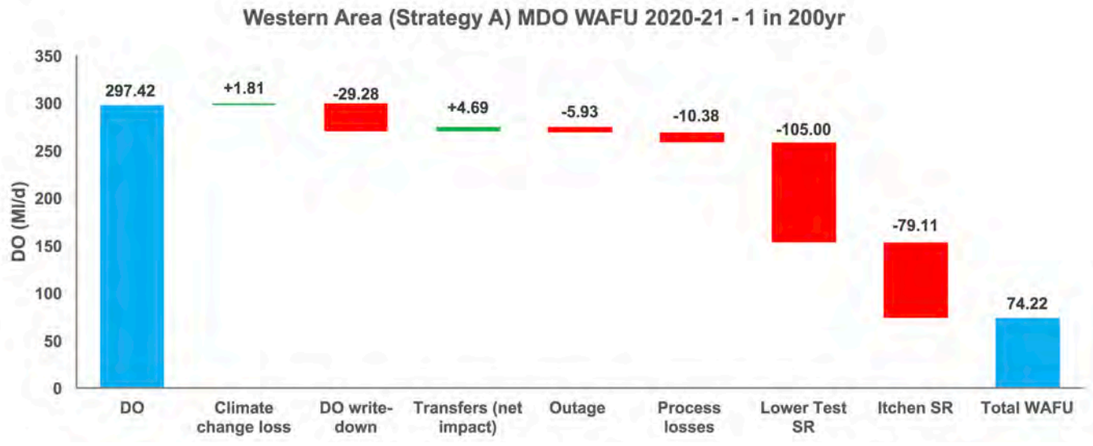
During 2016 and 2017 the Environment Agency notified us of additional changes it wished to implement to our Test surface water source, and a change to an Environment Agency licence in the Candover valley. The

Environment Agency has also served notice that it wishes to impose the River Itchen licence changes in full immediately. As a direct result of the Environment Agency's proposed licence changes we anticipate that in dry or very dry environmental conditions we will lose a significant proportion of our currently available water supplies in Hampshire.

In order to maintain supplies to customers following the implementation of these licence changes, significant investment in new water resources will be required. These licence changes make the area drought vulnerable, both in the period until new resources can be made available, and through the planning period. We have registered objections to the proposed licence changes and as a result, the government has asked the Planning Inspectorate to appoint an Inspector to hear the respective cases at an Inquiry, due to commence in March 2018.

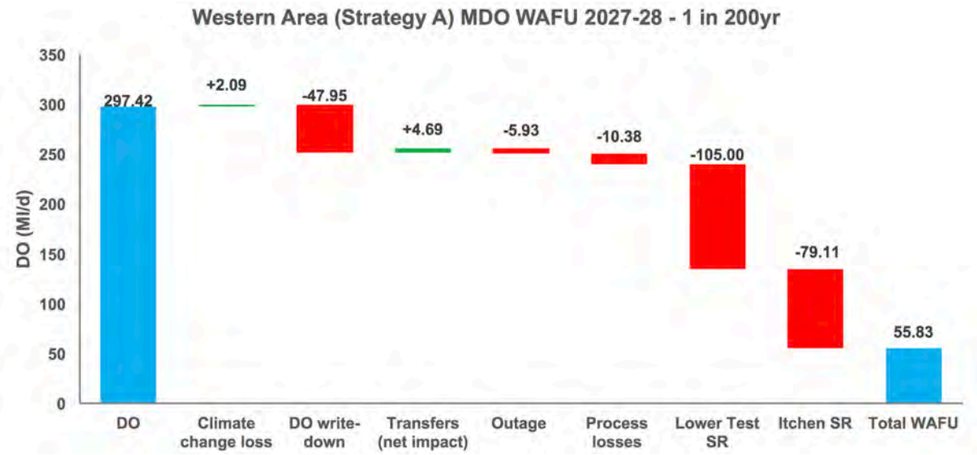
Given the complexities of the number of licence changes being proposed, we have modelled a number of strategies and sensitivity tests for the Western area to test the differences between outcomes. More information on these strategies is in Annex 11. Those for Strategy A (the full known licence changes) are represented below. If implemented in full, the known changes to licences would be partly implemented immediately, and partly in 2027. At the start of the planning period, with the Environment Agency's licence changes partly implemented, we estimate that WAFU in the Western area in a 1 in 200 year drought would be 74.2 Ml/d.

Figure 5.9 Western area (Strategy A) WAFU for 1 in 200 year drought (MDO) at start of planning period



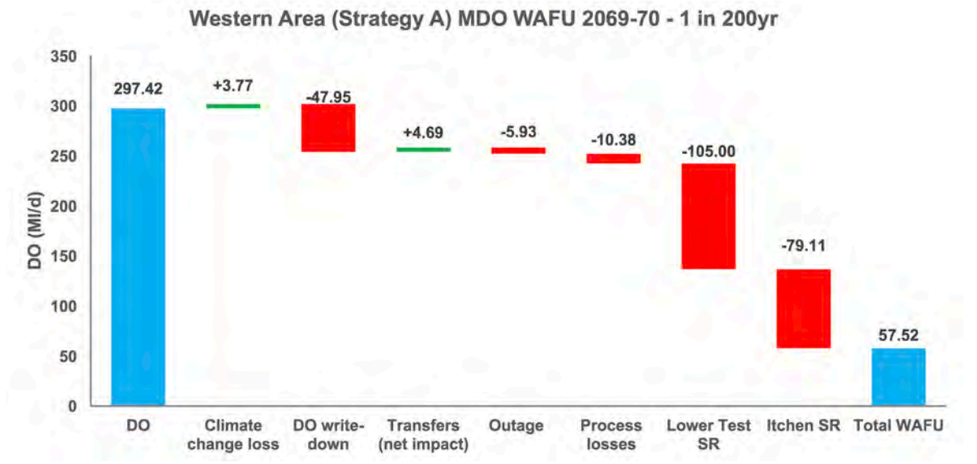
In addition to the second part of the Environment Agency's notified licence changes to our Test surface water source, we anticipate that there will be a need for further licence changes at other sources in the Western area by 2027. These licence changes will be proposed by the Environment Agency in order to protect and enhance the environment, to comply with the Water Framework Directive. We have allowed for this in our estimates. As a result of these known and potential licence changes, we have estimated our WAFU for the Western area in 2027-8 to be 55.8 Ml/d.

Figure 5.10 Western area (Strategy A) WAFU for 1 in 200 year drought (MDO) at 2027-28



By the end of the planning period (2070) we estimate WAFU for the Western area as 57.5 Ml/d.

Figure 5.11 Western area (Strategy A) WAFU for 1 in 200 yr drought (MDO) at end of planning period



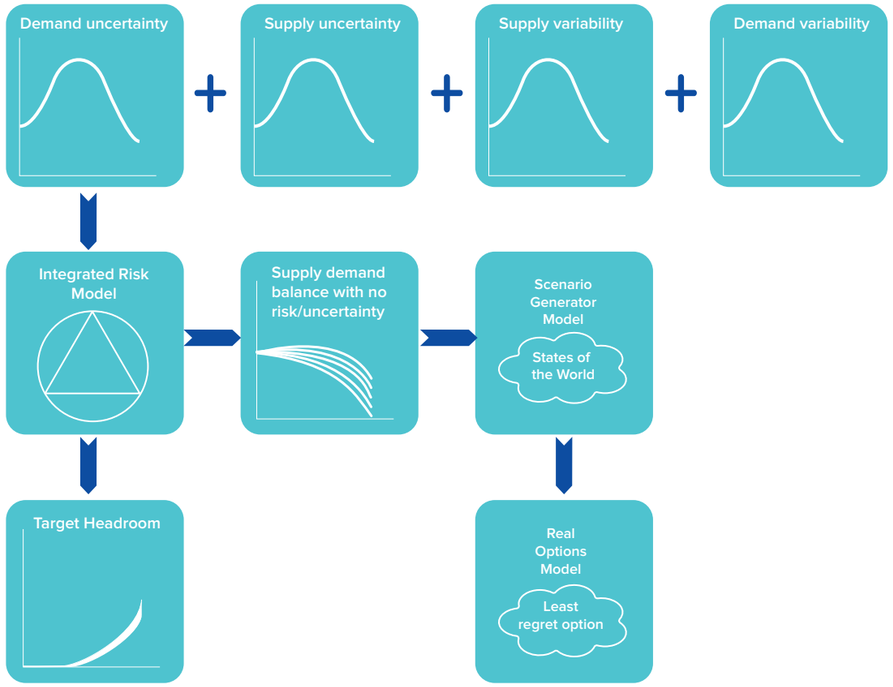
5.5. Planning for uncertainty

How we incorporate uncertainty into our forecasts

We recognise that there are a number of uncertainties associated with our demand and supply forecasts. We therefore sensitivity test the impact of these uncertainties on our forecasts and build in an allowance into our supply-demand balance, traditionally called target headroom (a surplus of supply to allow for uncertainty in supply and demand forecasts). To calculate our approach to risks and uncertainties we use a series of models as shown on Figure 5.12, summarised below:

Integrated risk model – this provides an estimate of target headroom and by taking into account a range of risks and uncertainties provides an integrated risk profile of the supply-demand balance that could be encountered in any one year.

Figure 5.12: How we model for uncertainty



Scenario generator model – this uses a technique to quantify risk by simulating a range of possible outcomes, the probabilities of their occurrence and generating a range of supply-demand profiles that occur at different drought scenarios. These scenarios are called 'states of the world'.

Real options model – this is a decision making tool that allows for an examination of possible futures – this is described in more detail in section 7.1 of this document.

There are two main sources of uncertainty that we model:

- uncertainties associated with forecasts of long term influences on supply and demand; and
- uncertainties associated with inaccuracies in our measurements and modelling outputs.

These approaches replace the traditional 'Target Headroom" approach to risk and uncertainty.

Uncertainties in our demand and supply forecasting

For our demand forecast, we examine uncertainties in:

- **population growth** – forecasting this involves examining trends and demographic, economic and political factors. The further ahead we forecast, the more potential there is for projections to change. We look at lower and higher population growth in our forecasts.
- water efficiency achieved by changes in **customer behaviour** – customer water use behaviour is an important influence on demand but can be difficult to forecast. We look at high and low efficiency scenarios, from a 2% to 22% increase in demand. This includes varying shower times and use of hosepipes for metered and unmetered customers.

- **climate change** – this is likely to lead to a generally drier and warmer climate with an increased frequency of extreme events (storms, floods, droughts etc.). The component of domestic demand most likely to be impacted by a shift in climate is external use (garden watering, paddling pools etc.) but it may also lead to more frequent personal washing and clothes washing. There is also the possibility of changes in behaviour in response to climate change (e.g. allowing a garden to be 'brown' for parts of the year) such that the shift to drier, warmer climate may not necessarily lead to an increase in consumption. There is considerable uncertainty as to how climate change will manifest itself over various timescales and the behavioural response it will invoke. We have therefore analysed various climate change scenarios, although we found that these did not have a significantly different effect upon our forecast.
- sensitivities around potential changes to **non-household demand**

For our supply forecast, we examine uncertainties in:

- **climate change** - for water resources, there is a relatively wide range of uncertainty as climate change could mean a drier future in which water resources will become more scarce, and wetter futures where increased winter rainfall translates to increased resources. We therefore assess a range of possible futures.
- **bulk imports** – the availability of bulk supplies during drought conditions and reliability of supplies from other water companies could vary according to environmental conditions. Variations in the water supplied through bulk supplies is therefore assessed.
- **sustainability reductions** – this is a key area of uncertainty for us, and is addressed in more detail below.

Achieving sustainable abstraction

We have been an active partner in supporting delivery of the Environment Agency's Restoring Sustainable Abstraction (RSA) programme and more recently Water Framework Directive (WFD) programme. Requirements for investigations, options appraisals and implementation schemes have been set out in the Environment Agency's National Environment Programme (NEP) which is issued every 5 years to align with Ofwat's business plan process to allow funding to be sought.

Over the last 20 years we have undertaken investigations and implemented schemes to improve the environmental sustainability of our abstraction base, including the revocation of an abstraction licence at a groundwater source in the Test valley, the reduction in licence volumes at a source in Sussex (North Arundel) and river restoration to a stream on the Isle of Wight (Lukely Brook).

We believe it is in the best interest of customers and the environment to address unsustainable abstraction as quickly as possible and to look beyond the 5 year NEP / business planning cycle to ensure future risks are addressed. This will ensure optimal solutions can be implemented taking account of the long term availability of supplies. As well as being supportive of the Environment Agency's most recent sustainable abstraction programme, we are also developing a long term environmental forecast. This will consider future scenarios taking account of climate change and its impact upon sustainable abstraction as well as other drivers such as behavioural change.

There are a number of drivers that must be addressed in order for a sustainable abstraction regime to be achieved. These include protecting habitats and species designated under the Habitats Directive, safeguarding Sites of Special Scientific Interest (SSSIs) and protecting Biodiversity Action Plan (BAP) species. In addition the Environment Agency's sustainable abstraction programme now strongly emphasises the WFD objective to ensure water bodies do not deteriorate as well as improving water body status where this is achievable.

A number of investigations are ongoing and the magnitude and timing of the next round of sustainability reductions is not likely to be known until 2023. Sustainability reduction scenarios (lower, middle and upper)

have therefore been developed for each WRZ to test what the impact of differing levels of reductions might be.

For our **Eastern area** there are no sustainability reductions in the lower and middle scenarios. For the upper scenario, estimated sustainability reductions from 2029, are 28.6Ml/d for PDO and 23.0Ml/d for MDO/ADO.

For our **Central area** there are also no sustainability reductions in the lower and middle scenarios. For the upper scenario, the estimated sustainability reductions from 2029, are 74.9Ml/d for PDO and 53.1Ml/d for MDO/ADO.

For the **Western area**, as well as the lower, middle and upper scenarios, we have also considered the timing of the known sustainability reductions on the Test surface water and Itchen ground and surface water sources. Strategy A is represented in this document, with the outputs from other sensitivity testing set out in Annex 11. Strategy A takes as its starting point the licence changes to the Test Surface water and Lower Itchen sources notified by the Environment Agency. This sees the implementation of Itchen and Test sustainability reductions in 2017, and a further phase of Test surface licence change in 2027. These changes result in immediate sustainability reductions in PDO of 174Ml/d in all scenarios, rising to 174 - 223Ml/d across the three scenarios after 2027. The immediate MDO impacts are 184Ml/d in all scenarios, rising to 184 - 220Ml/d across the three scenarios after 2027.

Future scenarios

On the basis of all of the above, Figure 5.13 shows the water we have historically input into our supplies and the possible future supplies that may be required in the future based on the scenarios we have tested. As the figure clearly shows, the future is uncertain, and we could experience a wide range of potential futures, each of which represent slightly different challenges for us to meet and overcome. Changes to our demand in the future tend to take place gradually, over a sustained period of time, making them relatively straight forward to accommodate within our WRMP preparation. Changes to supplies as a result of sustainability reductions are either immediate or very short term, and can be very significant in scale, making them harder to plan and accommodate within our WRMP.

However, our modelling techniques allow us to explore this variability and to identify 'several states of the world' that we should plan to accommodate within our WRMP. We are then able to weigh up the risks associated with these, and to identify the 'least regret' set of options for us to implement to ensure we have resilient supplies for customers.

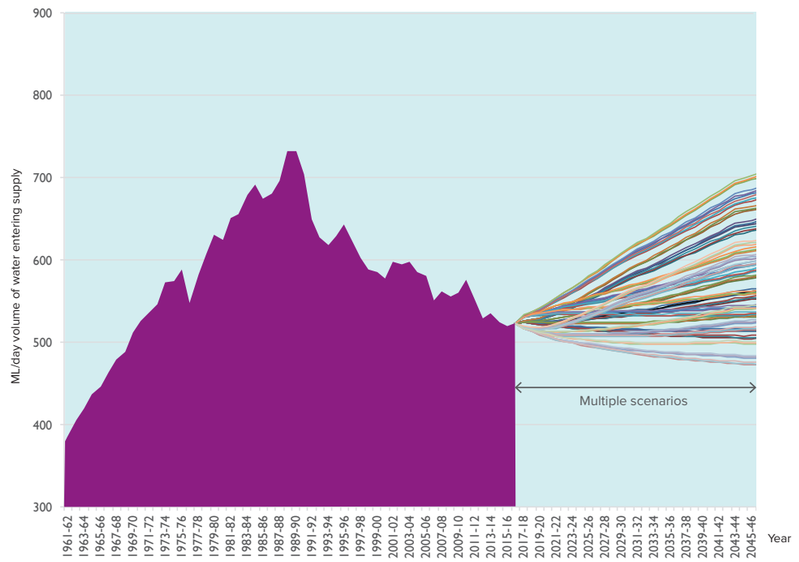
Consultation Question:

Q Do you think we should plan for a wide range of possible 'futures' and how much we may need to supply in each?

Consultation Question:

Q We have developed a long-term environmental forecast. Do you agree with how we have taken this forecast into account in our plan?

Figure 5.13: Water we have historically input into supplies and possible future supply scenarios



5.6. Summary of the supply-demand balance

For each of our areas, we have calculated the future baseline supply-demand balance during a 1 in 200 year drought. These are presented as a series of probabilistic distributions, representing a range of possible futures that we then feed into our decision-making process.

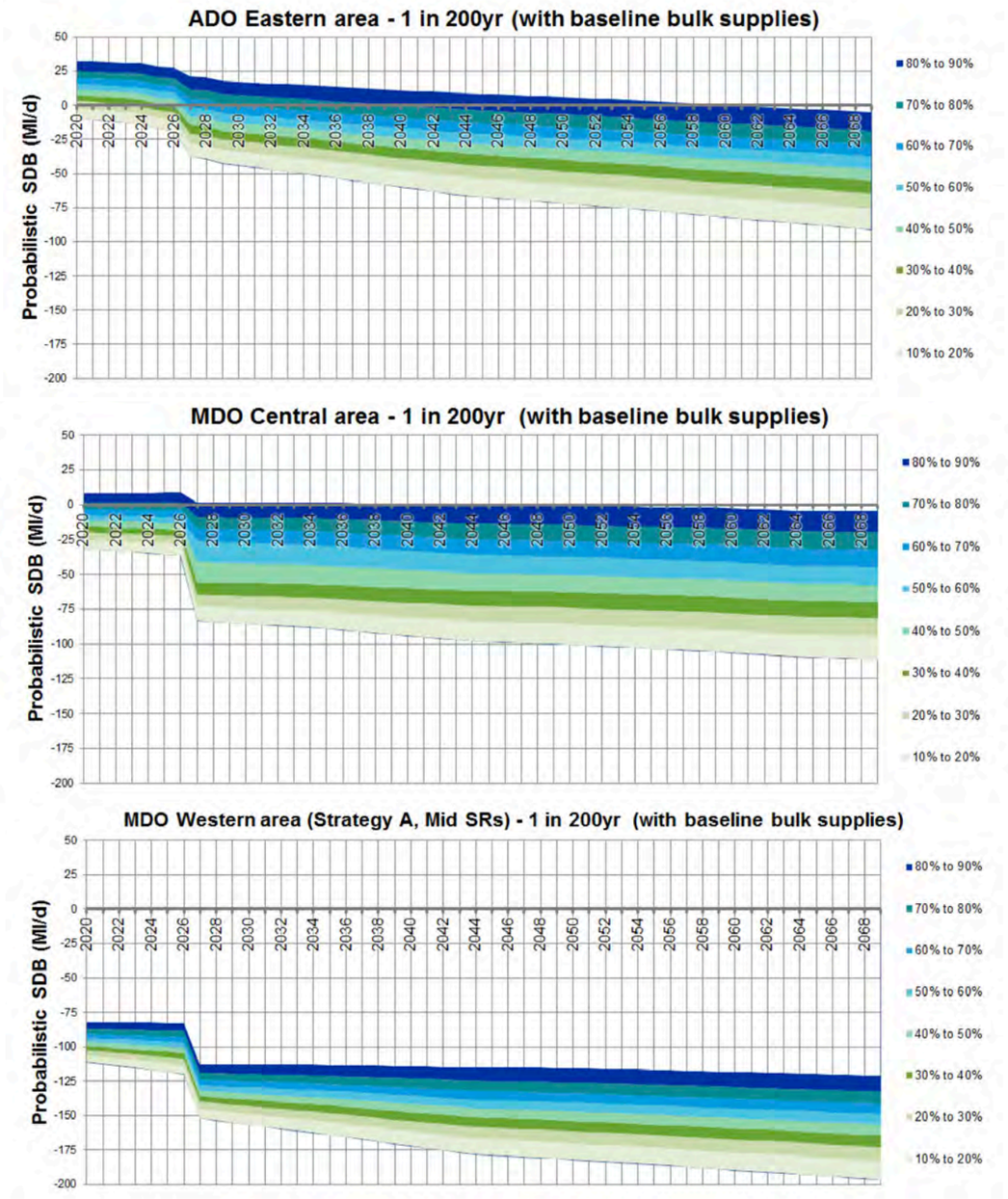
In our Eastern area, we anticipate that in 2027-28, during a 1 in 200 year drought our supply demand balance will move from surplus to deficit as a result of potential sustainability reductions. A further major influence for this area is the water that is exported to South East Water.

In our Central area during a 1 in 200 year drought, we anticipate that our supply demand balance would move into deficit early in the planning period and with a sharp decrease as a result of potential sustainability reductions in 2027-28. The bulk import of water into the area will serve to lessen the effect of any immediate deficit as well as the availability of Drought Orders and Permits.

In our Western area, despite us expecting a reduction in the demand for water, with the introduction of sustainability reductions in 2017 on the Itchen and Test, and the further known reduction on the Test in 2027, there will be a significant supply demand balance deficit throughout the planning period for the Western area during a 1 in 200 year drought event. The risk of further sustainability reductions in 2027 exacerbates this potential deficit. The bulk import of water into the area lessens the deficit, but there is significant reliance on securing Drought Orders and Permits.

The graphs overleaf (Figure 5.14) illustrate the potential supply demand balances in the Eastern, Central and Western areas. The colour banding represents the different potential balances between supply and demand that may be experienced, depending whether we experience more or less challenging futures. The "0" line across the centre of each graph represents a balance between supply and demand. Where the coloured bands go below this line new demand management or resource development schemes need to be implemented to restore the supply demand balance. The bottom graph for the Western area highlights the significant deficit under any future.

Figure 5.14: The baseline supply-demand balance distributions at the 'severe drought' level



Further information on our supply and demand forecasting is in Annexes 2 to 5.

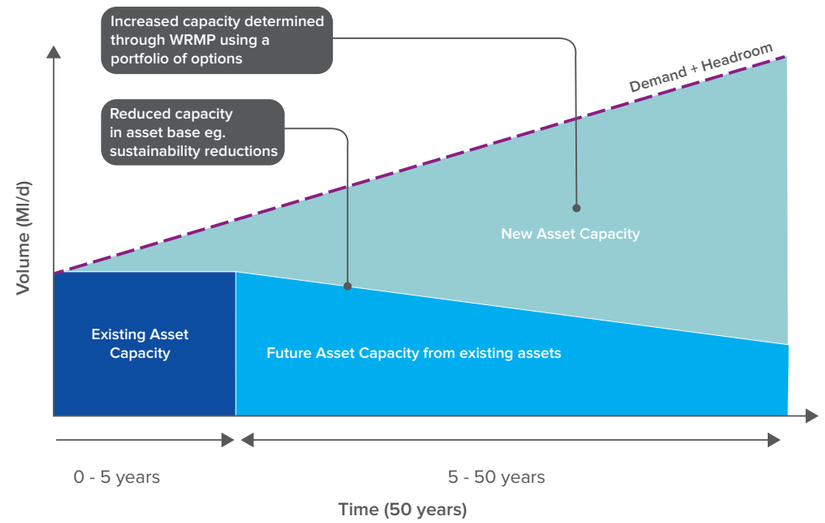
Find out more in Annexes 2, 3, 4 & 5

6. Options appraisal

6.1. Options appraisal process

It is clear from our work in preparing the WRMP that there will be deficits in our water supply balance across our supply areas during the plan period. We need to make sure we plan to respond to this, identifying appropriate demand and supply side schemes to maintain resilient supplies for customers. We plan to bridge the gap between the volume of water our existing assets can provide, and our future demand including headroom, through a process of options appraisal, as shown in Figure 6.1.

Figure 6.1: Role of option appraisal process in meeting the future demand for water

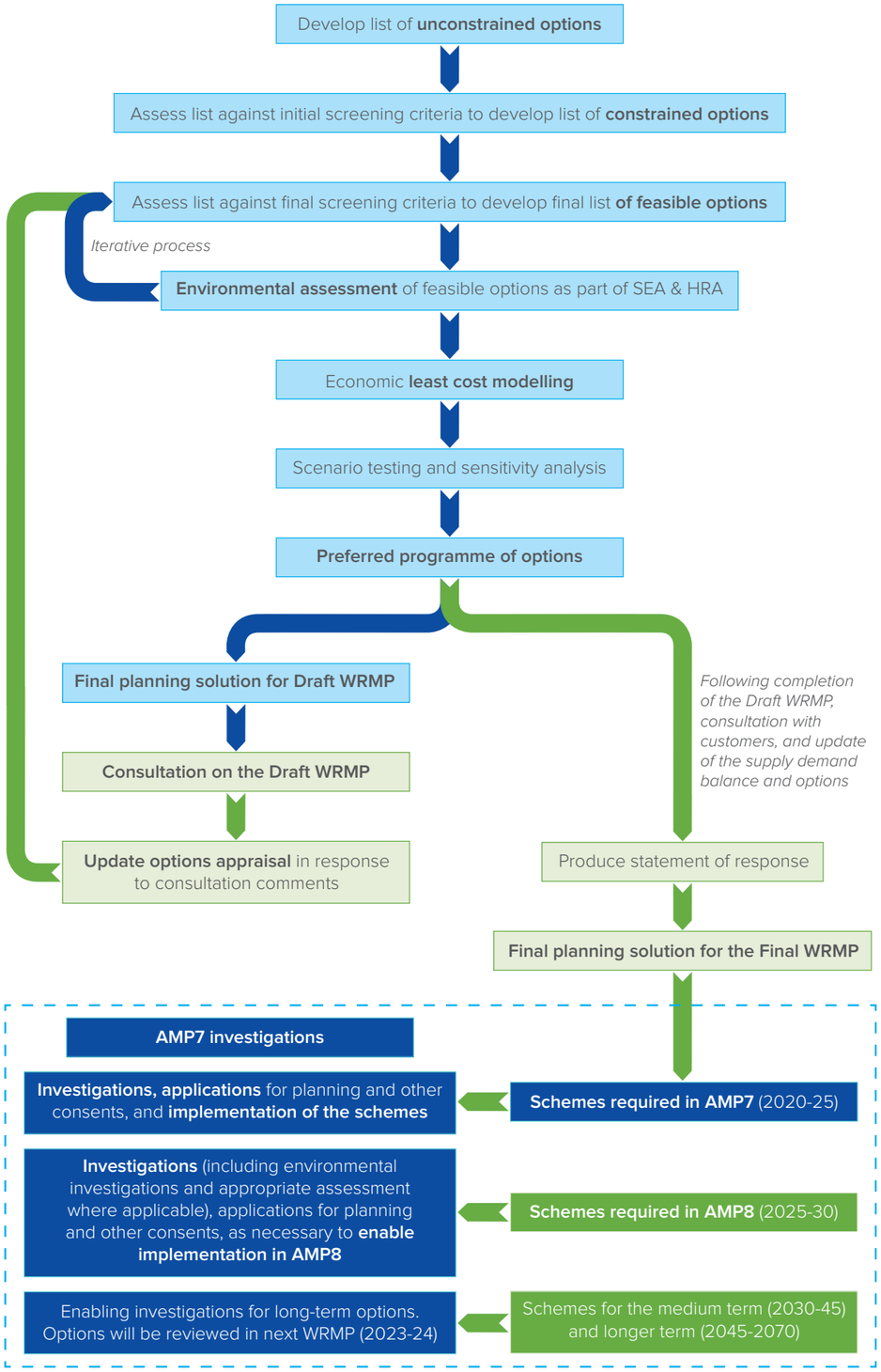


The options appraisal is a critical stage in the development of the WRMP. We identify and assess a wide range of options to both increase water supply (supply side options) and to reduce water demand (demand management options). Our options appraisal process follows industry guidance issued by the Environment Agency and recommendations from UK Water Industry Research. Broadly, our options appraisal process includes the following stages:

- Identification of an **unconstrained list of options.**
- Screening and filtering of the unconstrained list options against initial screening criteria to develop a **constrained list of options**. Options that are impractical or have unacceptable environmental or economic impacts are removed at this stage.
- Screening and filtering of the constrained list options against a final screening criteria to arrive at **a feasible list of options**. Feasible options are taken forward into the decision-making modelling process (see Section 7).
- **Environmental assessment** of the feasible options as part of the Strategic Environmental Assessment (SEA) and Habitats Regulation Assessment (HRA) process.

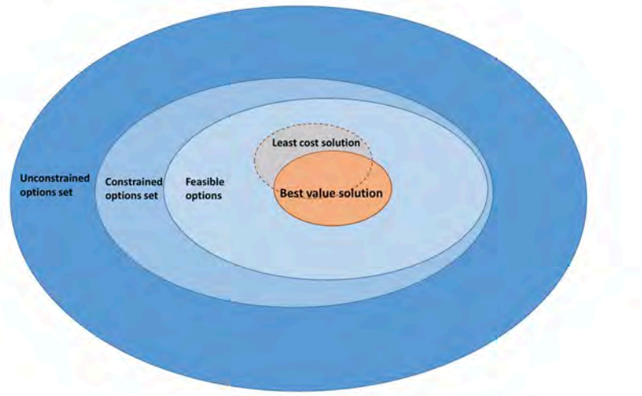
Figure 6.2 shows how the options appraisal process and how it feeds into the implementation of the final WRMP.

Figure 6.2: Options appraisal process



Through this process we screen a wide range of options in order to develop future strategies for each of our areas, as set out in Figure 6.3. Where we can, these will be the best value solution for our customers taking into account a range of social and environmental costs.

Figure 6.3: Option screening process



Unconstrained list of options

The first stage of the process involves creating a high-level list of options. In developing this list, we take account of government policy and aspirations, include options from previous WRMPs and identify new options in close consultation with customers and stakeholders.

The unconstrained list of options includes both options to reduce demand (demand management options) and increase water supply (supply-side options). Demand management options can be effective in controlling what might otherwise be unrestricted growth in demand for water. The implementation of demand management measures is an important component of our approach to water resource planning.

A table showing the unconstrained options list is included in Annex 6. Each unconstrained option is assessed against the first round screening criteria to identify if it should be taken forward onto the constrained list of options. The purpose of this screening process is to remove options that are impractical or have unacceptable environmental or economic impacts. The assessment criteria for options are summarised below (further information is included in Annex 6):

- Is it technically feasible?
- Will it have beneficial environmental outcomes?
- Will it result in increased resilience?
- Can it be implemented in a phased/modular way?
- Does it address water resources planning problem?
- Does it meet customers and regulator expectations?
- Does it avoid disproportionate costs and / or delivers appreciable water?
- Confidence in implementation/output

Based on the answers to the above screening questions, a decision was made as to whether the option should be taken forward onto the constrained list. By applying a consistent set of screening criteria in an objective and systematic approach in this way, we narrow down our assessment to a smaller list of viable options.

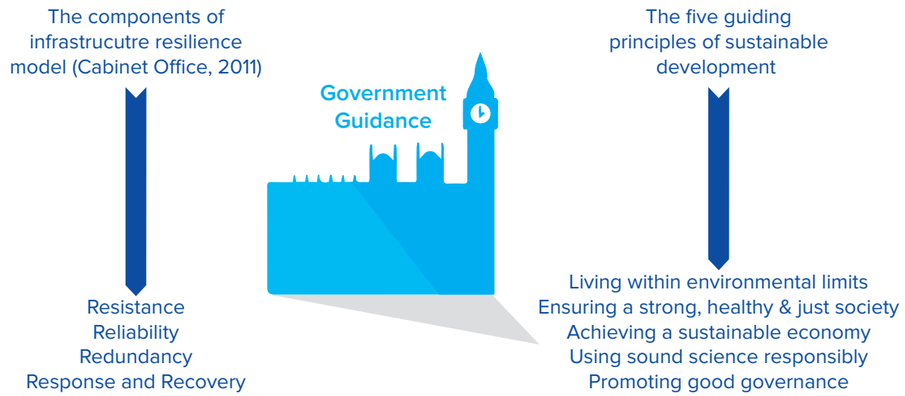
Constrained list of options

We undertake further screening and filtering at this stage to rule out options that are unsuitable due to environmental impacts or have a high risk of failure.

To undertake environmental and social assessment of each option, the assessment utilises the outcomes of the SEA to identify (i) the risk of adverse effects and (ii) the opportunity for beneficial effects (e.g. improved water quality, reduced flood risk, improved catchment management) resulting from the option. Where environmental or social impacts are identified, an assessment is made as to whether they can be mitigated.

The risk of future uncertainties is also taken into account e.g. regulatory changes, acceptability of the option, potential planning constraints and risks or changes in customer behaviour (for some demand management options). The sustainability of each feasible option is considered with reference to the UK government's guiding principles for sustainable development (see Figure 6.4).

Figure 6.4: Government guidance informing the assessment of unconstrained list of options



The government's infrastructure resilience model provides an indication of the confidence that the option will 'deliver' the required reduction in supply demand balance deficit. Where an option depends heavily on assumptions about changes in customer behaviour, or may be significantly impacted by different climatic conditions, it is less reliable than an option that is unaffected by such factors (e.g. water reuse and desalination).

We also consider whether an option is acceptable by evaluating the outcomes of customer engagement and risks in terms of planning uncertainty.

The assessment criteria for the options on the constrained list are summarised below. (Further details on the screening process for this stage is provided in Annex 6):

- Does the outcome of the Strategic Environmental Assessment (SEA) show a risk of adverse effects?
- Does the outcome of the SEA show opportunity for beneficial effects?
- Is there mitigation to address potential impacts?
- Is there dependencies or mutual exclusivities with other options or third parties?
- Is it at risk of climate change impacts or future uncertainty?
- Can it be implemented in a phased or modular way?
- Does it contribute to overall resilience?

Each of the constrained options were objectively assessed against these criteria, with the outcomes recorded within a 'Level One Factfile' (see Annex 6). This factfile provides the basis on which a decision can be made on whether an option is considered feasible or ruled out of the WRMP process. A summary of the rejected options is included in Annex 7.

Feasible list of options

From the assessment of the unconstrained and constrained lists of options, a set of feasible options is identified. These are then subject to more detailed engineering and environmental assessment, to provide consistent and comparable information on each of them as an input to the selection of options for the draft WRMP. The option types in the feasible list of options are shown in Table 6.1.

Table 6.1: Types of options in the feasible options list

Option group	Option category
Demand management	Leakage management
	Metering/tariffs
	Water efficiency (Target 100)
Drought options	Demand interventions
	Supply interventions
New water	Desalination
	Groundwater abstractions (new)
	Surface water abstractions
Storing water	Aquifer storage and recovery
	Reservoirs
Water reuse	Indirect potable water reuse
	Industrial water reuse
Managing the water environment Trading water	Catchment management (Catchment First initiative)
	Bulk imports and exports supplies
Managing existing assets	Licence trading
	Asset enhancement
	Enabling transfers (inter-zonal)
	Borehole rehabilitation

A brief summary of the option types is set out in Figure 6.5.

The more detailed assessment of the feasible options undertaken at this stage, includes investigations and assessments to provide:

- Engineering description and designs so we can calculate a cost.
- The earliest potential start years taking account of construction complexity, likely planning constraints and risks, and environmental and other investigations likely to be required to implement the scheme.
- Likely costs – capital expenditure, operating and financing costs.
- Carbon emissions – embodied carbon (the lifecycle carbon emissions of materials used in construction) and operational carbon (emitted through operation of the scheme over its lifetime).
- Environmental and social considerations – impacts and costs informed by the Strategic Environmental Assessment (SEA), more general environmental assessment, Habitats Regulations Assessment (HRA) and its ability to meet the Water Framework Directive (WFD) objectives
- The water savings across a range of potential drought event scenarios.

Figure 6.5: Summary of option types

Demand management options

Enhanced water efficiency

Providing tailored advice to customers and targeted retrofitting of water saving devices

Pros Raises awareness of water saving and reduces demand for water

Cons Expensive for the amount of water saved and does not secure supplies during droughts

Active leakage control

The repair of water mains and connection pipes which leak water

Pros Reduces need to abstract water

Cons Can be relatively expensive and does not help secure supplies during droughts

Permanent acoustic logging

Allows leaks to be located more quickly

Pros Reduces need to abstract water

Cons Can be relatively expensive and does not help secure supplies during droughts

Fixed link pressure reducing valves

Allows us to control pressure in water mains more effectively to reduce leak volumes

Pros Reduces need to abstract water

Cons Can be relatively expensive and does not help secure supplies during droughts

Mains renewal

Replacement of non-polyethylene (non-PE) pipes

Pros Reduces need to abstract water

Cons Very expensive for relatively small savings in leakage (although cost benefit is improved if other drivers are taken into account)

Seasonal tariffs

Higher charges in the summer than during the winter, although overall bills should remain the same

Pros Encourage reduced demand in the summer when the network is under most pressure

Cons Does not secure a reliable supply during droughts and could cause hardship

Metering remaining unmeasured customers

Extension of the Universal Metering Programme

Pros Reduced demand and all household customers paying a metered tariff

Cons Very expensive to install meters in remaining unmeasured households for a relatively small reduction in demand

Enhanced metering of existing metered customers

Enhancements to meter reading regimes or smart metering of existing metered households

Pros Improved awareness of consumption by customers and Southern Water and enables alternative charging mechanisms to be considered

Cons Very expensive as requires widespread meter replacement and system upgrades for a relatively small reduction in demand

Rising block tariffs

A higher charge is made as more water is used

Pros Could reduce demand by up to 5 per cent so we can take less from the environment

Cons Does not secure a reliable supply during droughts and could cause hardship

Drought options

Drought options

Temporary interventions to help reduce the supply demand deficit during drought events

Pros Restrict demand or provide additional water during drought events

Cons Reliability of demand savings is low and assurance that water will be available for abstraction during drought events is uncertain

Supply-side options

Desalination

Saline water is abstracted and turned into drinking water

Pros Reliable water supply in drought, can be switched on and off

Cons High energy use, costs and carbon footprint. Brine by-product to dispose of

Groundwater abstraction

New groundwater abstraction, licence aggregation, recommissioning old licences or increasing surface flows with new groundwater boreholes

Pros Could provide reasonable volume of water

Cons Likely to be governed by licence conditions limiting abstraction to certain times. May conflict with WFD status

Surface water abstraction

New surface water abstraction, additional volume from an existing abstraction or relocation of existing abstraction

Pros Could provide reasonable volume of water

Cons Can only take place when river levels exceed the minimum residual flow so not considered to provide much system resilience without assiciated storage. May conflict with WFD status

Aquifer Storage and Recovery (ASR)

Pumping water from rivers or groundwater in winter to store in underground aquifers

Pros Improves storage to provide extra water in summer and droughts, and makes use of the natural environment

Cons There are few suitable locations in the South East

Storage reservoirs

Building a new storage reservoir or enlarging an existing one

Pros Improves storage for extra water in summer and provides longer term artificially created habitat

Cons Long lead-in times, and impacts on the environment

Indirect potable water reuse

Reusing wastewater to a river for downstream abstraction for drinking water

Pros Reliable supply of water, even in drought, and extra water in the environment

Cons May require relatively expensive treatment processes

Water for industry

Treating wastewater to a higher standard and using for industry

Pros Avoids using drinking water for industrial processes (which is the standard practice at present)

Cons Can be relatively expensive

Licence variations

Changing an abstraction licence with the Environment Agency to allow the abstraction of different volumes of water from existing sources such as rivers or groundwater.

Pros Maximises supplies of water from sources which are not under pressure

Cons The extra water may not always be available all year round or in droughts

Licence trading

Buying existing abstraction licences to abstract water from industry or agriculture

Pros Uses a water allowance which is already available for abstraction

Cons The water traded might not be available if this conflicts, for example, with the 'no deterioration' commitment in the Water Framework Directive

Water treatment works enhancement

Upgrades to treatment processes or capacity at existing water treatment works

Pros Does not require licence changes or external permissions

Cons Regular reviews of existing assets already take place so there may not be many options available

Borehole rehabilitation

Bringing back online disused groundwater sources for which abstraction licences remain

Pros Does not require licence changes or external permissions

Cons May require significant additional infrastructure such as treatment or drilling of new boreholes

Bulk imports and exports

Buying and selling large supplies of water from or to neighbouring water companies

Pros Moves water around the South East to where sources are under pressure and helps deliver a 'regional grid'

Cons Not producing any 'new water'

Catchment management

Working in partnership with landowners and river guardians to better manage the flow and quality of rivers

Pros Low cost compared with developing new water supplies and they provide multiple environmental and societal benefits.

Cons Schemes to address pollution require a long-term commitment and can take time to deliver benefits. River restoration to improve ecological resilience may not be accepted by some stakeholders as an alternative or complement to reducing abstraction.

Asset enhancement

Improvements to Southern Water's existing assets to maximise the DO available within existing licence constraints, particularly addressing network constraints to release 'locked-in' DO

Pros Does not require licence changes or external permissions and makes best use of existing infrastructure

Cons Regular reviews of existing assets already take place so there may not be many options available

We record this information in a Level 2 factfile for each of the feasible options (see Annex 6).

All of the options on the feasible options list are considered to be viable and potentially deliverable, and all of the feasible options are therefore made available for selection in the investment modelling process. Unlike previous stages of the options appraisal process, options are not 'screened out' at this stage.

The information on the feasible options feeds into the investment modelling process to identify the least cost solution for each WRZ. We use this, and subsequent decision-making processes to derive strategies to meet the supply demand balance deficit in each WRZ, as described in section 7 of this document.

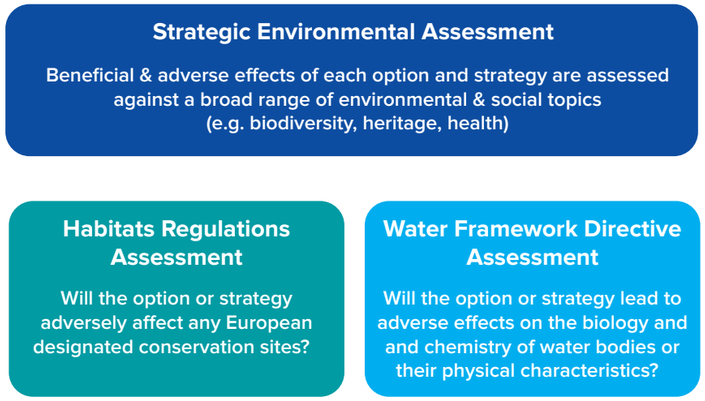
6.2. Strategic Environmental Assessment (SEA), Habitats Regulations Appraisal (HRA) and Water Framework Directive Assessment (WFDA)

In developing our draft WRMP, we carry out detailed environmental and social assessments following statutory environmental requirements, national legislation and guidance.

We engage with customers and the environmental regulators (Environment Agency and Natural England) on our approach to environmental and social assessment, and on our findings. Feedback informs our assessments, including rejecting or modifying options to take account of the environmental concerns or opportunities.

The statutory processes, national legislation and industry guidance that we follow are set out in Figures 6.6 and 6.7.

Figure 6.6 –Statutory environmental requirements - HRA, SEA and WFDA



During our options appraisal process, we assess the beneficial and adverse environmental and social effects through a staged approach. The options are considered against defined environmental and social criteria that increase in detail as we progress through the options appraisal process. The demand management and supply side options are assessed in the same way, and to the same level of detail.

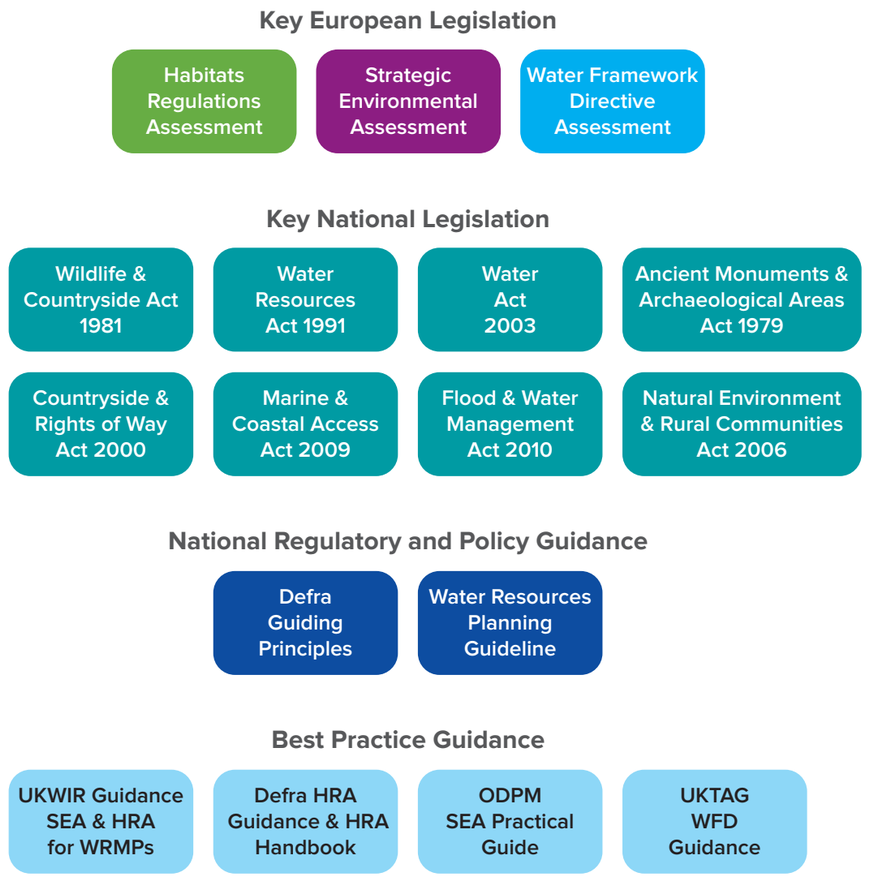
Environmental and social considerations in development of options

We assess the unconstrained list of options against high level screening assessment criteria, which includes:

- Risks to international and national designated sites
- HRA and WFD compliance risks
- Key risks to the water environment
- Key risks to important landscape, recreation and heritage features
- Key planning risks
- Key societal risks

This screening helps identify options that would likely lead to unacceptable adverse effects on the environment or society. We exclude these options from the 'constrained' list of options.

Figure 6.7: Statutory processes, legislation and guidance



The assessment criteria we use for the 'constrained' list of options is more detailed and incorporates:

- Risk of Water Framework Directive (WFD) water body status deterioration
- Risk of likely significant effects on European designated conservation sites under the Habitats Regulations
- Potential effects on biodiversity, flora and fauna (including invasive non-native species) Potential effects on the water environment (including hydrology, hydrogeology, water quality and flood risk)
- Potential effects on archaeology and cultural heritage
- Potential effects on landscape and visual amenity
- Potential effects on other SEA topics (population and human health; air and climate; material assets; soils and geology)

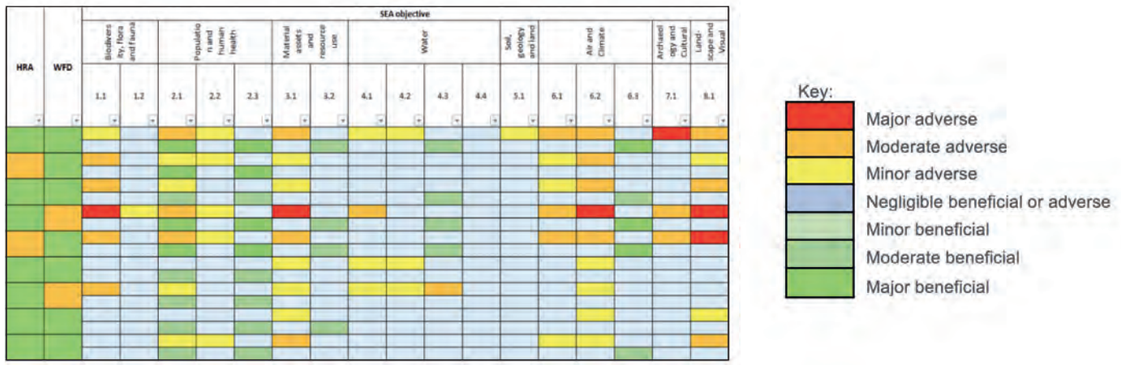
HRA and WFD risks are assessed on a scale from negligible to high, with potential effects scaled from beneficial to major adverse in the SEA. We share and discuss the findings from the constrained options screening process with the Environment Agency and Natural England, along with key stakeholders at our stakeholder meetings. Options are rejected or modified to take account of feedback from stakeholders and the outcome of the screening assessment. Options that have potential for unacceptable adverse effects on the environment and/or on society are excluded from the feasible options list.

Environmental and social assessment of feasible options

Detailed SEA, Habitats Regulations Assessment (HRA) and WFD assessments are undertaken for all the feasible options. We consider both beneficial and adverse effects of each of the feasible options to fully understand the overall potential effects of all of our options. Where applicable, we identify mitigation measures to prevent or reduce any identified significant adverse environmental or social effects of an option. We take these mitigation measures into account in assessing the potential residual effects on the environment and/or society.

Supply options are assessed against WFD objectives and the HRA test of ensuring no significant adverse effects on European designated conservation sites. The Drought Permit and Drought Order options included in our draft Drought Plan and all of our existing water sources are also assessed. The results are summarised in our assessment tables, an example of which is in Figure 6.8 below.

Figure 6.8: Example of environmental assessment



The SEA assessment summary table shows for each scheme the adverse and beneficial effects assessment as two separate rows. Each coloured box in the table indicates the significance of effect assessed against the relevant SEA objective linked to the SEA topic area shown in the top row (e.g. biodiversity, flora and fauna). The key below the table indicates the significance of effect scale. Some SEA topics have more than one underlying SEA objective (e.g. there are four objectives linked to the SEA 'water' topic). The table provides a quick reference overview of the scale of adverse and beneficial effects associated with each scheme and the strategy as a whole.

These findings feed into the investment modelling and the development of our WRMP strategies, as described in Section 7 of this document.

Further details are provided in the SEA Environmental Report (Annex 14), HRA Report (Annex 15) and WFD Assessment Report (Annex 16).

6.3. Engagement and customer feedback

As explained in Section 2.6 of this document, we have been engaging with stakeholders and customers since 2014 on our WRMP.

We have learnt about stakeholders and customers priorities, views on the development of our plans, to find opportunities for collaboration, and learn from examples of best practice. We also engaged with our regulators to keep them informed on the developments of our plan, to explain our methods approaches and report results. This is described in Annex 1.

We have taken into account our understanding of customer preferences from our previous plan. We have also assessed whether those preferences have changed, and collected data through a scheme preference online survey, willingness to pay research and scheme preference workshops.

Our key findings from stakeholders include:

- Stakeholders are keen to work with us on catchment management and to support us doing more of it
- We should work with landowners to help slow and manage flows
- Water efficiency should be the first option we implement to increase the amount of water available, followed by further leakage reduction
- Stakeholders want us to consider demand reduction options before implementing new supply options such as transfers and water reuse
- After demand reduction options, water reuse is the most popular supply option

Our main findings from customers include:

- Customers are averse to accepting reductions in service in exchange for lower bills
- Underground water storage was our customers preferred measure for maintaining a supply-demand balance
- Leakage improvements are the highest priority to customers amongst the water service measures
- For the majority of customers a bill increase to help implement schemes is reasonable

Our pre-consultation was important to better understand customers' views. It has informed us on appropriate levels of service and, together with stakeholders, their views on the supply and demand management options. It has contributed to the development and formulation of our preferred strategy by excluding options that were not likely to meet customer or regulator expectations in the options appraisal.

Consultation Question:

Q Do you support the fact we have selected some water recycling options in preference to desalination to align with the preferences of our customers?

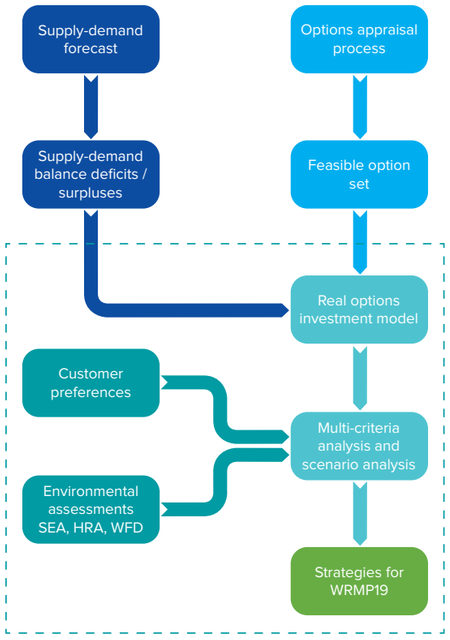
Find out more in Annexes 1, 6, 7, 14, 15 & 16

7. Proposed strategies to meet water futures

7.1. How we develop our strategies

Having identified the scale of potential deficit in our supply-demand balance and developed our list of feasible options, we use an investment model to select a combination of options which will maintain the supply demand balance at least cost. The investment model incorporates all the feasible supply and demand side options in a process shown in Figure 7.1.

Figure 7.1: How we develop our strategies



The draft proposals are formulated through an iterative process of economic least cost modelling.

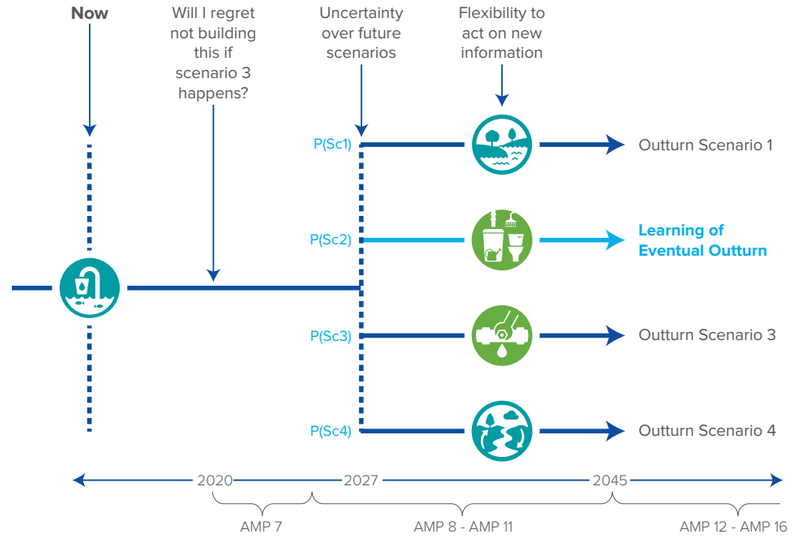
The objective is to define a strategy, comprising a portfolio of schemes that:

- Provides secure supplies of water;
- Protects the environment; and,
- Represents best value for customers.

The real options approach, as illustrated in Figure 7.2, is used to understand how our plan would be best varied in light of possible future scenarios, which result in uncertainty in our future forecasts. Despite uncertainties, our plan must present a preferred set of options, and as a result, a number of schemes may be required to be investigated and promoted in the short term before the uncertainties are better understood. We wish to ensure that the draft WRMP is flexible enough in the short term against a wide range of possible futures.

The real options method therefore allows us to learn about uncertainty over time, build in flexibility so that we can act on new information and ensure that any schemes needed in the relative short term are implemented and do not become rapidly redundant, that is, a 'no regrets' solution.

Figure 7.2: Real options modelling process



Each of our three supply areas (Eastern, Central and Western) have their own decision making models as the three supply areas are geographically separate and effectively isolated for water resources planning purposes. We therefore present strategies for each of the three supply areas separately. We also split our strategies for each of the areas into different planning periods:

- Schemes required in the period 2020-2025 and for which we will fund through the forthcoming Business Plan
- Schemes required between 2025-2030, where investigations are needed to ensure they are feasible before we produce our next plan in 2023 and any required planning permissions or consents are obtained
- Schemes that may be required in the medium term (to 2045) or longer term (to 2070) but which are subject to greater uncertainty and will need to be confirmed or revised in subsequent WRMPs.

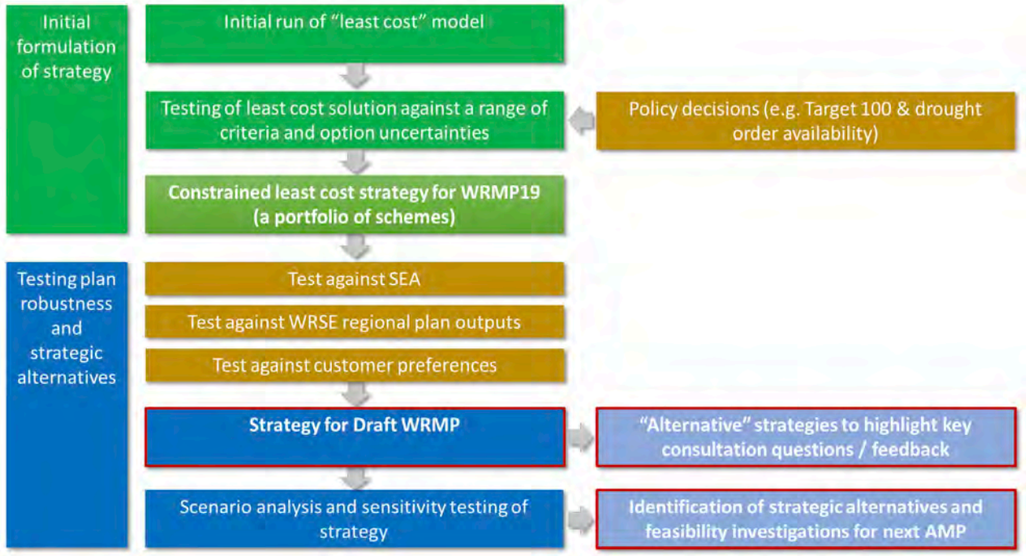
As shown in Figure 7.3, an initial 'least cost' run is undertaken to develop a 'basic solution', without further consideration of potential constraints. This is then tested by, for example, modifying assumptions about availability of certain options such as Drought Orders, or factoring in potential delays to the delivery of options, to progress our understanding of the impacts assumptions might have on the strategy. These alternative scenarios are considered through the real options method.

From examination of the various model run tests, and taking into account our policies and pre-consultation discussions with regulators and stakeholders, policy decisions and refinements were introduced to reflect a 'constrained' least cost strategy. The policy decisions were in regard to the inclusion of water efficiency assumptions and the availability of Drought Orders in severe and extreme drought events. These are not the only schemes impacted by customer choices but they are the most strategic changes.

Consultation Question:

Q After we've introduced options to save water, such as reducing leaks and Target 100, which would you prefer us to develop first – water recycling or desalination?

Figure 7.3: Development of WRMP strategies



Our preferred strategies may differ from the least cost solution as we take account of other criteria to ensure our proposals represent the optimum balance of financial, environmental and social costs. It must also take into account other nonmonetary issues, risks and uncertainties and customer preferences. Overlaying these considerations does not necessarily mean the constrained least cost strategy will need to be changed. It may already adequately address key considerations from these tests. It is also the case that although some schemes may be less favoured by the SEA, regional plans or customers, the availability of suitable, better alternatives or the scale of the deficit faced may mean that some options need to be retained in the feasible list regardless. For the Western area, this was the case to some extent, due in large part to the large scale of potential (and uncertain) sustainability reductions with limited alternative options available.

Further information on how we develop our WRMP strategies is in Annex 8.

7.2. Introduction to the strategies

Sections 7.3 to 7.5 of this document summarise the draft strategies for the Eastern, Central and Western areas respectively. This is only a summary, and more detailed information and explanation on the strategies is provided in Annex 11 (Eastern area), Annex 10 (Central area) and Annex 9 (Western area).

These strategies are set out in the draft WRMP for consultation with stakeholders and customers. We have identified where there are alternative potential strategies that we could adopt, including variations in the individual schemes being selected and their timing. This is particularly important for those schemes in the strategy that are required in AMP7 or AMP8. Where there may be some uncertainty around the delivery of these schemes, we may need to conduct feasibility investigations of alternative schemes (and potentially environmental surveys and planning activities) in parallel to developing the portfolio of schemes selected in the Strategy. This will help us to better understand the alternative strategic schemes that may be needed, should the schemes in the preferred plan not be implementable.

To reflect our real options approach, we have illustrated the options that would be selected in our strategies under different potential futures. These highlight how the choice of options varies according to whether we face a more or less challenging future. We show this in a 'branch diagram', an example of which is shown in

Figure 7.4 below. The more challenging the future, the more options we need to investigate and promote to balance the demand for and supply of water.

Figure 7.4: Illustrative example of a branch diagram

For each alternative strategy, we have looked at the likely scale of adverse and beneficial environmental and social effects for each option, both on its own but also in combination with the other options included in that strategy, and other projects. We made several modifications to the strategies to remove options where environmental and social effects were considered to be unacceptable relative to other alternative options available to meet the forecast supply deficit.

However, in some cases, due to the scale of the forecast supply deficit, we were not able to remove the option from consideration entirely, but instead we have acted to defer the timescales for needing that option to allow sufficient time for:

- further work to reduce the uncertainties surrounding some of the drivers for the option being required (e.g. sustainability reductions; climate change risks to supply reliability)
- further investigation over medium term to reduce uncertainties for identified adverse effects
- consideration of additional mitigation measures and/or modification to the option
- additional consultation with customers, regulators and stakeholders on the relative environmental and social effects of the option compared to other feasible alternatives

In relation to Drought Permits and Drought Orders, the decision was taken to restrict the use of these powers for extreme drought conditions only (droughts with a frequency of occurrence in excess of 1 in 200 years) in the longer term. In the short term, Drought Orders and Permits in our Central area and Western Area would be required in less severe drought conditions due to the scale of the supply deficit in these areas.

As well as the adverse effects of options, we looked at the beneficial effects of options to decide whether any options should be prioritised in view of the environmental or social benefits they may bring. This led to our decision to preferentially include water efficiency measures in our WRMP strategies as part of our target to help our customers achieve an average per capita water consumption of 100 litres per day by 2040, along with measures to further reduce water leakage rates beyond the sustainable economic level.

7.3. Strategy for the Eastern area

The Strategy for the Eastern area is set out in Figure 7.5 overleaf, with detailed information set out in Annex 11. Our potential investment in water supplies in our Eastern area over the next 50 years is up to £90m, expressed in current values.

The Eastern area strategy seeks to maintain levels of service for customers through the strategic development of a shared resource with South East Water, in addition to continued drive for greater efficiency in how we use water. This approach also utilises a minor raising for the retained water level in Bewl Reservoir by 40cm. This does not require the existing dam to be raised, but it will require some minor modifications around the edge of the reservoir.

Our proposed strategy is to implement a series of demand management measures in the short term whilst we undertake detailed engineering and environmental assessments of our resource options. Those assessments will be undertaken alongside work with the Environment Agency to explore potential sustainability reductions in more detail. By the early 2020s we will be more certain on the scale of future licence changes we will face, and be in a position to apply for planning and other consents to be secured and for necessary schemes to be constructed and commissioned. The timings within the WRMP are our best estimates for delivery at this point in time, but may be updated to reflect further investigations and the outcomes of public consultation in the final WRMP.

In our Eastern area **during AMP7 (2020-2025)** we propose to start implementing **additional leakage reduction** within all WRZs in our Eastern area. This is predicted to deliver savings of up to 2.7Ml/d by 2025, potentially rising to up to 17.5Ml/d by 2070. Alongside this, we plan to **increase the percentage of metered households** from the current figure of 88% up to 92%, and to **increase the frequency of meter readings** for all households. Increased metering and meter reading helps us to identify potential leaks within supply pipes to houses, and increases customers' awareness of their water usage, including how this changes in different seasons. These measures, combined with our media and education campaign as the first part of our **Target 100** vision will decrease the demand for water sufficiently in the Eastern area to accommodate planned growth within the supply area.

We have a number of sources within the Eastern area that experience water quality issues that can risk their reliability and resilience. We plan to implement **catchment management and infrastructure solutions** to address rising nitrates and improve resilience at these sources within AMP7, to safeguard supplies to customers. With these measures in place, we believe that our supplies will be resilient to all but severe droughts, and so we would only very rarely need to apply for **Drought Permits or Orders.**

During the early part **of AMP8 (2025-2030)** we plan to make **improvements to an existing source at Meopham**, and to investigate and then build new below ground infrastructure to enable us to **make better use of the existing Selling-Fleete transfer** between our WRZs. Other schemes that we plan to implement early in AMP8 may include the need to **vary our existing licence at this source and at West Sandwich**. We also plan to deliver a **new pipeline import of water from South East Water.** Despite these measures, there remains a risk that we might need to apply for Drought Orders in severe or extreme droughts, relating to Bewl Reservoir and the River Medway.

Our forecasts show, however, that there is the potential for a number of sustainability reductions to lead to licence changes at our existing sources within the AMP8 period, notably in 2027 which is the next deadline for measures required by the Water Framework Directive to be implemented. We will need to undertake investigations of a number of potentially large scale schemes within AMP7, including applying for planning and other consents, so that they can be constructed in AMP8 if required. Our strategy for the Eastern area shows five potential futures, assessing the different schemes we would need depending if these are more or less challenging.

The modelling undertaken for the draft WRMP indicates that under any of the potential futures we will need to investigate in AMP7, and then may need to build in AMP8, a number of schemes to balance supply and demand. This includes an **indirect potable water re-use scheme on the River Medway,** a scheme to **raise the water retained in Bewl reservoir by 40cm**, and we will also seek to **acquire an existing industrial water licence at Sittingbourne**, and utilise this for public water supply. We also plan to implement further **catchment management and infrastructure solutions** to address nitrates and pesticides, and implement further **leakage reduction measures** in AMP8.

Looking further ahead to the medium term **(AMP9-11, or 2030-2045)**, the degree of uncertainty in our forecasts increases further, depending on the challenges we will face. We will review these uncertainties in our next WRMP planned for 2023, and re-assess the need for further water resources and demand management measures to be implemented at that time.

Our medium range forecasts at the current time, however, are identifying that in the 2030-2045 period in more challenging futures we would be likely to need to implement further schemes to balance supply and demand. These are currently identified as being further **leakage reduction**, an I**ndustrial Water re-use scheme at Sittingbourne** in Medway East WRZ, and an **indirect potable water re-use scheme at Sandwich WwTW,** linked to the River Stour in Thanet WRZ. We may also need to implement **catchment management** at one or two sources, and could still need **Drought Permits or Orders** under more challenging futures. Our re-assessment of these options in the next WRMP will include considering whether other potential schemes may be preferable in environmental, social or economic terms, with other options including long distance pipeline transfers, desalination plants, and more intensive (and more expensive) water efficiency or leakage reduction measures. Under less challenging futures, we would need to implement leakage reduction and potentially catchment management measures, however we would not currently anticipate needing further schemes within the **2030-2045 period**, although this position may change in subsequent WRMPs.

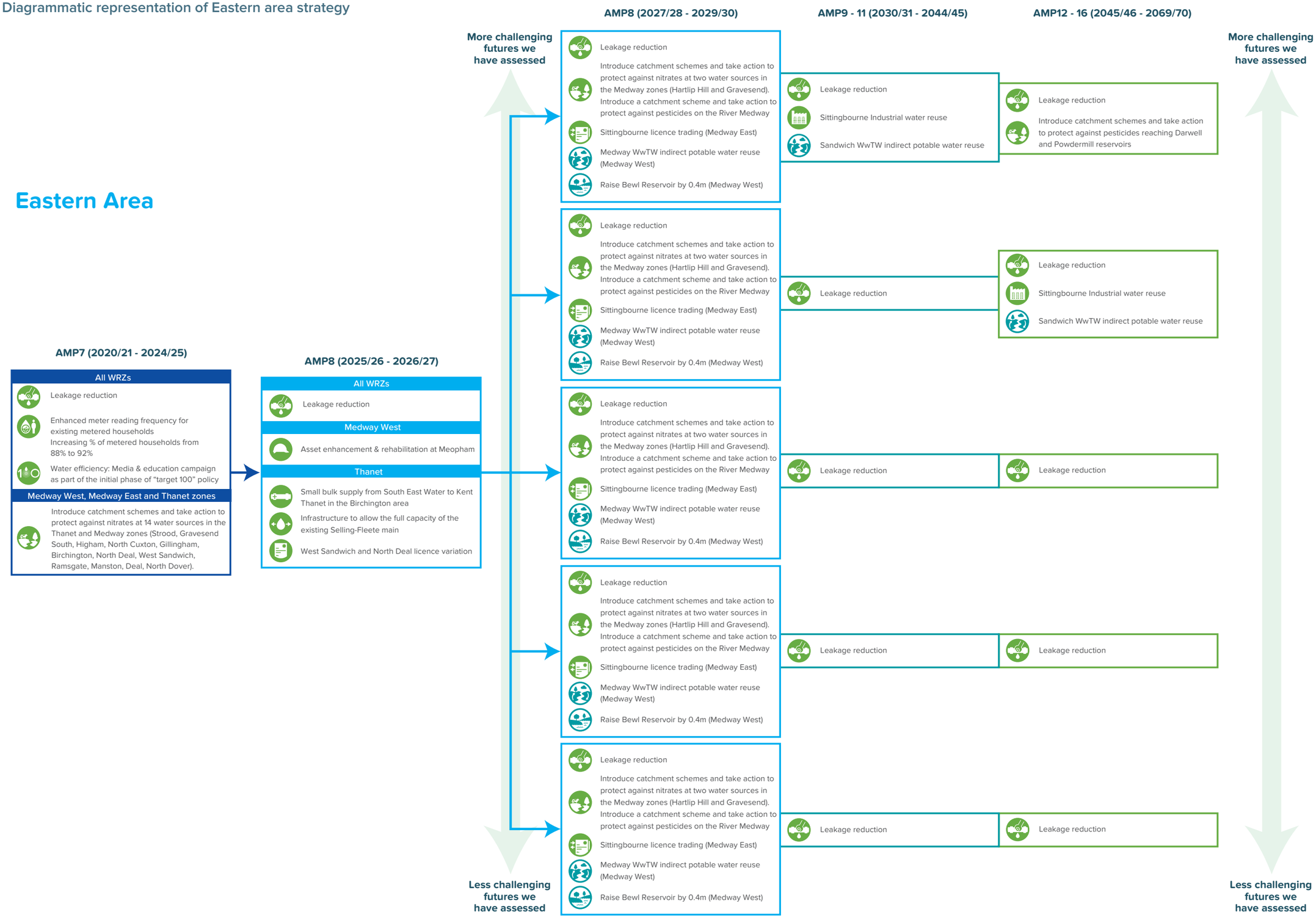
Our longer term forecasts at the current time identify that in the **2045-2070 period** we would be likely to need further schemes to meet the supply demand balance. At the current time, these are indicatively identified as further **leakage reduction** under all futures, with **catchment management and infrastructure solutions** to address pesticides at two sources, and the **Sandwich indirect potable water re-use** and the **Sittingbourne industrial water re-use** schemes if they have not been implemented already. There is considerable uncertainty over the timing and scale of these options, and reconsideration within the next (and subsequent) WRMP may be likely to result in different options being selected.

Sensitivity testing of the proposed Eastern area strategy and potential alternative options

Our sensitivity testing of the proposed Eastern area strategy has included considering the implications of one or more of our planned schemes being delayed, or not being able to be implemented. This testing enables us to identify potential alternative schemes that we will need to investigate and considering promoting, depending on the future challenges we experience and our success in implementing our planned schemes. These potential alternatives include the following major schemes.

Sandwich WWTW water reuse scheme – this may be an alternative strategic option to our proposed schemes, providing supply resilience in Kent Thanet, and may generally be needed in the mid-2030s under the more challenging futures.

Figure 7.5: Diagrammatic representation of Eastern area strategy



Southern Water

River Medway desalination – this is likely to only be needed in the event that some planned schemes cannot be delivered. It is more likely to be required in more challenging futures and not until later in the planning period, however if the Medway water reuse scheme is not implemented it may be selected as early as AMP8. On this basis, it would be appropriate to undertake feasibility investigations of this option ahead of the next WRMP in 2023.

Sittingbourne Industrial water reuse – this scheme is already selected later in the planning period (2040s at the earliest), but there may be benefits in implementing this sooner in conjunction with the proposed Sittingbourne licence trading scheme.

Implementation of customer offerings or propositions to encourage efficient use of water associated with universal metering and enhanced AMR meter reading frequency
Trials will need to take place to investigate and then optimise potential offerings / propositions for customers. These trials would enable us to better understand potential impacts on customers, and to improve our understanding of potential water savings benefits.

Environmental assessment of the proposed Eastern area strategy

The SEA summary of the draft WRMP strategy for the Eastern area is summarised in the assessment Table 7.1 below (full details are available in Annex 14).

The strategy includes a number of catchment management options to improve nutrient management and land-use practices and to reduce the issues relating to pesticides entering surface waters. The effects are beneficial in relation to many of the SEA objectives with negligible or no adverse effects.

Demand management measures are a key component of the strategy. The environmental effects are mainly beneficial but with some minor temporary adverse effects in respect of materials required for water leak repairs and metering, as well as the risk of temporary traffic disruption and associated carbon and air quality effects of street works for leak repair activities.

The Medway indirect potable water reuse scheme has the potential for major adverse effects relating to archaeology and cultural heritage due to the pipeline construction work – these construction risks would need to be addressed through detailed planning and design/routing of the pipeline route.

The Sittingbourne licence trade option requires further investigations and development of detailed mitigation measures to address potential risks identified through the HRA process to avoid adverse effects to several designated European conservation sites.

The strategy includes pipeline schemes which were assessed as having potential moderate adverse effects to biodiversity, fauna and flora due to construction effects on sites of nature conservation interest, as well as to landscape and visual amenity within the Kent Downs AONB. Mitigation measures will be required to reduce the magnitude of effects to an acceptable level. The licence variation scheme and the recommission the Meopham greensand groundwater source are assessed as having predominantly negligible adverse effects. Raising Bewl Water reservoir by 40cm will involve some temporary adverse effects during construction, and detailed mitigation measures will need to be developed to protect the environment and the local community to minimise these effects.

Overall, the environmental assessment has concluded that the strategy has predominately negligible to minor adverse effects and negligible to minor beneficial effects.

Table 7.1: Summary environmental assessment of Eastern area strategy and alternatives

Eastern Area: Option name	Residual effect significance	SEA objective: Biodiversity, flora and fauna	Population and human health	Material assets and resource use	Water	Soil, geology and land use	Air and Climate	Archaeology and Cultural Heritage	Land-scape and Visual Amenity
Enhanced AMR meter reading frequency (monthly) for existing metered HHs	Adverse								
	Beneficial								
Leakage reduction	Adverse								
	Beneficial								
Water efficiency: Media & education campaign as part of initial phase of "target 100" policy	Adverse								
	Beneficial								
Medway Reuse scheme	Adverse								
	Beneficial								
Sittingbourne licence trade	Adverse								
	Beneficial								
Selling-Fleete Main – maximise capacity	Adverse								
	Beneficial								
Raising Bewl by 0.4m	Adverse								
	Beneficial								
SEW Newchurch to SWS KT	Adverse								
	Beneficial								
Recommission Meopham greensand groundwater source	Adverse								
	Beneficial								
West Sandwich and North Deal WSW licence variation	Adverse								
	Beneficial								
Nitrate Options (catchment management and infrastructure solutions)	Adverse								
	Beneficial								
Pesticide Options (catchment management and infrastructure solutions)	Adverse								
	Beneficial								
River Medway Desalination, up as far as Allington Lock	Adverse								
	Beneficial								
Sandwich WWTW Indirect Potable Water Reuse	Adverse								
	Beneficial								
Sittingbourne Industrial Water Reuse (7.5Mld) (in addition to the licence trading)	Adverse								
	Beneficial								

Q Consultation Question:
Do you think our approach to provide water in our Eastern area (in Kent) is the right one?

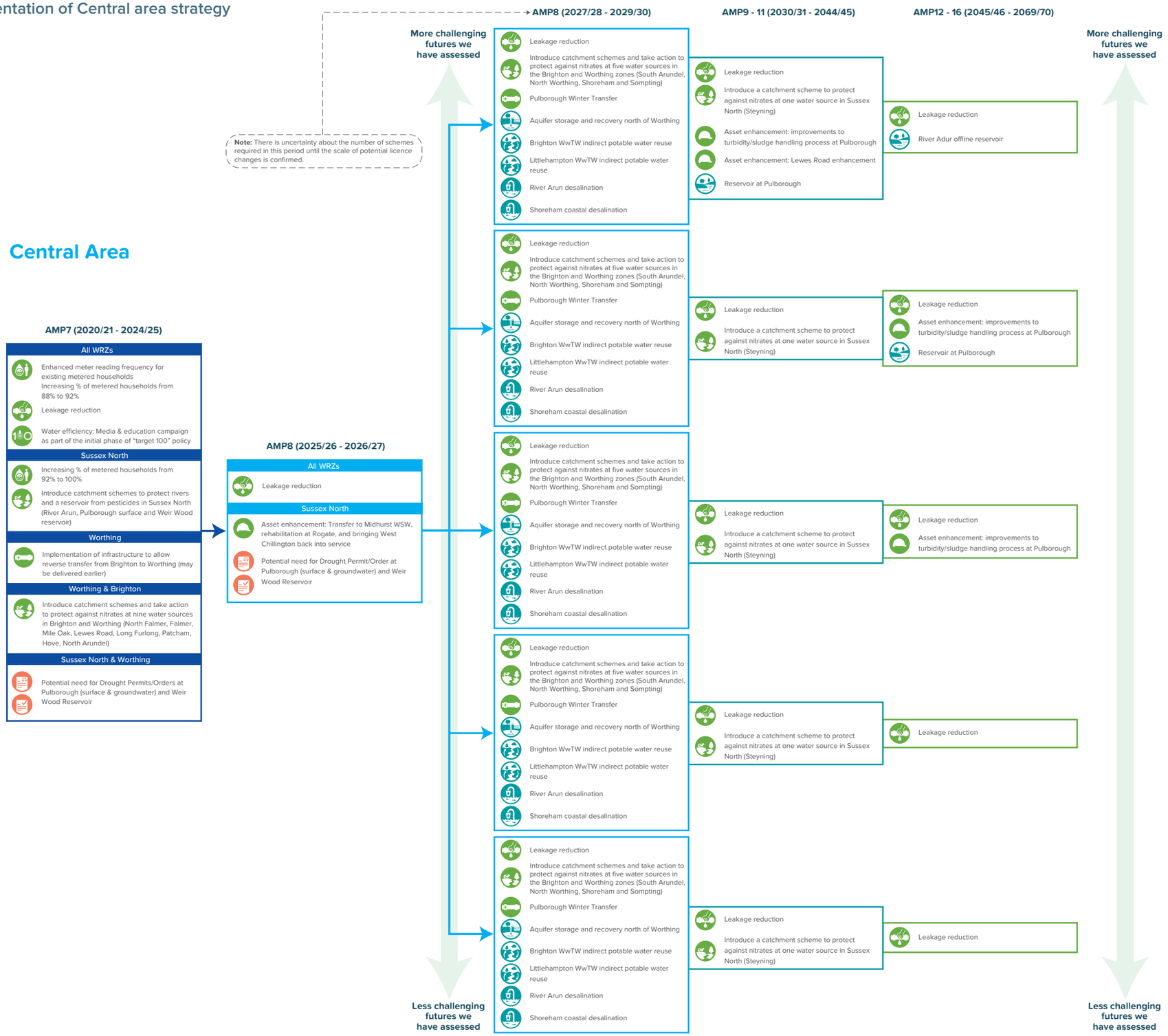
7.4. Strategy for the Central area

The Strategy for the Central area is summarised in Figure 7.6 overleaf, with detailed information set out in Annex 10. Our potential investment in water supplies in our Central area over the next 50 years is up to £640m, expressed in current values.

There is the potential for a number of sustainability reductions to lead to licence changes at our existing sources within **the AMP8 period (2025-2030)**, notably in 2027 which is the next deadline for measures required by the Water Framework Directive to be implemented. The strategy for the central supply area is dominated by the potential future sustainability reductions, the full extent of which remains uncertain at this time. We have assessed and highlighted the potential differences to our WRMP strategy by comparing the two real option strategies with and without the potential sustainability reductions. We will need to investigate the potential sustainability reductions, and the feasibility / design of the potential solutions to resolve any deficits caused by the sustainability reductions, at the same time.

As with the Eastern area, it will be necessary for detailed engineering and environmental assessments to be undertaken and for planning and other consents to be secured and for the schemes to be constructed and commissioned. For transfers from other water companies there may be a need for asset enhancements,

Figure 7.6: Diagrammatic representation of Central area strategy



Southern Water

and/or for the development of new water resources within those companies in order to free up water to make the transfer available. The timings within the WRMP are our best estimates for delivery at this point in time, but may be updated to reflect further investigations and the outcomes of public consultation in the final WRMP.

Our detailed plans include the following schemes that potentially need to be developed depending on the future sustainability reductions:

In our Central area **during AMP7 (2020-2025)** we propose to start implementing **additional leakage reduction** within all WRZs. This is predicted to deliver savings of up to 3.4Ml/d by 2025, potentially rising to up to 15.6Ml/d by 2070. Alongside this, **we plan to increase the percentage of metered households** in the Central area, from the current figure of 88% up to 92%, and then within the Sussex North WRZ increasing this further to 100% metered properties, given the relative lack of alternative water resources within this WRZ. **We will increase the frequency of meter readings** for all households in the Central area, and implement our media and education campaign as the first part of our **Target 100** vision, to decrease the demand for water in the Central area.

We plan to introduce **catchment management and infrastructure solutions** to address rising nitrates and increase resilience at 9 existing sources within our Worthing & Brighton WRZ, and for pesticides at 3 sources in Sussex North WRZ. These will increase the reliability and resilience of these sources, to safeguard supplies to customers. We also plan to **improve our existing infrastructure to allow transfers both ways between Brighton and Worthing**. Despite these measures, there remains a risk that we might need to apply for **Drought Permits or Orders** in severe or extreme droughts in AMP7, and into AMP8.

During the early part of **AMP8 (2025-2030)** we plan to **improve treatment and/or rehabilitate boreholes at 3 sites in Sussex North,** and to implement **catchment management and infrastructure solutions** at 5 sources.

Our forecasts show that there is the potential for a number of sustainability reductions to lead to licence changes at our existing sources within the **AMP8 period (2025-2030),** notably in 2027 which is the next deadline for measures required by the Water Framework Directive to be implemented. There are a significant number of sources potentially at risk in our Central area, and we will need to undertake investigations of a number of potentially large scale schemes within AMP7, including applying for planning and other consents, so that they can be constructed in AMP8 if required.

The modelling undertaken for the draft WRMP indicates that under any of the potential futures we need to investigate in AMP7, and then build in AMP8, a number of major schemes to balance supply and demand. The need for these schemes is being driven by the potential scale of licence changes we may face in 2027. The schemes include **two indirect potable water re-use schemes** from Brighton WwTW and Littlehampton WwTW, and an **aquifer storage and recovery scheme** north of Worthing. The strategies also include **two potential desalination plants** at the River Arun, and Shoreham Coastal. There would be long distance below ground pipelines associated with a number of these options, including pipelines in the South Downs National Park. We would also need to implement further **leakage reduction measures** in AMP8.

This is a significant amount of new infrastructure potentially required in AMP8 (2025-2030), and we will need to thoroughly investigate and prepare applications for planning and other consents for these schemes over the next few years. We will time that work, such that when the sustainability reductions become clearer in early 2020s, we are in a position to proceed to build those schemes that are necessary as a result.

Looking further ahead to the medium term **(AMP9-11, or 2030-2045)**, the degree of uncertainty in our forecasts increases and we will review these uncertainties in our next WRMP planned for 2023, and re-assess the need for further water resources and demand management measures to be implemented at that time. Our medium range forecasts at the current time, however, are identifying that in the 2030-2045 period we would be likely to need further schemes to meet the supply demand balance.

We would need to implement additional **catchment management** measures under all futures, with **increased leakage reduction** also required. Under the most challenging future there could also be a potential need for a **new reservoir at Pulborough**, within the South Downs National Park, and for us to **improve our existing assets** at Pulborough and at **Lewes Road.**

Our longer term forecasts at the current time identify that in the **2045-2070 period** we would be likely to need further schemes to meet the supply demand balance. At the current time, this includes **additional leakage reduction** under all futures, and catchment management to protect against nitrates at 1 source. Under more challenging futures the **new reservoir at Pulborough** and **asset enhancements at Pulborough and Lewes Road** would be required, if not already implemented. Under the most challenging future an additional **new offline reservoir on the River Adur** is indicatively identified in Worthing WRZ to serve Sussex North WRZ. There is considerable uncertainty over the timing and scale of this option, and further reconsideration within the next (and subsequent) WRMP may be likely to result in different options being selected.

Our re-assessment of the medium and longer term options in the next WRMP will include considering whether other potential schemes may be preferable in environmental, social or economic terms, with other options including long distance pipeline transfers, desalination plants, and more intensive (and more expensive) water efficiency or leakage reduction measures.

Sensitivity testing of the proposed Central area strategy

Our sensitivity testing of the proposed Central area strategy has included considering the implications of one or more of our planned schemes being delayed, or not being able to be implemented. We have also assessed the extent to which uncertainty over the scale of the potential sustainability reductions is driving the need for investment in a number of major new schemes by 2027. This testing enables us to identify potential alternative schemes that we will need to investigate and consider promoting, depending on the future challenges we experience and our success in implementing our planned schemes. These potential alternatives include the following major schemes.

Work with South East Water on the development of the Brighton WwTW indirect potable water reuse scheme
The proposed Brighton WwTW indirect potable water reuse scheme is a joint scheme with South East Water. We need to work closely with South East Water to investigate and promote this option. There are currently large costs associated with the proposed long distance pipelines for this scheme, but there may be alternative ways of operating the scheme which could reduce these. We need to investigate these, and to optimise the size of the scheme and consider how it may operate with the Shoreham coastal desalination option. We will also seek to confirm whether the existing Weir Wood reservoir export to South East Water will continue to be needed, as if it is not, then this would free up around 5Ml/d of water in the Sussex North WRZ.

Work with the Environment Agency to agree as early as possible in AMP7 the sources that are actually likely to require licence changes to meet sustainability reduction objectives.
The scale of uncertain sustainability reductions is driving the selection of a number of schemes in AMP8. If the sources that are actually likely to require sustainability reductions can be formally agreed with the EA, we may be able to cease or limit the cost of feasibility investigations and planning preparation needed in AMP7.

Investigate and plan River Adur offline reservoir
If the tidal River Arun desalination scheme, or the Littlehampton indirect potable water re-use option is not available, then this scheme could be brought forward for delivery at the end of AMP8.

Implementation of customer offerings or propositions to encourage efficient use of water associated with universal metering and enhanced AMR meter reading frequency
Trials will need to take place to investigate and then optimise potential offerings / propositions for customers. These trials would enable us to better understand potential impacts on customers, and to improve our understanding of potential water savings benefits.

Work with Portsmouth Water to understand the risks to the bulk import to Pulborough under an extreme drought
There may be a short term risk under extreme drought conditions if the bulk supply is not available at its full amount of 15Ml/d. We need to understand this more clearly, and consider implications for our WRMP.

Environmental assessment of the proposed Central area strategy

The SEA summary of the draft WRMP strategy for the Central area is presented in table 7.2. A summary of the assessment is provided in this section. Full details are in Annex 14.

The strategy involves implementing catchment management options to improve nutrient management and land-use practices and to reduce the issues caused from pesticides entering surface waters. The SEA assessment findings for these options are very similar: the effects are beneficial in relation to many of the SEA objectives with negligible or no adverse effects.

Five demand management options form an important component of the strategy. The environmental effects are mainly beneficial but with some minor temporary adverse effects relating to construction activities.

The two water reuse schemes have potential for beneficial effects associated with their likely significant increase in reliable water supply; however, both options would involve considerable construction activity within the South Downs National Park, use significant materials for construction and operation, as well as requiring high energy usage. There is also some uncertainty relating to potential operational effects of increased flows on aquatic ecology related to the Brighton scheme. This requires further investigation and consideration of the need for additional mitigation measures to protect the water environment.

The strategy includes two desalination options - Tidal River Arun and Coastal desalination at Shoreham, for which several moderate adverse effects have been identified, including energy use and carbon emissions. The Pulborough winter transfer scheme (Stage 2) may result in some

temporary moderate adverse effects as a consequence of pipeline construction. The asset enhancement options have limited construction- related requirements. However, for the West Chiltington option there is some uncertainty regarding the potential effects to surface waters and wetland habitats. Further investigation has been highlighted as being necessary to better understand the risks of these potential effects.

The Aquifer storage and recovery (ASR) scheme has mostly negligible to minor adverse environmental effects, with no adverse effects on the water environment anticipated. Moderate adverse effects relate to the energy use and carbon emissions associated with water treatment and pumping, as well as construction activity relating to the South Downs National Park. Over the longer term, the two reservoir options have

Q Consultation Question:
Do you think our approach to provide water in our Central area (in Sussex) is the right one?

Table 7.2: Summary environmental assessment of Central area strategy and alternatives

Central Area: Option name	Residual effect significance	SEA objective: Biodiversity, flora and fauna	Population and human health	Material assets and resource use	Water	Soil, geology and land use	Air and Climate	Archaeology and Cultural Heritage	Land-scape and Visual Amenity
Enhanced meter reading and installation	Adverse								
	Beneficial								
Leakage reduction	Adverse								
	Beneficial								
Water efficiency: Media & education campaign as part of initial phase of "target 100" policy	Adverse								
	Beneficial								
Brighton WTW Indirect Potable Reuse scheme for SWS)	Adverse								
	Beneficial								
Littlehampton Water Reuse Scheme	Adverse								
	Beneficial								
Rehabilitate Rogate Boreholes	Adverse								
	Beneficial								
Rehabilitate West Chiltington	Adverse								
	Beneficial								
Pulborough winter transfer scheme Stage 1	Adverse								
	Beneficial								
ASR Scheme Lower Greensand (Sussex Worthing)	Adverse								
	Beneficial								
Tidal River Arun Desalination	Adverse								
	Beneficial								
Pulborough winter transfer scheme Stage 2	Adverse								
	Beneficial								
Coastal desalination at Shoreham	Adverse								
	Beneficial								
Nitrate Options (catchment management and infrastructure solutions)	Adverse								
	Beneficial								
Pesticide Options (catchment management and infrastructure solutions)	Adverse								
	Beneficial								
Asset enhancement - Lewes Road	Adverse								
	Beneficial								
River Adur offline reservoir	Adverse								
	Beneficial								
Reservoir at Pulborough	Adverse								
	Beneficial								

been assessed as having several moderate to major adverse effects, including in relation to landscape and biodiversity, flora and fauna. However, there would also be beneficial effects in relation to opportunities for recreational amenity and local biodiversity enhancement as part of an extensive landscaping programme.

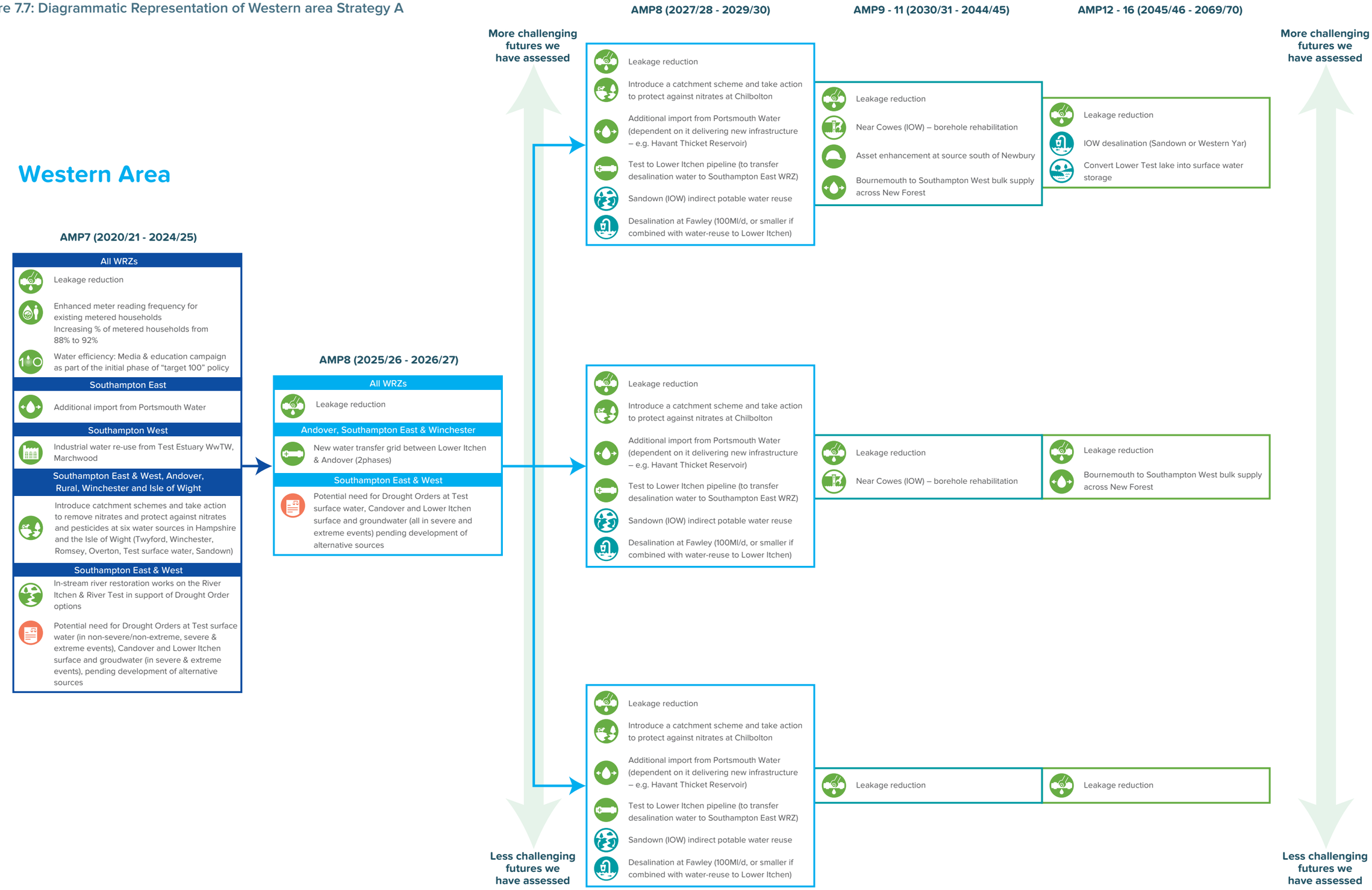
Overall, the environmental assessment has concluded that the strategy has predominately minor to moderate adverse effects and negligible to minor beneficial effects. The two water reuse schemes will present some potential major adverse effects, mostly during construction but also in respect of high energy use. Additional mitigation will need to be considered for these reuse schemes as they are brought forward for development over the planning period.

7.5. Strategies for the Western area

The Strategies for the Western area are summarised below and represented in Figure 7.7 overleaf, with detailed information set out in Annex 9. As has been noted throughout this document, the Western area represents the most significant challenge we face in preparing this WRMP. As a result, our potential investment in water supplies in our Western area over the next 50 years is up to £910m, expressed in current values.

Our Western Area has traditionally not experienced water shortages like our other supply areas, and has not had a hosepipe ban imposed to restrict customers supplies. There has, to date, been sufficient water available within our abstraction licences to both protect the environment and to provide secure supplies to customers. However, the Environment Agency's recently notified proposed licence changes on the Lower Itchen, Test and Candover, together with future as yet uncertain further licence changes that may be required, fundamentally change the water resources position in Hampshire.

Figure 7.7: Diagrammatic Representation of Western area Strategy A



Southern Water

Some of the changes would be immediate, others would be introduced in 2027. We have objected to the Environment Agency's proposed licence changes that have been notified to us, as their imposition will place supplies to our customers, and the environment, at risk until we can develop alternative sources of supplies in combination with demand management measures. An Inquiry into the proposed licences is due to commence in March 2018.

If the licences are changed as the Environment Agency is proposing, we will have insufficient supplies of water available in the Western area to supply our customers in all but normal environmental conditions. As soon as conditions start to become drier than normal, we will in the short term, have to impose temporary use bans (hosepipe bans) and apply for Drought Orders to allow us to continue to abstract water below the conditions imposed in the new licences. This position will only change when we have been able to develop new supplies.

The scale of these alternative supplies is massive, involving multi-million pound investment in large scale new developments to provide supplies to customers when the proposed new licences will prevent us from abstracting from existing sources. For the most part, the schemes we will need to develop are complex engineering projects, with considerable environmental investigations required in advance of planning and other permissions being able to be secured. Until we have secured those permissions, and built the new schemes, our supplies to customers will remain at risk. However, once the alternative sources of water are built and become operational, the risk to customers starts to reduce in tandem with the rate the new schemes are able to provide water.

Not all of our proposed new resource developments can be implemented by us alone, as they involve the transfer of water from other water companies through existing or new transfer pipelines. Some of these transfers are reliant on the other water company making improvements to their own sources, or developing new ones. These can involve significant investigations and applications for consents of their own, increasing the potential risk that they could be delayed.

The timings within the WRMP are our best estimates for delivery at this point in time, but may be updated to reflect further investigations and the outcomes of public consultation in the final WRMP. We have prepared the draft WRMP on the basis of Strategy A, which enables us to plan to meet the implications of the Environment Agency's notified licence changes on the Test and Lower Itchen.

The following section represents the outcomes of Strategy A, which is the Environment Agency's proposed licence changes implemented in full. Details on the sensitivity testing we have undertaken are set out in Annex 9.

In our Western area **during AMP7 (2020-2025)** under Strategy A, we propose to start implementing additional **leakage reduction** within all WRZs. This is predicted to deliver savings of up to 2.3Ml/d by 2025, potentially rising to up to 11.7Ml/d by 2070. Alongside this, we plan to i**ncrease the percentage of metered households** in the Western area, from the current figure of 88% up to 92%. We will **increase the frequency of meter readings** for all households, and implement our media and education campaign as the first part of our **Target 100** vision, to decrease the demand for water in the Western area. Although important, the overall contribution that this will make is limited, and we will need to undertake significant investment in new infrastructure as well.

We plan to introduce **catchment management and infrastructure solutions** to remove nitrates and protect against nitrates and pesticides at existing sources, to increase their reliability and resilience and to safeguard supplies to customers. We also plan to secure the **transfer of additional water from Portsmouth Water Company**, through the recently constructed new transfer pipeline in Southampton East WRZ. This pipeline was specifically sized so that it could accommodate more water for circumstances such as this. We will also be implementing **an industrial water re-use scheme** from the Test Estuary WwTW at Marchwood, to enable water that would otherwise need to be used as this industrial supply to be made available for domestic use.

With the above measures in place, our supplies to customers will remain at risk during the AMP7 period, and into AMP8 until sufficient alternative supplies are delivered. On the basis of environmental conditions we expect to encounter before 2027, we have forecast that we will need to implement **temporary use bans** in Hampshire, and to apply for **Drought Orders** on the Test surface water abstraction, Lower Itchen groundwater and surface water abstractions, and in relation to a groundwater source in the Candover valley in order to protect supplies to customers. Where Drought Orders are applied for, we will implement river restoration and habitat mitigation measures in potentially affected rivers in combination with the Drought Orders.

Consultation Question:

Q Do you support our policy to introduce Drought Permits and Orders more frequently until at least 2027 in Hampshire and the Isle of Wight to secure supplies while new options are developed following the proposed changes to our abstraction licences?

During the early part of **AMP8 (2025-2030)** we plan to build our planned **water transfer grid between the Lower Itchen and Andover,** in two phases. This below ground transfer pipeline will provide better connectivity between our existing supplies, enabling us to transfer water in both directions. We will also continue our leakage reduction measures. Despite these and the AMP7 schemes, however there remains a risk that we will need to implement **temporary use bans** and apply for **Drought Orders** in the early part of AMP8.

We face significant further reductions in our supplies within the **AMP8 period (2025-2030**), notably in 2027 which is the next deadline for measures required by the Water Framework Directive to be implemented. We have already been notified of further changes to the Test surface water abstraction licence at that date, and there are a number of other sources that will be likely to be affected. In anticipation of these, we will undertake investigations of a number of potential large scale schemes within AMP7, including applying for planning and other consents, so that they can be constructed in AMP8.

The modelling undertaken for the draft WRMP indicates that under all of potential futures we to investigate in AMP7, and then build in AMP8 under Strategy A, a very large **desalination plant on the Solent**, designed to utilise the existing outfall infrastructure that was associated with a former power station. We anticipate that this could be required to be up to 100 Ml/d in scale (100 million litres of water a day) when in full operation. At other times, the desalination plant would need to operate continuously at a lower level, which would provide approximately 25 Ml/d to provide supply to the local area. Large new pipelines would be required with the desalination plant. There is the potential that the scale of the desalination plant could be reduced if we were to develop a water re-use scheme to transfer highly treated wastewater to increase flows in the Lower Itchen.

We will also need to investigate and build an **indirect potable water re-use** scheme on the Isle of Wight, at Sandown to provide more secure supplies to customers on the Island. We will also need to secure an additional large scale **transfer of water from Portsmouth Water Company**, in excess of what can be transferred through existing pipelines. We would need this additional supply by 2027 due to the known Test surface water licence change. This scale of supply is anticipated to mean that Portsmouth Water would need to develop its **Havant Thicket Reservoir**, to ensure its customer's own supplies are protected. We may be unlikely to be able to secure any significant transfer from Portsmouth Water until the new reservoir is at least partly operational, although we will work closely with Portsmouth Water to develop the additional resources it needs. This places some risks and uncertainty around the timing of the water

becoming available for our use, as Portsmouth Water is indicating its Havant Thicket scheme may not be fully operational until 2029.

We will need to plan and develop large scale new pipeline transfers within our own supply areas in AMP8, to increase the connectivity between our WRZs so that we can more easily move water from an area potentially in surplus (or where a large scale new resource is planned) to other WRZs. Our plans include developing the **Test to Lower Itchen pipeline scheme**, although our forecasts show that when constructed this would be used to transfer desalinated water from Southampton West WRZ to Southampton East WRZ, rather than water from the River Test. We will also implement nitrate catchment management and infrastructure solution at one source, and implement additional leakage reduction as well.

This is a significant amount of new infrastructure required in AMP8 (2025-2030), and we will need to thoroughly investigate and prepare applications for planning and other consents for these schemes over the next few years in AMP7. Our forecasts indicate that from 2027 onwards, once the new resources have been developed, we will be much less reliant on the potential need for Drought Permits and Orders, with those being limited to the Test surface water source in extreme events only.

Looking further ahead to the medium term **(AMP9-11, or 2030-2045)**, the degree of uncertainty in our forecasts increases and we will review these uncertainties in our next WRMP planned for 2023, and re-assess the need for further water resources and demand management measures to be implemented at that time. Our medium range forecasts at the current time for the Western area Strategy A, however, are identifying that in the 2030-2045 period we would be likely to need additional schemes to meet the supply demand balance in more or most challenging futures.

These potential schemes are currently identified as being **asset enhancements** at a source near Cowes on the Isle of Wight, and at a source south of Newbury. We would also potentially need a new **water transfer pipeline** across the New Forest National Park, most likely from Bournemouth Water but with the potential for a supply from Wessex Water also needing to be explored. We would also anticipate needing to implement additional **leakage reduction.**

Our longer term forecasts at the current time identify that **in the 2045-2070 period** we would be likely to need further schemes to meet the supply demand balance under Strategy A. At the current time, these are indicatively identified as further leakage reduction, a potential **desalination plant on the Isle of Wight**, and the creation of a **reservoir in the Lower Test Valley** through the conversion of an existing lake. If not already implemented, we would also need the **transfer pipeline** across the New Forest. Our re-assessment of the medium and longer term options in the next WRMP will include considering whether other potential schemes may be preferable in environmental, social or economic terms, with other options including long distance pipeline transfers, desalination plants, and more intensive (and more expensive) water efficiency or leakage reduction measures.

Sensitivity testing of the proposed Western area strategies

Our sensitivity testing of the proposed Western area strategy has included considering the implications of one or more of our planned schemes being delayed, or not being able to be implemented. We have also considered what changes there might be to our strategies if a major scheme had to be reduced in scale. This testing enables us to identify potential alternative schemes that we will need to investigate and considering promoting, depending on the future challenges we experience and our success in implementing our planned schemes. These potential alternatives include the following major schemes.

Isle of Wight options
Investigation during AMP7 of the potential to incorporate a blend of small-scale water reuse and desalination schemes at Sandown, as an alternative to the water re-use at Sandown, and then a desalination plant on the IOW later in the planning period.

Mixture of schemes on the Riverside, New Forest
Investigation in AMP7 of both the proposed pipeline transfer from Bournemouth (or Wessex Water) and the Test Estuary industrial water reuse scheme in parallel as alternative schemes. This will include assessing the two potential transfers from the West.

Itchen water reuse schemes as alternative or additional to desalination on the Solent.
The proposed desalination plant on the Solent is a very large scale infrastructure project, and there may be potential to reduce the scale of this by additionally promoting an indirect water re-use scheme to the River Itchen. There are a number of potential sources for such a scheme, including Portsmouth Harbour WwTW, Portswood WwTW, and Woolston WwTW. We propose to investigate these options in AMP7.

Consultation Question:

Q A large scale new desalination plant in Hampshire is needed to balance the supply and demand for water. We could reduce our reliance on desalination by combining this with water recycling (water re-use) scheme, where treated wastewater would be released into the Lower Itchen for re-abstraction. Which approach do you prefer?

Alternative connections between Southampton West and Southampton East.
The draft WRMP includes the proposal for the Test to Lower Itchen pipeline, to transfer water from the Solent desalination plant to Southampton East. Sensitivity tests have shown that this pipeline is only required if a very large scale (100Ml/d) desalination plant is constructed, and that if a smaller desalination option is proposed (in combination with an indirect water reuse scheme as described above), then improvements to existing transfer valves could be a more appropriate scheme for increasing connectivity between Southampton West and Southampton East. We will investigate this further in AMP7.

Option for large scale river restoration measures on Lower River Test
We have been working with stakeholders on the River Test, considering whether there is the potential for large scale river restoration measures that could be implemented, coupled with long term environmental monitoring. The intention would be for these measures to secure the long term resilience of the river and its habitats, for the benefit of the environment. We may also be able to utilise environmental monitoring information, and the more resilient environment that would result from river restoration, to seek to defer or reduce the scale of proposed licence changes to our Test surface water source that are due to be implemented in 2027. We will continue to work with stakeholders on this potential scheme.

Consultation Question:

Q Do you think we should continue to investigate the potential of river restoration in Hampshire to help delay the need to invest in new sources such as desalination and water recycling?

Creation of a reservoir in the Lower Test Valley
Although this scheme is unlikely to be required until later in the planning period, under sensitivity tests involving high sustainability reductions it could be required in the latter part of AMP8. Undertaking feasibility studies in AMP7 would therefore be prudent.

Transfer from Thames Water
Should it not be possible to implement either desalination schemes in Hampshire or water reuse schemes on the Lower Itchen, then the main strategic option remaining will be a large-scale strategic transfer from Thames Water to the Hampshire WRZs, based on development of the upper Thames reservoir. This option would also require suitable inter-zonal infrastructure to allow water to be moved from east to the west in our supply area (i.e. construction of the pipeline from the Test to the Itchen but with flows reversed to allow the transfer to the Test and onward distribution around the WRZs).

Implementation of customer offerings or propositions to encourage efficient use of water associated with universal metering and enhanced AMR meter reading frequency
Trials will need to take place to investigate and then optimise potential offerings / propositions for customers. These trials would enable us to better understand potential impacts on customers, and to improve our understanding of potential water savings benefits.

Environmental assessment of the proposed Western area strategy

The SEA summary of the draft WRMP strategy A for the Western area is presented in the assessment table 7.3.

The strategy includes catchment management and infrastructure solution options to improve nutrient management and land-use practices as well as in-stream river restoration works for the lower River Itchen and lower River Test (in particular providing increased environmental resilience to the abstraction of water from these rivers in times of drought under Drought Order powers). The effects of these options are assessed as beneficial in relation to many of the SEA objectives with predominately negligible or no adverse effects, except for minor adverse effects from carbon emissions.

The environment effects of Demand Management measures are mainly beneficial but with some minor temporary adverse effects in relation to construction activities. The Sandown water reuse scheme could result in adverse effects regarding the Isle of Wight Area of Outstanding Natural Beauty (AONB) and further investigations need to assess effects on the River Eastern Yar from discharges at times of low flows. The Test Estuary industrial water re-use scheme has a lower magnitude of adverse effects on the environment.

The strategy involves the development of a 100Ml/d capacity desalination plant at Fawley and major adverse effects have been identified in relation to the operational use of non-renewable materials and generation of wastes in the treatment process, as well as carbon emissions. Potential major adverse effects relating to biodiversity, fauna and flora as well as landscape and visual amenity may arise arising from construction of pipelines within or near to the New Forest National Park and a designated European conservation site. However, these effects are temporary and, with careful design, planning and mitigation measures, these effects should be reducible to acceptable levels.

Many of the water supply options involve the transfer of water by medium to large diameter pipelines and these have been assessed as having negligible adverse effects on the environment once operational. However, there is the potential for moderate to major temporary adverse effects associated with the construction of these pipelines, including on the New Forest National Park and a designated European conservation site. For all of these pipelines, careful design, planning and mitigation measures will be needed to reduce the identified adverse effects to acceptable levels.

Table 7.3: Summary environmental assessment of Western area strategy A and alternatives

Western Area: Option name	Residual effect significance	SEA objective: Biodiversity, flora and fauna	Population and human health	Material assets and resource use	Water	Soil, geology and land use	Air and Climate	Archaeology and Cultural Heritage	Land-scape and Visual Amenity
Enhanced meter reading and installation	Adverse								
	Beneficial								
Leakage reduction	Adverse								
	Beneficial								
Water efficiency: Media & education campaign as part of initial phase of "target 100" policy	Adverse								
	Beneficial								
Fawley Desalination	Adverse								
	Beneficial								
Test Estuary WwTW industrial reuse	Adverse								
	Beneficial								
Import from Bournemouth Water	Adverse								
	Beneficial								
Additional import from Portsmouth Water (9 Ml/d)	Adverse								
	Beneficial								
Additional import from Portsmouth Water (21 Ml/d)	Adverse								
	Beneficial								
Hampshire grid system (phase 1)	Adverse								
	Beneficial								
Hampshire grid system (phase 2)	Adverse								
	Beneficial								
Sandown WwTW Indirect Potable Reuse	Adverse								
	Beneficial								
Borehole rehabilitation near Cowes	Adverse								
	Beneficial								
Test to Lower Itchen transfer	Adverse								
	Beneficial								
River Test and River Itchen catchment management options and river restoration pilot	Adverse								
	Beneficial								
Nitrate and Pesticide Options (catchment management and infrastructure solutions)	Adverse								
	Beneficial								
Water re-use into River Itchen (indicative as different potential sources)	Adverse								
	Beneficial								
IoW desalination options	Adverse								
	Beneficial								
Asset enhancement south of Newbury	Adverse								
	Beneficial								
Convert Test Lake into a surface water storage site	Adverse								
	Beneficial								
Hampshire grid system (reversible link between HA and HK)	Adverse								
	Beneficial								
Woodside transfer valve (HSW to HSE)	Adverse								
	Beneficial								

Overall, the environmental assessment has concluded that the Western area Strategy A has predominately minor to moderate adverse effects and negligible to minor beneficial effects. However, given the scale of the schemes required to address the supply deficit, a small number of potential major adverse effects may arise – most are related to construction in or near to sensitive environments, but there are also some permanent effects, notably in respect of high energy use and carbon emissions associated with the large desalination scheme at Fawley.

Consultation Question:
Q Do you think our approach to provide water in Hampshire and the Isle of Wight is the right one?

7.6. Environmental and social performance of the draft WRMP strategies as a whole

We have actively considered environmental and social effects throughout the development of our draft WRMP and consulted regularly with our regulators, stakeholders and customers to seek their views on the assessed effects. We have complied fully with the statutory requirements for environmental and social appraisal of our draft WRMP and followed national best practice guidance. Our assessments have

been based on a broad range of objective environmental and social criteria to ensure all options were considered on a consistent basis, in line with the meeting the requirements of the SEA Directive.

Habitats Regulations compliance

Our draft WRMP is compliant with the Habitats Regulations. We have demonstrated that none of the options included in our strategies (either alone or in-combination with other options, programmes, projects or plans) will lead to significant adverse effects on any European designated conservation site, habitats or species.

In the short term (to 2027), we will potentially need to make use of the Lower Itchen sources Drought Order in a severe drought (1 in 160 year drought event or worse) which may have adverse effects on the River Itchen SAC in the lowest reaches of the river. All other Drought Orders or Permits that may be required have been assessed as not having an adverse effect on European designated conservation sites, habitats or species. **Further details are provided in our draft Drought Plan 2018.**

Water Framework Directive (WFD) compliance

Our draft WRMP is compliant with the WFD. We have demonstrated that none of the options included in our strategies (either alone or in-combination with other options, programmes, projects or plans) would lead to a permanent deterioration of WFD status for any water body. Our plan also includes measures to enable abstraction from some of our existing water sources to be reduced to address risks of WFD status deterioration to specific water bodies. This will contribute to the achievement of the overall WFD objective for all water bodies being classified as at least 'Good' ecological status or potential.

Use of Drought Orders or Permits in severe droughts (in the short term until 2027 in our Central and Western area) and extreme drought conditions may potentially lead to a temporary deterioration in WFD water body status for a small number of water bodies, but this would not result in a permanent deterioration or hinder achievement of the overall WFD objective of at least 'Good' ecological status or potential for each water body. **Further details are provided in our draft Drought Plan 2018.**

A sustainable water resources plan

Through our environmental and social assessment approach, we have developed a long-term, sustainable water resource plan that:

- maintains water supply reliability for our customers without unacceptable adverse effects on the environment or local communities
- ensures the use of Drought Orders and Drought Permits is restricted to only extreme drought conditions in the longer term (beyond 2027) to minimise the frequency of impact on the water environment at times of prolonged dry weather conditions

Q

Consultation Question:

Do you support the increased level of resilience to drought which our plan provides in the longer term? (We have assumed that in the long term, drought permits and orders would only be implemented in droughts more severe than a one in 200-year event)

As well as protecting the environment, our draft WRMP provides opportunities for environmental enhancement through various measures, in particular:

- Reducing water abstraction from a number of existing water sources where there is a risk of adverse effects on the water environment
- Actively pursuing further measures to reduce leakage from our water supply system and customer properties, reducing water abstraction from the environment
- Extending water metering to more customers and helping our customers reduce their demand for water to achieve our long term target of reducing water consumption to an average of 100 litres per person per day
- Implementing catchment management measures that will enhance catchment land quality and water quality in local rivers and groundwater
- In-river restoration measures for the [Lower] River Test and [Lower] River Itchen

Find out more in Annexes 8, 9, 10, 11, 14, 15 & 16

8. Summary, conclusions and next steps

This document provides a technical overview of our draft WRMP. Further detailed information is set out in a series of Annexes, available on our website (southernwater.co.uk/wrmp).

We recognise that water is precious. Our draft WRMP explains how we plan to balance the supply and demand for water over the period to 2070 in a sustainable way, ensuring that we protect and enhance the environment and making sure our bills are affordable for all our customers.

We are facing significant challenges, but also great opportunities. We plan to invest to support a resilient economy in the South East, bringing innovation to our water resources network and improving the quality of the water we provide and the service we give to customers.

There are a significant number of new schemes that we are planning to implement over the coming years. We will work in close partnership with our customers, stakeholders and our environmental and financial regulators to plan, investigate, secure approval for, and then build necessary new infrastructure. Alongside this our exciting plans for implementing greater water efficiency and demand reduction, Target 100, and investment in our existing infrastructure will secure safe and reliable supplies to our customers.

In the Western area we face particularly large challenges as a result of known licence changes proposed by the Environment Agency to protect and enhance the environment. We are planning to accommodate these changes within our plans, but must also ensure that we meet our legal duty to maintain supplies to our customers. There are risks associated with this approach, and we will face a period of approximately 10 years when more frequent temporary use bans and Drought Order applications will need to be made, than we or our customers would like, until our investment in new resources can be delivered.

As well as the known sustainability reductions, our draft WRMP is planning to take account of further as yet unconfirmed sustainability reductions by 2027. The scale of these will not be known until the early 2020s when they will be confirmed by the Environment Agency following the conclusion of investigations we are proposing to undertake in the next 5 years. Whilst options to resolve these potential future challenges need to be investigated, designs produced and consents secure, we would only implement options following the final confirmation of the sustainability reductions.

Our proposals in this draft WRMP are being published for consultation, and your views will help shape our final WRMP.

We will receive feedback on our draft WRMP from the Environment Agency and other stakeholders, and their views will also be taken into account. We may also receive the outcome of the Inquiry into the licence changes in Hampshire, which will also influence our future plans.

We will listen to the comments that are made, and set out a document to explain what you have said and how we have responded – our Statement of Response. This will be published 3 months after the end of our consultation period.

We will submit our Statement of Response to Defra, including changes that we propose to make to the draft WRMP in light of the comments we have received.

Defra will then confirm whether we can publish our final WRMP, whether it requires changes to be made before it can be published, or it may ask for a hearing or inquiry to be held into our plan before it can be finalised.

We will ensure that everyone who responds to our consultation is kept up to date with progress, and will publish regular updates on our website.

Q Consultation Question:
Would you like to get involved in developing our solutions to provide water, for example, community schemes to save water, developing water recycling and desalination options or in any other way?

Q Consultation Question:
Did you find the information you needed in our consultation? What else would you like to know?

Q Consultation Question:
How did you hear about this consultation?

Southern Water

Glossary of Acronyms and Terms

Acronym	Term	Definition
ADO	Average Deployable Output	Annual average deployable output from a source
AMP	Asset Management Plan	Water company business plan
AMR	Automatic Meter Reading	Type of water meter that can be read remotely using drive-by technology
	Catchment	The area from which precipitation (rainfall) and groundwater would naturally collect and contribute to the flow of a river
	Central area	Supply area comprising the Sussex North, Sussex Brighton and Sussex Worthing Water Resource Zones
CAP	Customer Advisory Panel	Independent panel to ensure Southern Water delivers its customer priorities and promises
Defra	Department of Environment, Food & Rural Affairs	The Government department responsible for setting water policy
DO	Deployable output	The output of a source or bulk supply as constrained by licence (if applicable); pumping plant and/or well/aquifer properties; raw water mains and/or aqueducts; transfer and/or output main; treatment; water quality
	Drought Permit	An authorisation granted by the Environment Agency under drought conditions, which allows for abstraction/ impoundment outside the schedule of existing licences on a temporary basis
	Drought Order	Powers granted by the Secretary of State during drought to modify abstraction/ discharge arrangements on a temporary basis
DYAA	Dry year annual average	Represents a period of low rainfall and unrestricted demand and is used as the basis of a WRMP
DYCP	Dry year critical period	The period(s) during the year when water resource zone supply demand balances are at their lowest

Acronym	Term	Definition
DYMDO	Dry year minimum deployable output	This is the autumn period in a dry year when groundwater levels and river flows are at their lowest and sources are constrained to their minimum deployable outputs
	Eastern area	Supply area comprising the Kent Thanet, Kent Medway East, Kent Medway West and Sussex Hastings Water Resource Zones
	Groundwater	Water held underground in the soil or in voids in rock
HRA	Habitat Regulations Assessment	Assessment to consider the potential effects of alternative options and strategies on designated European sites
MDO	Minimum deployable output	Deployable output for the period when groundwater levels are at their lowest
Ml/d	Mega litres per day	Millions of litres per day. Unit of measurement for flow in a river or pipeline.
NEP	National Environment Programme	A list of environment improvement schemes that ensure water companies meet European and national targets related to water
	Non Essential Use (Ban)	A drought order approved by the Secretary of State to restrict specific water uses activities
NYAA	Normal Year Annual Average	This is the demand for water expected under normal conditions
Ofwat	Office of Water Services	The economic regulator of the water sector in England and Wales
	Outage	Temporary loss of deployable output
PCC	Per capita consumption	Amount of water typically used by one person per day
PDO	Peak deployable output	Deployable output for the period in which there is the highest demand
RSA	Restoring Sustainable Abstraction	Environment Agency programme to identify abstractions that are unsustainable or potentially damaging and to restore sustainable abstraction
	Source	A named input to a water resource zone where water is abstracted from a well, spring or borehole, or from a river or reservoir

Acronym	Term	Definition
SEA	Strategic Environmental Assessment	Statutory requirement for the assessment of effects of certain plans and programmes which could have significant environmental implications
	Supply-demand balance	The difference between total water available for use (as supply) and forecast distribution input (as water demand) at any given point in time over the Water Resource Management Plan's planning period/horizon
	Sustainability Reduction	Reductions in deployable output required to meet statutory and/or environmental requirements
TUB	Temporary Use Ban	Drought restriction imposed by water companies on customers. Restrictions include not using water supply for leisure pursuits such as watering a 'garden' using a hosepipe, filling a pool, washing a car, among others
WAFU	Water Available for Use	Combined total of deployable output; future changes to deployable output from sustainability changes, climate change etc.; transfers and any future inputs from a third parties; short term losses of supply and outage; and, operational use or loss of water
WFD	Water Framework Directive	EU Environmental Legislation committing all EU member states to achieving good quality and good quantitative status of all water bodies
WRMP	Water Resource Management Plan	Statutory plan produced by water companies every five years to plan to meet supplies over 25 to 50-year period
WRSE	Water Resources in the South East	Partnership of water companies and regulators in South East England working together to make best use of available water resources
WRZ	Water Resource Zone	The largest possible zone in which all resources, including external transfers, can be shared and hence the zones in which all customers experience the same risk of supply failure from a resource shortfall
	Western area	Supply area comprising the Hampshire Andover, Hampshire Kingsclere, Hampshire Winchester, Hampshire Rural, Hampshire Southampton East, Hampshire Southampton West and Isle of Wight Water Resource Zones

Get in touch
wrmp@southernwater.co.uk

Track our progress
southernwater.co.uk/wrmp

Follow us on Twitter
@southernwater

Southern Water
Southern House
Yeoman Road
Worthing
West Sussex
BN13 3NX