South Staffs Water














South Staffs Water

Water Resources Management Plan 2024

Securing your water future

Contents

List of appendices

Appendix H	Problem Characterisation Review
Appendix I	ValueStream Methodology Specification
Appendix J1	ValueStream 1 workbook for supply options
Appendix J2	ValueStream 1 workbook for demand options
Appendix K	Artesia Demand Management Optimisation Report
Appendix L	Board Assurance Statement
Appendix M	Demand Management Activities detail report
Appendix N	Options DO Benefit Modelling Report
Appendix P	SEA and other environmental reports
Appendix P1	A3 INNS Assessment Sheets
Appendix P2	HRA Report
Appendix P3	NCA and BNG Report
Appendix P4	SAE Environmental Report
Appendix P5	WFD Report
Appendix P6	INNS Report
Appendix P7	WFD Option Level Impact Assessments
Appendix R	2022 Drought Review
Appendix S	Carbon Assessment Methodology
Appendix X	Jacobs draft WRMP24 Assurance Statement

Executive summary

We all need water to live. Here at South Staffs Water, it is our role to ensure that there is enough water for both the needs of our customers and our environment in our region not just today, but for future generations to come. That is a role we take very seriously, and this document sets out how we will achieve this for the next 25 years.

Every five years, we publish our Water Resources Management Plan (WRMP) which details how we will meet the predicted demands for water in our area over the next 25 years. This plan covers from 2025 to 2050, and even shows a view of beyond that to 2100. There have been several changes since our last plan was developed in 2019; climate change and growth projections have been updated, our region has now been classified by the Environment Agency as an area of serious water stress, and we need to plan to increase our drought resilience to ensure we can continue to provide a secure supply of water to our customers.

South Staffs Water gets its water from a mixture of surface water and groundwater sources across the region. Over the next 25 years, we will need to reduce the amount of water we take from our existing groundwater sources in order to protect the environment from the impacts of climate change, and to help waterbodies to achieve good status as defined in the Water Framework Directive. We are expecting the population in our area to increase over the next 25 years, and this will increase the demand for water. So, we have increased demand, and less water available, and by 2050 we would have a supply deficit of around 60 mega-litres per day (Ml/d).

In order to address this, we have identified options to reduce demand and options to increase supply. Our first approach is always to try and reduce demand – less water required means less water abstracted from the environment, and also leads to lower costs for our customers. But sometimes, it may be that new supply options are also required to ensure there is enough water available to meet the projected demand, and so we have explored a variety of new options from new surface water abstractions, to increasing the size of our reservoirs, to transferring water in from outside of our region.

We have assessed all of these options to understand the value they bring. This means that as well as looking at the cost of an option, we have looked at the benefits and dis-benefits they may bring to the economy, the environment and our customers, through a range of metrics such as tourism and amenity value, flood resilience and biodiversity. We used this information to make sure that this WRMP is a best value plan for both our customers and the environment.

It is important that our plans align with the priorities and preferences of our customers, wherever possible, and so we have undertaken an extensive customer engagement programme over the last 18 months to help shape and test our plans. Our customers clearly told us that their priorities are that we should focus on demand management first by reducing leakage and helping educate customers to reduce their water usage. If new supply options are needed, we should focus on maximising existing sources first before building new ones, and we saw an increased level of support for South Staffs to protect the environment and deliver improvements in this area, compared to WRMP19.

The Water Industry has made some ambitious commitments over the last couple of years, and the Environment Act 2021 has added further ones. These include:

- Achieve 50% leakage reduction, from 2017/18 level, by 2050.
- Deliver household consumption (PCC) of 110 litres per person per day by 2050.
- Reduce non-household consumption by 9% by 2038.
- Reduce the amount of water we put into supply per person by 20% by 2038.
- Be “net zero” for operational carbon by 2030.

We have incorporated these into our demand management strategy, and we share the details of how we’ll achieve this in the plan. When we apply the savings that these demand management activities will achieve, it closes the gap

between the required demand and the supply available, and means we no longer have a deficit in the planning period. In addition, our system is already at the enhanced level of drought resilience now required, and so we do not need any new supply options.

Of course, long term planning has a certain element of uncertainty, particularly the further into the future we look. It is important that our plan is robust enough to deal with changes to our assumptions. There are several key areas where we could see different scenarios in the future; these include the level of population growth, the impact of climate change, and the scale of the abstraction reductions needed in the future to protect the environment. So, we test our plan against different assumptions in these areas to understand what impact it would have on our supply demand balance if, for example, climate change turned out to be more severe than current projections, or there was a surge in population in our region. We discuss these scenarios in more detail in the document below, but as we tested our plan against the different scenarios, we found that we were still able to deliver the required water to both customers and the environment up to 2050 without any additional options being required. If this hasn't been the case, we would have developed an adaptive plan; this would have detailed what different actions we would have taken, and when, if we had seen one of these scenarios come to pass.

Our demand management plan is not only the best value plan, but also the least cost. Our environmental assessments also support this value compared to new supply options. However, it does still have some risk associated. This is because our plan relies on several external factors that are not wholly within the control of South Staffs Water. To reduce household consumption, we are reliant on changes to customer behaviour, supported and encouraged by ourselves through providing smart metering and innovative tariffs, as well as education and support. Our plan also assumes savings delivered by the Government led initiative on water labelling of white goods, currently due to implementation in 2025. If this does not progress, it will have a considerable impact on the level of savings we're able to achieve to household consumption levels.

A key enabler for our delivery is through universal smart metering. At WRMP19 we discussed universal (often referred to as compulsory) metering with our customers, but overall, they did not support it and so we did not progress with plans to introduce it. Following our classification as an area of serious water stress, we have explored this again with our customers through our WRMP24 engagement programme. This time, we have received majority support for this approach with customers more used to smart meters following the success of energy smart meters over recent years, and customers also see it as a fair way to pay and to help educate everyone on their usage to enable water savings and reduced bills. However, there was a strong focus from our customers about ensuring vulnerable customers and those with large families are protected and supported, and we are currently developing additional options above our current customer support packages that we could implement alongside our universal metering programme that we plan to undertake over the next 10 years.

We will monitor our performance against this plan every year and report on this to the Environment Agency to ensure we are delivering these ambitious targets. It is a resilient plan that has been tested against different future scenarios and aligns with our customer priorities and preferences. We believe our proposed WRMP24 provides the best value solution to the future water demands of both our customers and the environment.

1. Introduction to our water resources management plan

Summary

Every water company in England and Wales must produce a Water Resources Management Plan every 5 years. This plan looks at the predictions for water demand over the next 25 years, and what water supply is available to meet this demand. It then details how it will ensure it meets this demand through a potential range of demand management options and new supply options.

Our last plan was produced in 2019, and a lot has changed since then. Much of this relates to climate change and its impact on future water availability, both for public water supply and for environmental needs. In 2021, South Staffs Water was declared as an area of serious water stress by the Environment Agency. This means that either currently or in the future, the household demand for water is a high proportion of the current effective rainfall.

Even as we have been developing this plan, in 2022 our region is currently classified as being in drought, and the need to ensure our supplies are resilient to future periods of long dry weather is apparent. This WRMP looks to ensure a step change in drought resilience as we have undertaken studies to identify the actions required to make our system resilient to a 1 in 500-year drought, where the previous requirement was a 1 in 200 year drought. In reality, this means that the chance of an extreme drought reduces from 0.5% to 0.2% in any given year.

A key focus of this plan is to ensure that we meet not only the water needs of our customers, but also that of our environment. Our plan will ensure that abstraction reductions are delivered over the next 25 years from our existing sources in order to counteract the impacts of climate change and ensure the environment has the water it needs. This will also ensure delivery of the Water Framework Directive (WFD) targets.

In addition, our population is growing. The Covid-19 pandemic saw customer use over 20 litres per person per day more than they did prior. This is due to people working from home more and increased hygiene practices. Even now, we are seeing this increase has not returned to pre-pandemic levels, nor has it been offset by a reduction in non-household usage. This means that demand for water has increased since WRMP19 and is set to increase across the lifetime of our plan.

Whilst the threat of climate change is not a new challenge, our understanding of it and the risk it poses to public water supply and the environment has evolved since our last WRMP in 2019. It is clear that our old method of developing WRMPs, where individual water companies prepare their own and focus only on their own requirements, will not alone solve the wider water issue in England.

This has led to the development of regional water resources planning groups across England. There are five groups, and South Staffs Water is part of Water Resources West. This regional group comprises of South Staffs Water, Severn Trent Water, United Utilities, Hafren Dyfrdwy and Dwr Cymru Welsh Water, and has combined the supply and demand needs from each of these companies, and non-public water supply sectors, to create a regional water resources plan. The five regional plans have been overlaid to create a national picture, which ensures that the best value plan, for both customers and the environment, to meet the water needs of the country has been developed.

The WRMP has strong links to a number of other plans. It is a key building block of the PR24 business plan which we will submit to Ofwat in October 2023.

1.1 What is a water resources management plan?

Water companies are required by law to draw up, consult on and maintain a water resources management plan (WRMP), which sets out how they will manage resources in order to meet the requirements of the Water Industry Act 1991. This WRMP covers the period 2025 to 2050 and takes into account factors such as population growth and climate change. The plan is subject to annual review and companies need to write a new plan where circumstances change or the Secretary of State (SoS) at the Department for Environment, Food and Rural Affairs (Defra) requires them to. A new plan must be prepared every five years.

Our WRMP shows how we intend to maintain the balance between available water supply and the demand for water over the next 25 years. While South Staffordshire Water now incorporates the supply area of Cambridge Water, this WRMP applies only to the original South Staffs Water operating area and a separate plan has been prepared for the Cambridge Water operating area.

1.2 The process of developing a water resources management plan

The Water Act 2003 made WRMPs statutory documents which must be submitted to the SoS at Defra. Companies submit draft WRMPs and make them public; this is followed by a period of consultation where comments on the plan can be sent to the SoS. We then consider the comments received and make any necessary changes to the final WRMP before it is submitted to the SoS again for approval for final publication.

In addition to the statutory requirement to consult specified stakeholders the Environment Agency's 'Water resources planning guideline' specifies a pre-consultation stage and early engagement with regulators, customers and interested parties.

We recognise that we must ensure our plans represent a balanced view of customer priorities and views on key issues. We have built on the approach to customer engagement which we used for the 2019 WRMP and have integrated it more with the wider regulatory business plan (PR24) engagement process. Our activities relevant to the WRMP include the following.

In line with statutory requirements, we contacted a range of stakeholders to invite views on what the WRMP should consider.
We held regular meetings with the Environment Agency and Ofwat during the development of the draft WRMP.
Between November 2020 and February 2021, we appointed Accent Research and PJM Economics to carry out foundation research in order to determine the structure of our customer engagement programme.
We have retained our Independent Customer Panel, and it has been kept informed and in particular consulted on the customer engagement.
We carried out customer engagement on our WRMP and long-term plan over 12 months from summer 2021 to summer 2022 to gain customer views of service levels and where we should invest to meet demand for water. Independent consultants Community Research facilitated the process.
We have also undertaken online surveys with customers in our region to further support this evidence, as supported by Community Research.

A detailed discussion of our customer engagement is included in chapter 4.

1.3 Statutory pre-consultation

There is a statutory requirement to consult the Environment Agency, Ofwat, the SoS and any licensed water supplier that provides water to premises in our area through our supply system before preparing a draft plan.

We sent pre-consultation letters to key stakeholders in January 2022, notifying them of our work to develop a new draft WRMP and asking them for initial views on issues to be considered. Letters were sent to the following.

- CCWater, the water consumer watchdog.
- Ofwat.
- The Environment Agency.
- Defra.
- Natural England.
- Cyfoeth Naturiol Cymru (Natural Resources Wales).
- The Independent Customer Panel.
- Severn Trent Water.
- United Utilities.
- Bristol Water.

We have held several meetings with Ofwat, the Environment Agency and CCWater in order to provide additional detail, and progress updates, as we have gone through the development of our WRMP. Appendix A1 details all of the pre-consultation feedback received for this plan.

1.4 Public consultation on our draft water resources management plan

The Water Act 2003 states that companies must publish their draft plan within 30 days of notification that Defra is not proposing to give any direction (under section 37B(10) of the Water Act 2003) to amend the plan on the grounds of national security. We received this notification from Defra on 9th November 2022.

We published our draft plan on our website on Tuesday 15th November 2022. We also notified key stakeholders (as specified in the WRPG) of the consultation period, directing them to the website and advising that a paper copy of the plan is available if required. These stakeholders included:

- the SoS.
- the Environment Agency.
- Ofwat.
- licensed water suppliers within our area of supply.
- Regional Development Agencies within our area of supply.
- Regional Assemblies within our area of supply.
- local authorities within our area of supply.
- Natural England.
- the Historic Buildings and Monuments Commission.
- Canal and River Trust.
- Severn Trent Water; and
- CCWater.

Our draft plan was out for consultation for 14 weeks, and so consultation closed on Tuesday 21st February 2023. We have now reviewed all of the feedback received and have published our statement of response to this feedback alongside this updated revised draft WRMP on 17th May 2023.

1.5 Environment Agency liaison

The water resources planning guidelines specify that water companies should consult with their local Environment Agency team about the methods to be used when developing a plan.

We held regular meetings with Environment Agency staff during the development of the draft WRMP. These meetings provided the Environment Agency with early sight of particular areas of the plan and gave it the opportunity to seek clarification on any issues. Draft supporting documents, such as those prepared by consultants on our behalf, were shared with Environment Agency staff.

Feedback during these meetings and in response to draft supporting documents has helped shape our WRMP.

1.6 Timetable

The timetable for adopting the final WRMP is as follows:

- 3rd October 2022: the date we submit our draft WRMP to the Secretary of State at Defra.
- 16th November 2022: the start of a 12-week consultation period (the closing date will depend on the date we receive permission to publish).
- 17th May 2022: we will publish on our website our response to any representations we receive on our WRMP consultation as well as a revised draft WRMP.

We will publish our final WRMP on our website once the Secretary of State has authorised us to do so. Copies will also be made available at our head office.

1.7 Links to other plans and context

1.7.1 Water Resources West – Regional Plan

The Environment Agency released its National Framework in 2021, which created the structure of regional planning groups. Regional groups bring together the water companies that operate in each of England's regions with key water users and other stakeholders. South Staffs Water is a member of Water Resources West, along with Severn Trent Water, United Utilities, Dwr Cymru Welsh Water and Hafren Dyfrdwy.

Each regional group must produce a single plan that builds resilience to a range of uncertainties and future scenarios. It will set out the preferred plan for the region – delivered through a set of options that present the best value to customers, society and the environment, rather than simply least cost. Together, the five regional plans must add up to meet the collective national need.

Through a collaborative process, these regional plans will deliver a step change in water resource planning, specifically in the following areas:

- Increasing resilience to drought
- Delivering greater environmental improvement
- Long term reductions in water usage
- Leakage reduction
- Reducing the use of drought permits and orders
- Increasing supplies
- Moving water where it is needed

We have worked with the other water companies in Water Resources West in order to deliver these requirements, and to ensure our WRMPs are aligned and better coordinated to ensure that we are delivering the best value plans for the region as a whole, rather than just focusing on our individual companies. Throughout this document we refer to our links with Water Resources West, and how we have worked together throughout the process of developing

both the WRMP and regional plan. Our supply and demand numbers feed directly into the regional plan, and there is clear and direct link between the two plans. Our plan is directly reflected in the regional plan.

We will continue to work with Water Resources West in key areas such as environmental destination as we continue on our planning journey.

1.7.2 Strategic environmental assessment

In accordance with the strategic environmental assessment (SEA) directive[1] water companies have to consider whether the proposals within their WRMP could cause "significant environmental effects" and if so carry out an SEA to assess the potential impacts of options being considered.

This can then be used to inform the selection of WRMP schemes. The short-listed measures/options, including demand management, leakage reduction and resource development measures can be assessed against SEA criteria and the resulting water resource management plan programme selected on the basis of a reasonable balance between cost and environmental and social impact.

An SEA must therefore be carried out at the same time as a WRMP is developed and be integrated into the development of the plan.

We decided that it was appropriate for us to carry out an SEA in conjunction with this WRMP. A summary of the SEA process and the results of the SEA are included in section 10, with the details contained in Appendix P.

1.7.3 PR24 business plan

Our WRMP has been integrated into the process of developing our business plan for the five years from 2025 to 2030, which we will submit to Ofwat in October 2023. Our plan will also contribute to the LTDS and has been progressed as a key workstream of the development of this.

We have carried out customer engagement to inform the WRMP as part of a wider programme of engagement covering all aspects of the business plan.

Our approach to modelling options for the WRMP has been developed to ensure that expenditure arising from WRMP drivers can be integrated with other aspects of expenditure – for example, on capital maintenance of existing assets.

1.7.4 Drought plan

The WRMP planning guideline identifies strong links with water company drought plans. Our latest drought plan was published in August 2022.

Our WRMP has been prepared to be consistent with our latest drought plan.

We have considered potential links between our plan and Environment Agency and Natural Resources Wales drought plans. In particular, we have sought to identify any river support schemes managed by the Environment Agency or Natural Resources Wales that might affect our ability to abstract water and whose operation may be restricted in a drought. In our case, the principal scheme of interest is the Clywedog Reservoir – Shropshire Groundwater Scheme – River Severn system. Operation of this system in normal and dry years is accounted for in our

[1] Directive 2001/42/EC of the European Parliament and of the Council of the European Union of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment.

Aquator model (Aquator is a computer model widely used in the water sector to calculate the amount of water available in different scenarios) and its influence on abstraction used in our calculation of DO.

1.7.5 Local authority plans

Our population and property forecasts are based on the latest local authority development plans taking account of their projections for new housing needs.

1.7.6 River basin management plans

River basin management plans (RBMPs) include programmes of measures to comply with environmental legislation and meet the objective of improving the environment. Of particular relevance to WRMPs are the measures required to comply with the Water Framework Directive (WFD) 'no deterioration' clause. This is accounted for in the Water Industry National Environment Programme (WINEP) of obligations, which the Environment Agency compiles and provides to water companies.

All existing sources of water which are at risk of causing deterioration to the environment have been assessed through our WINEP during AMP7. As a result, we have agreed licence changes with the Environment Agency in order to mitigate the potential impact of any additional growth in our area. These changes, and the resulting loss of DO, have been included in our baseline forecasts in our plan.

1.7.7 Flood management plans

Our operating area covers the river catchments of the Humber and Severn and we have considered flood management measures identified by the Environment Agency and the other statutory partners (county and metropolitan borough councils) for the following areas.

- **Humber:** West Midlands Flood Risk Area, Staffordshire Trent Valley management catchment, Tame, Anker and Mease management catchment.
- **Severn:** the Worcestershire Middle Severn Catchment.

We have identified the following activities within our WRMP and have incorporated appropriate measures.

- **Protection in areas of flood risk:** we will continue to design and install water supply infrastructure such that public water supplies are resilient against major flood events.
- **Flood storage and conveyance:** where new infrastructure is planned in the flood plain, we will agree and put in place measures to mitigate against any loss of flood storage or conveyance.
- **Discharges to surface water:** we will continue to adhere to the appropriate environmental permitting process to ensure that all our discharges are sited appropriately so as not to increase flood risk in the receiving water body.

1.7.8 25 Year Environment Plan

In 2018 the Government published its 25 Year Environment Plan. This plan sets out government action to help the natural world regain and retain good health. The clear goals that the adoption of the plan are set to achieve are:

1. Clean air
2. Clean and plentiful water
3. Thriving plants and wildlife
4. A reduced risk of harm from environmental hazards such as flooding and drought
5. Using resources from nature more sustainably and efficiently
6. Enhanced beauty, heritage and engagement with the natural environment

South Staffs are committed to playing our part in the delivery of these objectives, and we have ensured these goals are supported through the options developed in this plan.

1.7.9 Government Environmental Plans

1.7.9.1 The Environment Act 2021

November 2021 saw the Environment Act passed as legislation. This Act sets clear statutory targets for the recovery of the natural world in four priority areas: air quality, biodiversity, water and waste. It builds on the 25 Year Environment Plan by providing deliverables in these key areas to ensure pace of delivery.

The water demand target from the act states that the volume of potable water supplied per head of population in England should be 20% lower than that in 2019/20 by March 2038. We have included this target in our plan and section 10 covers how we propose to do this, through a range of activities to reduce leakage and household consumption.

1.7.9.2 Environmental Improvement Plan 2023

In early 2023, the Government published its Environmental Improvement Plan 2023 which looks to build on the Environment Act 2021. Goal 3 of the plan relates to clean and plentiful water, and describes a key policy to facilitate infrastructure projects, reduce leakage and increase efficiency in new developments and retrofits to promote a sustainable and resilient water supply.

The Environmental Improvement plan articulates the interim targets for achieving key sector targets, such as:

- Reduce the use of public water supply in England per head of population by 20% from the 2019 to 2020 baseline reporting figures, by 31 March 2038, with interim targets of 9% by 31 March 2027 and 14% by 31 March 2032.
- Reduce leakage by 50% by 2050, with interim targets to reduce leakage by 20% by 31 March 2027 and 30% by 31 March 2032.
- Reduce non-household water demand by 9% by 2037 and 15% by 2050.
- Restore 75% of our waterbodies to good ecological status.

Our plan achieves these targets, and we share the detail behind the demand management activities in section 9, and the actions and timescales we propose in order to achieve 75% of waterbodies to good ecological status in section 6.11.

1.7.9.3 Plan for Water

In April 2023, the Government published its “Plan for Water” which is an integrated plan for delivering clean and plentiful water. This further builds on the Environmental Improvement Plan and we have ensured our plan aligns to its aims and goals.

2. Scope of our plan

Summary

Our WRMP covers the South Staffs Water region, which operates as a single water resource zone. This means that any options we progress would impact upon the whole of the South Staffs area.

This plan looks to primarily ensure resilience to future climate change impacts, as well as meeting the increasing demand for water caused by a growing population.

Our key objectives for this plan are set out below:

- Deliver a sustainable and resilient supply of water for both our household and non-household customers now and in the future.
- Commit to reducing the amount of water we abstract from the environment over the lifetime of the plan in order to protect and enhance the natural environment in which we operate.
- Identify the longer term uncertainties e.g. climate change, and, if required, provide adaptive pathways within the plan in order to ensure we can respond to future challenges.
- Be acceptable and affordable for our customers.

We are situated in the centre of the Severn Trent Water operating area, and as such need to work closely with them to ensure our collective impacts and needs are balanced. We do this through direct liaison, but also through the regional planning group, Water Resources West, which ensures we plan for the water needs of the entire region rather than just on a localised basis.

There is always uncertainty when developing long term plans, as these are built on assumptions of the scenarios which may come to pass in the future e.g., climate change, population growth. As such, we look to stress test our plan for a range of scenarios to ensure it is robust to changing situations. If there are larger areas of uncertainty, or the plan needs to be adapted in certain circumstances, we may need to consider an adaptive plan. We have reviewed our need for an adaptive plan, which would provide an alternative pathway if a future assumption were to change.

We have agreed common processes for developing our plans with the other companies in Water Resources West to ensure consistency in approach. In addition, we have sought assurance from Jacobs to ensure we have met our obligations in the Water Resource Planning Guidelines.

2.1 Challenges facing South Staffs Water

We are faced with:

- growth in population and properties driving demand upwards.
- our region is now classified as an area of serious water stress.

- as a result of climate change, we need to ensure our system is resilient to a 1 in 500-year drought by 2040.
- we need to ensure we no longer just focus on our own supply area, but also develop a regional water resources plan that looks to ensure that the entire water needs across our region, and ultimately the nation, are understood and planned for.
- customer demand for water increased during the Covid-19 pandemic and is still higher than pre-pandemic levels.

So, we have taken the opportunity with this WRMP to review the whole of our existing operations across all sources and not just to look for options to address a supply/demand balance deficit. We have reviewed the challenges we face and the scale and complexity of them through an exercise of problem characterisation and have adopted a multi-criteria approach to decision-making. We have identified the most appropriate mix of supply and demand options going forwards.

The remainder of this WRMP is structured as follows.

- Our forecasts for baseline demand are described in chapter 5.
- Customer views are described in detail in chapter 4.
- The environmental impact of our abstractions is described in chapter 6.
- Our problem characterisation exercise and multi-criteria approach to decision-making is described in detail in chapter 9.

2.1.1 Water Stress

The Environment Agency developed a water stress classification methodology for water companies in 2007 for the purposes of Regulation 4 of the Water Industry (Prescribed Condition) Regulations 1999. If a water company is classified as 'water stressed' it must consider compulsory metering to balance supply and demand. If a company is not classified as water stressed it cannot impose compulsory meters on customers without seeking direct approval from Defra under separate water scarcity legislation.

The Environment Agency published an initial consultation on identifying areas of water stress in 2007 and followed this with a response in August the same year. It later updated its classifications in 2013, and again in 2021 following public consultation.

Each water company is classified as being not water stressed, in moderate water stress or in serious water stress. The assessments are carried out by the Environment Agency and are based on a Water Exploitation Index (WEI) linked to the status of water bodies within the area.

For the previous South Staffs Water WRMP published in 2019, our area of supply was not classified as water stress, however following the revised approach in 2021 the determination indicates that there may be environmental impacts caused by public water supplies, or need for further resources, which may be reduced by improved water efficiency through metering.

Accordingly, our plan has explored metering programmes, including compulsory metering (described in our plan as universal metering) as part of our demand management options. We have also explored customer support for universal metering in light of the level of deprivation faced in the region.

2.2 Performance against WRMP19

At WRMP19, we committed to various actions to reduce demand for water and increase our supply resilience. These are described in the table below, along with our performance against these commitments to date:

Table 1 WRMP19 commitments

Key elements of our plan	What we said we'd do	How have we done?
Leakage	By 2024/25, we will reduce total leakage on our network by 12 Ml/day from the 2019/20 performance commitment level of 70.5 Ml/day. We will achieve this transformational reduction through a combination of pressure management and active leakage control. We will develop a live network where data can help identify leaks more quickly and improve performance and use other innovative techniques. We are targeting a reduction in leakage of more than 40% across the 25-year planning period.	We have met our leakage targets for the first three years of AMP7. 2022 proved to be a challenging where a drought and then some significant freeze thaw events in winter led to large ground movements which has impacted our leakage performance in year three. However, we have an ambitious plan in place to ensure we get back on track to deliver in the final year of the AMP. We are progressing well with our smart network programme.
Metering	We will aim to encourage an average of more than 8,000 households a year to switch to a water meter over the lifetime of this WRMP.	We are behind on our delivery of this target, predominantly due to the Covid-19 pandemic where we were unable to attend properties to fit meters. Since the pandemic, the cost-of-living crisis has significantly impacted on the number of customers wishing to switch to a meter as they fear the impact on their bills. We have increased our marketing and customer engagement, but this has had little impact. We're now focusing on how we can support more customers through the change to offer more security and support.
Water Efficiency	We will reduce baseline PCC by 1l/p/d by the end of the five-year period from 2020 to 2025. We will work with developers to explore invectives for them to include rainwater harvesting and greywater recycling within new sites. We will continue to work with customers and target water efficiency advice at those who may be concerned about whether they can afford to pay their water bills.	**PCC -** We have seen an increase in PCC since the Covid-19 pandemic. This is due to increased hygiene practices, more people hybrid working or working from home, and the increased value our customers have for their outside spaces since the pandemic i.e., we have seen an increase in outdoor water use. Whilst we are seeing PCC reduce, it is not yet at pre-Covid levels, and we have employed an innovative improvement plan for the since Covid to provide customers with more data and support to change behaviours. However, we believe our baseline household consumption has now had a permanent uplift as more people work from home post the pandemic and this

		change looks set to be permanent. We have included this in our forecasted consumption in our plan.
		Developer Incentives - We have introduced a very successful developer incentive programme that has outperformed throughout AMP7. We continue to expand this and build on it, taking on board learnings from other water companies and incorporating best practice.
Resilience	We will liaise with our neighbour, Severn Trent Water, to further explore a bulk supply trade to provide additional resilience to our water supply system – especially during the period of investment in our two major treatment works. Reintroduce two groundwater sites through refurbishment.	The upgrade work at our two major treatment works is progressing to schedule. We have liaised with Severn Trent Water during this process and maintained continuous supply through this during all construction work, even during the drought in 2022 where we saw record demand for water. We are also on track to reintroduce the two groundwater sites identified in the plan.
Environment and sustainability	We will continue working with the Environment Agency to achieve objectives around the Water Framework Directive and river basin management plans.	We have agreed licence caps and changes with the Environment Agency which will be enacted by 2027. These will ensure that there is no risk of deterioration from growth in demand from our groundwater sources.

Despite the challenges we have seen since 2020 due to the Covid-19 pandemic and the drought of 2022, we have ambitious improvement plans in place to ensure we deliver our end of AMP7 target positions. However, we believe that there is a new baseline position for PCC post the pandemic which now makes our target unachievable. As a result, we have updated our forecast for the plan for the final plan to take into account this new baseline and ensure the plan is deliverable from the outset to ensure we are not putting customer supplies at risk. We are confident our forecast starting position is achievable through the delivery of our water efficiency improvement plan and leakage action plans in the final year of AMP7, using in AMP data to forecast trends and reductions.

However, if we find that we do not meet the forecasted starting levels in the plan for either leakage or consumption, we will need to re-base the demand forecast to reflect the actual April 2025 starting position. We would undertake this through our annual review of the WRMP. This occurs at the same time as our annual performance review where we submit our performance against key performance indicators such as leakage and PCC to Ofwat for the previous year.

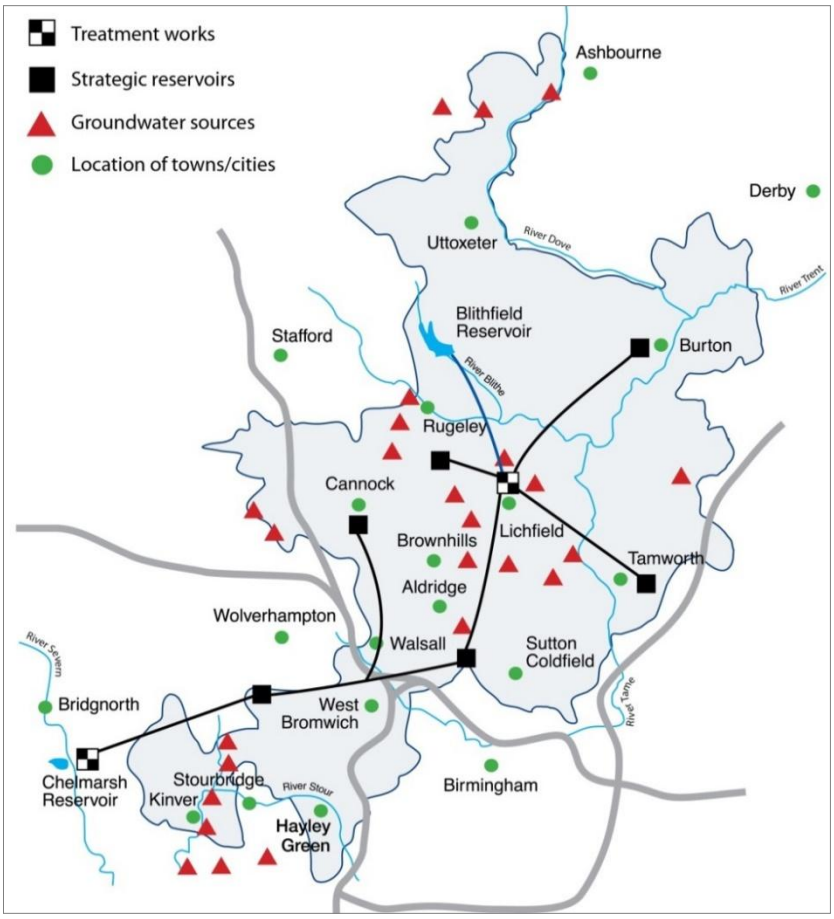
2.3 Planning period

This plan covers the period 2025/26 to 2049/50. The year 2020/21 is the base year for the draft WRMP. Actual data for the base year as reported in the 2021 Annual Review has been normalised to remove the impact of year-on-year climatic variation and Covid-19 impact. Demand side reductions are from 2017/18 position.

2.4 Water resource zone integrity definition

Our region of supply is defined as a single water resource zone (WRZ) with the risk of shortages of water being equal across the whole area of supply. The region has two surface water treatment works – our River Severn works and our Central works – and 25 available groundwater sources, which are mainly situated in the southern and central areas. All these sources are linked by an integrated supply system. A map of the area of supply is shown in the diagram below.

Figure 1 South Staffs Water supply area and water resource zone



The supply area has varied topography and the supply system has been developed over time to provide security of supply to all customers. This has been achieved by the linking of the strategic service reservoir supply areas with large diameter mains, booster stations and remotely controllable valves to enable the transfer of water throughout the region's supply area.

The region has 20 supply zones with potable water storage provided by 31 service reservoirs and water towers. Water sources feed directly into some supply zones and zonal transfer boosters move water to zones with no direct

resource input and between supply zones at times of peak demand or asset maintenance. Strategic control valves operate in a similar way to zonal transfer boosters but transfer water under gravity.

As an example of zonal flexibility and integration, we have the ability to transfer water from the River Severn Works, which is situated outside the supply area at the south-west corner, through the supply system to Outwoods, Castleway, Hopwas and Glascote supply zones. This is achieved by transferring water through the strategic reservoir system. Water transfers from storage reservoirs, which receive River Severn Works water, through large diameter trunk mains towards the north of our area. The water then gravitates further northwards through a 36" main connecting to our Central Works and gravitates to Outwoods for boosting onto Castleway or to Hopwas for boosting onto Glascote.

The northern most extreme of the region's area of supply is the Uttoxeter area. Supplies to this area can be fully maintained by controlled gravity flow from a storage reservoir, which receives Central Works water.

We operate a Control Room that is manned 24 hours a day. The primary purpose of this is to monitor and manage the supply system on a day-to-day basis. All zonal transfer boosters and control valves can be operated remotely from the Control Room.

In a resource shortage situation, the highly interconnected supply system allows us to transfer water between service reservoirs such that supplies can be maintained to all customers through balancing the fall in all water storage reservoirs. Our water resources allocation model, (Aquator), is set up to represent this ability to transfer water throughout the area of supply.

The River Severn Works is a shared resource with Severn Trent Water. The water is abstracted by us at the River Severn Works and transferred to Severn Trent Water through four mains connections to meet demand in Wolverhampton.

2.5 Planning scenarios

The Environment Agency's water resources planning guidelines detail the range of planning scenarios which a company may need to consider. In accordance with this we use the dry year annual average (DYAA) scenario for water resources planning purposes. A normal year demand forecast is developed initially and the key components of this demand which are influenced by dry weather are then adjusted to derive the DYAA demand forecast.

Previously we have developed supply and demand forecasts for the peak week scenario as this scenario influenced requirements for peak treatment capacity at our two main treatment works. This was particularly important at this time as we were making decisions about future investment in these works. Extensive work has been undertaken at both of these works to upgrade treatment and output capacity during AMP7. As such, these constraints on peak treatment capacity at the two main works has been removed, as evidence during the hot weather in the summer of 2022 where we saw record levels of demand across our area and saw us successful meet increases in daily demand over 30% for a period of 10 days. As such, we are no longer including this peak week scenario as these previous system resilience and capacity issues have been addressed.

The base year data for 2019/20 has been normalised and this is then used as the starting point of the demand forecasts for all planning scenarios.

The WRMP does not include scenarios of very prolonged periods of high demand and reduced supply such as droughts. Droughts require additional measures and are planned for in our drought plan. There are strong links to the drought plan as described in chapter 6.4.

In urban areas when many customers wish to take large volumes of water at around the same time usually for discretionary purposes such as garden watering pressures in the system can drop and customers can experience low pressure and occasionally no water. This is defined as supply stress and is not a water resources problem. However, some of the strategies designed to manage the overall supply/demand balance, in particular metering, will also benefit those areas specifically suffering from supply stress.

It should be noted that our WRMP is at the supply system overview level. Local transfer capacity difficulties as described above, for example, may still require investment. These issues are not considered within the WRMP, but where they required investment, we included them in the final business plan.

2.6 Climate change

We have included an assessment of the impact of climate change on the availability of water supply in this WRMP. The best estimate for this impact is included directly in the supply forecasts and the uncertainty associated with estimating the impact is included in the assessment of headroom uncertainty.

A component for the impact of climate change on demand has been included within the household demand forecast. The uncertainty around this has been included in the headroom assessment.

We have followed the approach to assessing the impacts of climate change as set out in the Environment Agency's water resources planning guidelines and are also aligned with the other companies in Water Resources West (WRW).

2.7 Other licensed water undertakers in our area of supply

Since the start of the development of this WRMP, several appointments have been granted by OFWAT and we now have three licensed water undertakers in our area of supply:

- Independent Water Networks Limited
- Leep Networks (Water) Limited
- ESP Water Limited

We have engaged with these undertakers to understand their planning details for each site within our area including number of properties, built out and occupation timescales and demand for water. This includes our commitments in bulk supply agreements and their proposed distribution input throughout each year of the planning period. The summary of our bulk supply transfers is detailed in the table below.

Table 2 Licensed water undertaker details

Licensed undertaker	Number of sites in SST operating area	Bulk supply arrangement Ml/d
Independent Water Networks Limited	5	0.72
Leep Networks (Water) Limited	4	0.93
Total	10	1.65

As well as engaging on key topics within the WRMP we have also discussed drought plans, levels of service, water efficiency plans and messaging, joint customer communications and metering. We will continue to work with these organisations, and others that may be granted licences in our area, to ensure a consistent approach to these areas.

We have included this information in our data tables with table 1 outlining the bulk transfer details to these three companies, and in table 3 as a combined potable water export with the DI forecast of each undertaker combined each year over the planning period. A summary of the DI impact through the planning period is shown in the table below.

Table 3 Licensed undertaker DI profiles

	Final Plan DI – Ml/d					
Licensed Undertaker	2024/25	2029/30	2034/35	2039/40	2044/45	2049/50
Independent Water Networks Limited	0.47	0.61	0.60	0.58	0.57	0.56
Leep Networks (Water) Limited	0.29	0.66	0.86	0.81	0.81	0.75
Total	0.76	1.27	1.46	1.39	1.38	1.31

Our WRMP only includes developments that have been granted a licence as of 31/12/2023. Any future developments are included in our future baseline demand predictions which are based on local authority growth plans. We are aware that a license has been granted to ESP Water Limited in our region; however, their WRMP does not reflect this and so we have not reflected this site in our bulk supply numbers to ensure alignment. Our bulk supply agreement with this site is 0.06 Ml/d and is included in our baseline DI numbers.

2.8 Severn Trent Water

Severn Trent Water borders our area of supply on all sides, and we have a number of shared interests which require close liaison and a consistent planning approach within our respective WRMPs. Through our regional planning with WRW and through direct liaison, we have ensured this consistent approach.

2.8.1 River Severn Works abstraction licence arrangements

Our River Severn abstraction is a shared resource with Severn Trent Water. We have confirmed with Severn Trent Water that the way in which our arrangement is modelled by both companies is consistent.

2.8.2 River Severn modelling

Our water resources model used for calculating DO does not include a hydrological model of the River Severn catchment. The River Severn inputs are taken from the Severn Trent Water model. We provide Severn Trent Water with relevant data and information regarding our own operations in order for the River Severn component to be accurate. Severn Trent Water provides data to us for DO estimation and for estimation of the impact of climate change on supply. We have used the latest updates from Severn Trent Water, based on rainfall run-off modelling in the preparation of this WRMP, which has been reviewed by consultants Hydrologic.

2.8.3 Bulk supplies

We export a number of small bulk supplies to Severn Trent Water and receive a number of very small bulk imports across the border. We also have a number of emergency bulk supply points in case of localised operational events close to our border. These regular and emergency bulk supplies are in addition to the joint resource at our River Severn works.

We have met with Severn Trent Water to agree planning assumptions on the scale of the imports and exports for the planning period.

2.9 Water trading and other options

Through the pre-consultation phase of developing this plan, and through our development of the regional water resources plan with Water Resources West, we have worked with other water companies to identify opportunities for water trading. We have considered options in particular with United Utilities, and these options are included in our feasible list described in section 9.

We have also explored with the other third parties and the Canals and Rivers Trust whether there are opportunities for water trades with them. These options are also included in section 9.

2.10 Retailers

Since April 2017 non-household customers have been able to switch water retailer – that is, the company which bills them and provides customer service. We have engaged with the retailers who operate within our area of supply seeking views on their plans to offer water efficiency to their customers.

We detail our stakeholder engagement activities in section 4.

2.11 Sensitivity analysis

When developing their WRMPs, water companies have to make assumptions, affecting almost every part of the plan. Therefore, it is important to demonstrate the sensitivity of the plan to these assumptions. We have looked at sensitivity in two areas.

The sensitivity of the supply/demand balance to data uncertainty is accounted for within the assessment of headroom, which is described in chapter 7.
The sensitivity of the proposed actions in the plan to assumptions or changes in the supply/demand balance is accounted for in our multi-criteria modelling approach described in chapter 9.

2.12 Adaptive Planning

For WRMP24, there is the need to look at adaptive planning. An adaptive plan is a framework which allows you to consider multiple preferred programmes or options. The adaptive plan should set out how you will make decisions within this framework.

You can consider an adaptive plan if you have:

- significant uncertainty, particularly in the first 5 years of your plan
- a strategic decision in the plan's medium term, which has a long lead-in time
- large long-term uncertainty which might lead you to consider different preferred options

We have considered the need for an adaptive plan, and we describe this in more detail in section 10.

2.13 Governance and assurance of the plan

South Staffs Water is a core member of Water Resources West (WRW) and many of our decision around the approach to key elements of our planning have been agreed through workstreams within Water Resources West. This includes the approach taken to elements such as target headroom, climate change modelling, environmental destination and growth projections.

In WRW, each workstream has a lead from one of the core water companies, and then has a representative from each company within the core delivery group. Key decisions regarding standardising the approach to certain variables are agreed in these workstream sessions with the workstream leads. Every month, a WRW senior group meeting is held, with representatives from key stakeholders as well as each water company lead. Any key decision areas are passed to this group to discuss and agree, to ensure that there is consistency across the companies and hence the region, and that there has been appropriate sign off within each organisation. The company lead is not the same individual that sits on the workstream delivery group in order to ensure there is an appropriate level of governance through the process.

Above the senior group, there is the CEO group for WRW which comprises CEOs (or their representatives, at least Director level) where key decisions and progress are shared for overall approval. This means there are three layers of governance for key decision areas. The CEO group are also responsible for the formal sign off of the regional plan, following individual company Board approval.

Within South Staffs Water, we have a similar approach. The core delivery team, who are also involved in WRW, develop the plan with overview from the Head of Water Strategy. Monthly review meetings were held with the Director of Strategy & Regulation and the Managing Director – these sessions provided progress updates, key decision areas and alignment with Water Resources West.

Every month, a written update has been provided to both the Exec team and the Board of the company to share the progress, current overview of the plan and a forward look of activities and timelines. In addition, Board sessions were held at key intervals to ensure Board members were fully versed in the current position and to seek approval for key areas of the plan. These sessions and the specifics are detailed below:

- February 2021 – share recent classification as area of serious water stress and implications for WRMP24 i.e. review of compulsory metering.
- March 2021 – initial view of WRMP and changes since WRMP19, including initial overview of potential challenges.

- April 2022 – share details on sustainability abstraction reductions and scale of environmental destination for inclusion in plan. Seek approval for environmental destination scenario to be included in plan, aligned with WRW companies.
- May 2022 – provide overview of supply demand balance. Share supply side options and prioiritiation of these through best value planning.
- July 2022 – share demand management options and impact on supply side options required, including detailing trade offs, costs and envirionmental impacts. Seek approval for planned demand management strategy.
- September 2022 – share final overview of draft WRMP and seek approval for submission and signature of Board assurance statement.
- April 2023 – signoff of sustainability reductions for AMP8. Share overview of statement of response and revised draft WRMP and seek approval for submission.

South Staffs Water has also maintained its independent customer challenge panel, and we have shared our plan with this group. In particular, we have regularly kept the group up to date with our customer engagement work and they have robustly challenged this throughout the process to ensure we have a thorough and meaningful enaggement piece. We have recorded our challenge log and submitted it as appendix B13 with the plan which details all of the challenges the customer panel have raised and the actions we have taken as a result. We have also submitted a statement from the Panel as appendix B14 which provides their independent overview of our approach to the WRMP and particularly the customer research element of this. This independent overview, focused on the customer voice, has ensured we can demonstrate that we have undertaken robust and meaningful customer engagement.

In addition, we have held progress updates with the Environment Agency, Ofwat and CCWater as we have developed the plan. These sessions have allowed us to share the progress of the plan and the proposed direction, as well as receive feedback to ensure compliance with the guideliness and expectations of our regulators.

We have employed the services of consultants Jacobs to carry out an independent assurance review of our draft WRMP. Jacobs' staff reviewed key aspects of the plan and the overall proposals. A report was produced following the audits and presented to our Board of Directors.

The audit report identified a small number of areas where further explanation or amendments could be considered. These were generally of a minor nature and presented no material impact to the overall supply/demand balance. We reviewed these areas and made amendments where appropriate. The audit report concluded that the draft WRMP meets the legal requirements, demonstrates a secure supply of water and complies with the Environment Agency's water resources planning guideline.

During September 2022 our Board of Directors reviewed and endorsed draft WRMP. We published this statement alongside our draft WRMP24 documents.

Following the conclusion of our draft plan consultation period, we have held sessions with the Environment Agency, Ofwat and the Canal & River Trust to discuss the feedback in more detail and ensure our understanding as well as sharing our proposed approach to feedback and likely outcomes. In April 2023 our Board reviewed and endorsed our Statement of Response and revised draft WRMP and gave approval for submission.

3. Our WRMP in the wider context

Summary

Our plan is developed using guidelines, policies and legislation, and we must ensure that all of these, both new and old, are suitably incorporated and reflected in the preferred plan. Whilst the Water Resource Planning Guideline provide the template by which we need to develop our plan, we must also ensure it aligns to our business planning process as defined in the PR24 methodology released by Ofwat.

Government direction, such as the 25 Year Environment Plan and the newly created Environment Act, must also be reflected to ensure our plan aligns and helps to deliver these aims and targets.

We must respond to and reflect what our customers tell us are their key priorities, and ensure we address their needs and concerns in our plan. At the time of writing this plan, we have seen the cost-of-living crisis deepen and this is reflected in the customer engagement work we have undertaken throughout the process. We have to acknowledge current issues whilst planning for future situations and scenarios, acknowledging that current needs and priorities may be very different for our customers in five years' time.

Our customers, regulators and stakeholders all prioritise the need for demand management to be a key part of our focus for these plans. In addition, we have seen our customer awareness and engagement in our environmental role increase since WRMP19, and their support for us to do more to protect the environment reflects the drivers within the Government Environmental and Water plans.

Balancing the wants and needs of our customers, our stakeholders and the environment is fundamental to this plan, to ensure we deliver the best value for all. Our WRMP then forms a fundamental building block for our business plan submission for PR24, and so we have ensured its development is aligned with the PR24 process.

3.1 Links to other policies and programmes

This WRMP is set within the context of some significant challenges and changes which have taken place in the water sector over the past five years. The table below summarises the key aspects of the framework within which we have developed our WRMP.

Table 4 Context for the WRMP

Statement or document	Owner	Key points of relevance for WRMP	Publication date
Water Industry Strategic Environmental Requirements (WISER) setting out statutory and on- statutory expectations for PR24	Environment Agency and Natural England	Regulators expect: • excellent environmental performance. • enhancement of the environment. • improving resilience. …through innovation, understanding environmental valuation and partnership working. A range of statutory requirements are included.	May 2022
Final water resources planning guidelines specifying approach to WRMPs	Environment Agency	What to include in WRMPs and approach to take? Changes since the 2019 water resources management plan (WRMP19) include environmental destination, classification as water stressed area, increasing drought resilience to 1 in 50, and regional planning requirement.	February 2022, update in March 2023
PR24 methodology & Public Value Principles	Ofwat	Specific water resources guidance: • Use of common reference scenarios to test plans. • Adaptive planning should be applied if meets required criteria. • Forecasts of supply/demand balance and capacity (as defined by water resources yield) are to be submitted with business plans (assumptions and outcome to be consistent with WRMP). • Costs in the WRMP should be reflected directly in PR24 submission.	Draft July 20122
25 Year Environment Plan Environment Act 2021 **Environmental Improvement Plan** **Plan for Water**	Government	All provide direction and targets relating to water resources and biodiversity. Specific targets: • 50% leakage reduction by 2050, including interim targets. • 110 l/p/d by 2050, including interim targets. • 20% reducing to DI per capita by 2038. • 9% non-household consumption reduction by 2038, 15% by 2050.	2018, 2021 & 2023
Other plans and dependencies	Public Interest Commitments	**Water Industry:** commitments Industry demand management commitments were made that have been confirmed through the Government environmental plans. Net zero operational carbon by 2030.	Ongoing
	WRW	**Water Resources West:** collaborative project looking at strategic regional solutions for water resources in the long-term.	Ongoing
	Customers	**Customer research:** both company and wider industry research shows customers want more leakage reduction, more help to save water, are generally in favour of metering and support current levels of service.	Ongoing
	Historic England	The **historic environment** should be considered as part of the Strategic Environmental Assessment. Plan developed using guidance from Historic England Advice Note 8 proving guidance to developing a robust sustainability appraisal framework. **Historic England's** Good Practice Advice Note 1	1st Dec 2016 8th Feb 2019

Statement or document	Owner	Key points of relevance for WRMP	Publication date
	Waterwise	The UK Water Efficiency Strategy to 2030, developed through engagement with South Staffs Water and other water companies, outlining 10 strategic objectives to reduce demand for water.	21st Sept 2022

3.2 Customer expectations

We have carried out extensive customer research as part of our preparations for the PR24 business plan and our WRMP. We have triangulated the available research to develop a rounded view of customer expectations. This is described in detail in chapter 4 of this plan and the associated appendices. We have developed our WRMP to take account of customer views.

3.3 How we have incorporated these policies and programmes

3.3.1 Government Environmental Plans

The new Environment Act came into force in 2021, and this was followed in December 2022 by confirmation of the associated targets. This has been built on further by the release of the Government's Environmental Improvement Plan 2023 and the Plan for Water. Several of the goals and targets in these directly relate to the water industry and we have ensured that our plan meets the following targets stipulated within these:

- a 50% reduction in leakage by 2049/50, with interim targets in 2027, 2032 and 2038.
- a commitment to reduce PCC to 110l/p/d by the end of 2049/50, with an interim target of 122 l/p/d by 2038.
- a reduction in distribution input (DI) per capita by 20% by 2038, with interim targets in 2027, 2032 and 2038.
- a reduction in non-household consumption by 9% by 2038 and 15% by 2050.
- 75% of waterbodies to achieve good ecological status.

Government and regulators' policy is clear that water companies must challenge themselves more and be more ambitious with demand management. Customers echo this view. We have taken this on board and have set out ambitious plans to reduce demand. In order to achieve the above, we have also committed to the installation of universal smart metering across our region by 2035.

Smart metering underpins our ability to deliver ambitious demand management savings. The information that frequent meter reads provide to us and our customers can help provide targeted support and actions. It will improve our ability to identify customer supply side leakage, as well as on our network, and we will then develop a programme to support customers with repairs. Metering also enables innovative options, such as the introduction of green tariffs, to encourage customers to reduce their usage. These are options we will continue to work with our regulators and customers on to further develop in AMP8.

We will be building on our AMP7 engagement with developers to incentivise them to build more water efficient homes and estates. We have seen strong take up of our scheme by Developers in AMP7 and we propose to continue to develop this scheme to ensure we can increase our reach in this area and drive further reductions through support to schemes such as water neutrality and grey/rainwater reuse systems.

Our plan details the activities will we undertake to achieve the reductions required in the targets. However, we will continue to review the most effective options as new information and opportunities arise.

3.3.2 Environmental protection

We have considered the impact of our operations on the environment. We have included reductions in the volume of water we can take from those sources included in the WINEP as at risk of causing a deterioration of the environment. This has reduced our baseline DO.

We have also included abstraction reductions over the next 25 to protect the environment from climate change, and to enable delivery of the Water Framework Directive objectives of achieving “good” status for waterbodies. We discuss environmental destination in more detail in section 6.11.

Defra, Natural England, the Environment Agency and water companies have identified the transfer of raw water as a potential pathway for the spread of Invasive Non-Native Species (INNS), as noted in WISER. As part of our plan, we have considered how our current and future operations may cause the spread of INNS. We have assessed the risk to spread of INNS for all options within the plan and ensured that risks are fully mitigated when considering scheme details and costs.

It is also essential to consider impacts to the historic environment and the significance of heritage assets and their setting.

3.3.3 Options

We have considered options to balance supply and demand that can be provided by third parties. We have liaised with the Canal and River Trust and other third parties to explore potential sources of water. We have explored opportunities with Severn Trent Water and United Utilities.

A number of third-party options have been included in our feasible list of options described in chapter 9.

3.3.4 Resilience and droughts

For WRMP24, the Water Resource Planning Guidelines have stated we need to ensure our system is resilient to a 1 in 500-year drought event by 2040. This is an increase from the previous level of 1 in 200 years and means that there would be a 0.2% change of an extreme drought in any given year.

Our assessment of drought resilience throughout the planning period shows our supplies are resilient to a 1 in 500-year drought across the 25-year planning period and will remain so even in the event of future sustainability changes to prevent deterioration. The operation of our River Blithe pumpback scheme is proven to be a significant contribution to our drought resilience.

Our proposals for leakage reduction, more metering and engagement with developers for more water efficient properties will assist with our resilience to these events.

We are not putting forward any new drought management options in addition to those currently in our existing drought plan.

3.3.5 Innovation

Our ambitious demand management plans are based on developing new and innovative approaches. Through AMP7 and 8, we are delivering our “smart network” programme which will provide more live data cross our network to

enable more efficient and timely delivery of our leakage and water efficiency programmes, as well as our day-to-day service offering to customers.

Our South Staffs region currently has metering penetration of around 45%. We intend to strive for universal metering by 2035. This will enable us to deliver further innovation in our water efficiency and leakage reduction work. One key example is around tariffs. South Staffs is working with customers to develop the basis of a green tariff structure that would incentivise customers to use less water. We have also tested the principle of community-based tariffs, where benefits for the local community could be delivered as an incentive. We will continue our engagement with customers and our regulators on the future of tariffs throughout AMP8 and beyond.

3.3.6 Partnerships and collaboration

It is clear that for the UK as a whole water companies will need to look wider than our own boundaries to balance supply and demand. Cross-boundary, regional and multi-sector partnerships will be needed to maintain water supplies and minimise our impact on the environment in the long term.

We have worked with a number of collaborative groups throughout the production of this WRMP. We have been members of the:

- Trent working group.
- Severn working group.
- Water Resources West (WRW) group.

These groups have been considering the needs of different sectors and regions for water from those catchments to identify solutions which best meet the needs of all.

We are actively engaging and working with the local agricultural sector to educate and encourage appropriate use of chemicals in catchments that provide public water supplies. We started this work in 2015, focusing on the catchment around our Blithfield Reservoir. We have rolled this out to some of our groundwater catchments and have agreed to work with Severn Trent Water in the River Severn catchment as this is a source we both use and we can share resources to get best results. For AMP8, we are planning to expand this work further by moving into new catchments and working to address a wider range of pollutants and determinants.

We will also work with Severn Trent Water to determine the long-term abstraction reductions needs through the Environmental Destination investigations we will undertake in our AMP8 WINEP programme. By collaborating on this, we can ensure we provide a whole catchment approach which will deliver the best outcome and will make the process more efficient and cost effective.

We will continue to work collaboratively wherever appropriate. As the Environment Agency develops its next iteration of the National Framework, we expect the role of regional planning groups to expand, and we are committed to our role in this.

4. Customer engagement

Summary

To ensure our customers' and stakeholders' preferences sit at the heart of our plans, we have undertaken a robust engagement programme. This programme commenced in 2020 following the conclusion of the WRMP19 and Price Review 2019 (PR19) business planning process.

Between WRMP14 and WRMP19 we delivered a cultural shift in our approach to engagement that was driven from our executive team's view that the customer voice should drive all the key decisions we make, now and in the future. Our engagement at WRMP24 goes further to allow us to gain a more robust set of preferences from a wider number of customers and other key stakeholders, than at WRMP19.

We have also used new techniques to engage with customers to ensure we have detailed evidence to support our plans given the importance of the plan, with a marked shift towards deliberative conversations over an extended period. This shift in approach has proved valuable and timely, particularly given the impacts caused by the COVID pandemic when conducting research.

Our plans are based on a wide range of engagement activities that we have carried out in preparation to support our draft WRMP24 submission. Below we have provided a summary of our engagement journey that has helped to significantly improve our understanding of our customer and stakeholder preferences. This is broken down into 3 key stages. Appendix B1 contains supporting material for each of these stages.

4.1 Laying the foundations and designing the engagement programme

During 2020 and into 2021, we ran a series of online activities on our H2Online Community to engage our 300+ members in discussing WRMP priority areas. The H20nline community is an online network of engaged customers who provide feedback and responses to key topics on a regular basis through the year. The aim was to draw out key preferences and uncover themes to help shape our WRMP24 customer engagement programme. Although the Community feedback is mainly from a set of more engaged, informed group of household customers who are not fully representative of the wider customer base, our community also has a group of less engaged and informed members who also take part less frequently in activities over time. As such, the feedback provides a cross-section of views across key demographics, including metering status, which is valuable for helping to inform wider research programmes and to understand the reasons behind customers' preferences. The activities covered a wider range of topics, including:

- leakage performance expectations.
- metering preferences and reactions to trials to increase meter up-take.
- views on messaging approaches and initiatives to encourage water saving behaviours given the impacts of COVID pandemic and more recently increases in the cost of living (including taking part in water dairy videos).
- reactions to support mechanisms to protect financially and PSR vulnerable customers in the context of changes to policies, such as universal metering.
- preferences for water recycling options and views on regional water resources planning approach.

The insights gained from these activities during 2020 were then taken into a comprehensive, independent desk research review undertaken by one of our preferred supply chain partnerships, Accent and PJM Economics. This review was conducted between November 2020 and February 2021, following several workshops to scope a brief for the

review. The core objective for the WRMP24 customer research programme is to be able to demonstrably and transparently obtain and utilise customer insight to produce a WRMP that genuinely reflects customer and wider stakeholder preferences. Given this, the main objective of this study was to conduct a detailed review of customer engagement in the water industry in the context of water resources management planning, and the latest guidance, expectations, and regional method statements, with the aim of drawing out recommendations for SSC's WRMP24 customer engagement programme. The review materials were grouped thematically as follows:

- Our own customer engagement research (past and on-going)
- Research conducted by other UK water companies for WRMP19. The review focused on those companies that received for their research a rating of A or B by Ofwat
- Reviews of wider industry PR19 customer engagement by Ofwat and CCWater
- Key industry publications pertinent to PR24/WRMP24 requirements. These included publications by CCWater, the Environment Agency (EA), UKWIR and Ofwat, including the Water Resources Planning Guidance (WRPG).
- Relevant available publications on engagement strategies used by Water Resources West (WRW), Water Resources East (WRE) and Water Resources South East (WRSE) to engage with customers and stakeholders around resilience, environment, demand-side levers and supply-side solutions.

The outputs of the desk review report recommended that we implement a customer research programme organised around four main themes, corresponding to key customer input points during the WRMP development. These are illustrated in the figure below. See Appendix B2 for the full report.

In addition to the four themes of the engagement programme, we also commissioned Impact Research to undertake a thematic analysis of all the insights to provide a robust evidence base to support our key policy decisions. See Appendix B3.

4.2 Implementing the engagement programme

To ensure consistency when implementing the WRMP24 engagement programme, we have also considered our wider PR24 approach. From our extensive WRMP19/PR19 desk research and current literature review we developed a series

of high-level principles to guide our WRMP24 engagement programme. These principles have been applied consistently throughout our engagement programme to ensure we achieve robust, high-quality research outputs which can be used with confidence to support the decisions made in our WRMP24.

- Targeted and meaningful
- Robust but proportions
- Inclusive
- Adaptive/flexible
- Customer friendly
- Transparent
- Collaborative
- Ethical

Central to the design of our programme was recognition that there is value in applying both qualitative and quantitative methodologies to exploring customer views in key areas. Qualitative research gives depth to the understanding of preferences and motivations behind these and enables richer discussions of topics, while quantitative research can help extract insights based on representative, but less informed samples. To maximise the value of the programme, we elected, where appropriate, to use the same key questions in both the qualitative and the quantitative research. This has allowed us to review the findings from both methods used to be interpreted jointly rather than separately. We explain the qualitative and quantitative in more detail below.

4.2.1 Qualitative customer engagement

The core of our local customer engagement programme is our Water Resources Advisory Panel (WRAP). This was carefully recruited in July 2021 to ensure it represented as many consumer voices as possible on an online Forum. At its heart, the WRAP is a group of household (HH) and business (NHH) customers (and future customers) who are convened (multiple times) to feed into an organisation's thinking on their priorities, business plans, service or policy developments or strategic direction. This allows for a continuous, ongoing two-way dialogue with gradually more informed customers. This engenders trust on both sides and allows consumers to input into complex issues and ongoing debates within organisations.

This approach has given us a clear steer on consumers' views and priorities as well as offering a compelling narrative about the journey that participants went on throughout the WRAP process, both individually and collectively. It also allowed us to check back in with the Forum through the programme to ask them follow up questions and also share with them what other members of the Forum had said so that preferences could be further discussed.

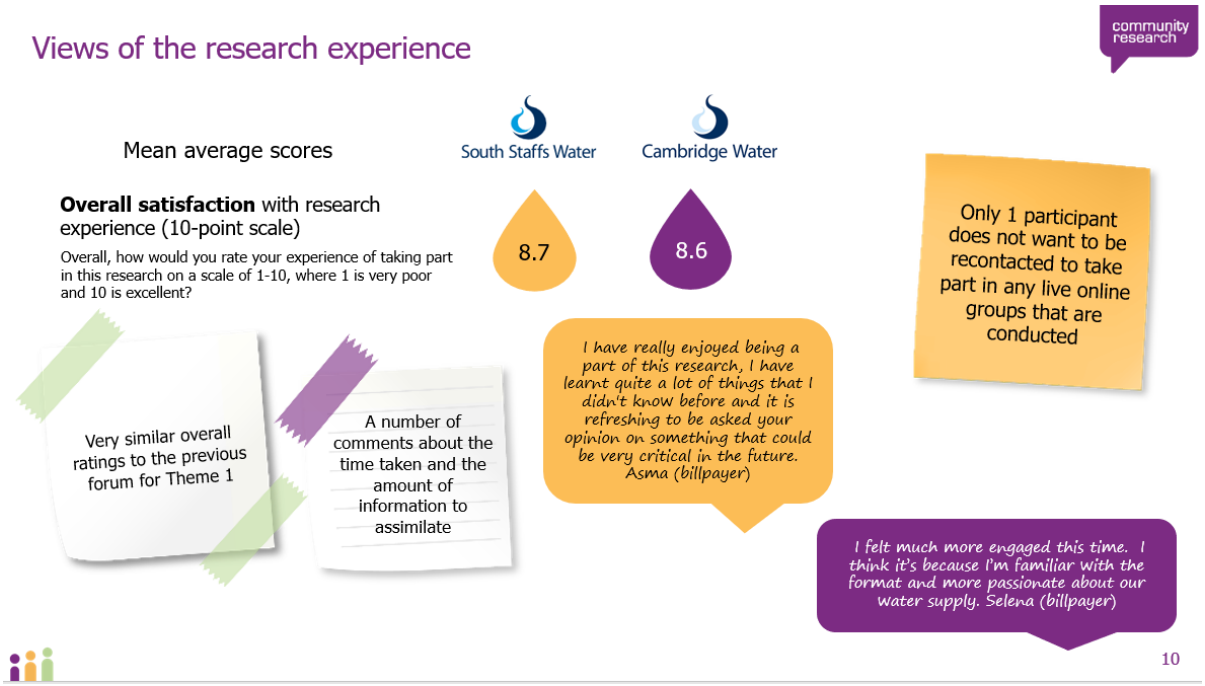
When evaluating the insights from the Forum we have considered that those who participated in the Forum 'opted in' to the process, so it could be that those who did are different in some way than other customers / citizens. We have also considered that they become progressively more informed about the challenges we face and the detail of the demand and supply options available. This is a key reason why alongside the Forum we have run large scale, representative quantitative studies so that we can compare differences in responses and the potential reasons for these.

The engagement points in the WRAP Forum are detailed in table 5 with references to supporting appendices, which detail all the insights gained. The project methodology statements are also provided as evidence of the approach taken.

Table 5 Engagement points with our WRAP Forum

WRAP Forum engagement	Supporting evidence
Theme 1: strategic choices, facilitated 2 week online Forum, July 2021	Appendix B4 (final report) Appendix B5 (methodology statement)
Theme 3: deep dives, facilitated 1 week online Forum, October 2021	Appendix B6 (final report)
Theme 3: deep dives follow ups, facilitated Zoom discussion group, February 2022	Appendix B7 (final report)
Theme 4: acceptability / affordability testing	We are planning to engage with our Forum again to discuss their thoughts on our final WRMP24 in 2023.

By taking a broadly representative group of consumers along a deliberative engagement path over an extended period, it increases their understanding and allows them to have a voice within our business. Views from the WRAP Forum members who took part in the engagement activity in October 2021 is shown below and highlights the positive feedback received in the end of Forum survey undertaken on their experiences of taking part.



Source: Community Research Deep Dives final report, October 2021 (Appendix B6)

In addition to the WRAP Forum, we have also engaged extensively with our H2Online Community members since 2020 to help shape our plan. Our Community is independently managed by Explain Research and all members are household bill payers. We will engage our Community again to show them our WRMP24 final plan in 2023 to close the loop through our "You Said, We Did" feedback approach, which will also explain the reasons for any changes made between draft and final plans that will impact them as customers.

4.2.2 Qualitative stakeholder engagement

Our online roundtable held in October 2021 enabled us to engage with a range of stakeholder representatives and was independently facilitated and reported on by Community Research. The Forum was structured to cover the same themes as the Theme 1 WRAP forum, but with additional materials provided for this more informed and engaged audience. Appendix B8 details the report provided by Community Research.

We also ensured we followed up with a detailed written response to all the questions stakeholders raised during the roundtable. Alongside this we have engaged on-going with stakeholders at one-to-one meetings to discuss their views and any concerns to help shape the development of our draft plan.

4.2.2 Quantitative customer engagement

Our quantitative studies were carefully designed to follow the first two WRAP Forums and Accent, with input from Community Research, designed the stimulus materials for the studies and delivered the fieldwork and reporting. This enabled us to develop materials that would work in a 20-minute online survey which, where appropriate and feasible, would allow us to inform customers and ask them the same questions to compare the insights to those gained from the WRAP.

The two quantitative studies are detailed in table 6 with references to supporting appendices, which detail all the insights gained and the methodology statement, which covers both studies.

Both studies achieved a robust sample across demographics which was then weighted to the 2011 Census data. Additional care was taken to conduct on-street-interviews and/or depth interviews with digitally disadvantaged and other customer segments who would not engage with the online survey. In both studies, 40% of customers were identified as being in a vulnerable situation which is consistent with other quantitative studies that we have run over the last two years. This provides evidence that we captured the preferences of customers who are more likely to be impacted by the decisions in our WRMP24, particularly those who are struggling to pay their water bills and/or those who have a medical condition that means they have a reliance on a reliable and safe water supply. As in all our major quantitative studies a sample of future customers (non-bill payers, aged 18-25) was also include.

Table 6 Engagement points with our WRAP Forum

WRAP Forum engagement – run by Accent	Supporting evidence
Theme 1 and 3: strategic choices and deep dives Quantitative online and face-to-face survey, Feb-Mar 2022.	Appendix B9 (final report)
Theme 2: weights and metrics Quantitative online and face-to-face survey, Dec 2021 to Mar 2022	Appendix B10 (final report)
Methodology statement – covering both studies	Appendix B11

There are two main quantitative studies that will be completed to inform our final WRMP24 submission in 2023. These involve:

- Working with our partners Turquoise to run a representative quantitative study in early 2023 to robustly acceptability and affordability test the final WRMP24 investments and associated bill impacts.
- Delivering our PR24 Willingness to Pay Study is due to complete in November 2022 and will provide us with normalised WTP figures (per year) among our South Staffs customers (HH and NHH). Within this study there are service attributes directly applicable to WRMP investment decision making, including:
    - TUBS/NEUBs service levels.

- Leakage levels.
- Environmental protection – area of land managed.
- Number of properties with AMR meters.

4.2.3 Thematic reviews of insights

Impact's PR24 Thematic analysis report summarises the combined insights from a review of almost 40 pieces of evidence including research reports, literature reviews and white papers from our local engagement programme and collaborative studies, other water companies and relevant third parties. See Appendix B3.

We have committed to the over-arching recommendations of the triangulation framework put forward by SIA/CCWater's extensive review of water companies' PR19 triangulation approaches and we have worked closely with Impact to develop a best practice approach we strongly believe is suitable for a thematic analysis to support our plan development. The analysis and report are structured under the following headings shown in table 6.

Table 7 WRMP24 thematic review areas

WRMP24 key areas – thematic reviews
Best Value Planning and investment priorities
Environmental destination
Service level and resilience to drought
Balancing demand and supply side options
Demand side options: • Leakage • Water recycling • Behaviour change and Per Capita Consumption (PCC) • Metering – including smart technology • Supporting low-income and priority households
Source preferences, reservoirs and water transfers - Including associated water quality impacts
Acceptability and affordability of WRMP24 plan

Alongside the Thematic report, an Excel Spreadsheet serves as the key data collation tool. The tool has one sheet per topic area and common columns to each, comprised of critical information about the data source including date of data collection, contextual environment, sample size, objectives of study, applicable region and method of data collection. See Appendix B12.

We are using the report to inform and guide the development of our final WRMP24 plans. The report will be updated in 2023 in light of further evidence from our customer engagement programme, including final plan acceptability and affordability testing, business as usual engagement, PR24 willingness to pay study, and feedback from wider stakeholders such as Ofwat over the next year.

Table 6 highlights how we have drawn on the expertise of our research supply chain to deliver our engagement programme.

Table 8 SSC's preferred supply chain partners

Workstream	Supply chain partner
WRAP Forum - qualitative research	Community Research
Theme 2 quantitative study	Accent (research elements) in partnership with PJM Economics (economic modelling)
Themes 1 and 3 quantitative study	Accent
Theme 4 – acceptability / affordability, quantitative testing	Turquoise – to deliver this element ahead of final plan submission
Theme 4 – acceptability / affordability, qualitative testing on H2Online Community	Explain Research
Thematic reviews – triangulation	Impact Research

4.3 Assuring the engagement programme

We have taken robust steps to ensure our customers, stakeholders and regulators can have confidence that our engagement is high-quality and so can be relied upon when making policy and investment decisions in our WRMP24. The steps we have taken are outlined in table 7.

Table 9 SSC's preferred supply chain partners

Assurance review	Evidence
We have engaged with our customer panel, which formed a champions group of experts in 2021 to challenge and input into all stages of our WRMP24 engagement programme. This covered activities such as reviewing discussion guides, questionnaires, attending presentation de-briefs and commenting on research reports. A log detailing all the specific challenges raised and our response to these was kept and we have provided this as evidence of the level of challenge undertaken by our panel on behalf of our customers. We have also provided a statement from our Customer Panel which summarises their involvement in our company level research programme, and their assessment of it.	Appendix B13 Appendix B14
We have commissioned the consultancy Jacobs to undertake a review of the outputs of our engagement programme. The objective was to provide assurance in how we have demonstrated the evidence from stakeholder and customer engagement in its WRMP24 in the South Staffs Water supply region. This includes any justifications of why we may have chosen not to use customer or stakeholder engagement feedback in the WRMP24. Jacobs's independent report is provided as evidence of this assurance and that we have accurately reflected our customer and stakeholder preferences in our draft plan and we have responded to the recommendations outlined.	Jacobs Assurance Statement
We have engaged our executive team and our board with the insights from our engagement programme.	Board Assurance Statement – Appendix L

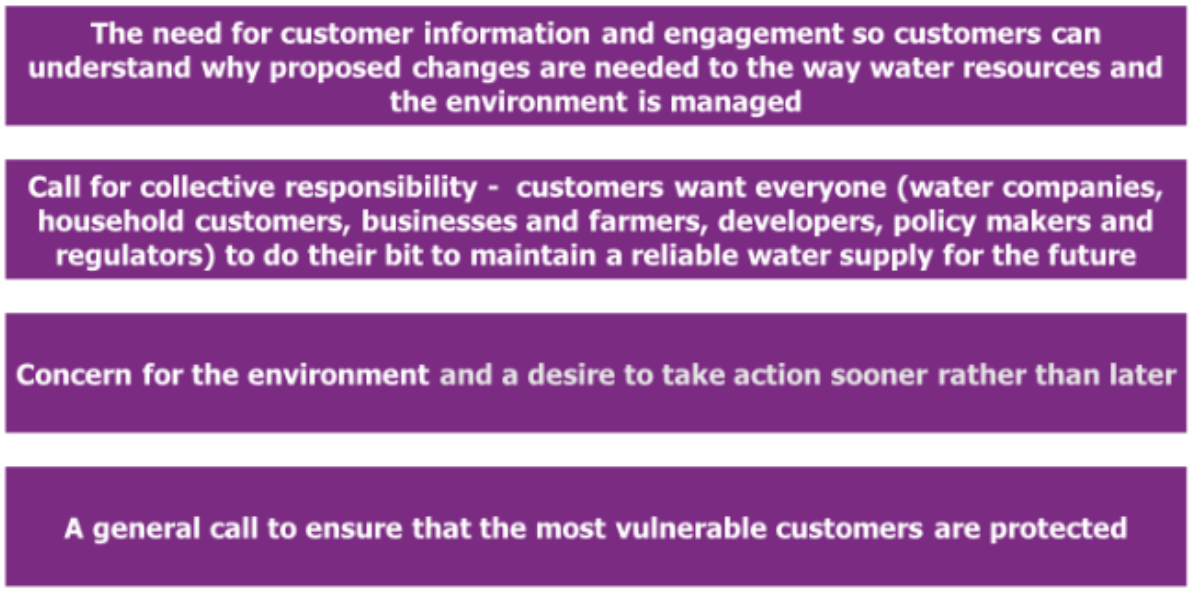
4.4 Overview of customer and stakeholder engagement findings

Our engagement programme has identified four 'golden threads' that are driving our customers' and stakeholders' preferences. Whilst customer segments and stakeholders may attach different levels of importance to these four threads in their individual responses, these are commonly observed across all customer household and business demographics and stakeholder representatives.

The threads were first uncovered from the Theme 1 strategic decisions WRAP Forum (July 2021) through the detailed comments that the participants left as they engaged with activities over the 2-week Forum. However, it is important to note that:

- The calls for collective responsibility and fairness in decision making and the need for customer engagement to inform people of why decisions have been made, what they need to and what support is available to help them play their part have remained consistent throughout the last 15 months, no matter what the external context.
- Protection for the vulnerable has remained an important thread that customers and stakeholders expect us to deliver on, but since 2022 increasing numbers of customers have started to turn their gaze more towards the impacts that the cost-of-living increases are having on their own household's financial situation.
- The qualitative evidence suggests that "concern for the environment" started to move for a notable number of customers from being an urgent short-term priority to address quickly in 2021, towards a longer-term priority to deliver on in 2022. This was driven by the rises in the cost-of-living increases impacting on a proportion of peoples' preferences and their willingness to support the company to go further and faster to protect the water environment in the short-term.

These 'golden threads' have underpinned the policy and investment decisions that we have made in our WRMP24. These threads are outlined in the diagram below.



Our engagement since February 2022 has highlighted that the "increases in the cost of living" is now becoming an established 'golden thread' that must be considered further in our final plan and through the results of our on-going acceptability and affordability research studies of how our plan is being received by customers. We will also use our H2Online Communities and the Customer Priorities Tracker, detailed in Impact's Thematic Analysis, to monitor the impact of the increases in the cost of living on customers' preferences and priorities.

Impact's WRMP24 Thematic analysis report provides a detailed review of all the relevant insights we have drawn on (see Appendix B3). We have summarised the key points in the table below and our responses in our plan to these.

Table 10 Insight summary

WRMP theme	What customers and other stakeholders told us	Our plans to meet expectations
Investment priorities	The top priorities have remained consistent across WRMP and broader customer priorities research studies since those identified for WRMP19: • high-quality and reliable water supply • fair, accurate and affordable bills • reducing leakage on pipes • helping those customers who may need extra support – both through financial and other targeted support • great customer service • protecting natural environment – habitats, water sources Future top priorities that customers expect us to deliver, include: • giving consumers more control of their water usage (e.g., smart metering) and providing education on how to use water responsibly, particularly true for younger generations (16-25) • planning for population growth and managing the impact of climate change • ensuring affordability of bills vs ensuring long-term resilience of assets to meet future demand • meeting the challenge of rising energy costs by lowering our carbon footprint; and • investing in innovation to drive improvements in operational and customer services offered. Our qualitative research with our WRAP Forum in July 2021 found that customers are generally happy to pay for investments that will benefit future generations. They recognised that they already benefit from contributions paid for by previous generations for the benefit of all. Making sure the environment is fit for future generations is the responsible thing to do, not least because current customers have contributed to the problems. However, in our 2022 quantitative studies, customers overall slightly favoured keeping bills as low as possible for customers, above making investments in long-term infrastructure and protecting the water environment. When tested qualitatively the majority of customers continue to express a preference to have a smooth increase in their water bills over time, rather than being front or back loaded so that it can vary over time.	We believe our plan delivers on these core priorities and provides the best balance between investments to protect water supplies and the environment and ensure water bills are affordable for customers. We will test the acceptability and affordability of our final plan robustly in 2023 to validate our plans with customers and take appropriate action to protect those customer segments who do not find their bills affordable.
Best value planning	Across all our engagement, the top three priorities for best value planning identified are; affordable water bills over the long term, making 'the most from what we have' (reducing leakage, encouraging customers to use less) and a plan that is adaptable in case of new/emerging conditions'.	Our plan offers a demand side set of options which aligns to customer preferences and helps keep bills affordable in the context of the challenges we face.

	Options selected should meet, at minimum, three criteria to be considered "best value"; financially viable, low carbon; and effective in the long term. Options that appear short term stop gaps and/or poor environmentally, were largely rejected (including use of drought permits and water transfers).	
Environmental Destination	• As seen in the drivers of best value, environmental concerns are high on the agenda for most customers, having come to the forefront since engagement conducted for PR19 and WRMP19, usually featuring within the top five priorities for customers. Yet, despite being a priority, the majority of customers were not willing to pay much towards achieving environmental goals through their water bill and therefore, since 2020 when the pandemic initiated a rise in the cost-of-living, environmental concerns have slipped down the priority list for some, particularly during 2022, replaced by areas that serve personal interests more and protect the financial impacts on them as customers. • In our themes 1 and 3 quantitative study, 50% of customers wanted us to achieve the middle level of environmental destination level 2 (BAU+) compared with only 14% wanting us to achieve the top level of destination. Customers who supported level 2 thought it was the best balance between protecting the environment and the cost to deliver. • In our themes 1 and 3 quantitative study, 47% of customers said that 2050 was the right timescale to deliver their preferred level of environmental destination, with 23% saying this was too late. However, environmental stakeholders want us to deliver the highest level of environmental protection as quickly as possible. • In our 2021/22 brand tracking study, 45% of customers agree that we are "a company that does a good job at protecting the environment in the areas we abstract water from". With over 1 in 3 customers not able to answer the question, this highlights how important education campaigns are to raise awareness of our plans to protect and restore the water environment. • In our Theme 2 quantitative study, abstracting more water from rivers was the least supported of any demand or supply side option tested, attracting only 1 point on a 0-100 priority preference scale.	We propose to implement "environmental destination scenario BAU+" by 2050. We will work closely with the Environment Agency to understand the impact of our abstractions on key water courses and water bodies and have committed to investigations in AMP8 to understand the exact needs of catchments.
Service level and resilience to drought	**Severe drought restrictions** • Customers and wider stakeholders remain universally opposed to severe drought restrictions (standpipes/rota cuts) being implemented. • In our Themes 1 and 3 quantitative study, 53% of our customers support the proposed move from 1:200 to 1:500 risk of drought restrictions being used, with 31% neither supporting nor opposing it. • Highest selected option (by 41% of customers) was to achieve the 1:500 resilience target by 2040. 29% wanted us to achieve the target sooner. **Service levels (TUBs/NEUBs)** • TUBs/NEUBs are not popular as a way of managing water resources when compared to other demand and supply options. In our Theme 2	We do not propose to make any changes to our levels of service for TUBs or NEUBs. It is important that our plans provide the required level of resilience to ensure that severe supply restrictions never occur, now and in the future.

	quantitative study, they attracted only 2 points on a 0-100 priority preference scale when customers were asked to rank their preferences. • However, in terms of TUBs and NEUBs, multiple studies show customers would be willing to accept lower service levels than they experience at present. Business customers seemed more mixed in their views than household customers, partly because they see their usage as "essential" where others might define it as non-essential. • In our Themes 1 and 3 quantitative study, after reading about the challenges we face in meeting future demand and protecting the water environment, 52% of HH and 45% of NHH customers would support us bringing in temporary restrictions every time there is a long period of dry weather. Only 2% of customers wanted the current service levels to be improved. • There was also strong support (56%) for bringing in higher charges for high levels of non-essential use during periods of drought to help reduce demand. • The main caveat to these insights is that as so few customers have actually experienced a TUB/NUEB that their preferences when asked may not truly reflect their reaction if a ban we to be imposed on them (as evidenced by critical comments on social media over the summer of 2022 when customers in some areas of the country were subjected to a TUB, particularly in the context of the ongoing negative perceptions over leakage performance). • Qualitative support in a wider regional research study for harmonising levels of service across regional water resource areas – seen as the fairest way to manage the situation for all.	

Balancing demand and supply side options	• Across all qualitative and quantitative engagement customers from all demographics have and continue to consistently prefer demand side options, rather than increasing supply side options. This is because customers say they are:
	  • Cost effective
	  • Common sense
	  • Environmentally sound
	• In particular, leakage gained the highest level of support of any demand or supply side option, attracting 38 points out of a 0-100 priority preference scale when customers were asked to rank 10 options in our Theme 2 quantitative study. Given the next highest option, "reduce water use through education and advice", only attracted 15 points and the highest supply side option "expanding existing reservoirs", attracted only 8 points, this clearly highlights the significant preference for a leakage led plan.
	• However, in our WRAP Forum, as customers become more informed about the challenges we face and the options available and what they can deliver to address future water demand and supply balance, calls grow for a well-balanced use of demand management and supply strategies.
	• Of supply side options, increased water abstraction from rivers was the least popular, and at times unacceptable to some customers. Whilst the principle of sharing a vital resource between regions was well supported, water transfers were mainly viewed as a short-term gap stop solution only, as the majority of customers do not want to
		We are committed to a demand led set of options.
		
		See section 10 for our proposals.

	become over reliant on transfers and some disliked the negative environmental aspects these solutions can bring. • **The overall message is clear that, to be acceptable, our plan must make the best possible use of current water resources before investing in any large-scale supply-side options.**	

Demand options - leakage	• Reducing our leakage levels further emerges as a clear and consistent priority among most customers.
	• Among a less informed, representative sample of customers in our themes 1 and 3 quantitative study 46% want to see leakage reduced to as close as zero as possible.
	• As customers become more informed around the challenges associated with reducing the volume of water lost, 80% support the national target for reducing leakage – just 2% oppose.
	• Customers who are more engaged with protecting the environment are significantly more likely to have a higher level of support for the national target for reducing leakage. Key reasons for supporting the national target are:
	  • Wasting water doesn't make sense – 'we'll leave more water for future (if leaks are fixed)'.
	  • Educate customers to be more aware of water usage/ shortages.
	  • The right thing to do.
	  • Impossible to reduce leakages to 0%.
	• Customers also flagged in discussions that they want to see interim targets set in the context of the 2050 national target, to hold the company to account on progress.
	• Leakage also remains an emotive issue for customers, and some feel that levels must be reduced if people are to be motivated to play their part with water conservation.
	• However, despite this strong sentiment from customers, a notable proportion are reluctant to pay for this on bills and expect this to be funded by us in other ways. This situation has been exacerbated by financial hardship since the COVID pandemic.
	• In addition, leaks on customer properties are unlikely to be effectively addressed without an education programme to inform customers of the scale of this problem, how to detect leaks and how to reduce them.
		We are committed to delivering the 2050 national leakage target.
		
		We will continue to explore the benefits of new technologies and approaches to identify if further leakage reductions can be gained.

Demand options – universal metering	• On balance, the majority of customers continue to support the principle that metering is the fairest approach to charging, although this is backed more strongly by customers who already have meters installed, and future customers. • Universal metering fell just short of gaining majority support among a less informed, representative sample of customers in our Themes 1 and 3 quantitative study. 44% supported the policy when uniformed about the benefits, with this rising to 49% once informed. Levels of support were significantly higher among metered customers (70%) vs unmetered (28%). • However, it is important to note that among unmetered customers 30% had a neutral view, with 36% against. The most commonly cited reasons for being against the policy was the fairness of taking away the choice of being or an unmetered charge and the fact that water is a basic human right and if it becomes too expensive it might impact on peoples' health as they have to cut back on usage. This highlights	Given the challenges we face we are committed to delivering smart universal metering by 2035. We will work with customers, stakeholders and other interested parties to put in place a communications plan and targeted support to customers who are struggling to pay their bills or who would be adversely impacted from having a meter due to a medical condition.

	potential through engagement to shift views, particularly those who are neutral, to being supportive of a universal metering policy.
	• In addition, universal metering only attracted 8 points out of a 0-100 priority preference scale when customers were asked to rank the options in our Theme 2 quantitative survey and was also a mid-ranked option on our WRAP Forum.
	• More informed and engaged customers in deliberative discussions call strongly for universal metering, as do those representing environmental stakeholders.
	• Support for universal metering is driven by 5 key reasons:
	  • Greater equitability
	  • Control and awareness
	  • Incentive to reduce consumption
	  • Protecting the environment
	  • Potential to save money
	• However, customers and stakeholders have some concerns about how to move unmeasured customers to universal metering, including concerns for vulnerable customers who might struggle to afford their charges and/or have a medical condition that means higher water usage is needed.
	• In our WRAP Forum in the summer 2021 the majority of customers wanted us to target areas of higher consumption first if rolling out universal metering. In our quantitative testing in 2022, minimising the cost of rolling out universal metering was the preferred option given by 38% of customers, with one-in-four wanting to target areas to reduce the demand for water the quickest – the drive towards lowest cost is linked to the rise in the cost of living.
	• 51% of customers in our Themes 1 and 3 quantitative surveys said that they would pay at least £2.50 or more a year more to have smart metering rolled out by 2050. Overall, amongst a less informed sample of customers in our quantitative study there was limited appetite to pay more to roll our universal metering any faster.
	• However, among our informed WRAP Forum the majority supported a roll out by 2035. Metering is strongly believed to encourage behaviour change and is considered the fairest way of paying for water, so getting all customers on a new meter is therefore seen as more of a priority than updating older meters. However, when engaged in detail on the topic many of the WRAP Forum mainly supported a combined approach of fitting new meters for unmeasured customers and retrofit of older meters should happen at the same time from a fairness perspective.
	• Across all our wider research there is a consistent preference expressed by household customers for receiving water meter readings monthly or quarterly. There was also broad agreement across all our deliberative research that the current meter read frequency of once a year is not fit for purpose for accurate billing and engaging consumers with water conservation.
	• However, in our Themes 1 and 3 quantitative study, 57% of customers said they were not prepared to pay more to have a more regular frequency of meter reads, a response significantly more likely to be given by those from lower social economic backgrounds.
	• With regards to preferences for smart meter technology if rolling out universal metering, once educated, a small and informed group of customers from our WRAP Forum had a preference for AMI over AMR metering technology and some willingness to pay for the programme,	

	due to a perceived small price difference between the two technologies and that it made sense to future proof the investment. • However, there were concerns raised over the use of AMI technology, such as how data security would be handled and how reliable the technology is to work in all locations.	

Demand options – water efficiency and behaviour change	• A wide range of research studies, including our local engagement, continues to indicate that a gap remains for many customers between considering the impact on the water environment when they turn on the taps. Many customers are not aware of rainfall levels, the scale of population growth and the low proportion of water habitats which are rated as in good health. A proportion are also unaware that they live in a water stressed area.
	• On our WRAP Forum the national target for reducing customer demand for water (PCC) was largely acceptable to customers, although the stretch targets to 80 l/h/d seemed too difficult to achieve at this point. However, environmental stakeholders would prefer to see a stretched level of ambition achieved as quickly as possible.
	• The 110 l/h/d target is achievable as long as:
	  • Customers are educated and incentivised to change behaviours.
	  • There is investment in changing infrastructure (water recycling, water efficient appliances) and developers are encouraged to build houses which help consumers use less water.
	  • Businesses are also set targets to reduce consumption.
	  • The impacts of the pandemic in terms of increasing PCC are not long term.
	• Many of our WRAP Forum say that the aspiration should be for the PCC target to be 'the sooner the better' – there is a need for action; 30 years is too long to wait we should be ambitious. However, some are more cautious and mentioned that behaviours can be slow to change.
	• There is appetite from stakeholders in the building sector and wider sectors (e.g., environmental) and customers for building in water recycling into new builds. Customers remain keen to have education on water efficiency strategies, whether via schools, directly to their homes or information on water saving strategies for large businesses.
	• Behaviour change is an area that overlaps with other demand and supply side options, but in general customers say they need to have a full understanding or any particular issue before any change is likely e.g., the amount of leakage that takes place on customer properties, or the benefits of smart metering versus the costs of installation. For the most part, customers agree they could save more water than they do at present (but need motivation to do so and barriers removed). Education and advice was the second most popular option (behind leakage) when customers were asked to rank 10 options in our Theme 2 quantitative survey, attracting 15 points on a 0-100 priority preference scale.
	• From reviewing all the available NHH research studies into demand management, these indicates that the biggest barriers to the market engaging in water efficiency are:
	  • The lack of accurate and accessible meter data.
	  • A lack of skills and knowledge to understand how to be more water efficient.
		We are committing to the national target of reducing PCC to 110 l/h/d by 2050.
		We will continue to encourage developers to build water efficient home through incentives. Policy approach will be agreed in our PR24 plan.
		We forecast that the Government Water labelling scheme from 2025 will deliver water savings through purchase of efficient white goods and other appliances.
		In the non-household market we are committing to universal smart metering - this programme will replace our existing meter stock with Enhanced Meter Technology (EMT) that will provide intelligent consumption information for use by businesses and Retailers to drive water efficiency savings.
		We are committed to delivering the proposed Environment Act target of 9% non-household consumption reduction by 2037.
		We will continue to engage with customers about new ways of charging for water as we develop options to trial.
		.

	• The lack of return on investment of becoming more water efficient and/or when they should become more water efficient. • There was also an overall lack of knowledge around water scarcity and the fact that at this time water restrictions are not seen as a business threat. • There were no obvious incentives to drive them to save water and no consequences in place for not becoming more water efficient. • NHH customer engagement has also shown that: • In-person audits and carefully designed leakage allowance policies can engage them effectively in water efficiency • Larger water users also fed back that more partnership working between energy and water around data and developing solutions to help the NHH customer meet sustainability targets is key and they expressed a greater interest in being engaged with water recycling initiatives through targeted support from wholesalers to help them with business cases and case studies. • Our H2Online community members have been vocal in telling us that we need a multi-channel approach to educating customers to encourage water conservation – from TV, radio, digital, print and face-to-face engagement. • Water recycling is a popular option across a number of our engagement studies, with both household and non-household customers, however the reality of installing a retrofit system provides challenges which would require education up front on the benefits and likely costs, potential subsidies to help customers accommodate the costs of retrofitting a system and information on how to maintain it. These would all need to be in place before large scale adoption is likely to take place. • From the start of our WRAP Forum there were spontaneous calls from some for water companies to bring in new tariffs to encourage water saving behaviours, particularly for use in periods of drought. Our early engagement around new tariff options suggests that tariffs which benefit the individual household are preferred over community based ones. We will continue to engage customers on this area to develop our plans.	
Supporting low-income and priority households	• We have engaged extensively with our customers on how to manage the transition for customers from unmeasured to measured charges. There was no overall majority on the best way to approach this, but there was common agreement that is it fairest to give customers at least a year after their meter is fitted, to allow the opportunity to change their behaviours, before being switched to measured charges. • The use of guaranteed price caps during a transition period was also popular among some on our WRAP Forum and H2Online Community members to help protect against bill shock. • There was universal agreement that we must provide clear communication and a range of measures to help ensure customers are not adversely impacted by any of our investment and policy decisions, particularly those who are already struggling with paying their bills or who have a medical condition that requires higher levels of water use. • Offering a price guarantee that ensures that medically vulnerable customers would not pay more than their current annual fixed	We are continuing to engage with customers and other parties to review options for supporting customers during the introduction of universal metering. We are also reviewing options with our customers and stakeholders for the use of “ghost metering” as part of our universal metering to allow customers a two year period to get ready for being on metered charges following installing a meter at their property.

	rateable value charges was also seen as important for us to consider in our plan. • It was also important to customers that any new tariffs developed in the future which are linked to water consumption do not adversely impact on vulnerable customers groups. Fairness was a key consideration throughout the engagement.	
Source preferences, reservoirs and water transfers	• When asked to rank a range of demand and supply side options in our Theme 2 quantitative survey, expanding existing reservoirs was only ranked 5th of 10 and therefore seen to be less of a priority to meet the future demand balance. • Water transfers also received limited support and were seen as a short-term solution, only to be used if needed to meet future demand. Customers are often concerned about how reliant we could become on other water companies and some think water transfers should be a last resort, as this could affect other suppliers' resilience. • They want to be informed about when transfers may happen and if there will be any effect on the quality of the water they receive. Some customers were also spontaneously concerned about the effects this might have on the environment. The CO2 emissions associated with moving large volumes of water over a long distance especially provoked a strong reaction among some customers.	We are committed to a demand led set of options and not require any supply side options in our preferred plan. We are not considering any large scale water transfers in our plan.
Acceptability and affordability of WRMP24 plan	• We will provide detailed feedback on our customers' views on our final plan in 2023 and the actions we have taken based on their feedback.	

4.5 Stakeholder Engagement

Throughout the development of the plan, we have also undertaken a corresponding stakeholder engagement plan. For our non-statutory stakeholders, such as retailers, eNGOs and other interested parties, we held a webinar during pre-consultation to share our thoughts or our draft plan and gain feedback. In addition, we held several roundtable events in October 2021 where we gained views from local businesses, councillors and community groups on their views on what our priorities should be and the potential elements within the plan.

We have also undertaken focused engagement sessions with the Environment Agency, Ofwat and CCWater during 2022 to provide updated on the progress of the plan, and gain feedback on our proposals.

All of the comments and feedback received from these sessions is included in appendix A.

5. Baseline demand for water

Summary

Our baseline demand forecast incorporates a multitude of factors and assumptions. Through support from Artesia, we have produced population forecasts and both household and non-household consumption forecasts. We have reviewed the number of people we believe will be living in each household, which has a bearing on the average consumption of each individual. We have updated these forecasts for the revised draft WRMP to ensure our information is as up to date as possible.

It is also important to understand what makes up this household usage, and we do this through defining the micro-components, and we worked with Artesia to develop a new micro-component forecasting model for this WRMP. The balance between the values of these micro-components often varies with occupancy and it is an important area for us to understand if we are to target our water efficiency work appropriately.

One of the most significant changes for our WRMP compared to WRMP19 relates to our assumptions regarding metering penetration. In 2021 the Environment Agency designated our region an area of serious water stress, and as such we have looked at the option to deliver universal metering across our entire population. We have undertaken extensive customer engagement on this topic to understand the level of support and the concerns, and this is covered in chapter 4 above. This universal metering underpins some of our proposed demand management programme, and this is covered in more detail in sections 9 and 10.

We have updated our demand forecast for our revised draft plan. This ensures our plan is updated with the latest and most current information to ensure it is as accurate as possible. We've updated both the household and non-household forecasts.

Our forecasts show that without intervention, demand continues to increase throughout the planning period.

5.1 Overview of the baseline demand forecast

The following commentary is based on the development of the normal year annual average forecast and highlights how this is converted to DYAA.

The baseline demand forecast is built on latest forecasts of population and properties in conjunction with the continuation of existing policies around metering and leakage management. At this stage, it does not account for customers' views on what they want us to do in these areas going forward and does not include any preferred demand management options. The baseline demand forecast is the starting point for assessing whether we have sufficient water to meet demand over the next 25 years.

The final demand forecast resulting from our proposed programme of leakage reduction, metering and water efficiency is described in chapter 10.

We have followed the Environment Agency's water resources planning guideline and the following methodologies when developing our forecasts.

- UKWIR (2016), 'WRMP19 Methods – Household Consumption Forecasting'.
- UKWIR (2016), 'Population, household property and occupancy forecasting'.

The baseline demand forecast includes climate change impacts, population growth, changes in household size, changes in property numbers and existing demand management policies.

By the end of the planning period distribution input in the baseline dry year scenario is forecast to increase by over 16Ml/d. Household water demand is forecast to rise by around 13Ml/d and non-household consumption by around 3Ml/d.

Over the 25-year period total household population is forecast to rise by approximately 170,000 people and it is forecast there will be an additional 137,000 homes by 2050. Under our baseline metering strategies household meter penetration would rise from around 48% in 2024/25 to around 74% by 2049/50.

The baseline household demand forecasts include assumed savings as a result of water efficiency activity before the delivery of demand management options identified in the final plan scenario. Our baseline demand forecasts estimate that average PCC under dry year conditions will drop from 137l/p/d in the base year (2019/20) to 131l/p/d at the end. Under the normal year scenario, it is lower still.

Non-household demand is forecast to remain relatively stable with slow growth over the plan period.

Total leakage is included in the baseline demand forecast at the current performance commitment of 59.5Ml/d by 2024/25.

Normal year demand has been converted to dry year demand by the application of a dry year factor of 8% household demand. This factor was derived from a review of climatic factors and per household consumption. The adjustment has been applied to both the measured and unmeasured household demand in a normal year.

The central estimate of the impact of climate change on demand is included in the household demand forecast. The uncertainty associated with the impact of climate change on demand is included within headroom.

5.2 Total population and property projections

Population data is collected every ten years through the National Census by the Office for National Statistics (ONS). ONS provides detailed census results at a number of spatial scales from local or unitary authority (LAUA) down to small scale 'output area' (OA) level where the mean population per OA is 300. ONS also provides annual updates of population and biannual 25-year forecasts of future population growth at the medium spatial scale – that is, lower super output area (LSOA) where the mean population per LSOA is 1,500.

The ONS datasets also provide information on the number and type of households and the age distribution (demography) of the population. Data on the type of households is used to distinguish the population who live in non-household ('institutional and communal') properties and includes those living in medical, care, defence, prison service and education establishments, and those living on farms.

We have worked with Severn Trent Water as part of the joint 'Water Resources West' Regional Planning group to ensure our approach to population and property forecasting is both consistent and meets the standards specified in the current guidance. Trend-based and plan-based projections were produced following UKWIR guidelines and taking into account further availability of data from the company and relevant local government bodies.

The project was carried out in four main stages.

1) Area reconciliation: the geographical area covered by South Staffs Water was defined in terms of individual unit postcodes and digital boundary files. Postcodes that were found to straddle the boundary were split and treated as partly inside the area. Postcodes are smaller than Output Areas, and definition in terms of postcodes provides a detailed assessment of which Output Areas, and parts of Output Areas, lie within the boundary. This process used area boundaries as supplied by us to Severn Trent Water.
2) Trend-based forecasts: forecasts were produced based on ONS trend-based projections of population and Department for Communities and Local Government trend-based projections of households. These fulfil the requirements for trend-based population, household and billed household forecasts as specified in UKWIR guidance.
3) Plan-based forecasts: forecasts were produced based upon Local Authority and County Council plans and forecasts. These fulfil the requirements for plan-based population, household and billed household forecasts as specified in UKWIR guidance (UKWIR 19 Methodology, 'Population, Household Property and Occupancy forecasting 15/WR/02/8'). Plan- based forecasts project higher levels of growth than trend-based-forecasts.
4) Reconciliation of plan-based forecasts with most recent billed household counts: the plan-based forecasts were adjusted to agree with counts of billed households for mid-year of the base year 2019/20.

Base year household population and property figures taken from our customer database and consistent with those reported in the '2019/20 Annual Review' were used to reconcile the base year data.

The forecasts show that household population is expected to increase by 170,000 people by 2050 and that there are approximately 137,000 new homes forecast to be built. This is an increase of 24% in connected household properties.

5.2.1 Non-household population and properties

Growth in new non-household properties is assumed to be on average flat over the planning period based on the average growth experienced in recent years. This includes where unmetered non-household supplies are refurbished and supplies are split. Our baseline assumption is that unmeasured non- household properties will continue to reduce because of commercial meter optant switchers and as a result of site developments.

Data on the type of households is used to distinguish the population who live in non- household ('institutional and communal') properties and includes those living in medical, care, defence, prison service and education establishments, and those living on farms. This is referred to as 'communal population' in the WRMP. Communal population is deducted from total population to give household population.

5.3 Metered household property projections

By 2049/50 there will be 393,000 more measured households arising from new connections and our targeted universal metering programme. This is described in more detail in chapter 9. This will effectively proactively switch our customer base to meters and drive the reduction in consumption in order to achieve the 'Per Capita Consumption' (110 PCC) target by 2050.

The number of unmeasured households fall directly related to the meter option and meter switching promotions as households opt to have meters installed. The metering strategy is aimed at switching all unmetered households to meters.

Continuation of current metering policies will result in meter penetration increasing from around 48% of billed properties in 2024/25 to circa 100% by 2034/35.

5.4 Void properties and demolitions

Void properties are those that are unoccupied and therefore do not have an associated consumption. Supply pipe leakage allowances are applied to void properties. The forecast for void properties is based on an assumption that the total number of household and non- household void properties remains constant over the planning period and is calculated in a consistent method with our other regulatory reports such as the APR and annual charges review.

5.5 Household occupancy rates

Artesia Consulting Ltd were commissioned to develop the Company's Household and Non-Household consumption forecasts (Appendices C1 and C2). Embedded in the forecasts are modelled household occupancies derived from Artesia's experience from working across the industry. The purpose of modelling occupancies across the customer household types is to distribute the population between each of the customer groups so that the sum of them all is equal to the total household population estimate.

While there is an underlying trend for population to grow over the planning period, overall household occupancies are forecast to reduce. Overall occupancy falls from 2.5 people/property in 2024/25 to 2.3 people/property in 2049/50.

The household occupancies of different customer groups have independent profiles that reflect their characteristics.

The underlying occupancy rate for unmeasured households is forecast to rise reflecting larger family units (growing families) over the planning period as the metering strategy takes effect and we approach 100% meter penetration.

New meter optant households have a lower occupancy than other customer groups. This is because optants are generally smaller households who use low volumes of water and therefore make a financial saving by opting for a meter and controlling their water bills through metering.

5.6 Baseline household demand

The current water resources planning guideline identifies the need for water companies to use methods for supply and demand analysis that are appropriate to the level of planning concern in their water resources zones (WRZs). The problem characterisation for our single WRZ identified a 'moderate' rating. The baseline household consumption forecast has been produced using micro-component modelling and forecasting, which is suitable for a zone with a moderate level of water resource planning concern. A new micro-component forecast model was developed for us for this WRMP by consultancy firm Artesia.

The model quantifies the water used for specific activities (for example, showering, bathing, toilet flushing, dishwashing and garden watering) by combining values for ownership (O), volume per use (V) and frequency of use (F). The micro-component model is combined with property, population and occupancy forecasts in a unique way in that the micro-components vary with occupancy. Certain components have a valid relationship with occupancy, and others do not. This method is used to calculate base year OVF per household consumption (PHC) values, which are then calibrated to the WRZ normal year PHC values.

Forecasts of the property, population and occupancy are established by household segment through a model to allow for various assumptions and mathematical calculations as the meter penetration increases. Each household segment has a different base year OVF table/calculation; these are based on both measured differences between measured and unmeasured households, as well as assumptions made about devices within new properties and optant properties.

Micro-components are then forecast using a combination of longitudinal micro-component data and future market transformation programme derived micro-component values. These trends are applied to the normal year micro-component values. An additional occupancy specific trend is also added, to ensure that the varying occupancy within each of the household segments is captured.

Data from national studies was used to update previous micro-component estimates – from surveys, the Market Transformation (MTP) scenarios and other, older sources – and to consider upper and lower consumption forecasts.

Relevant data, existing survey results, and consumption data from metered customer billing records were all analysed and investigated, along with data collected in the 2016 UKWIR behaviour integration study, to estimate base year micro-component estimates.

Household customers were segmented based on meter status (measured/unmeasured), with sub-divisions for meter type (existing metered, free meter optants, new property). Data was used to determine how to account for differences in consumption between segments, and also the effect of meter switching. Normal year and dry year adjustments were made to the base year consumption and the consumption forecast.

Climate change impacts on consumption have been calculated in accordance with UKWIR 13/CL/04/12, 'Impact of Climate Change on water demand'. The model includes functionality to output forecasts with and without climate change factors. The additional demand from climate change is added to the external use micro-component only. The reason for this is outlined in the UKWIR report and is due to the statistical analysis of Anglian Water and Identiflow® datasets for household micro-component consumption consistently demonstrated that the volumes of external water use are strongly influenced by weather parameters. Our own research has shown this to be true since the Covid-19 pandemic as our customers attribute more value to outside space. There is a lack of consistent evidence of weather impacts on internal water uses. Therefore, where it is necessary to allocate the effects across components of household demand it would be reasonable to assume that all additional water consumption in hotter or drier weather is for external water uses. The small additional volume attributed to climate change is included in the baseline forecasts.

A scenario approach to modelling uncertainty was used, to reflect the various uncertainties in consumption forecasts.

Best practice guidelines for household demand forecasting have been followed in deriving the baseline household demand forecast.

We provided the following data to enable Artesia to develop the model.

- Population forecasts.
- Property forecasts.
- Reported annual return data for reconciliation with the base year.

Full details of the micro-component modelling are included in appendix C1. The results of the micro-component forecast are in the tables based on NYAA.

We have updated the baseline household demand position for the revised draft WRMP to ensure our plan is based on the most up to date information. We have also reviewed the Covid impact on demand, and incorporated the improvement plan we have in place to achieve our end of AMP7 PCC position. As a result, we ensure that we start the planning period from our expected AMP7 target outturn position.

Details of the water efficiency strategy are contained in section 10.

5.7 Baseline non-household demand

Since the Water Market opened on 1st April 2017 non-household customers have been able to choose their retail service supplier. Those not eligible have remained with the incumbent water supply and forms the retail market.

Following the separation of the Retail/Wholesale markets water companies have been unable to directly communicate with the retail markets and as a result water efficiency has been the responsibility of the billing company. This has led to some loss of knowledge of non-household customer consumptions.

However, WRMP24 will give water companies the opportunity to engage directly with the Retail market with a view to introduce consumption and waste reduction strategies. As a result, we have submitted plans to reduce non-household consumption by 9% by 2038 and 15% by 2050. See section 10.1.4 for more details.

Non-household consumption was analysed using a trend-based approach at a high level, and subsequently, at individual sector level and consumption bands. Large users were also considered separately.

Consumption figures were tested against a set of economic factors, including but not limited to:

- unemployment
- Gross Domestic Product (GDP)
- population

Results indicate a general increase in consumption over the plan period. Further analysis by consumption band has shown that differences between groups tend to be masked when producing a high level forecast. Performance is improved when bands are evaluated independently.

A set of forecasts was provided based on high-level trend and band analysis. With a variety of scenarios, it is clear that some may have different probabilities of occurrence, and that all forecasts are not equally probable. The most probable scenarios were used to calculate a mean forecast for use in the plan.

We did not apply an allowance for a dry year to non-household demand as we assumed dry year conditions do not significantly affect commercial water use, but we made an allowance in the forecasts for supply pipe leakage.

We have updated the baseline household demand position for the revised draft WRMP to ensure our plan is based on the most up to date information. Full details of the approach to non-household modelling are included in appendix C2.

5.8 Baseline leakage forecast

For the baseline demand forecast we have included total leakage across the period from 2024/25 of 59.5Ml/d, which is our end of AMP7 performance commitment position.

We have committed to reduce leakage by 50% by 2050 in the final plan incorporating a number of innovative leakage management technologies and processes. The final plan leakage commitment follows a glide path that will achieve 22.7Ml/d by the end of the plan period. See section 10 for more details.

5.9 Minor components of water use

Minor components of water use include:

- distribution system operational use (for example, mains flushing and water quality)
- water taken legally but unbilled (for example, fire stations and standpipe use plus MUR adjustment)
- water taken illegally (for example, water theft and illegal connections)

The estimate of water use for these categories is based on our own specific data for the base year and is assumed to remain constant over the planning period.

5.10 Dry year demand

Normal year demand is converted to dry year demand by applying a dry year factor to household demand. This factor was derived from a review of climatic factors alongside Per Household Consumption (PHC). Studies consistently demonstrate that demand is directly related to sunshine hours and maximum temperature and the relationship with rainfall is significantly weaker.

The resulting dry year factor (8%) is applied to the normal year household consumption forecast uplifting it to the dry year scenario. The adjustment has been applied to both the measured and unmeasured household demand in a normal year and is incorporated in the micro- component modelling.

All other elements of demand are considered to be unaffected by the characteristics of a typical dry year.

5.11 Climate Change

The household consumption forecasting guidance describes the requirement that all HHCFs should be provided with and without the addition of climate change impacts. To achieve this, we have used the methods and models provided in the UKWIR report, “Impact of climate change on water demand”, (UKWIR, 2013).

More specifically, this report contains demand factors for each UKCP09 river basin, describing the percentage change in household demand for two case study relationships, Severn Trent and Thames, and three demand criteria (annual average, minimum deployable output and critical period). The demand factors are given for the 10th, 25th, 50th, 75th and 90th percentile to reflect the uncertainty in the climate projections.

The first step is to select the correct model for use. Based on proximity, the selected model for South Staffs Water is the Severn. The default percentiles selected are the 50th percentile, with the annual average values used for the normal year (NYAA) and dry year (DYAA) demand criteria.

Once the climate change factors are selected, the final step is to generate the values by year. This is achieved by linearly interpolating the values from the base year point of zero, to the final climate change factor for 2045, and continuing this trend until the final year of the forecast. This is included in the planning tables.

5.12 Ongoing demand forecast work

At draft WRMP stage, our work with our consultants highlighted some potential areas for improvement. We have detailed these in the table below, including our proposed actions.

Table 11 Demand forecasting improvements

Potential improvement activity	Response
Consider developing SSW-own forecasts rather than being dependent on Severn Trent Water	For consistency we have continued to use the Severn Trent Water forecasts for the revised draft WRMP. However, we are planning to develop our own for future use in the same way we have done for our Cambridge Water region.
Consider a micro-component study (including new-build properties) to improve on the current approach (based on ageing national datasets)	Our consultant for this work is the primary consultant for demand forecasting across the industry and therefore has extensive data to utilise in the forecasting. We are reviewing the potential for us to undertake this work ourselves every three to four years to ensure it remains up to date.
Update the non-household demand forecasts prior to final plan submission	We have updated this forecast for the revised draft plan.
Work with MOSL and retailers to improve the quality of non-household forecasts	We are part of an industry wide working group that are currently collaborating on a project to do this. This will not be completed in time for the WRMP24 but will be utilised once developed.
Improve SSW's understanding of which Standard Industrial Classification category its non-household customers (supplied directly by SSW or indirectly via retailers) fit within	We continue to work with our retailers in order to improve the classification data we hold. This programme of work involves significant data gathering and also the development of an ongoing process to keep the information up to date. We propose to continue working with retailers to develop both of these areas.
Adopt a more "continuous" approach to non-household demand forecasting (rather than re-looking in detail only once every five year planning cycle)	We are working with our current consultant to develop a tool that can be owned and managed by South Staffs Water. This will enable us to manage our own demand management forecasts and mean we are able to review this more frequently. We will continue to work towards delivering this in AMP7.
Consider SSW resilience to longer duration hot, dry events such as summer 2018	As we develop a tool that means we can update and run our own forecasts more frequently and within our own control, we will look at additional scenarios, including 2018 and 2022.

6. Baseline supply forecast

Summary

We have updated our baseline supply forecast for WRMP24 in line with the Water Resource Planning Guidelines. This has involved a significant change in our method for assessing baseline DO and resilience to droughts. However, the analysis has proved to be consistent with our analysis at WRMP19, which shows our system is resilient to 1 in 500 year drought events. We are not proposing any changes to our levels of service, and our WRMP reflects directly our latest Drought Plan which was published in August 2022.

The way we assess the climate change impacts on our DO has also changed in the same way. This has shown that our system sees relatively minor impacts due to climate change, most likely because the constraint on our system is the level of service 2, rather than extreme drought.

In addition, we have included large scale changes to available supply due to the environmental destination arising from the Environment Agency's National Framework. Whilst there is work to do during AMP8 to refine these numbers through extensive investigations across our sources, we have included provision for the BAU+ scenario in our planning. This ensure we are preparing for significant abstraction reductions in the future, and expect the scale of this, and the timing, to be updated at WRMP29 following the completion of our WINEP investigations in AMP8.

We have updated our supply forecast for the revised draft plan. We have updated the baseline DO to reflect changes to a time limited licence. We have also changed the baseline DO we have included in our planning tables to reflect that our system is constraint by our level 2 level of service, rather than a 1 in 500 drought.

We have also provided additional information relating to our process for determining the appropriate level of outage for our plan, as well as how we have calculated the impact of climate change on our water availability. Since the draft WRMP, we have agreed sustainability licence changes, so we detail these in this section, along with our proposed environmental destination profile, which we have also updated since the draft WRMP.

6.1 Overview of the South Staffs Water operating area

6.1.1 Planning area – the water resource zone

In May 2017, following assessment using the WRZ integrity guidance (Environment Agency, July 2016), we agreed with the Environment Agency that we would continue to represent a single resource zone.

6.1.2 Supply sources

We have two surface water sources – River Severn and Blithfield Reservoir – and 25 available groundwater sources, which are mainly situated in the southern and central areas. All these sources are linked by an integrated supply system. Surface water sources provide approximately 50% of our water resources in the dry year and the remainder comes from our groundwater sources, abstracting from the Sherwood Sandstone aquifer.

We have a number of small bulk imports and exports with Severn Trent Water, some of which are used daily and others which are for emergency use only. Our River Severn treatment works is jointly funded with Severn Trent Water and we discussed this arrangement in section 2.7.

6.1.3 Levels of service (LoS)

Our published levels of service are based on the frequency of droughts previously experienced, and the likelihood of water use restrictions becoming necessary.

Our level of service is based on droughts observed in the historic record dating back to 1902, specifically those where we required additional measures to manage supplies and demands, and the likelihood of restrictions being necessary. The last time we asked our customers not to use their hosepipes was in the drought of 1976, but we plan to meet unrestricted customer demands in a repeat of the conditions experienced during the 1995/97 drought. We equate this to a frequency of restrictions of once every 40 years in this area.

The calculated DO for this level of service models the available yields in drought conditions to ensure this level of service can be met with the available resource.

We are also required to demonstrate that we can achieve the included reference levels of service from the water resources planning guideline. The levels of service are shown below.

Table 12 Levels of service

Restriction	Company proposed levels of service
Temporary use bans (formerly hosepipe ban)	1 in 40 years
Non-essential use (Ordinary Drought Order)	1 in 80 years
Rota cuts or standpipes	1 in 500 years

The annual average risks shown in the table above are based on our levels of service and the following assumptions.

- We are not proposing any changes to our current levels of service between now and 2050.
- We continue to meet, or exceed, these levels of service.

Should any of these risks change during the 25 year planning horizon – for example, as a result of a changing climate – we will bring in demand- or supply- side options that mean that we can still maintain these levels of service for our customers.

We use the frequency of temporary use bans (TUBs) of not more than 1 every 40 years on average to determine our Level of Service Deployable Output (LoS DO). We have used our Aquator model to simulate the water balance of the system by relating the application of TUBs to the crossing of the relevant control curve of Blithfield reservoir – that is, when reserves at Blithfield go down below the control curve, TUBs are activated and the associated demand saving percentages applied.

For this WRMP, we have assessed our system in relation to a 1 in 500 drought. We reported in our WRMP19 that our system was resilient to a 1 in 200 drought, and likely to be higher. We have shown through our Aquator modelling at WRMP24 that our system is resilient to 1 in 500 droughts, and that the constraint on our system is the TUB LoS at 228 Ml/d. As such, there are no further options required in this plan to deliver the 1 in 500 resilience directed in the Water Resource Planning Guidelines.

6.1.4 Planning scenario

We plan for the DYAA scenario and derive deployable output (DO) using our water resources allocation model, Aquator.

6.2 Deployable output

6.2.1 Method selection

Based on the UKWIR and Environment Agency study ('Water Resources Planning Tools' 2012), otherwise referred to as WR27, we have determined the level of analysis required to assess DO which is proportionate to the nature of our supply system and the risk to both supplies and the environment.

A WRZ (conjunctive use system) assessment framework has been selected for the following reasons:

- A conjunctive use model was used for previous WRMP submissions and therefore there is data and intelligence from previous model building and refinement studies available.
- There is a medium to high degree of constraints on outputs with some elements (groundwater) having simple constraints and others (surface water) having complex constraints.
- There is a requirement to evaluate our existing levels of service and options for alternative levels of service.

A catchment/aquifer assessment framework is not currently required to assess ecological needs. However, our model has the capability to carry out this task if required in future.

The DO of our supply system has been assessed using best practice techniques within the report No. 14/WR/27/7, 'Handbook of Source Yield Methodologies' (UKWIR, 2014).

6.2.2 Deployable output assessment method

The DO assessments form a key component of the supply forecasts inputting to the Water Resources West (WRW) regional plan, and ultimately our WRMP. They are designed to meet the latest EA's 1:500 drought resilience guidance, through application of system response methods using the Scottish DO approach.

The DO assessments utilised South Staffs Water's Aquator XV model, which was migrated earlier in 2021, and which is based upon the Aquator v4.3 model used in WRMP19 (with targeted improvements or refinements applied). In addition to assessing the DO under stochastic baseline and climate change scenarios, tested of the DO benefits of demand saving measures was also completed.

For the revised draft WRMP we have updated our supply forecast again to reflect updates to the model. We have also removed the River Trent recirculation licence from our modelling, as this licence is time limited and has not been renewed in 2023.

6.2.2.1 Description of method

The South Staffs Water Aquator XV model used for this project is a close relative to the Aquator v4.3 model used in WRMP19 (i.e., direct migration with minor amends applied only). The basis of our model was originally developed with the application of English and Welsh DO analysis in mind using historic (or climate impacted historic) hydrological data, albeit using a relatively long hydrological record back to the 1880s.

Meanwhile, the use of the 19,200 years of stochastic data to assess the 1:500 year DO for Level of Service 4 events has been driven by new regulatory guidance, and fundamentally changes the modelling approach required from previous WRMP rounds. The model was updated to allow for stochastic DO assessment to meet the Environment Agency's Water Resource Planning Draft Guidance related to 1:500 year DO. Given the nature of our system, a systems-based approach has been followed using the Scottish DO method.

To enable the use of stochastic hydrology, refinements have been made to the model, in particular to set appropriate failure criteria linked to Level of Service 4 failures and implement suitable resetting of model states every 48 years to enable continuous DO simulation across batches of stochastic data. Inflow data was either provided by Severn Trent Water or derived from simulating the Severn Trent Water Aquator XV model at the 1:500 DO level to export required time series (equivalent to those used in the legacy model and previous WRMPs).

The first-time application of stochastic data was anticipated to be challenging. This involved significant testing and model investigation in the early stages of work, which through the process has allowed an effective and efficient approach to 1:500 DO estimation to be achieved both for this project and in the future.

In particular, as DO modelling progressed through to the climate change stage, further improvements to the approach were applied, especially given the known severity of some UKCP18 scenarios. However, as a 'first cycle' assessment of DO using this approach, we agreed an overriding principle was to retain the basis of the original Aquator model as far as practical for the purpose of this assessment.

A report detailing the process undertaken and any system updates required is included in appendix D.

6.2.3 Baseline deployable output results

The first-time application of stochastic data was anticipated to be challenging. This involved significant testing and model investigation in the early stages of work, which through the process has allowed an effective and efficient approach to 1:500 DO estimation to be achieved both for this project and in the future.

Baseline stochastic DO assessments were completed across all 19,200 years of stochastic inflows in the STWL Aquator XV model using Aquator XM. DO estimates for Level 2, 3 and 4 events were produced, noting that in all cases the Level 2 DO is the clear overall constraint to DO as with previous modelling using English and Welsh DO (which does not directly account for Level 4 frequency). Therefore, whilst the aforementioned step increase in failures under Level 4 failures is informative of underlying system resilience considerations, it does not influence the overall reported DO. This is reflected in the table below, and shown in table 22 of appendix D:

Table 13 Baseline DO Outputs

	Return period (years)	Demand (Ml/d)
Level of service 2	40	339.22
Level of Service 3	80	345.94
1:200	200	348.51
Emergency Drought Order (combined failures)	500	345.01

When assessing, using new techniques, the 1:500 DO with stochastics and climate change, the frequency of Level 2 events remains the constraint to overall DO in line with WRMP19. Under baseline conditions, broadly speaking, the DO remains similar to those previously modelled in previous plans and model versions.

As with legacy DO modelling, this position means that SSW are relatively resilient to Level 4 events against the 1:500 resilience standard being applied. In historic DO modelling (noting that we had a relatively long inflow record from the 1880s to present) this can previously be seen, where typically there is a material amount of storage retained above minimum levels at the point of DO failure; the findings with stochastic hydrology are consistent.

Our updated modelling for the revised draft WRMP takes into account the removal of the River Trent recirculation licence and incorporated upgrades to the model. We have updated our data in the planning tables to reflect the level of service 2 DO, rather than use the 1 in 500 year drought DO, as it is the level 2 that is the constraint on our system. We have also ensured that the DO is without the benefit of demand interventions, as we include these demand interventions, as detailed in our drought plan, in the planning tables in table 3b, 5 and 6. As a result of these updates, our baseline DO has reduced by 11.09 Ml/d.

At draft WRMP stage, our work with our consultants highlighted some potential areas for improvement. We have detailed these in the table below, including our proposed actions. It should be noted that this supply modelling work was undertaken whilst we were updating our drought plan, which was published in August 2022, and so many elements were picked up within that review.

Table 14 Supply forecasting improvements

Potential improvement activity	Response
Review the logic for triggering Temporary Use Ban (TUB) restrictions in the model	This is due to this level 2 being the constraint on our system. We did review this as part of our recent drought plan update which we published in 2022. We will review and update this if required at our next drought plan development which will be early in AMP8.
Review the assumed percentage savings for TUBs based on SSW and other company experience	For the data used in our modelling for the WRMP, we have used baseline DO without demand interventions included, so that these are not double counted when we apply our drought measures. Following the drought of 2022, several water companies initiated TUBs and we have reviewed the savings that they saw against our drought plan. We assumed 8% savings for TUBs, which is broadly in line with the experience of companies in 2022. We have also reviewed these percentage savings in Aquator and ensured they are in line with this.
Ensure the trigger curve for TUBs in optimally placed	This was also reviewed as part of our recent drought plan update which we published in 2022. We will review and update this if required at our next drought plan development which will be early in AMP8.
Include a more recent and typical industry practice weekly/monthly profile in the supply model, rather than the current 1995 daily sequence	We are proposing to run a variety of scenarios for future model runs, including both the 2018 and 2022 sequences.

Work with Severn Trent Water to improve the representation of the River Severn system in the model	We have undertaken some upgrades to the representation of the River Severn in the model through this WRMP process and will continue to work with Severn Trent Water to ensure these are kept updated and accurately represent their model.
Undertake work to further prove that groundwater is inelastic to climate change/stochastic droughts	This was also reviewed as part of our recent drought plan update which we published in 2022, through work with our environmental consultants. As part of our planned environmental destination investigations in AMP8, we will gather further evidence on this topic and update our next drought plan if required.

6.3 Time-limited licences

We have three time-limited licences.

Abstraction from the Broome Lodge borehole is for the purpose of augmenting water levels in the nearby pools and rivers and is neither used for public water supply nor affects the operation of other boreholes.

The River Blithe pumpback licence was renewed in 2021 which reduced permitted annual abstraction volumes therefore had no impact on peak transfer capacities. We are currently reviewing mitigation measures in the River Blithe with the aim of identifying and implementing options to achieve Good Ecological Potential in the water body downstream of Blithfield Reservoir (which is a Heavily Modified Water Body under the WFD). These measures may require us to further amend the licence or to put in place other measures to protect fish passage at the River Blithe pumpback site.

Part of the River Severn Works licence is time limited to 2034 (11Ml/d). Our baseline forecast assumption is that both licences retain their present influence on DO across the planning period.

We also had a time limited licence which allowed recirculation of water from the River Trent to enable abstraction from the River Blithe when the HOF was in place. This licence has not been renewed by the Environment Agency during AMP7 due to concerns regarding the mixing of water and impact of fish passage and spawning. We have removed this licence from our forecasting and modelling for the revised draft WRMP.

6.4 Links to our drought plan

Our drought plan was reviewed and updated in 2021. The final Drought Plan was published in August 2022 and the work undertaken for that has been mapped over into the WRMP.

6.4.1 Measures included within deployable output analysis for WRMP

The DO analysis in Aquator for the WRMP includes selected drought measures in accordance with Environment Agency guidelines. Supply-side measures that are modelled include operation of the River Blithe pumpback and conservation of Blithfield Reservoir (operational changes to make more use of River Severn works). Demand-side measures that are modelled include:

- appeals for restraint
- temporary use (hosepipe) bans

- non-essential use ban

Operational measures that are primarily designed to optimise supplies and reduce waste (such as ensuring all sources are working and reducing leakage) are not considered separately as this is implicit within the model. Similarly, drought permits on the Rivers Severn and Blithe/Trent are not included in line with Environment Agency guidelines.

The Aquator model imposes these measures triggered by drought control curves based on reservoir storage levels in Blithfield Reservoir. The constraints on these measures are outlined in appendix D and are largely based on experience of the 2011 drought and/or UKWIR guidance.

Table 6 in the accompanying WRMP tables details the links to our drought plan and the benefits of associated options.

6.4.2 Additional supply measures within our drought plan

The additional measures we can draw on in the event of a drought that are included within this WRMP are:

- **the River Blithe/Trent Drought Permit**, which allows us to operate the River Blithe pumpback when flows in the River Trent at North Muskham fall below the 'Hands off flow limit'; and
- **the River Severn Drought Permit**, which allows us to abstract from the river at low flow conditions when the Environment Agency is seeking reductions in abstraction under their River Severn Drought Order.

The benefits of these measures can be estimated and have been included within table 6 of the WRMP tables.

In addition, our drought plan identifies the possibility of operating Blithfield Reservoir at low levels – that is, below historic minimum operational levels. Following works in the 1990s there are no remaining hydraulic constraints to this procedure, but there are uncertainties over water quality in the reservoir at these levels which may limit the volumes of water that can be safely treated. Accordingly, there is little certainty over yield and this measure has not been included in table 6 of the WRMP tables.

6.4.3 Determination of extreme droughts

Our approach to assess the impact of 1 in 500 year droughts has changed since WRMP19, in light of new regulatory guidance.

This involved the use of the 19,200 years of stochastic data to assess the 1:500 year DO for Level of Service 4 events, and fundamentally changes the modelling approach required from previous WRMP rounds. Our Aquator model was updated to allow for stochastic DO assessment to meet the Environment Agency's Water Resource Planning Draft Guidance related to 1:500 year DO. Given the nature of our system, a systems-based approach has been followed using the Scottish DO method.

6.4.4 Assessment of resilience in base year

We have evaluated our resilience to drought based on our current resources in the base year.

We used our Aquator model and its associated datasets to evaluate the performance of our supply system and the contribution of our various drought management measures. The key features are:

- in all scenarios in the base year we have a healthy surplus of supply over demand of around 50Ml/d.
- the contribution of the River Blithe pumpback is an important measure but is reduced in most droughts unless its associated drought permit is implemented; and

- while our full range of demand-side measures – (appeals for restraint, temporary use and non-essential use bans) are used in these scenarios, their impacts are reduced under most droughts. This is because the way our simulations use our current drought curves generally means these measures are applied mid-way through the drought rather than at the start of the summer demand period.

When assessing, using new techniques, the 1:500 DO with stochastics and climate change, the frequency of Level 2 events remains the constraint to overall DO in line with WRMP19. Under baseline conditions, broadly speaking, the DO remains similar to those previously modelled in previous plans and model versions.

As with legacy DO modelling, this position means that we are resilient to Level 4 events against the 1:500 resilience standard being applied. In historic DO modelling (noting that we have a relatively long inflow record from the 1880s to present) this can previously be seen, where typically there is a material amount of storage retained above minimum levels at the point of DO failure; the findings with stochastic hydrology are consistent.

6.4.5 Assessment of resilience over the planning period

We have also tested our drought resilience by considering how our measures might perform over the whole planning period under our proposed programme of works.

The assumptions that we made when we carried out this analysis are:

- baseline demand rises by around 16Ml/d from 309Ml/d in the base year to 325Ml/d in 2049/50.
- our proposed programme includes savings from demand management through activities helping our customers reduce consumption.
- the net effect is that demand-side drought measures are therefore likely to be at least the same across the planning period if not higher.
- our proposed programme includes a significant reduction in leakage by around 23Ml/d by the end of the planning period.
- our DO is likely to fall by around 54Ml/d over this same period because of sustainability changes and climate change.
- we will have completed our work on our two major treatment works during AMP7 which will deliver improved water quality and enable larger yields in dry conditions.

6.4.6 Contingencies for extreme droughts

Our analysis shows our supplies are resilient for a range of droughts across the 25-year planning period. Accordingly, we are not putting forward any new drought management options in addition to those currently in our existing drought plan.

6.4.7 Groundwater drought resilience

For our recent drought plan, we reviewed our previous work on groundwater resilience. Due to the evidence of the resilience of the Sherwood sandstone aquifer to rainfall changes, we have continued our approach of relying on surface water levels as triggers in our plan, rather than groundwater levels. Further detail on this is included in our 2022 Drought Plan which was published in August 2022.

6.5 Outage

Within our WRMP we must include an assessment of outage, which is to accommodate potential short-term or temporary loss of the amount of water available for supply.

Outage is defined as a temporary loss of DO because of:

- planned maintenance and capital work (planned outage); or
- unforeseen events such as power failure, source pollution or system breakdown (unplanned outage).

The outage allowance was determined in line with the Water Resources Planning Guideline for WRMP24, as well as the requirements of Water Resources West (WRW).

An outage modelling tool was recently developed for Water Resources South East (WRSE), to facilitate best practice outage analysis. It enables simpler processing of events and PDFs, provides a better audit trail and enables faster and simpler Monte-Carlo model runs without the need for any Microsoft Excel “add-ins”. This modelling tool was applied here and ensures a consistent approach across the regional planning areas.

Historic events have been analysed and included from 2001 to 2021. The list of events was first reviewed to identify if events were legitimate outages. Non-legitimate events have been excluded from the data. The data were then grouped by source and by category and categorised as planned or unplanned events. The events were also reviewed to ensure that where two or more events were recorded as occurring at the same time and the same site, these were only counted as one event.

Events at sources no longer in supply were excluded to avoid overestimating overall magnitude (if DO has decreased) and prevent any bias in the outage calculation.

6.5.1 Outage results

The outage results for the various percentiles are represented below.

Table 15 Outage results

Percentile	P70 (Ml/d)	P80 (Ml/d)	P90 (Ml/d)	P95 (Ml/d)
WRMP19	6.9	8.3	10.3	n/a
WRMP24	8.2	10.1	14.2	16.9

The most recent guidance for selecting outage percentiles is in 2016 UKWIR risk based planning. Two key passages state:

Both the original methodology and the 2002 ‘Uncertainty and Risk in Supply & Demand Forecasting’ guidance recommended the use of Monte-Carlo methods to generate a PDF of outage risk. However, to date there has been no guidance on the percentile that should be used if a company has generated outage using a Monte-Carlo method.

*For **aggregated** approaches, practitioners have two options:*

i. *Where there is no demonstrable linkage between drought and outage, then either the risk percentile that has been used by the company in previous WRMPs is maintained, or a percentile between 75% and 90% is chosen based on experience of the issues caused during historic outages under drought conditions.*

ii. *ii. Where there is a link between drought and outage, then companies can, legitimately, use a higher percentile allowance.*

All companies in Water Resources West have adopted the 80th percentile (corresponding to a 20% risk). For SSW, this percentile is 10.1 Ml/d for DYAA. This is an increase compared to our WRMP19 plan, which had an outage allowance of 8.28 Ml/d. We also selected the 80th percentile at both WRMP19 and WRMP14, and there have been no significant changes to our system in this time that would suggest an alteration in risk profile is required. 10.1 Ml/d equates to 3% of our DO. A report detailing the outage methodology and results is included in appendix E.

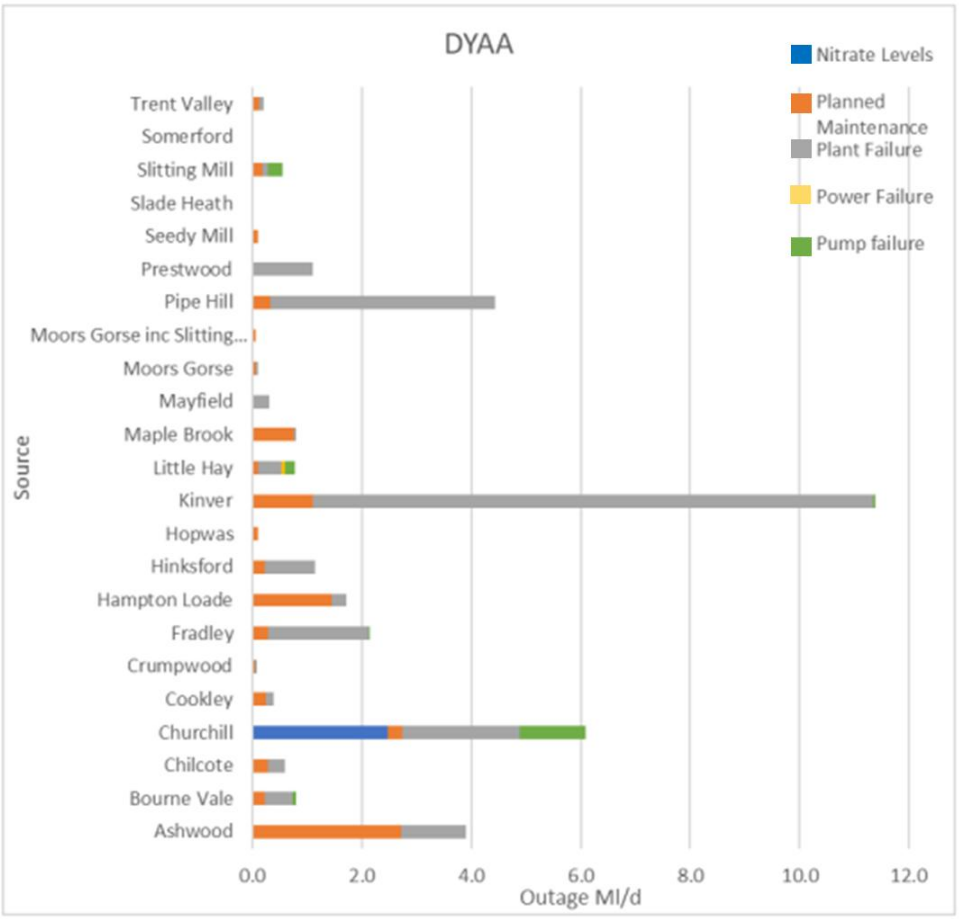
However, throughout AMP7 we have consistently ran with a higher level of outage than our WRMP19 forecast, and a 3% allowance is lower than many other companies across the industry. As such, we need to make sure that our plan is realistic and that current performance of assets and water quality challenges are accurately reflected in our outage allowance for this plan. If not, we could risk a plan that is overly optimistic and which then could potentially put the reliability of our supply of water to our customers at risk.

As a result, we have increased our outage allowance in line with our 2022/23 actual outage position (18 Ml/d) to 17 Ml/d (reflecting further work we're already undertaking in AMP7 to reduce outage). We have been focusing on reducing outage in the region throughout AMP7 which can be seen in our annual performance, and we are focused on ensure we continue to do so whilst having the necessary level of outage to ensure our assets are properly maintained and refurbished.

It should also be noted that the outage reported in annual reviews in recent years have included planned outage. In a 1 in 500 drought, our drought plan states we would halt all planned outage and therefore we would only be observing unplanned outage. Currently we are able to make choices around our timing to restoring sites following an unplanned outage e.g., if water resources are healthy, we may leave a site overnight or over the weekend. However, in a 1 in 500 drought, our policy changes and all have to sites must be attended within 2 hours. These in turn make a difference to a normal year outage profile and that represented in the data tables for a 1 in 500 year drought.

The chart below shows the breakdown of outage per site with the reasons for this outage.

Figure 2 Outage breakdown by site



6.5.2 Reducing future outage

As part of our PR24 business plan development, we will include programmes of work that will improve the condition of our assets, make treatment processes more reliable, and increase the resilience of key assets within our network. Through this programme of capital maintenance, enhancements, resilience and water quality improvements, we will be making our assets more reliable and reducing the risk of their failure.

Some key areas we are proposing in our PR24 plan include:

- Increased borehole survey and maintenance programme.
- Upgrades to treatment capacity and standards at several borehole sites.
- Run to waste schemes at sites to reduce downtime.
- Improved unplanned outage process linked to water resource availability and demand levels at the time.
- Closer link to planned outage process and water resource availability.
- Restructure to the capital investment delivery team with a focus on reducing length of time planned outage requires and ensuring all schemes delivered on time.
- Restructure to connect the water resources and water quality teams into the same department to ensure these risks are managed and balanced effectively in order with a focus on reducing outage.

6.6 Climate change

We have assessed the impact of global warming and climate change on our future supplies. Our approach for WRMP24 is different to WRMP19 as we update to utilise the latest climate change projections (UKCP18) and use both RCM and probabilistic scenarios.

The method utilised is consistent across all companies within Water Resources West, as agreed in the Supply Workstream sessions. In addition, we have utilised data from Severn Trent Water, due to our location within their supply area, which ensures consistency in approach. As this is a new approach, the method has evolved throughout the process, and the report detailing the final agreed approach is contained within appendix D.

Our groundwater all comes from the Sherwood sandstone aquifer which has a high level of resilience to changes in temperature and demand, with a current view of this being circa 15 years. We have agreed to some licence caps across these sources by 2050 (see section 6.9) and are planning for future abstraction reductions at these sources by 2040 (see section 6.11) which will protect the related waterbodies and catchment from the impacts of climate change.

6.6.1 Basic Vulnerability Assessment (BVA)

Our climate change vulnerability assessment from WRMP24 and our recent drought plan, published in 2022, has determined that our resource zone can be classified as “medium” vulnerability, as shown below.

Figure 3 Climate change vulnerability assessment

Uncertainty range (% change wet to dry)	Mid-scenario (% reduction in DO)		
	<5%	>5%	>10%
<5%	Low	Medium	High
6 to 10%	South Staffs Water	Medium	High
11 to 15%	High	High	High
>15%	High	High	High

A pragmatic assessment approach is required as any DO modelling is highly dependent on outputs from the Severn Trent Water regional model. This makes it important that for each climate change scenario considered, equivalent climatic conditions are modelled simultaneously on the River Trent and Severn as on the River Blithe. Accordingly, it was decided to adopt a medium to high vulnerability approach as required by the vulnerability assessment of Severn Trent Water for its Strategic Grid Resource Zone. Therefore, we have adopted a tier 3 approach and produced a new climate change forecast for WRMP24, which is consistent across all companies within Water Resources West.

6.6.2 Climate change scenarios and tools

UKCP18 comprises a range of different products, each providing different realisations of the future climate. Each product has different features and limitations for water resources planning. The UKCP18 Regional and Global projections are spatially coherent but were only available for the highest emission scenario, RCP 8.5 at the time of developing this WRMP. Conversely, the UKCP18 Probabilistic projections are available for all emissions pathways

(i.e., all RCPs), but they are not spatially coherent. The lack of spatial coherence in the probabilistic projections is a limitation for regional water resources planning, because companies within a regional group need to be able to undertake joined-up assessments of climate change, particularly where transfers are being investigated. Along with the use of our spatially coherent regional stochastic dataset, this means that conditions simulated at each of the transfer are matched together, just as they would be if we were simulating a historical event. The downside of RCPs is that there are only 12 in number, which makes it difficult to assess uncertainty. The UKCP18 probabilistic projections, while not spatially coherent, total 3,000 in number and provide invaluable additional information to help inform how climate change uncertainty is represented in target headroom.

In accordance with the Water Resources Supplementary Planning Guideline (Environment Agency, 2021), a range of UKCP18 products were used in our Tier 3 detailed climate change assessment. In order to meet the requirements of regional planning, the Regional Climate Model projections were used by all member companies of Water Resources West regional planning group. The Regional Climate Model Projections were chosen rather than the also spatially coherent Global Climate Model Projections because they are available at finer resolution (12km) than the Global Projections (60Km), which is beneficial as they could contain more drought information. While the Regional Climate Model Projections are spatially coherent, they were only available at RCP 8.5 (when completing the climate change assessment for this plan), which is the highest emission trajectory included in UKCP18. Therefore, in order to understand the full range of possible climate change impacts, the probabilistic projections were also used to provide inputs to our target headroom assessment.

6.6.3 Details of assessment

SSW sits within the same broad spatial area as the STWL system, as part of WRW, and various resources are represented in both models albeit to different extents. For example, the SSW system is coarsely represented in the STWL model, whereas the STWL model represents in significant extra detail the full representation and regulation of the River Severn. Given this interlinkage, stochastic inflow data from the STWL WRMP24 DO and climate change modelling project were used for the modelling of stochastics, such that there was a consistent basis to the datasets.

Severn Trent Water undertook the “Regional Climate Data” project to support water resources planning at regional and company level, which provided rainfall, average temperature and PET data for drought risk assessment and climate change modelling. This includes processing and bias-correction (BC) of UKCP18’s 12km Regional Climate Models (RCM) for river basins, as well as climate change factors for UKCP18 Probabilistic projections and Global Climate models for England and Wales. This is summarised in the table below.

Table 16 Climate change datasets used in WRMP24 climate change assessment

Data Set	Rationale	Resolution
UKCP18 RCM bias-corrected factors	Climate change risk assessment. 12 bias corrected RCM RCP8.5. P, T and PET change factors to apply to stochastic data sets, to create stochastics plus climate change. Factors for the 2060-2080 period	River basin
UKCP probabilistic	Climate change factors for P and T for RCP8.5 and A1B for the 2060-2080 period. To provide a broader context to the RCM data sets	England and Wales

All climate change factors were provided on a monthly basis for both rainfall and temperature. The 12 bias corrected RCM projections have factors that are unique to each river basin and have been assigned to each model catchment based on spatial location. Probabilistic projections apply the same England and Wales factors to all catchments so that the same coherent data sets can be used in all regions.

In order to reduce the number of projections in the assessment from the 100 which were sampled using Latin Hypercube based sampling, Severn Trent Water used drought indicators to produce a targeted sample of 20 probabilistic projections. The 400 scenarios of stochastic baseline flow series for 1950-1997 were compared with each of the 100 probabilistic stochastic flow series using the following two drought indicators:

- Average annual flow (more relevant for catchments where winter storage is important); and,
- April to September average flows (more relevant for direct intakes).

Percentage changes from the baseline stochastics were derived for the two drought indicators. An average change across the ten indicators was taken and then ranked to provide a combined drought indicator representing the whole Severn Trent Water area. Every 5th ranking was taken with the addition of the 99th ranking to give a total of 20 scenarios for use in our water resources impact modelling.

Two stochastic batches (known as Batch 4 and 7) were taken through to climate change assessments. These stochastic batches were previously selected and sampled for STWL, and thus the appropriate inflow data (or models to produce time series data at 1:500 DO) were available. In total, 32 UKCP18 climate change scenarios have been assessed using the Scottish DO method. Alterations to the River Severn representation were applied to allow plausible assessment of climate change impact, due to the legacy representation of the Severn essentially resulting in negative river flows.

The same approach was taken for both the RCM and probabilistic scenarios.

6.6.4 Assessment results

The 12 UKCP18 RCM scenarios (using RCP8.5 high emissions as modelled) broadly show the most severe 1:500 DO impacts. The highest impact for the RCMs was RCM13 (-29.84 Ml/d DO impact) and with RCM15 the lowest (-12.8 Ml/d). The P90 probabilistic DO impact was comparable with the RCM scenarios at -17.2 Ml/d, but the P50 showed a much more modest -9.6 Ml/d DO impact. In all cases, Level 2 events constrain DO as with the stochastic baseline, albeit in the most severe scenario the 'gap' to Level 4 1:500 DO closes.

The overall trend of probabilistic DO impact followed the general rank expected from the provided sampled probabilistic scenarios. However, given the system modelling exercise is influenced by system non-linearities (which is the benefit of using a water resources model), individual events may not be fully in line with the expected rank, and the sampling was also conducted based on the STWL system (albeit the SSW area lies geographically within that of STWL).

The below details the RCM outputs and impact on DO:

Table 17 Annual average change in flows as a percentage change from baseline for RCM & probabilistic scenarios

RCM Scenario	% change from baseline	Probabilistic Scenario	% change from baseline	Probabilistic Scenario	% change from baseline
RCM01	-7.07%	**Sc2**	-5.09%	**Sc79**	-2.13%
RCM04	-3.89%	**Sc17**	-3.70%	**Sc80**	-3.53%
RCM05	-6.04%	**Sc19**	-3.57%	**Sc82**	-6.02%

RCM06	-8.43%
RCM07	-4.77%
RCM08	-5.01%
RCM09	-5.71%
RCM10	-7.16%
RCM11	-5.09%
RCM12	-4.96%
RCM13	-8.83%
RCM15	-3.79%

Sc21	-3.62%	**Sc83**	-5.19%
Sc37	-3.27%	**Sc85**	-1.93%
Sc44	-2.24%	**Sc86**	-2.84%
Sc61	-4.23%	**Sc87**	-2.41%
Sc68	-5.24%	**Sc88**	-4.21%
Sc72	-1.26%	**Sc96**	-2.02%
Sc77	-1.33%	**Sc100**	-3.35

The worst-case probabilistic scenario sees a reduction in DO of 6.02% with a best-case scenario of 1.26%. The median is -3.55%. The worst-case RCM scenario sees a reduction in DO of 8.83% with a best-case scenario of 3.79%. The median is -5.4%.

Climate change impacts are likely moderated through the fact that Level 2 constrains overall DO.

6.6.5 How these results have been included in our planning

The key outputs of our impacts modelling were RCM climate change impacts at RCP 8.5. RCP 8.5 is the highest emission scenario of those available in UKCP18 data. RCP 6.0 is thought to be the closest to the scenario used by most water companies for WRMP19. Our choice of emission scenario for WRMP24 was carefully considered in the context of pertinent literature (e.g., the third Climate Change Risk Assessment, CCRA29) and discussed within our regional planning group (WRW). RCP 6.0 was selected, based on its representativeness of the range of warming predicted based on current commitments and ambitions on global warming, and for consistency with WRMP19.

It is not possible to assess RCP 6.0 directly due to the lack of a spatially coherent UKCP18 product. Therefore, temperature-based scaling was used to translate the DO impacts from RCP8.5 to 6.0 using the scaling outlined in the 2021 Atkins climate change scaling report.

In addition to scaling climate change impacts to different emissions scenarios, in order to fully integrate them into the WRMP, they must also be scaled through the planning horizon; from the future reference period 2070, back to the start of the planning period, 2025. While the guidance continues to recommend a simple linear scaling method, this approach remains flexible, and alternatives can be explored. As such, scaling relationships based on temperature, again developed by Atkins and represented in the 2021 climate change scaling report, were used to estimate climate change impacts in scenarios for which water resources modelling was not undertaken (i.e., for other RCPs such as 6.0) and to scale from 2070. Using this approach, the median RCM climate change impacts for RCP 8.5 were scaled to probabilistic RCP 6.0 equivalent impacts, and from 2070 back to 2025.

Following scaling, climate change impacts were added to the WRMP planning tables. These are summarised in in the below for key years in the WRMP24 planning horizon and compares these values to those derived at WRMP19 using UKCP09.

Table 18 UKCO09 and UKCP18 comparison

	Climate change impact – reduction in Ml/d					
	2025/26	2029/30	2034/35	2039/40	2044/45	2049/50
UKCP09	4.03	5.18	6.62	8.05	9.49	10.94
UKCP18	3.47	4.02	4.56	5.11	5.84	6.39

6.7 Raw water and non-potable water transfers

We have no raw water transfers to or from our supply system.

We have a non-potable water export, which is used for bottling purposes. We have used the base year volumes in 2019/20 and assumed zero growth across the planning period.

6.7.1 Potable water transfers

We operate around 30 potable water connections at the boundaries of our supply area with Severn Trent Water, which together constitute a net export of potable water. The majority of these are small in nature and are known collectively as the 'minor exports'. There is a much larger export to Severn Trent Water in the Wolverhampton area, which arises from the joint ownership of the River Severn Works.

The capacity of minor exports is up to 5Ml/d, but average usage has been consistently around 1Ml/d and is largely independent of seasonal demands. That said, volumes have increased occasionally to 2Ml/d during the peak demand months. As a result, the uncertainty around this value has been considered under headroom.

For WRMP purposes, in a DYAA (dry year annual average) scenario, this potable export from the River Severn Works to Wolverhampton:

- has a peak daily rate of 48Ml/d (under the current arrangements between us and Severn Trent Water)
- an average rate of 40.6Ml/d (under the current arrangements between us and Severn Trent Water)
- a rate of 36Ml/d (as a modelled average across the Severn Trent Water 95-year Aquator base DO run)

We have an additional large emergency supply arrangement with Severn Trent Water near Perry Barr, which was put in place for the purposes of non-routine maintenance of its supply system. As such, we have not considered this within our supply forecast as it is not intended for use in a dry year.

To deliver resilient supplies, we are working together with Severn Trent Water to provide the highest level of resilience possible to our customers. We both recognise that the best long-term solution for resilience in this part of the Midlands will come from a collaborative approach. We will continue to explore the different ways in which we could use shared assets on the River Severn, existing connections and other assets to give mutually beneficial outcomes.

All transfers are potable and meet drinking water quality standards.

6.8 Raw water losses, treatment works losses and operational use

The Environment Agency defines raw water losses as the net loss to the resource system(s) being considered, comprised of:

- mains/aqueduct (pressure system) losses
- open channel/very low pressure system losses
- losses from break-pressure tanks and small reservoirs

Raw water operational use comprises regular water use – for example, washing-out of raw water mains because of sediment build up and poor quality source water. Treatment works losses is defined as structural water loss (leaks) and overflows, while treatment works operational use comprises the net loss from the treatment process.

In addition to the multi-stage treatment process which operates at our two surface water works, we have complex treatment in place at six groundwater sites (not including a further two sites which are currently mothballed).

All raw water transfers from the point of abstraction to the treatment works are through closed pipe transfers. Both our reservoirs have licensed requirements to release water for the purposes of maintaining water bodies downstream and these compensation flows are accounted for within the Aquator model and not considered here. Raw water is used operationally at one site to clean band screens and this has been accounted under the treatment works operational use evaluation.

Throughout AMP7 we have installed accurate wastewater measurement systems on a number of sites to Environment Agency MCERTS standards for all significant discharges. Certification requires all meters to be calibrated and new environmental permits have been issued. These new wastewater meters allow a more accurate estimation of treatment works losses and operational use as a percentage of raw water onto each works, in particular from intermittent higher volume processes.

In AMP7 we are installing Ceramac treatment as part of our Green Recovery Programme. This technology will potentially increase our treatment operational use by 6 Ml/d. Our other sites are all 5% or lower. This is represented in the data tables where our AMP7 values from 2021 onwards are 15.37 Ml/d, but this increases to 21.37 Ml/d from 2025 onwards when the Ceramac technology will be online.

Hampton Loade is the largest contribution to this calculation and once the Ceramac technology has been fully installed and commissioned by the end of AMP7, we will undertake a site review to determine where we can make reductions to the losses at this site.

6.9 Changes since WRMP19

The table below details the changes we have seen in some of our key planning components between our final WRMP19 plan and the baseline for our WRMP24 plan. It outlines any difference in values for 2025 in the WRMP24 plan compared to this year in the WRMP19 plan and the reasons behind these differences.

Table 19 Differences between WRMP19 final plan and WRMP24 baseline

Key component	WRMP19 (Final Plan) 2025/26 (Ml/d)	WRMP24 (Baseline) 2025/26 (Ml/d)	Difference (Ml/d)	Explanation for differences
Company Supply Demand Balance	24.46	-50.46	74.92	58 Ml/d of this is due to the change in baseline deployable output as the WRMP24 tables looks at a 1 in 500 drought scenario where we would have less available DO. Remaining is predominantly due to increased household demand following Covid-19. Small increases to outage, process losses and also contribute to the overall increase.
Deployable Output	397.23	339.22	-58.01	This is because our system is already resilient to a 1 in 500 year drought. The tables require data to reflect a 1 in 500 year and so DO has been modelled for this. However, in this scenario, our level 2 is our system constraint and therefore provides a lower DO. This leads to a DO of 58 Ml/d less than WRMP19. We have included this from 2025/26 as our system is already 1 in 500 resilient.
Climate change impact	-4.03	-3.47	0.56	Minor change due to use of updated climate change projections at WRMP24 using UKCP18
Sustainability Reductions (WINEP/ Licence capping)	6	0	n/a	The 6Ml/d was for delivery within AMP7 and therefore is included in the updated DO.
Environmental Destination	0	0	0	Environmental destination not included at WRMP19. We have included sustainability reductions for AMP8 in 2029/30 and our ED reductions are scheduled from 2030/31 onwards in the tables.
1-in-500 resilience impact	0	0	0	The system is already 1 in 500 resilient. This change is reflected in the DO number above

Household demand	197.63	212.90	15.27	Reflective of increased household demand in the region following Covid-19. Also includes updated growth projections.
Non-household demand	56.44	54.98	-1.46	Minor change, includes latest growth information and post Covid-19 impacts
Target Headroom	8.75	10.04	1.29	Minor change as headroom scenarios updated, as per appendix G, and re-run for WRMP24.
Outage	8.28	10.10	1.82	Outage updated as per appendix E methodology for WRMP24.
Process losses	18.82	21.37	2.55	Processes losses updated to reflect actuals from AMP7. This is due to changes in process for water quality improvements following AMP7 large scale upgrades at both major WTW.
Distribution Input	293.77	308.99	15.22	Change due to increased household demand in region.

6.10 Sustainability Reductions

The UK Government is undergoing a process to reform the water abstraction management system in England. As a result, we undertook a series of investigations in AMP7 to understand the impact that any growth might have on some of our licences. In order to ensure that additional demand from growth does not cause a sustained increase in abstraction in areas where this could cause deterioration of the environment, we have agreed to licence caps across many of our sources.

In our draft WRMP we include this as a reduction in DO of 9.29 Ml/d. This has been included in the planning as a reduction of our available baseline DO. Since submission of the draft WRMP, we have now agreed these licence changes with the Environment Agency. The following principles have been applied:

- Surface water abstraction licences – no change
- Peak licence condition – no change
- Annual average licence condition – no change
- 15 year rolling average condition – this is a new condition applied to licences

The 15 year rolling average condition creates a new level of abstraction that we must ensure compliance with over a rolling 15 year period. If we had a dry year, we are still able to utilise our peak licences and our annual average. However, for most licences, we would then need to recover this increased abstraction in a normal year by reducing abstraction in order to ensure we meet the 15 year condition. We have shown the licences impacted and the new conditions in the table below. The far right column shows the reduction in annual licence capacity if we assumed the same annual abstraction rate every year of the 15 years and compared this to the licensed annual average.

Table 20 Sustainability reduction licence changes

Catchment	Site Name	Licence Number	Annual Average m3/year	15 year rolling average m3	Normalised annual reduction m3/year
Dove	Crumpwood	03/28/30/167	2,571,581	30,112,500	564,081
	Hulme	03/28/30/0115	0	0	1,500,000
	Mayfield	03/28/29/0044	190,000	2,847,000	200
				Total	**2,064,281**
Staffordshire Trent Valley	Moors Gorse	03/28/05/0012	4,599,000	61,101,000	525,600
	Slitting Mill	03/28/05/0012			
	Brindley Bank	03/28/05/0012			
	Slade Heath	03/28/03/0072	2,387,000	30,487,500	354,500
	Somerford				
				Total	**880,100**
Tame Anker Mease	Chilcote	03/28/23/0095	2,522,000	33,890,250	262,650
				Total	**262,650**
Worcestershire Middle Severn	Cookley	18/54/06/0140	6,570,000	69,532,500	1,934,500
	Churchill	18/54/06/0140	3,650,000	46,756,500	532,900
	Hinksford	18/54/06/0140	2,044,000	26,499,000	277,400
	Prestwood	18/54/06/0140	7,300,000	96,141,000	890,600
	Kinver	18/54/06/0140	3,285,000	62,469,750	879,650
	Ashwood	18/54/06/0140	6,570,000	93,951,000	306,600
				Total	**3,062,350**
Birmingham Lichfield	Maple Brook	03/28/07/0097	5,117,300	79,059,000	
	Seedy Mill	03/28/07/0097			-153,300
	Sandhills	03/28/17/0006	0	0	0
	Shenstone	03/28/17/0006	0	0	0
	Bourne Vale	03/28/17/0006	1,642,500	24,090,000	36,500
	Pipehill	03/28/17/0006	4,182,900	48,015,750	981,850
	Little Hay	03/28/17/0006	1,825,000	16,425,000	730,000
	Trent Valley	03/28/22/0004	8,646,850	118,095,750	
	Fradley	03/28/22/0081			773,800
	Hopwas Wells	03/28/22/0087	894,250	10,238,250	211,700
				Total	**2580550**
				Total	**8,849,931**
					24.2 Ml/d

We have updated our licences for three licences which have been unused for some time where we have no plans to bring these sources back into use – Hulme Springs, Shenstone and Sandhills.

We have therefore updated our modelling for the revised draft WRMP to understand the DO impact of ensuring we deliver against this 15-year rolling average condition. Overall, it delivers a reduction in DO of 18.67 Ml/d, and we have included this in the planning tables under line 7.2BL in table 3. It should be noted though, that in a year where we would experience a 1 in 500 drought, we would have an additional 18.67 Ml/d available DO to us as we utilise our peak licences. However, as this increase needs to be recovered over subsequent years, we have applied this 15-year condition as our DO sustainability reduction every year in the planning tables to ensure the long-term impact is correctly reflected.

We will deliver these licence cap changes by 2029-30.

These changes have been approved by our Board of Directors, with whom we have shared various updates with as we have been progressing through this work in AMP7, and they approved these licence changes at the April 2023 Board session.

6.11 Environmental Destination

In 2021, the Environment Agency published its National Framework, developed from the 25-year environmental plan. This Framework is intended to better manage the water resources across England. It provides strategic direction to water resources planning, including water users outside the water industry, and created the Regional Planning groups, as described in section 1.7.1.

The National Framework also sets out a greater level of ambition for restoring, protecting and improving the environment. The EA modelling assumes that around 700 million litres per day of water that comes from unsustainable abstractions will need to be replaces by other means between 2025 and 2050 in England. To support this, the Framework details some future scenarios and the scale of reductions required for each of these. It calls for a shared environmental destination – the agreed level of reductions by 2050 – across each regional planning group.

There are several scenarios explored by the EA, but the three key ones explored in the greatest detail are shared in figure 4 below.

Figure 4 Environmental Destination Scenarios

Scenario	Name
• Achieving flows to support 'Good' under Water Framework Directive • Excluding uneconomic waterbodies (RBMPs)	**BAU**
• Achieving flows to support 'Good' under Water Framework Directive • Excluding uneconomic waterbodies (RBMPs) • Ensuring more protections for European Protected Sites (new framework for protected sites)	**BAU+**
• Achieving flows to support 'Good' under Water Framework Directive • Including uneconomic waterbodies (RBMPs) • Ensuring more protections for European Protected Sites (new framework for protected sites) • Extra protections for chalk streams, sensitive headwaters and SSSIs.	**Enhanced**

Extensive work has been undertaken through the Water Resources West Environmental Destination workstream to determine the scale of these potential reductions for each individual company. Information has been provided by the Environment Agency which details the estimated abstraction reductions required. The EA also provided use of its "fix-it" tool which enables these reductions to be understood at a source level, and Mott McDonald were engaged to update this model to reflect changes in catchments and links between waterbodies, in order to provide a more refined estimate.

The table below details the potential abstraction reductions required across our licences for both the BAU+ and enhanced scenarios. The scale of abstraction reductions required to achieve each scenario increases as you move from BAU to enhanced. For South Staffs Water, BAU would require circa 48 Ml/d abstraction reduction, whilst enhanced rises to circa 60 Ml/d. However, these numbers are currently best estimates, rather than confirmed actuals, based on some high level information which requires updating, and localised knowledge and inputs in order to refine. We discuss how we propose to determine the true requirements in section 6.11.1 below.

Table 21 Environmental destination proposed abstraction reductions

			BAU+	Enhanced
Catchment	**Site Name**	**Licence Number**	**Licence reduction**	**Licence reduction**
Dove	Crumpwood	03/28/30/167	3.23	3.23
	Mayfield	03/28/29/0044	0.28	0.28
		Total	**3.51**	**3.51**
Staffordshire Trent Valley	Moors Gorse	03/28/05/0012	3.22	3.4
	Brindley Bank	03/28/05/0012	0.06	0.06
	Slitting Mill	03/28/05/0012	2.04	2.16
	Slade Heath	03/28/03/0072	1.19	1.33
	Somerford	03/28/03/0072	0.69	0.76
		Total	**7.2**	**7.71**
Tame Anker Mease	Chilcote	03/28/23/0095	0.3	1.26
		Total	**0.3**	**1.26**
Worcestershire Middle Severn	Cookley	18/54/06/0140	5.28	5.88
	Churchill	18/54/06/0140	2	2.22
	Hinksford	18/54/06/0140	2.06	2.3
	Prestwood	18/54/06/0140	7.86	8.74
	Kinver	18/54/06/0140	4.06	4.52
	Ashwood	18/54/06/0140	7.12	7.94
	Broom Lodge Farm	18/54/06/0140	0.01	0.01
		Total	**28.39**	**31.61**
Birmingham Lichfield	Maple Brook	03/28/07/0097	3.4	3.6
	Seedy Mill	03/28/07/0097	3.22	3.38
	Bourne Vale	03/28/17/0006	0.18	0.75
	Pipehill	03/28/17/0006	0.4	1.72
	Little Hay	03/28/17/0006	0.08	0.34

	Trent Valley	03/28/22/0004	0.75	3.15
	Fradley	03/28/22/0081	0.46	1.9
	Shenstone	03/28/17/0006	0.05	0.2
	Sandhills	03/28/17/0006	0	0.04
	Hopwas Wells	03/28/22/0087	0.1	0.44
		Total	**8.64**	**15.52**
		Total	**48.04**	**59.61**

The only sources not included in our process are our two surface water sources. This is because Blithfield reservoir is an impounding reservoir and any additional "top-up" abstraction from the River Blithe is already protected through a HOF on the River Blithe and another HOF on the River Trent. For our River Severn works, our abstraction here is already regulated through the River Severn Regulation which provides protection.

In order to prevent double counting, the abstraction reductions South Staffs has already committed to deliver in AMP8 (as detailed in section 6.10) are included in the environmental destination requirements. Therefore, for the BAU+ scenario, which has an overall proposed abstraction reduction of 48.01 Ml/d, 18.67 Ml/d will be delivered by 2030, with the remaining 29.37 Ml/d to be delivered after 2030.

For the revised draft WRMP, we have reviewed and updated our projected trajectory for achieving these abstraction reductions. Due to our positive supply demand position throughout the planning period, we are able to deliver these reductions by 2040 whilst still maintaining a healthy supply demand balance.

As part of reviewing our profile for achieving the abstraction reductions, we have also looked at how we would prioritise these reductions. Our order for this prioritisation is:

- Those reductions that would benefit designated sites e.g., SSSIs.
- Reasons for Not Achieving Good Status (RNAG) – where this is impacted by abstraction.
- Priority catchment – agreed at Water Resources West as the Worcester Middle Severn, based on extensive data gathering of all of the current issues, deficits and opportunities.
- Those reductions that would remove the need for augmentation schemes.

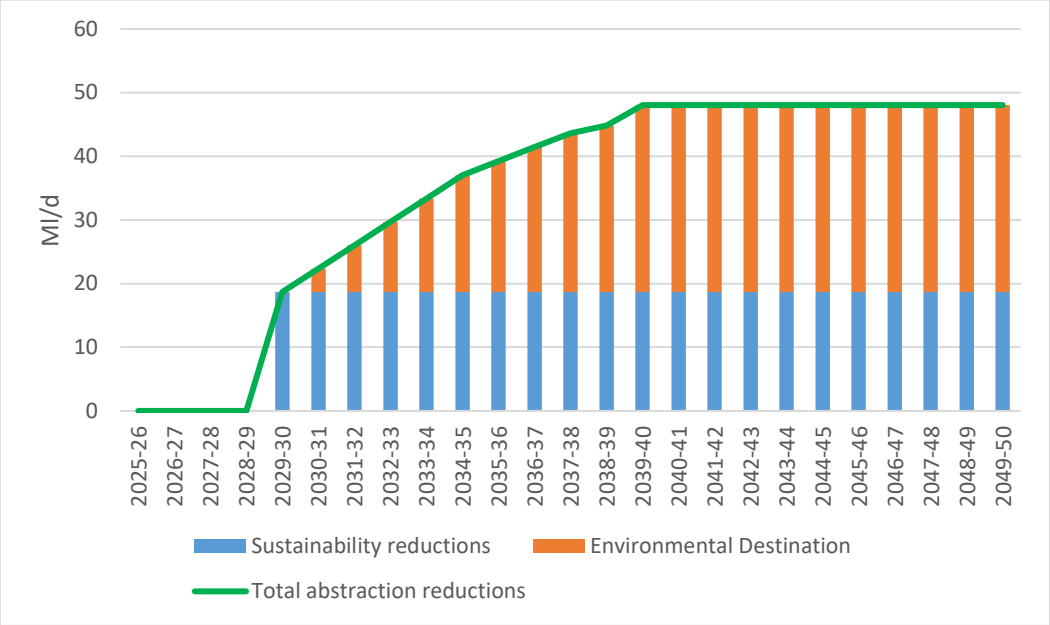
The delivery of our demand management activities provides a sizeable proportion of the headroom in the supply demand balance that enables us to make these reductions without the need for additional supply options. Therefore, we would also to balance the delivery of these reductions to ensure that we do not generate any short-term temporary needs for additional investment. This could happen if, for example, we undertook all reductions in a particular catchment which in turn led to a short-term deficit in that zone until the demand management activities reduced the demand back within our supply capacity. Then we may need to build additional storage and/or interconnector pipes, and due to the temporary nature of this, it would not be the best value approach.

Therefore, we will prioritise using the above criteria as far as possible, whilst also looking to ensure delivery of these reductions in the most expedient way. Examples of reductions we would prioritise include:

- Ashwood, Prestwood and Cookley – these reductions could benefit Hurcott and Podmore Pools SSSI and also are in the priority catchment of the Worcestershire Middle Severn.
- Slitting Mill and Moors Gorse – these reductions could deliver benefits to Cannock Chase SSSI.
- Pipehill and Maple Brook – these reductions could benefit Coalfield Heaths SSSI.

These sites deliver over 60% of the abstraction reductions in the BAU+ scenario and we would complete these before 2035. The graph below represents the total abstraction reductions made during the planning period and the profile of these.

Figure 5 Environmental destination proposed delivery profile



We will update the delivery profile at WRMP29 once we have completed our detailed investigations in AMP8. This will show the revised level of reductions required and an updated and comprehensive prioritisation based on our findings.

South Staffs Water is aligning with the other companies within Water Resources West and has included the proposed reductions for the BAU+ scenario in its plan. Following our no deterioration investigations in AMP7 across our catchments, our analysis showed that the water deficits identified most closely aligned with the BAU+ scenario and therefore we feel it is the most realistic scenario to include in our preferred plan at this time.

We have tested our WRMP against a range of scenarios to understand any impacts on our plan of changing situations such as higher or lower demand, or changes to our climate change predictions. As a result of these scenarios, we may look to identify an alternative pathway that sits alongside our alternative plan should it be required. One scenario we have tested is to understand the impact if our planned water efficiency demand management activity only delivers 50% of the benefit we expect. We see this has no impact on our timescales for delivering these abstraction reductions and we provide more detail on this in section 10.6.

We have developed an alternative pathway in section 10.7 which looks at delivering the enhanced scenario. This is to ensure that if our investigations in AMP8 show that we need to undertake a higher level of abstraction reduction then we have identified any necessary actions we would need to take and any alternative options we would need to utilise in order to deliver this. Our adaptive plan shows that we are able to deliver this in the planning period by 2050 without the need for any alternative options. Therefore, if our AMP8 investigations indicate we need to make larger abstraction reductions that in our WRMP24 plan, we are able to achieve these and have a plan to do so.

Appendix F details the process followed for environmental destination in detail and is the appendix for WRW.

6.11.1 Environmental Destination work in AMP8

The National Framework provides an early assessment of how much we may need to reduce abstraction by in order to meet the future environmental needs and goals. There is uncertainty in the exact volume changes required, as well as the most effective solutions. It is possible that for some of the catchments, the abstraction reductions shown above will not be sufficient, yet in others it may lead to increased flood risk.

Further work is required in AMP8 to accurately determine the scale of the abstraction reductions required for delivery in our area. We are proposing to undertake a series of investigations through our WINEP programme which will confirm the scale of the reductions required, and the locations, and a priority and timescale for delivery. These investigations will also look at the historic environment and any risk and benefits associated with the abstraction reductions required. We will work with Severn Trent Water on these investigations where appropriate as we share catchments. The outputs of these investigations with inform our WRMP29.

There are also non-public water supply abstractions in our catchments and WRW has undertaken an initial evaluation of the scale and sectors across the WRW region. Changes to these licences are also expected to be required in order to achieve the environmental goals. We will need to factor this into our investigation process during AMP8.

In our AMP8 WINEP programme we are also including measures identified through some catchment prioritisation work undertaken at Water Resources West, to ensure we're making environmental improvements prior to the full range of abstraction reductions being implemented. The prioritisation work identified the Worcestershire Middle Severn as a priority catchment in our area. Severn Trent Water also have public water supply abstractions from this catchment and we have worked with them to develop our approach.

Following the prioritisation, through WRW, we have undertaken detailed work with local stakeholders to develop a first iteration of a water resource focused catchment plan which prioritises multiple benefits. We are proposing to work with stakeholders to deliver some of the short- and medium-term measures identified through our WINEP programme.

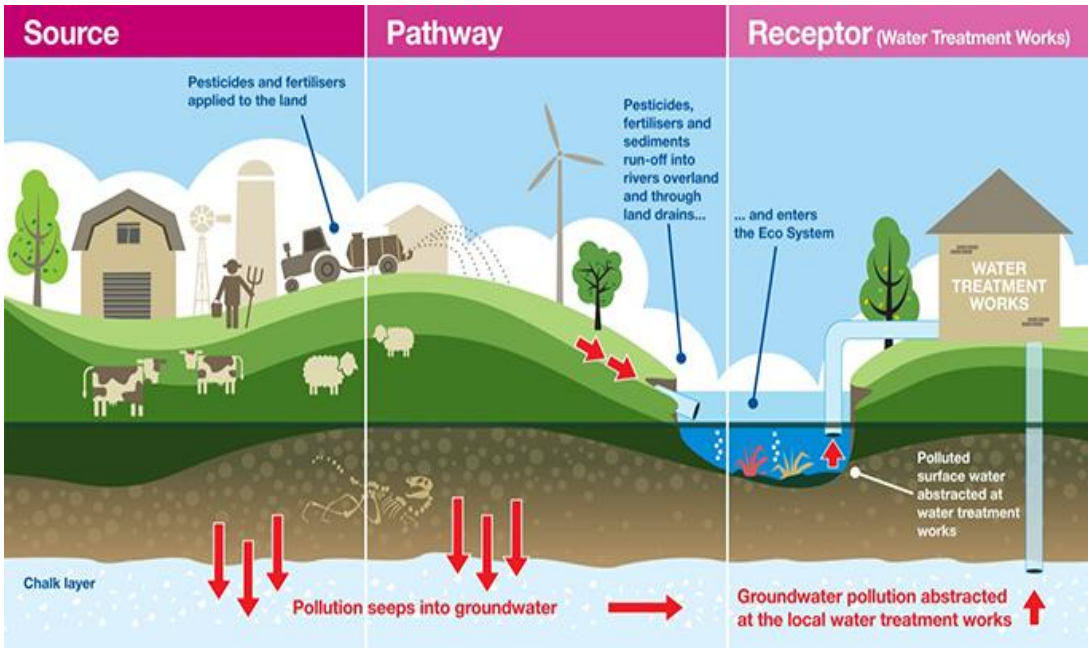
These measures include:

- Local flow support or enhancement measures e.g., augmentations.
- River restoration e.g., removal of barriers and modifications, fish pass schemes.
- Habitat support e.g., eel screens or removal.
- Impoundment mitigation e.g., installation of gravel downstream to restore watercourses.
- Riparian tree planting e.g., along the tributaries to Blithfield reservoir.
- Biodiversity improvements e.g., at Chelmarsh reservoir through woodland planting and habitat support.

We have explored various partnerships for delivering this work through discussions with projects such as Purple Horizon and discussions with local councils and Wildlife Trusts. We intend to continue to build on these partnerships to deliver multiple benefits through collaboration and potential additional sources of funding.

We also propose to expand on our catchment management activities. This work allows us to mitigate water quality risks at source through joint working with local landowners and farmers. Through a grant and advice-based programme, we have delivered many benefits through nature-based solutions, including:

- Undersowing of crops to prevent bare fields and reduce run-off.
- Improved farmyard conditions to prevent escape of waste material and chemicals to watercourses.
- Trial crop planting to reduce fertiliser needs and increase yields.
- Support for rainwater harvesting systems.
- Soil sampling and nutrient management advice



6.12 Drinking water quality

Our WRMP also has to include the requirement to meet drinking water quality standards and compliance levels set by the Drinking Water Inspectorate (DWI). An increase in nitrate concentrations as a result of agricultural land use has required investment in additional treatment and catchment measures in previous AMPs. We produce water that meets the standards of the DWI and complies with the Drinking Water Directive.

6.12.1 Catchment schemes

Nitrate removal plants require refurbishment or replacement in the future as their asset life declines. We have a catchment management programme to provide a twin-track approach to mitigation of nitrate in the future. Our programme is targeted at sources with rising nitrate trends where catchment management could be effective in delaying or removing a future need for treatment. We also employ catchment management as an effective, sustainable long-term solution to mitigate water quality risks. These schemes are to support the quality of water, rather than increase the quantity available. It will also help enable long term raw water quality to ensure we can maintain our baseline deployable output. We discuss these schemes in more detail in section 6.11.

The Drinking Water Inspectorate (DWI), the Environment Agency and Natural England are supportive of our proposals for catchment management projects at groundwater sources, and there is an expectation that these schemes should be in place wherever they have potential to mitigate water quality risks, additional treatment and to provide multiple benefits.

7. Headroom

Summary

Target Headroom is defined as the minimum buffer that a prudent water utility should introduce into the annual supply-demand balance to ensure that the Water Utility's chosen level of service can be achieved. Target Headroom is calculated according to a standard methodology developed and published by UKWIR (An Improved Methodology for Assessing Headroom, UKWIR, 2002).

To ensure consistency across the Water Resources West region, several of the companies within WRW commissioned Atkins to undertake a review to determine an appropriate approach to take for WRMP24 that avoids double counting with other areas of the supply demand balance but that ensures that appropriate levels of risk are allowed for in each year of the planning period. This report is included in appendix G2.

Following this review and our own work through Mott McDonald, we have selected a risk profile in line with the WRMP guidelines and used the output target headroom values for supply demand balance modelling of the Water Resource Zone.

For the revised draft WRMP we have updated our headroom profile due to the updates made to both the supply and demand forecasting. We have also included component D4 which relates to uncertainty of demand management option delivery.

Target headroom starts at 10.04 Ml/d in 2025, increasing steadily along the 80th percentile profile to a maximum of 14.4 Ml/d in 2050 and 20.1 Ml/d by 2100.

7.1 Review of headroom components

All components of target headroom uncertainty have been assessed and reviewed by South Staffs Water, with time series of uncertainty distributions defined from 2022 to 2100 for each component, reflective of dry year annual average (DYAA) conditions.

The distributions were uploaded into a tailor-made spreadsheet headroom model using @Risk Monte Carlo analysis. 10,000 iterations of the model were run to determine a comprehensive percentile distribution of headroom time series for DYAA conditions.

7.1.1 Supply-side components

S1–S3 (vulnerable licences) – uncertainty over future reductions in abstraction licensing has been updated to include the latest DO and abstraction licence values (S1-S3 are only used for sensitivity analysis and are not included in target headroom).

An allowance for S4, bulk transfers, was introduced at WRMP19 after better understanding of the uncertainty in company bulk exports. This has also been included again for WRMP24.

S5, gradual pollution of groundwater sources, is applied to allow for uncertainty associated with deterioration, rehabilitation and replacement of boreholes, uncertainty in future long- term trends in nitrate pollution, and

uncertainty over coalfield mine water pollution at MGPWC. Temporary losses of DO relating to these factors are quantified and accounted for in the outage allowance.

S6 comprises uncertainty in the accuracy of supply-side data. For every groundwater source, the constraining factor for DO is identified:

- abstraction licence
- infrastructure
- pumping water level (potential yield)
- treatment capacity
- water quality

For abstraction licences, the uncertainty relates to meter reading reliability. To avoid double-counting, only meters measuring abstraction separately to distribution input are included here. Infrastructure constraints carry uncertainty in pump outputs, yield constraints are subject to a number of uncertainties in the 'source reliable output' method, but we have no such sources. There are uncertainties in a number of treatment processes, and water quality can limit DO subject to uncertainty in existing conditions (primarily sand ingress). Trend uncertainty is covered under S5. Surface water yield uncertainty is because of imperfect climate and hydrological historical data records and variability in surface water yield models.

Uncertainty of climate change on source yield (S8), is quantified using Aquator modelling of climate change scenarios on the DO of surface water sources. No groundwater sources are constrained by potential yield, such that there is no risk of climate change impacting groundwater source yield. The range of uncertainty use in the headroom assessment is based on the difference between the wet and dry scenarios and the mid-range scenarios, as shown below.

Figure 6 Climate change RCM and Probabilistic ranges

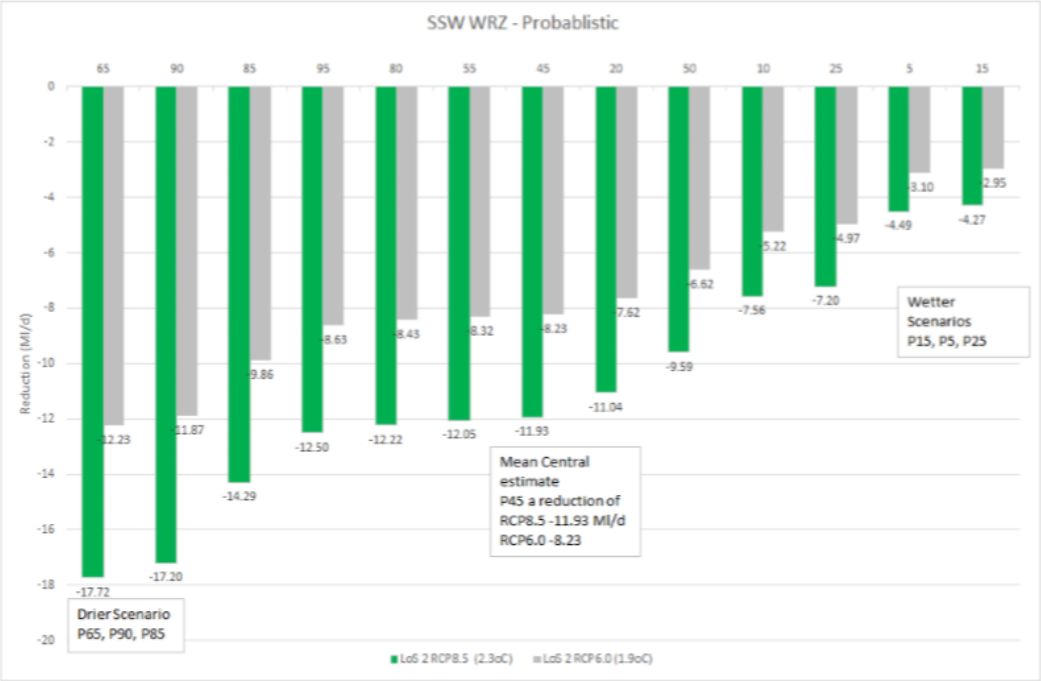


Table 22 Modelled certainty in DO resulting from climate change impacts on yield

Scenarios at 2070	Base DO (Ml/d)	Mid-range estimate	Base year	Year of impact	Range of uncertainty (wet) (Ml/d)	Range of uncertainty (dry) (Ml/d)
Dry year	339	317	2018	2070	7.1	9.9

No new options are planned for completion in the near future, such that in S9, only final preferred options need be considered. These should not feature in baseline target headroom, but uncertainty in their output would need to be determined as necessary for any options selected in the final preferred balance. As we have no supply side options in our preferred plan, we have not included this component in our headroom calculations.

Supply-side components have been updated to include the latest DO values reviewed for the revised draft WRMP.

7.1.2 Demand-side components

D1 accounts for uncertainty in the accuracy of sub-component data. As for S6, this reflects the reliability of meter readings, which could impact the accuracy of the demand forecast.

D2 comprises uncertainty in population growth, change in size of households, measured and unmeasured consumption, non-household consumption, dry-year correction, and peak period adjustment. These are input as time series of % uncertainty to the model.

D3, uncertainty of impact of climate change on demand, has been determined according to the UKWIR methodology, Impact of Climate Change on Water Demand (2013). This has used statistical analyses performed on PCC data from Thames Water and Severn Trent Water to generate regression models relating to climatic data. These models have been used in combination with UKCP09 climate projections to derive algorithms and look-up tables for each UK region.

We have selected the Severn Trent Water model as it best simulates the water using behaviour of our customer base. It has used probability data on increase in demand in the South Humber region as this geographically matches the majority of our supply area. The data tables contain forecast values for the percentage increase in household consumption and these have been directly applied using company average PCC values on an average basis.

The table below shows the range of uncertainty associated with the forecast annual average impact of climate change on demand. All impacts are scaled to a mid-value of zero to avoid double counting the base CC demand impacts (which are included in baseline demand). Probability data have been used to produce a triangular distribution.

Table 23 Climate Change Demand Uncertainty Annual Average: 5 yearly Headroom

D3 Issues	2025	2030	2035	2040	2045	2050
Maximum decrease in forecast	-0.17	-0.37	-0.56	-0.77	-0.97	-1.13
Best estimate	0.00	0.00	0.00	0.00	0.00	0.00
Maximum increase in forecast	0.25	0.47	0.74	0.97	1.25	1.51

Assumed climate change impacts are much lower in WRMP24, because the headroom risk profiles are already representative and reflective of extreme climate scenarios in the 1 in 500-year approach that has been used to calculate the supply-side components of the supply/demand balance. The resulting risk to the supply/demand balance from supply-side uncertainty is therefore lower than was the case for WRMP19.

For the revised draft plan, we have updated our headroom calculation and included component D4, uncertainty of demand management solutions.

The D4 component is computed from our preferred demand management programme by:

- Assigning uncertainty percentages to each option, to get upper and lower values for the yield.
- Compute the upper and lower yield for HH and NHH options per year.
- Calculate the min and max around zero per year (balanced around zero and with the correct sign for headroom).
- Building a triangular distribution around min, max and the mode (zero).

We have included the detailed D4 methodology in appendix K.

7.2 Data analysis and results

The results of the target headroom modelling under dry year average conditions are shown in the diagram below. A full table of results by percentile is presented in appendix G1. The chosen risk profile is also shown.

With other companies at Water Resources West, we commissioned a piece of work with Atkins to look at the changes that will impact the way in which we determine the most appropriate profile and glidepath for WRMP24 compared to WRMP19. The full detail of this work is outlined in appendix G2.

To determine the most appropriate headroom percentile, the report outlined when certain percentiles would be appropriate. Established practice means that base year target headroom is usually within the range 75th percentile (very low risk) to 95% (very high risk). Reviewing the very high and very low suitability, we feel our system requires a mid-range percentile from 80-90%. Within this, we believe our system is more suited to 80%ile rather than 90% because:

- Our system has operational flexibility to move water around our grid.
- Predictable storage system.
- We utilise predictable reliable (Sherwood sandstone) aquifers with a high degree of storage and long recession times, where behaviour under severe drought conditions is likely to be no different to that behaviour experienced during our operational record.

When looking at the glidepath, the Atkins work states that a near constant profile (i.e., maintain percentiles close to or even at base year) is appropriate where there is an increase in the S5 S8, D2, D3 and D4 components. The first chart below shows that all these components increase except for leakage. In addition, any absolute reduction in the volume of headroom should relate to an identified change in the risk/uncertainty for the WRZ otherwise it is logically difficult to justify a reduction from the base year target headroom. Based on these elements, we are proposing to maintain the 80th percentile profile across the planning period.

So, in summary, target headroom starts at 10.04 Ml/d in 2025, increasing steadily along the 80th percentile profile to a maximum of 14.4 Ml/d in 2050 and 20.1 Ml/d by 2100.

At WRMP19 we adopted a profile of increasing risk, starting from 95%ile at the start of the planning period, and finishing at 80%ile at the end of the planning period. Whilst this change in profile reflects increasing uncertainty, in reality the overall headroom value remained mostly static across the planning horizon start at 7.56 Ml/d in 2020/21 and finishing at 7.77 Ml/d in 2044/45. Our profile means we are accepting a higher level of risk in the future than at present, which is expected as, over time, aspects of uncertainty include in headroom will be resolved.

The graphs below show the contribution of the various components to the overall headroom calculation, and the chosen risk profile.

A report detailing the headroom methodology and results is included in appendix G1.

Figure 7 Cumulative headroom uncertainty

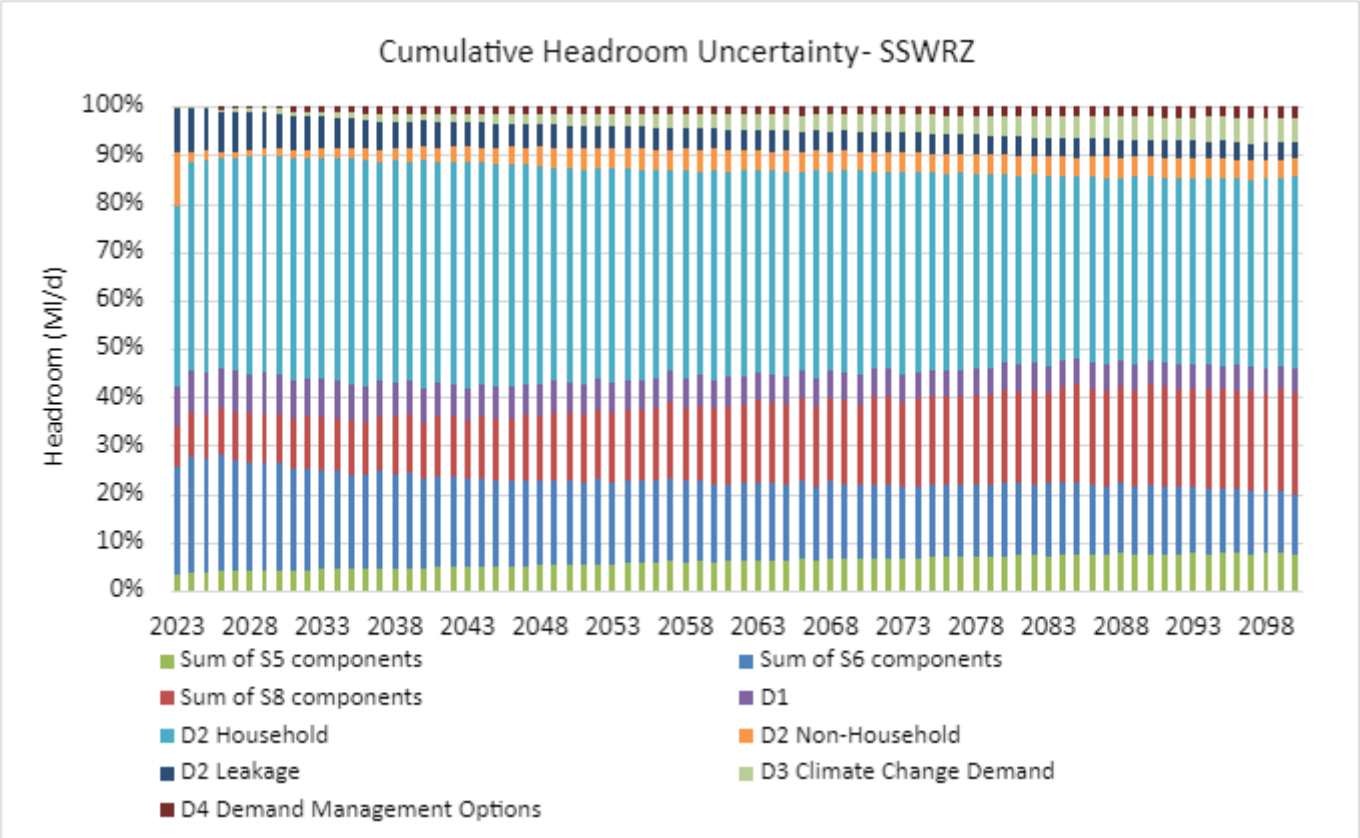
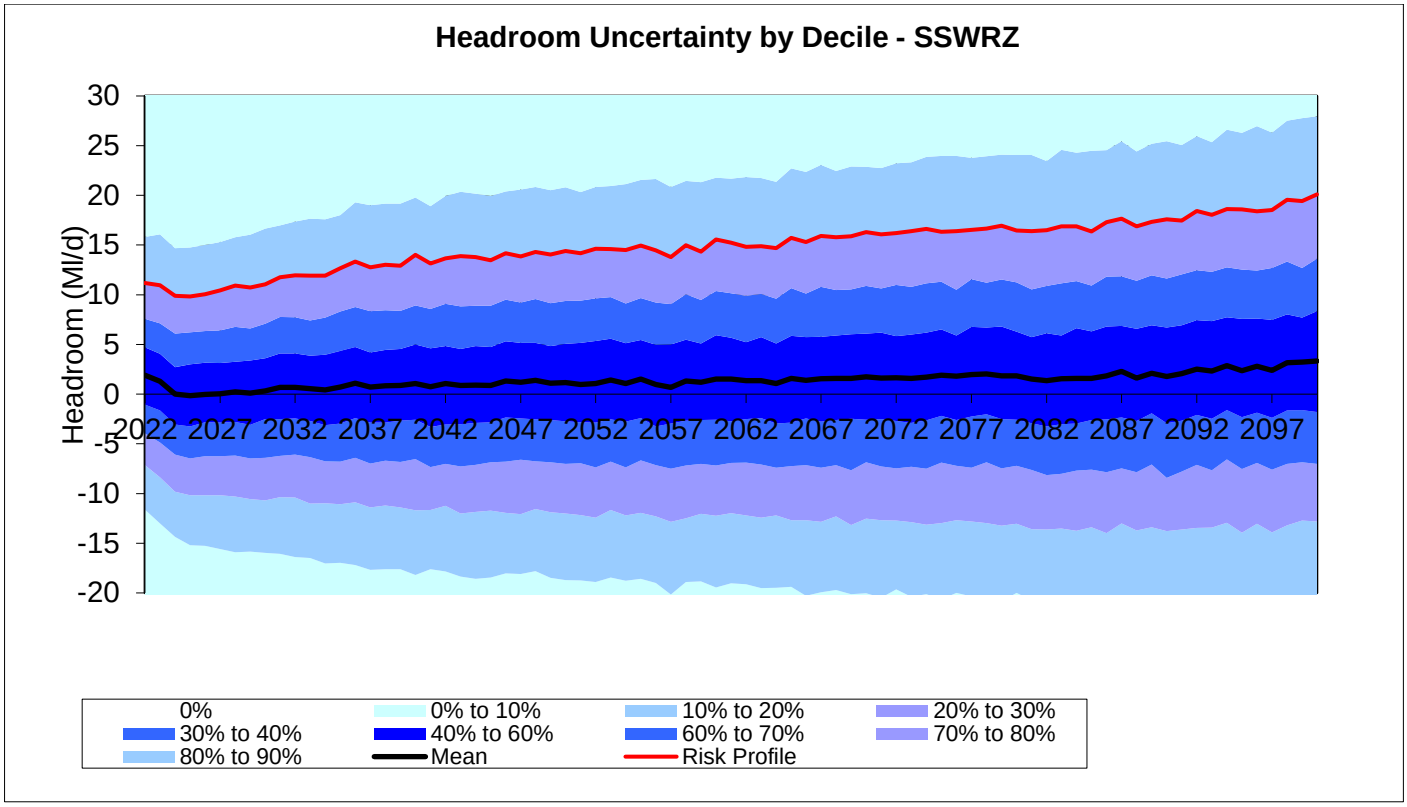


Figure 8 Target Headroom Results and chosen risk profile



8. Baseline supply/demand balance

Summary

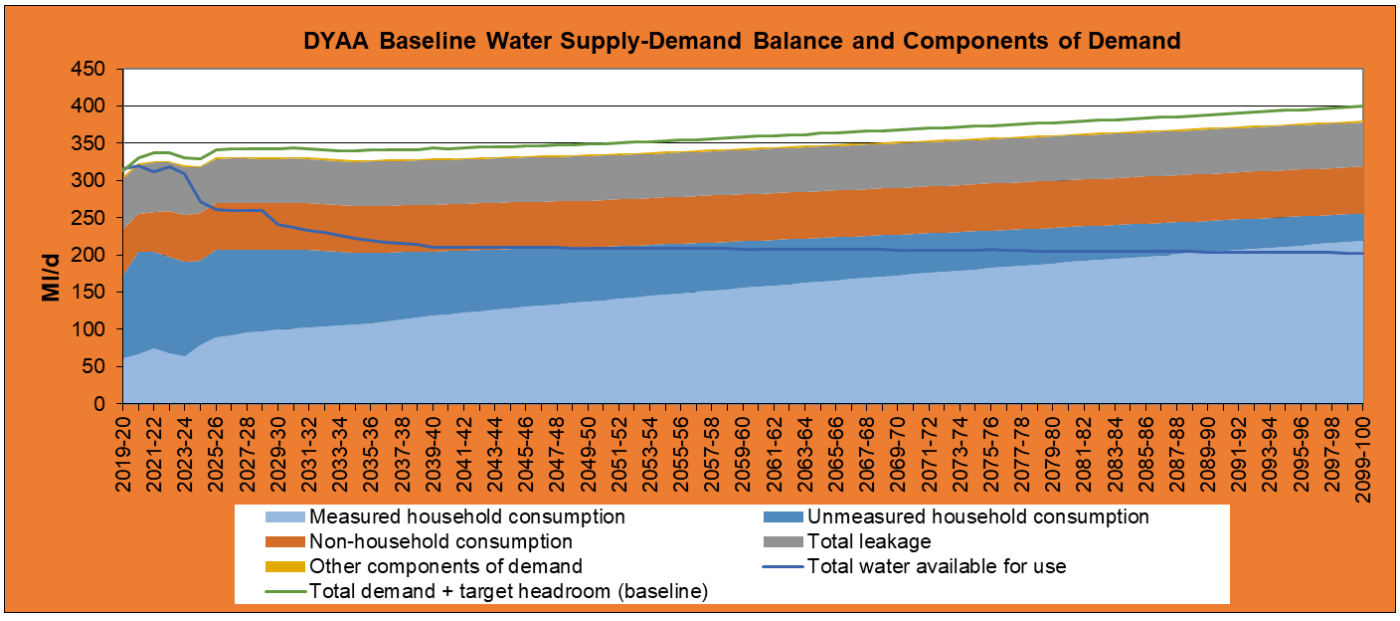
The baseline supply demand balance position is developed for the DYAA scenario. It looks at the total available supply compared to the demand. For supply, deductions are made for climate change, sustainability reductions, water quality changes, and future environmental needs. For demand, the forecast assumes the status quo for demand management, i.e., no additional leakage reduction or reduction in PCC, but does take into account planned growth in the area, as defined in the local plans.

The early deficit shown in the DYAA situation is mostly driven by the sustainability reductions agreed for AMP8. This deficit continues to increase as the planned population increases, but the most sizeable impact is the proposed additional abstraction reductions required to protect the environment against climate change and to meet the WFD obligations. This "environmental destination", as described in detail in section 6.11, could lead to a reduction of nearly 50 Ml/d in abstraction, and as such, we need to look at the appropriate options required to meet the demand needs whilst protecting the environment. This is discussed in detail is chapter 9.

8.1 Baseline dry year annual average supply/demand balance

The following chart shows the baseline supply/demand balance for the DYAA planning scenario. This is the predicted outcome if existing policies are continued without any further changes. It includes impacts from growth in population and properties, impacts on supply from climate change, reduced DO from improved modelling and groundwater source availability and reductions in DO to protect the environment.

Figure 9 Baseline DYAA supply/demand balance and components of demand



9. Deciding on future options

Summary

Without intervention, South Staffs Water would see a deficit in supply in the planning period. As such, we have worked to identify all potential solutions to ensure we are able to meet the supply and demand needs of our region over the planning period to 2050 and beyond.

Our primary approach is to look at how we can reduce demand first, before we look at the need to increase supply. Reducing the level of demand for water will reduce the abstraction of water from the environment, leading to positive improvements, and will reduce costs overall, which in turn will lead to reductions in customer bills. Through our extensive customer research programme we have undertaken throughout the development of this WRMP, our customers have repeatedly told us this is also their preferred approach.

However, in order to ensure a robust and best value plan is developed, we must also look at new supply options too. At WRMP24 we have updated any remaining feasible options we had at WRMP19, as well as reviewing those deemed unfeasible at that time so to see if any could now be feasible. We have also worked with key stakeholders and third parties to identify any new options and worked to develop these.

We have used environmental assessments to identify the feasibility of options, as well as gaining customer feedback on preferences. Through our pre-consultation on the plan in January 2022, we received feedback from the Environment Agency which led to several options being deemed no longer feasible due to changes in water availability in the waterbody impacted.

Through the use of the multi-criteria analysis tool developed by Water Resources West (WRW), we have a consistent approach across the WRW water companies of assessing the value each option provides, in order to determine the best value plan for each company and the region as a whole. The ValueStream, allows the comparison of options on more than cost alone, and provides a much stronger environmental input into the decision making process than has been present at previous WRMPs.

As part of the options development process, it is also key to understand any dependencies and enablers to any of the options. The water industry has made several commitments in recent years which must be factored into WRMPs:

- Achieving 50% leakage reduction (from 2017/18 level) by 2050
- Reducing PCC to 110 l/h/d by 2050
- Net zero operational carbon by 2030
- Non-household consumption reduction of 9% by 2038

For demand management in particular, there are two key enablers required for South Staffs to meet the first two ambitious demand management reductions. These are:

- Universal smart metering
- Water labelling – a government led initiative to label white goods (in the same way they are currently labelled for energy) in order to drive reductions in water usage in households.

For the revised draft WRMP, we have included additional detail in this chapter relating to:

- The full range of feasible options we have explored, including options included in our drought plan.
- The different scenarios and profiles we have tested for leakage, water efficiency and smart metering.
- The process we have gone through to optimise our demand management programme.
- Constrains on our decision making.
- How the Defra accelerated spend profile has impacted our programme.
- How our plan aligns with Ofwat's Public Value Principles.

9.1 Overview

We have followed the Water Resource Planning Guidelines to develop our options.

A full appraisal of capex, life cycle costs and opex (totex) for all options (existing resources and potential new resources as well as demand management options) ensures we can produce a least cost solution. The inclusion of other un-monetised attributes also allows us to optimise on other objectives and understand the value of differences. This multi-criteria approach and the best value planning approach is described in detail later in this section.

We have also discussed the potential range of options, and the pros and cons of each, with our customers through our engagement work detailed in chapter 4. This has helped to determine priorities and preferences, which has been incorporated into our approach.

Therefore, a full range of demand management options and supply options including all existing sources have been developed for modelling. This allows the opportunity to re-evaluate the mix of resources for the future and ensure our assets are able to meet future demand scenarios.

9.2 Problem characterisation

The problem characterisation assessment is a tool for assessing our vulnerability to various strategic issues, risks and uncertainties. This assessment enables the development of appropriate, proportional responses with regards to decision-making. We followed the approach set out in the latest guidance which provides a robust and consistent approach.

There are two key areas to the problem characterisation assessment.

How big is the problem? This assesses the scale of the strategic needs and the requirement for either new resources or demand management activities.
How difficult is it to solve? This assesses the complexity of the challenge.

A comprehensive problem characterisation assessment was undertaken at WRMP19, and this was updated for WRMP24. This review is included in appendix H.

Figure 10 Problem characterisation assessment

		Strategic Needs Score ("How big is the problem")			
		0-1 (None)	2-3 (Small)	4-5 (Medium)	6 (Large)
Complexity Factors Score ("How difficult is it to solve")	Low (<7)				
	Medium (7-11)				
	High (11+)		WRP24		

Our WRZ is in the amber area overall, with small strategic needs (scale of the problem) and high complexity scores (how difficult problem is). This is overall amber characterisation is the same as at WRMP19, although both areas were amber.

The key drivers behind the changes to the complexity and strategic needs scores are:

- The upgrade work in AMP7 to both of our major water treatment works has reduced the strategic needs score as the water quality concerns are resolved.
- The uncertainty around the environmental destination and the abstraction reductions required.
- The classification of South Staffs Water region as an area of serious water stress by the Environment Agency.
- The ongoing uncertainty of the impact of Covid-19 on demand profiles, both HH and NHH.

The significance of the WRMP problem characterisation is that it drives a need for more sophisticated decision making, based on a more complex extended modelling approach.

9.3 Best Value Planning Approach

In the past, we have followed the economics of balancing supply and demand (EBSD) approach to develop our preferred, which is a well-established framework and traditionally focused on monetisation and developing least cost portfolios to meeting supply and demand challenges. However, for the more challenging complex issues identified through the problem characterisation a more sophisticated approach to analysis is required.

AT WRMP19 we worked with Arup and Hartley McMaster, our incumbent provider for asset management optimisation, and worked through the UKWIR guidance to develop our existing optimisation software, which follows EBSD for portfolio selection, and extended it to allow investment option performance against other objectives to be assessed and incorporated into the portfolio selection process using multi-criteria analysis (MCA) techniques.

For WRMP24, we needed to ensure we take a Best Value Planning (BVP) approach to developing our preferred plan, as laid out in the Water Resource Planning Guidelines. In addition, we need to ensure that our method for assessing best value is aligned with other companies in our regional planning area, Water Resources West, to ensure the regional plan is valid and balanced.

As such WRW, and the water companies within it, commissioned HR Wallingford and PJM Economics to develop a multi-criteria analysis tool that would allow companies to assess the value of options, as well as then produce the best value plan to resolve the challenges in each company and the region overall.

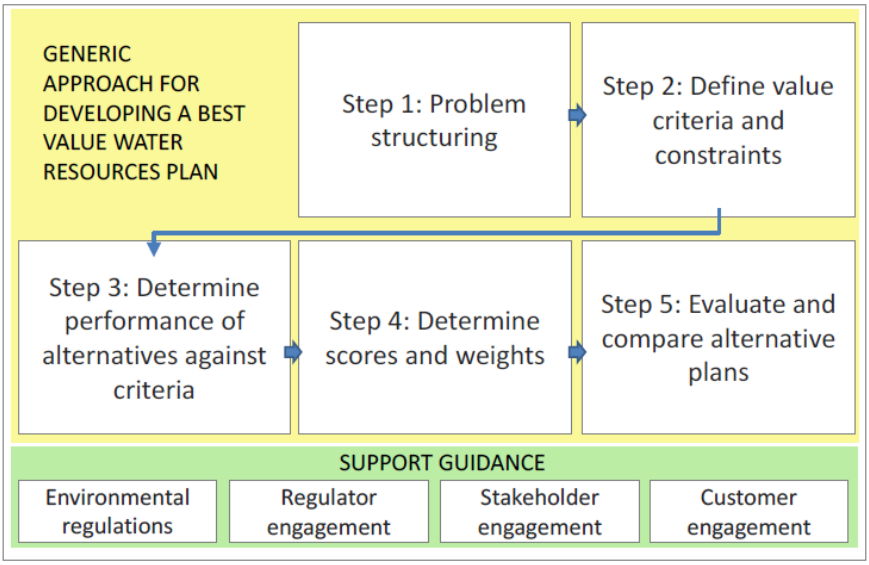
The UKWIR (2020) framework for best value water resources management plans sets out a multi-criteria decision analysis (MCDA) approach for developing a best value plan, and the tool developed follows this approach.

A report detailing the modelling approach is included in appendix I and a summary of key aspects is included in the following sections.

9.3.1 Tool Specification

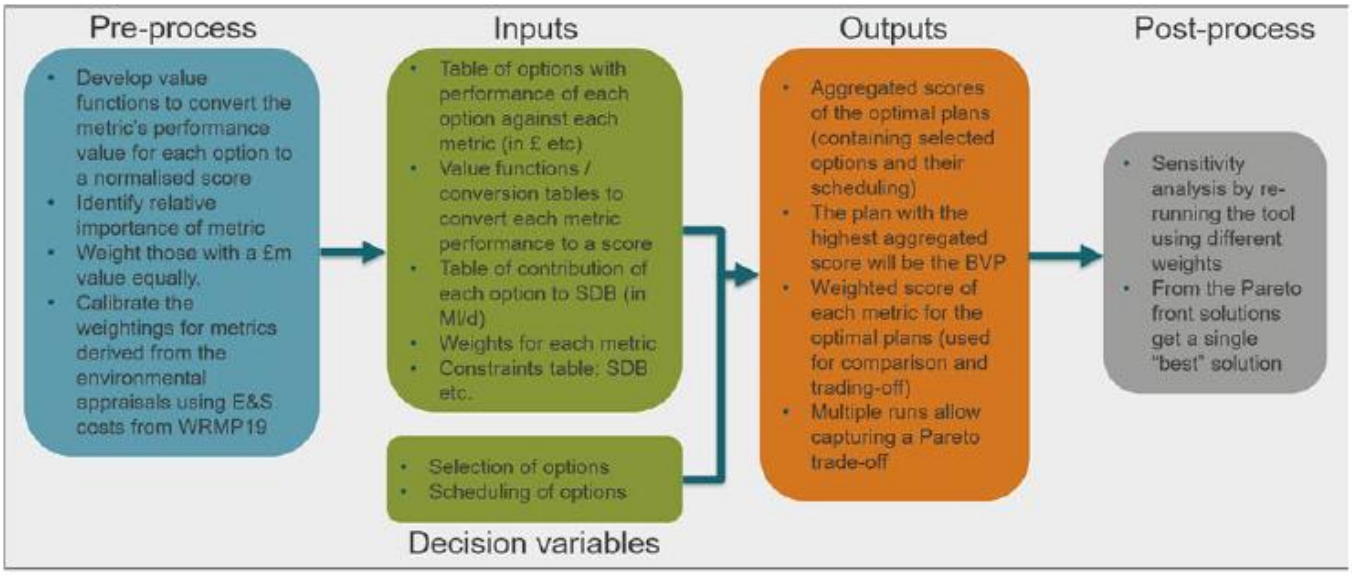
The diagram below shows the overview of the UKWIR (2020) framework for developing a best value water resources plan.

Figure 11 Overview of the UKWIR (2020) framework for developing a best value water resources plan



The multi-criteria decision tool was designed to facilitate specific tasks within steps 3, 4 and 5. The diagram below shows the components of the decision tool (i.e., the inputs and outputs) and the pre and post process steps required for using the tool. The overall approach is a weighed sum optimisation method for plan generation and selection.

Figure 12 Components for the decision tool (inputs and outputs) and pre and post process steps plan.



9.3.2 Value Criteria (metrics)

UKWIR (2020) best value plan framework details the need to define value criteria and constraints. WRW refers to value criteria as metrics, and therefore we will continue to refer to metrics throughout this narrative.

It was a requirement of the multi-criteria decision tool that it enables the consideration of several different types of metrics since this is a fundamental concept in best value planning. WRW carried out a workshop for deciding on the metrics that would be used for the development of the Regional Plan. South Staffs have also adopted the same metrics for creating its WRMP. These metrics are listed in the table below:

Table 24 Metrics decided at WRW

Ref.	Metric name	Description
1	Cost	Assessed by water companies. Total net present value (NPV) based on capital expenditure (CAPEX, initial and replacement) and operational expenditure (OPEX, fixed and variable).
2	PWS drought resilience	Assessed by water companies. Supply-demand balance change at 1 in 500 level.
3	Carbon costs	Assessed by water companies. Total NPV of monetised carbon costs.
4	Flood risk	Assessment from Strategic Environmental Assessment (SEA).
5	Human and social wellbeing	Assessment from SEA, covering health, human environment, social and economic wellbeing, cultural heritage, air quality assessments.
6	Sustainable natural resources	Assessment from SEA, Natural Capital Assessment (NCA) and Biodiversity Net Gain (BNG).
7	PWS customer supply resilience	Assessed by water companies. Customer valuations of willingness to pay (WTP) NPV, including supply interruptions, water quality, and water resources from SEA.
8	Multi-abstractor benefits	Assessment from SEA. Water quality and quantity, water resources.

9.3.3 Scores and weights

Given that the MCDA considers different types of metrics, each requiring different types of units, each of these measurements needs to be covert into a common scale for the MCDA process. This scale is typically represented between 0 and 100, representing the worst possible and acceptable outcome/performance and best possible and achievable outcome/performance respectively. Scores are used to determine how the different performances are valued.

Subsequently, weights are required to denote the relative value of performance changes on different metrics, or the trade-offs between metrics. HR Wallingford facilitated workshops with WRW to develop the weights required.

9.3.4 ValueStream Tool

The tool that has been developed is known as “ValueStream”. ValueStream comprises two Excel workbooks:

- ValueStream1: This is the decision tool pre-processing workbook for metric scores and weights.

- ValueStream 2: This is the main decision tool workbook that solves and objective function to find a combination of options that solves the supply demand balance (SDB) taking into account the performance of options against a set of decision metrics (that are scored and weighted in ValueStream1).

9.3.4.1 ValueStream1

Valuestream1 facilitates the input of data from the SEA and NCA assessments, then elicits scores and weights. These outputs are then copied and pasted into ValueStream2.

For South Staffs Water, Ricardo undertook SEA and NCA assessments on feasible supply options. The outputs from these assessments were entered into the ValueStream1 workbook, which provided the scores and weights which were transferred directly into ValueStream2. The ValueStream1 workbooks for supply and demand options are found in appendix J1 and J2.

9.3.4.2 ValueStream2

ValueStream2 comprises several worksheets that enable the selection and scheduling of options to form a plan in order to meet a given SDB profile through the planning horizon.

Inputs are required for the following:

- Supply demand balance profile across the planning period
- Options, including constraints and their performance against each metric from ValueStream1
- SDB contribution of each options
- Metric weights

By changing the SDB profile and the constraints around the options, different planning scenarios can be tested to understand the best plan for different circumstances. It also enables sensitivity testing of a preferred plan to understand the need for any adaptive planning.

9.4 Options development

Demand management options have been developed with the assistance of consultants Artesia. As there are a variety of commitments relating to demand management that the industry has already confirmed will be built into their plans, our demand management option process has been updated since WRMP19.

The public interest commitments (PICs) and now Government targets relating to demand management include:

- 9% reduction in non-household consumption by 2038
- Reduce PCC to 110 l/h/d by 2050
- 50% leakage reduction by 2050
- 20% reduction of distribution input per capital by 2038

Therefore, Artesia were asked to determine the optimal way of achieving these targets, both from a cost and deliverability point of view. This then produced a profile of activities over the planning period. This is shown in appendix K.

A range of scenarios for each option were looked at as part of the process. e.g., for PCC reduction we also looked at how to achieve 120 l/h/d and 90 l/h/d. We discuss the different scenarios tested in section 9.5.1 below. Within this are also some key dependencies. These are:

- Water labelling – the government led initiative to label white goods with water efficiency labels to drive customer reductions in usage.
- Universal smart metering – smart meters across the whole area unlocks additional activities to help drive demand reduction, such as smarter leakage detection and innovative tariff options.

Supply options have been developed with the assistance of consultants Atkins. We have reviewed the existing WRMP19 options and any new options identified. These options have been costed, including with respect to carbon, and costs are provided at December 2020 baseline.

In addition, Ricardo have undertaken SEA and NCA environmental assessments for all our supply options, and SEA assessments on our demand management options (as included in appendix P). Hydrologic have also modelled the DO benefit of each of our supply options, and this detail is in appendix N.

Supply options include:

- **Surface water enhancement** – increasing the size of our existing storage reservoirs
- **New surface water sources**
- **Water transfers** – working with neighbouring water companies, the Canal and River Trust, and other third parties
- **Licence trades**
- **Potable imports**
- **New reservoir**

At pre-consultation, all our groundwater options were removed from the feasible option list following feedback from the Environment Agency regarding groundwater availability in these catchments.

Options development has followed a dual streamed process from unconstrained through to feasible where SEA has been carried out alongside options development.

- Identification of unconstrained options through brainstorming events including both internal expertise together with leading industry consultants
- Environment Agency involved in both demand management options and resources options identification
- Initial screening using criteria such as feasibility, etc
- Further review of screening following more detailed scheme description
- Environment Agency views sought on resource options; and
- SEA scoping occurring concurrently.

Outline scheme design and costs were developed for each of the options included on the feasible list for inclusion in the ValueStream tools. The criteria used to evaluate each option through ValueStream are described in section 9.3 above.

We will continue to pursue options involving third parties at any stage within the five- yearly WRMP cycle. Should any third party know of an opportunity of this sort we encourage them to contact us.

The following sections describe the screening of unconstrained options to the feasible list. Our full list of options, including unconstrained, are included in table 4 of the WRMP tables.

9.5 Feasible options

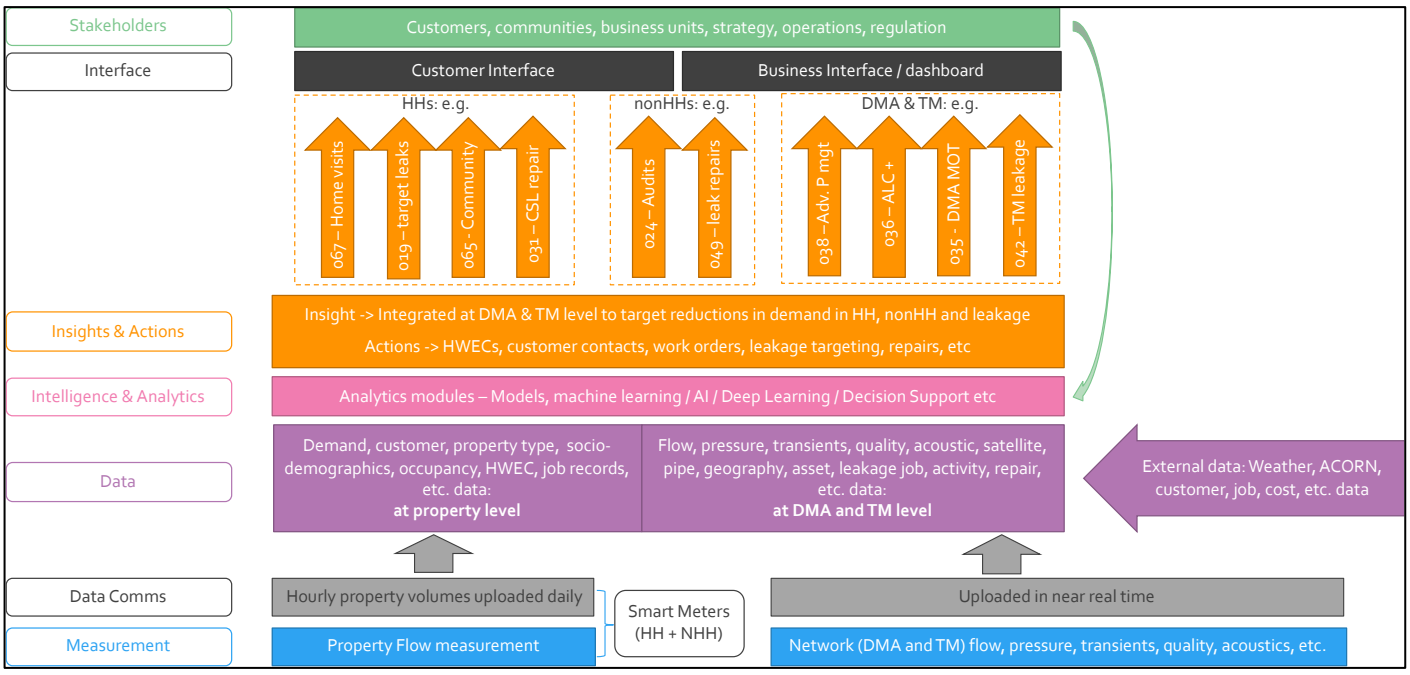
9.5.1 Demand Management Options

Appendix M provides more detail on each of the options within each section.

9.5.1.1 Smart Networks and Metering

As part of our demand management plan development, we have considered Smart Network scenarios, which represents an integrated approach to demand management built on the foundation of installing smart meters on all households. Our view of smart networks is represented below and details the key elements for smart networks, the dependencies and interfaces and how that drives activities that support and enable demand management.

Figure 13 Smart Networks in South Staffs Water



During AMP7 we have been progressing our smart network programme and this is set to continue through AMP8. The diagram shows clearly the important stream of data that metering provides, and so we now need to look at how we support this smart network further with more smart data from meters. As a result, we have assessed multiple different scenarios for metering:

- Universal metering by 2030
- Universal metering by 2035
- Universal metering by 2040
- Current optant level of metering across planning period
- Optants in AMP8 and then commence universal metering in 2030, complete by 2040

In our draft WRMP we stated that installing meters on its own does not deliver demand reductions, but rather facilitates demand reductions across households, non-households and leakage through behaviour change and targeting savings in specific locations. Following feedback received during consultation, we have reviewed this and updated our view of the benefits achieved directly through installing smart meters.

During AMP7, several companies are undertaking extensive smart metering programmes, including Anglian Water, SES and Thames Water. Through discussion with these companies and a detailed review of the results they have achieved through AMP7, we are proposing to adopt a 13% saving due to behavioural change upon installation of a meter to an unmetered property with the customer switching to being charged based upon measured volume. We have also assumed a behavioural change demand reduction of 2% when replacing a dumb meter with a smart meter. These estimates are based on the results seen by both Anglian Water and Thames Water and is in line with the experience in the energy sector.

As part of the scenario testing, we have assessed the deliverability of the metering schemes, again taking information and lessons learned from Anglian Water and SES in particular. We have also looked at the impact the metering programme has on delivering the leakage targets as well as the PCC targets, and what timescales we need to have metering in place by in order to achieve these. Importantly, we have also assessed the full range of benefits of each of these scenarios, particularly when compared to the cost e.g., installing a smart meter where there is currently no meter will provide a 13% saving in demand for that household. However, there is a very similar cost for upgrading a dumb meter to a smart meter, but it only provides 2% demand saving.

Another key element that factors into our decision making, as detailed in section 9.8, relates to our business planning process, where we develop a joint plan for both South Staffs Water and Cambridge Water. We look to balance the needs identified in the WRMPs of both companies alongside affordability and financeability, hence why we looked at a scenario where we delay the start of universal metering until 2030. This option would couple with the acceleration of Cambridge Water's universal metering programme so that is delivered in AMP8, as Cambridge Water faces a larger short term supply challenge.

We have also discussed universal smart metering with our customers, as described in chapter 4.

9.5.1.2 Water labelling

Water labelling is also used as an enabler in the optimisation of demand management activities. When looking at how to achieve the leakage and PCC targets, we have compared the programmes required based on the following water labelling scenarios:

- Water labelling introduced with minimum standards.
- Water labelling introduced with no minimum standards.
- Water labelling is not introduced.

The water savings from water labelling are described in Table 6 of the final report for the WaterUK PCC pathways project. After consultation with Water Resources South East, all companies have agreed to include the 'lower savings estimate' for water labelling without minimum standards as the agreed option.

For the optimiser, these savings are netted off the PCC pathway for household consumption reduction before the optimiser is run.

We assume that the Government starts to implement water labelling in 2025.

9.5.1.3 Leakage Reduction

We have assessed a range of different leakage activities that could be undertaken in order to achieve the 50% leakage reduction by 2050. We have also assessed the following two scenarios as represented in the table below.

Table 25 Leakage scenarios assessed

Scenario Ref	Name	Description
LEA_01	Linear to NIC	Linear leakage reduction from 2025 to 50% of the 2018 leakage value by 2050 as per NIC recommendations.
LEA_02	PIC plus NIC	Linear leakage reduction to the PIC target in 2030, then a linear reduction to the NIC target in 2050 i.e. tripling the rate of leakage reduction to 2030.
LEA_15	15% in AMP8 + remaining Environment Act targets	15% leakage reduction in AMP8, then all interim targets and achievement of 50% by 2050.
Scenario 1	Environment Act Targets post 2030	Achievement of 50% leakage target by 2050, plus interim targets post 2030 as defined in Government environmental plan.
Scenario 2	Environment Act Targets	Achievement of 50% leakage target by 2050, plus all interim targets as defined in Government environmental plan.

Leakage activities assessed in each of these scenarios are included in the table below.

Table 26 Leakage activities assessed

Leakage Activity	Description	Benefits (relating to UKWIR Zero leakage by 2050 outcomes)
Proactive trunk mains leakage reduction	Introduce continuous monitoring network across trunk main network, including service reservoirs. This allows more traditional awareness, localisation and repair approaches to then be applied	We can confidently quantify leakage and demonstrate when it is zero. All new leaks are found quickly after they break out.
Advanced pressure management	Installation of pressure loggers to monitor pressure transients, then utilise this information to optimise pressure profiles and deliver lower leak flows, reduced bursts and lower leakage rate of rise.	New leaks on existing networks are minimised.

Customer supply pipe repair or replacement (smart networks)	All customer supply pipes in a DMA are graded based on smart meter data. Clustering techniques are then used to create a risk grade for each customer supply pipe and identify specific DMAs that can be targeted for cost effective CSP repair or replacement.	All new leaks are found quickly after they break out. Repairs are quick economic and with minimum disruption. Background leakage is eliminated.
Customer supply pipe repair or replacement (non-smart networks)	As above, however this option is less efficient as the targeting is less successful without smart network data.	Repairs are quick economic and with minimum disruption. Background leakage is eliminated.
DMA Active Leakage Control Plus (smart networks)	A step change in DMA data analytics to make efficiency gains in targeting DMAs and allocating resources. Gather all DMA information together and classify the DMAs into cohorts. Build baseline leakage predictions for each based on specific DMA characteristics and then allocate the company target across these through economic optimisation. Develop a weekly prediction of the leakage profile and target ALC activity and priorities based on this, using traditional and new technology and data as it is developed.	New leaks on existing networks are minimised. We can confidently quantify leakage and demonstrate when it is zero. Background leakage is eliminated. All new leaks are found quickly after they break out.
DMA Active Leakage Control (non-smart networks)	As above, however this option does not have smart network data available and therefore is less efficient as the targeting of resource is less successful.	New leaks on existing networks are minimised. We can confidently quantify leakage and demonstrate when it is zero. Background leakage is eliminated.
DMA MOT (smart networks)	Using leakage-driven asset renewal, a DMA is targeted for mains replacement or rehabilitation. Whilst the LDAR is carried out, a “DMA MOT” is also carried out. Therefore, in addition to doing the repair or replacement, the DMA is subjected to a full STEP test or alternative sub-DMA leak localisation method. The result will be that the leakage within each pipe-length can be quantified and recorded. Appropriate active leakage control methods can then be applied to this DMA and a new minimum level of leakage achieved, and the DMA should be able to be held at this new level.	All new pipework is leak free. New leaks on existing networks are minimised. Repairs are quick, economic and with minimum disruption. Background leakage is eliminated.

DMA MOT (no-smart network)	As above, however this option is less efficient as the targeting is less successful without smart network data.	All new pipework is leak free. New leaks on existing networks are minimised. Background leakage is eliminated.
Distribution mains/comm pipe replacement	Replacement of company owned pipework following active leakage detection and delivering the outputs of a leakage-driven asset renewal programme.	New leaks on existing networks are minimised. Background leakage is eliminated. All new pipework is leak free.
Non-household customer supply pipe repair or replacement (no enhanced meter technology)	Repairing or replacing leaking pipes on non-household properties, where identified through DMA MOTs or active leakage control. Assumes no meter data from the NHH property and therefore could be more efficient with this, assuming this was installed. Also links to NHH consumption reduction programme in 9.5.1.5.	Repairs are quick economic and with minimum disruption. Background leakage is eliminated.

9.5.1.4 Non-household consumption reduction

The following options have been reviewed in order to deliver the targeted 9% reduction in household consumption by 2037:

- **Non-household water efficiency programme (company led, self-install)** - An analysis of business and water use would be undertaken, then depending on business type and volume of water used per annum a range of options could be promoted. This programme initially proposes provision of cistern displacement device or dual flush retrofit devices and taps inserts and provision of saving your business water use information and is installed by the non-household company themselves.
- **Non-household water efficiency programme (company led, site visit with install)** – as above, but South Staffs Water to undertake the installation work on site.
- **Retailer Incentive Mechanism** - This option encourages retailers to promote water efficiency for non-household customers. An analysis of non-household use would be undertaken. Retailers are incentivised to encourage with payments relating to volume saved.
- **NHH Enhanced Meter Technology** - upgrading or replacing selected non-household customers' meters, particularly the largest customers and/or where businesses are in close proximity. Artesia's recent study as part of MOSL's Strategic Metering Review found a strong benefit case for water companies rolling out enhanced metering technology to non-household customers. We would look to upgrade or roll out 'smart' meters for domestic customers and include non-household customers at the same time. The data provided with provide retailers, South Staffs Water and customers with a means to identify leaks and highlight opportunities to improve water efficiency or reduce consumption at non-household customers.
- **Metering of leftover commercials** - install meters at unmetered non-household properties. It is estimated at the end of AMP7 there will be approximately 8,000 non households that pay via an unmetered bill. This option assumes that 80% of these 8,000 can be metered, with the rest being infeasible due to shared

supplies and difficulties in metering some properties. Due to the nature of the left over commercial a higher installation cost is assumed. This option includes an estimate of savings from supply pipe repairs that occur as a result of an increased metering rate.

- **Water audits retail** – South Staffs Water intervention to carry out audits on non-household properties, based on water use and business type where we can then recommend appropriate options for reducing consumption.
- **Rainwater harvesting for new NHH properties** - Using estimates of costs and water savings for rainwater harvesting in new builds from the Waterwise report[2] for small and medium collection areas and low demand the saving is 592 l/prop/day (equivalent to 216 m^3 per property per year). Assume South Staffs Water provide £5k grant to encourage this for 10 new non-households per WRZ per year (CAPEX). All other costs will be met by the developer/owner of the property.

As detailed in 9.5.1.3 we have also looked at the potential of NHH customer supply pipe repair or replacement.

9.5.1.5 Household consumption (PCC) reduction

For the draft WRMP, we considered three PCC pathways which reflect on low, medium and high levels of ambition for PCC reduction by 2050. The medium pathway is based on the national framework for water resources target of 110 litres/person/day. The high and low pathways represent lower / higher ambitions for PCC targets and are shown in the table below. For the revised draft WRMP, we have assessed another scenario based on the newly introduced Environment Act targets. These scenarios are represented in the table below.

Table 27 PCC reduction scenarios assessed

Scenario Ref	Name	Description
PCC_01	PCC_LOW	120 l/h/d by 2050
PCC_02	PCC_MED	110 l/h/d by 2050
PCC_03	PCC_HIGH	90 l/h/d by 2050
PCC_04	PCC Environment Act	122 l/h/d by 2038, 110 l/h/d by 2050

For this optimisation, water labelling is included as an enabler. Three scenarios of water labelling are also tested – no water labelling, water labelling with minimum standards, and water labelling with no minimum standards. This has shown that water labelling is required in order to achieve the 110 l/h/d. In addition, the timing of the smart network and smart meter rollout also has a significant impact on cost and deliverability of this target.

[2] https://www.susdrain.org/files/resources/evidence/Ricardo_Independent-review-of-costs-and-benefits-of-RWH-and-GWR-Final-Report.pdf - see figures in the spreadsheet *RWH option figures from Ricardo report.xlsx.*

As agreed at Water Resources West, we have agreed to include water labelling with no minimum standards as our option and have taken the lower savings estimate for this. In this situation, and with a smart network and metering installed by the end of AMP9, the following activities are included in the optimiser:

- **Community rainwater harvesting** - an intervention for new developments where water collected through roof runoff and a sustainable drainage system is collected in a lake on the development. This water then undergoes basic treatment before being supplied through a separate supply system for toilet flushing, outside use and potentially clothes washing.
- **Water neutrality** - the additional demand from new development is minimised as far as possible and then offset by reducing demand in the surrounding area. Offsetting could also be done by reducing leakage and/or non-household demand.
- **Household water efficiency programme (partnering approach, home visit) -** provision of water saving kits, plumber installed retrofits, and encouraging behaviour change.
- **Housing associations, targeted programme** - direct company liaison with housing associations to promote water efficiency to residents. An initial audit or communication is followed up with regular communications as new water saving techniques and devices enter the market. The most efficient delivery would be for housing associations to use existing contractors to carry out the installations and so a partnership approach with the housing authority would result in a lower cost to deliver this option.
- **Innovative tariffs** - This intervention assumes smart metering as a pre-requisite and therefore can only be delivered within Smart Network programme. New tariffs are developed and introduced to encourage water saving behaviours through incentives. Tariffs can be targeted to deliver reductions in consumption based on individual household consumption patterns. The framework for tariffs for water services are determined by Ofwat. This intervention would therefore also require input from this regulator.
- **Home retrofit rainwater harvesting/greywater reuse** - This intervention would require a widespread programme to encourage the retrofitting of rainwater or greywater systems to existing housing stock. Rainwater systems are likely to be more successful at present due to the maturity of the technology and lower maintenance requirements. Retrofit options for greywater recycling products are less popular, more complex and require more maintenance.
- **Increased media campaigns and school education** - This intervention would build on the baseline activity and pilot studies that South Staffs Water is already undertaking, but would be higher profile, more consistent and co-ordinated at a regional level. The effectiveness of this campaign would vary depending on whether it was part of a co-ordinated programme, underpinned by smart metering. There are therefore two variants of this intervention, with and without smart networks.
- **New homes standards, voluntary** - At present, all new homes in England must meet the mandatory national standard set out in the Building Regulations, of 125 litres/person/day. Where there is a clear local need, local planning authorities can set out Local Plan policies requiring new dwellings to meet the tighter Building Regulations optional requirement of 110 litres/person/day. This option would be applied at a development scale through consultation and agreement with stakeholders, particularly the local authority, developers and main contractors. The target would be to achieve a new home standard below the current baseline forecast for new households.
- **Targeting properties for leak repairs or efficiency audits -** Home water efficiency visits can result in useful reductions in water use through the provision of water saving kits, plumber installed retrofits, and by encouraging behaviour change. Implementing this option after smart meter installation, as part of a Smart Network programme means that specific properties with the highest rates of consumption can be targeted for engagement, to determine the reason for the high water use. Repairs to internal leaks, e.g., from leaky loos can be made and advice given if water use is much higher than it should be. The savings associated with this option are based on reported losses from leaky loos. There are also two variants of this intervention, with and without smart networks.
- **Community Water Efficiency Scheme** - This option is based on the results of the St Albans pilot study of the 'Save 10 a Day' campaign, focusing on the benefits estimated from the households engaged most with the programme, by ordering water saving devices through the GetWaterFit app. We would deliver campaigns to

encourage households to adjust their water use behaviours and practices. The incentives could be either individual or community based. Individual schemes could be incentivised with a loyalty scheme where customers receive a reward if they achieve a certain percentage reduction in consumption. Community schemes could provide towns, villages or neighbourhoods with a community level reward based on consumption reduction across that area. There are also two variants of this option but where a more modest customer uptake is achieved based on less targeted intervention and communication due to no smart network data availability.

9.5.2 Supply Options

9.5.2.1 New groundwater options

There are no new groundwater options in our feasible list following feedback from the Environment Agency during pre-consultation for this plan. This is because all of these options looked at abstracting additional water from waterbodies deemed to have no water availability.

9.5.2.2 Surface water enhancement

We have explored four new options for surface water enhancements, focusing on Blithfield Reservoir and Chelmarsh Reservoir.

For Blithfield reservoir, we look at increasing the height of the dam. A 1m increase in height would lead to a DO benefit of 9.1 Ml/d, whilst a 2m increase would provide a DO benefit of 16.4 Ml/d.

For Chelmarsh, we have looked at raising the reservoir embankment height by up to 2m to provide either 15 Ml/d or 30 Ml/d DO benefit.

9.5.2.3 New surface water options

All of our new surface water options focus on the River Trent. We acknowledge that there are several options that are being explored by Severn Trent Water and Water Resources East that impact on the River Trent, and as such further in combination assessments would be required to determine the impact of several of these options occurring.

The first option looks at a 40 Ml/d transfer from the River Trent to Blithfield reservoir. The next two options look to build on this by developing a treatment works on the River Trent to enable water to go straight into supply. One of the options looks at a 40 Ml/d treatment works whilst the other reviews a 70 Ml/d treatment works. These options are mutually exclusive and cannot be combined due to water availability.

9.5.2.4 New trades/third party inputs

We have explored water transfers with United Utilities, connected in part to the proposed Severn to Thames (STT) transfer. We have identified four possible volumes ranging from 15 Ml/d to 75 Ml/d. In order to support these options, United Utilities would need to develop new sources of water elsewhere in their region to allow this release of existing capacity, and these costs must be taken into account when valuing the options.

We have two options relating to potential transfers from the Canal & River trust, either by taking advantage of surplus in the Birmingham canal and transferring this to Blithfield, or through potential capacity at Chasewater. The first option would deliver 15 Ml/d benefit whilst the second circa 5 Ml/d.

We have also explored three new options with third parties, which include a potable water transfer, developing a new reservoir and a licence trade. These have been included in our WRMP tables with the other options.

9.5.3 Drought Options

We have included both the demand and supply side drought measures as identified in our recently published drought plan in the WRMP planning tables as options. These are details in table 6, as well as tables 4 and 5. The planning tables represent a 1 in 500 year scenario which equates to level 4 in our drought plan. Our drought plan states we would deploy demand saving actions prior to this at levels 2 and 3, and these are:

- Appeals for restraint – saving of 3%, 9 Ml/d
- Temporary Use Ban (TUB) – saving of 8%, 24 Ml/d
- Non-essential Use Ban (NEUB) – saving of 5%, 15 Ml/d

These demand management activities have no financial cost associated with them and have no negative environmental benefits. As such, when included in our Valuestream modelling as demand management options, they are consistently selected as best value options in all scenarios tested.

We have four key supply side options from our drought plan which we have included as feasible options in our plan:

- Bulk supply imports – there are several small-scale potential imports from Severn Trent Water, totalling 5 Ml/d.
- River Blithe drought permit – this enables us to abstract from the River Blithe when the HOF is on place on that river. Provides a benefit of 8 Ml/d.
- River Severn drought order option 1 – this allows us to override the Environment Agency drought order when River Severn Regulation is in place. Provides a benefit of 5% which is 9.6 Ml/d.
- River Severn drought order option 2 – this allows us to increase from the Regulation requirement for abstraction to full works capacity. Provides a benefit of 24 Ml/d.

As stated in our drought plan, we believe it is unlikely that Severn Trent Water will be in a position to enable the bulk supplies to us in a 1 in 500 drought situation; this is due to the assumption that both companies are likely to both be experiencing the same level of drought due to the geography of both companies. Therefore, whilst we have included bulk supply imports as a feasible option in our WRMP, we have deselected it in our Valuestream modelling due to high levels of uncertainty around its availability, and therefore it does not feature in our preferred plan.

The River Blithe drought permit benefit is different in the WRMP to the drought plan due to how we are quoting the numbers. In the drought plan, we quoted the level we would typically pump at from our Nethertown pumpback scheme, whereas the WRMP has included the actual DO benefit we would see as a result. Since the drought plan, we have installed variable speed drives at our Nethertown abstraction point which enables us to vary the abstraction rate more and maximise the water availability. We will update the drought plan at the next review to ensure there is clarity in the numbers.

Through the drought plan development, we undertook environmental assessments on these supply side actions. For the River Blithe drought permit, the environmental assessment report (EAR) showed minor or negligible impacts. It also proposed monitoring measures which will be put into place should we utilise this option. The EAR for the River Severn drought order options show a potential minor impact. This is due to potential for increased prevalence of Himalayan balsam and Japanese knotweed along the riverbanks if flow-related disturbance is reduced and there may be in-combination impacts on the upper Severn Estuary under specific tidal conditions, leading to a temporary reduction of freshwater flow into the estuary. Again, a monitoring plan and appropriate mitigation measures have been proposed which aim to identify and reduce any unexpected impacts which may be detected during implementation.

Both the River Blithe and River Severn options that are currently part of our operation for a drought have known minor environmental impacts and there is no financial cost associated with them. As such, when included in our Valuestream modelling, they are consistently selected as best value options when compared to our other options to

increase supply, with the River Severn option 2 included, and feature in table 3b of the planning tables in support of our supply needs.

9.6 Demand management optimisation

We are committed to delivering the demand reductions outlined in the recent Government environmental plans. Whist these are important targets, it is important to demonstrate that they do deliver a best value plan for our customers and the environment, at a cost that is affordable. We have various options, outlined above, that we can utilise to deliver the targets, but we must ensure that these options, and the scale at which we deploy them, are deliverable, balance the cost against the benefits, minimise disruption for our customers and meet their expectations around service, delivery and priority.

An example might be leakage – customer supply side leakage constitutes 30% of all leakage, and repair of customer side leaks is one of the lower cost leakage options in our plan. One option could be to deliver a large-scale programme of work in this area to provide a low-cost option. However, this is a highly disruptive option for our customers, it relies on customer approval and support for us to work on their property, and only tackles a proportion of the total leakage. As we get closer to zero customer side leakage, the cost increases dramatically. And importantly, leakage is one of our customer top priorities – it will not be acceptable to our customers for us not to be heavily focusing on our own network.

In order to determine the most appropriate activities and the scale of these, we worked with Artesia on their development of a demand management optimiser. The optimiser focuses on the savings delivered, the cost for doing so, and the deliverability and risk of each option. It looks at various enablers, such as smart networks and Government water labelling, to understand the impact this has on the deliverability of targets and how this enables new and innovative options, such as green tariffs.

For each of the key demand management areas i.e., PCC, NHH consumption and leakage reduction, we tested several scenarios in the optimiser to understand what impact it has on the plan. These scenarios looked at changing the timescales for achieving various demand reductions, as well as some of the dependencies e.g., different water labelling deliverables and timescales for the delivery of smart networks. The scenarios for each area have been discussed in section 9.5.1 above.

The outputs from these scenarios are included in Appendix K, which has been updated for the revised draft WRMP as we have assessed some alternative scenarios following the confirmation of the Environment Act targets for demand reduction.

For each area, we have then compared the outputs of these scenarios to understand any interdependencies, overlay our customer engagement feedback on priorities and willingness to pay, as well as review deliverability and affordability. We have ensured we have aligned our assumptions for water labelling with those of the other companies in Water Resources West to ensure consistency in approach.

In Section 10.1 below, for PCC, NHH and leakage reduction, we detail which scenario we have selected for our preferred plan as well as explain the reasons why, based on the outputs of these scenarios.

9.7 Customer support for options

Our approach to customer engagement and the findings from that work are described in detail in chapter 4.

In general terms, customers are keen that we progress demand savings before exploring new supply options, and are in favour of all aspects of demand management including:

- leakage reduction
- metering
- education to help change behaviours.

Customers have not expressed a desire to improve levels of service and reduce the frequency of temporary use bans.

9.8 Decision Making Constraints

As detailed in previous sections in chapter 9, we have applied a modelling process to identify the best value and least cost approaches to resolving the supply demand deficits in our area. However, before agreeing our preferred programme, there are some constraints that we must make to our decision-making process, as outlined below.

- **Deliverability** – it is critical that our preferred plan is deliverable. We are keen that it is ambitious, particularly with relation to demand management and meeting the environmental needs, but we need to ensure that whatever we propose can be delivered in the timescales we state. We have liaised with our supply chain to ensure our proposals can be achieved and identify any potential issues.
- **Customer preferences** – we have undertaken extensive customer research as part of the development of this plan and have looked to incorporate this into our decision-making process where possible. Our customers are keen that we deliver on demand management before we look at investing in new supply options. They also believe it's important that we demonstrate we are delivering significant leakage reductions as a priority before asking them to reduce demand. Our customers want us to deliver improvements for the environment, but in a timescale that balances the associated costs for our customers over the horizon of the plan. They are keen that we deliver the required abstraction reductions as soon as possible, but not if it creates a supply risk or the need for additional short term/temporary investment.
- **Affordability** – We need to ensure our plan is affordable for our customers whilst still achieving the ambitions that we believe are important. Where possible, we will aim to smooth the bill impact to ensure our plan is balanced and manageable for our customers, rather than show sudden increases or decreases in costs.
- **Risk** – We have to be confident that our plan does not introduce new risks to our supply demand balance and our day-to-day operation. Our plan needs to mitigate any existing risks as far as possible through activities and options that are deliverable and affordable. We have ensured that any assumptions we have made are clear and logical and have not selected options where we feel there is a high risk to them e.g., reliant on third party delivery, are previously untested elsewhere in the industry, or where costs and/or benefits are unknown or currently unquantifiable. We are keen to balance innovation and advancement with certainty of delivery.
- **Combined impact of Cambridge Water WRMP** – South Staffs Water and Cambridge Water produce separate WRMPs but produce a single 5-year business plan. As such, we look, where possible and appropriate, to ensure our plans are based on the same assumptions and methodologies so that our business plan is built the same way. We also look to identify where there are areas where we can align, such as metering programmes, in order to deliver as efficiency and as cost effectively as possible.
- **Financeability** – As described above, our business plan includes both South Staffs Water and Cambridge Water. As water only companies, the WRMPs form a substantial part of the business plan, but we also need to take into account other work required outside of these, such as water quality improvements and network resilience. Our Cambridge Water WRMP has demonstrated the need for not only an ambitious demand management programme, in line with the South Staffs Water plan, but also substantial supply side schemes to meet both the high level of growth forecasted and environmental needs of the chalk streams in this area. One of these supply side schemes involves jointly developing a reservoir in the Fens with Anglian Water which we have been progressing with in AMP7 as part of the RAPID process. These costs are enhancement spend in the business plan, and as a smaller company, we must balance the financeability of our programme whilst ensuring we deliver all of the key elements required as part of both WRMPs and our other operations.

Therefore, we have looked at where there may be choices around the level of spend in AMP8, e.g., metering, in order to ensure that our programme is balanced. We have used a multi-criteria analysis tool Copperleaf to help support this decision making.

- **Regional consistency** – We are keen to ensure that our plan is developed in a consistent way to the other companies in Water Resources West. By making the same assumptions in the development of our plan, we will be able to clearly assess the needs of the region and identify areas of need and opportunity. Our plans will be truly comparable and ensure an accurate regional view is created. This has led to consistent agreement of core elements of the plan development such as climate change scenarios, headroom profiles and demand forecasting.

The below details specific areas where we these constraints have had an impact on our preferred programme.

- **Universal Metering** – Our modelling shows it is better value to deliver smart metering as quickly as possible because this enables additional options that are more effective and cost efficient. However, the following elements have led to us deciding to complete this work over 10 years rather than five years.
    - **Deliverability** - We have taken the learning from companies such as Anglian Water, Thames Water and SES who have ambitious metering rollout programmes in AMP7. This has outlined the complexities of large-scale rollouts and the realistic deliverables. We have also discussed possible programme options with our supply chain and have factored in the current supply issues with meter availability as well as resources to deliver. Nearly every water company is looking at large scale meter rollout programmes from AMP8 onwards and the meter supply and contract chain is highlighting there could be significant delivery issues. However, we believe our projected rollout profile is manageable within this.
    - **Financeability** – If we were to deliver universal metering in AMP8 alone, the cost impact of this is significant for the enhancement element of our business plan. In this situation, it would leave little capacity for additional enhancement spend in the business plan. We have assessed universal metering alongside other elements we have identified for enhancement cases to ensure that our overall business plan, as well as our WRMP, presents best value. This work shows that spreading the delivery over two AMPs provides overall better value.
    - **Affordability** – We have to look at our overall programme and understand the impact on customer bills, and how our proposals balance against what our customers have told us are their priorities. The cost impact on the overall plan if universal metering is rolled out over 10 years rather than five is not significant, and therefore we have looked to ensure that our plan balances costs across the AMP periods where possible and where appropriate.

- **Environmental Destination** – we have developed a profile for the delivery of the abstraction reductions needed to meet the BAU+ environmental destination. We have factored the following elements into developing this profile:
    - **Customer preferences** – our customers have stated that they want us to deliver the BAU+ scenario, due to the level of uncertainty regarding the level of reductions required. They believe it is an appropriate level of ambition based on the information known at this stage, and that we should look to obtain clarity as soon as possible, which supports our investigations we will undertake in AMP8.
    - **Risk** – our supply demand balance profile means we could deliver the reductions at a slightly faster rate than that proposed in our preferred plan. However, we believe there is too much risk in reducing our SDB position too far as this means there is little extra capacity for any changes or uncertainties. We have also balanced the order of priority for these reductions to ensure we do not create any temporary supply investment needs e.g. we will not undertake all of the abstractions in our priority catchment of the Worcestershire Middle Severn at the same time as this will create a temporary deficit in this zone until the demand management activity catches up. We have looked at delivering demand management activities in priority zones, but this is not an efficient approach for leakage reductions and is not conducive to our customer engagement

on water efficiency as we need consistent messaging to all of our customers if we are to recognise the benefits. Therefore, we will balance the reductions to ensure we deliver against our prioritisation criteria as far as is reasonably practicable, and still deliver all reductions by 2040.

9.9 Defra Accelerated Spend

In October 2022 we applied to Defra for funding to enable us to start several of our AMP8 proposals early, including to start the delivery of our universal smart metering programme ahead of AMP8. The proposal included the fitting of household and non-household meters. In March 2023 we were informed we had been successful in this bid.

South Staffs Water also operate Cambridge Water and the proposal covered metering for both regions. Due to our proposals in our Cambridge Water draft WRMP relating to the development of a new reservoir called the Fens Reservoir, this has led to costs in AMP7 that were not budgeted for in PR19. We submitted our Gate 2 submission for this in November 2022, where we identified a significant cost increase for the rest of AMP7 as a result of now having a preferred site and concept design, as costs can be more accurately forecast. As a result, we have had to balance the additional funding required from Fens with this accelerated spend and manage these within our financial constraints as a business.

Acceleration of our metering programme would be unfunded work in year 5 of AMP7. Both the Cambridge Water and South Staffs Water regions operate under the business plan meaning funding is determined and balanced across both regions. This AMP, we have struggled to absorb the Fens development costs as they were not accounted for within the Price Control. Our credit agencies do not recognise true ups in our ratings, therefore Fens Reservoir investment has put our metrics under significant pressure. It has further prevented us from accelerating investment on metering through the Defra fund, as supporting another true-up funded investment was not possible. We believe that Fens is the best value solution, and therefore prioritised this investment despite the challenges it caused. Therefore, we are not proposing to undertake any metering acceleration into AMP7.

9.10 Ofwat's Public Value Principles

Ofwat have developed a set of principles to help guide companies in exploring and delivering better social and environmental outcomes, recognising that this is a complex area with multiple stakeholders, judgements and trade-offs. The principles are intended to provide a framework, some parameters and flexibility to enable companies to develop the best solutions. It is important that companies should seek to create further social and environmental value in the course of delivering their core services.

Table 28 Ofwat's public value principles

Ofwat Public Value Principles		How these have informed our decision making and approach throughout this plan
1	Companies should seek to create further social and environmental value in the course of delivering their core services, beyond the minimum required to meet statutory obligations. Social and environmental value may be created both in direct service provision and through the supply chain.	Our plan looks to deliver the environmental destination abstraction reductions sooner than the dates in the National Framework. Our customers have consistently told us they expect us to be ambitious when it comes to environmental improvements, and this will provide benefits to the environment as well as our customers.

2	Social and environmental benefits should be measurable, lasting and important to customers and communities. Mechanisms used to guide activity and drive decision-making should support this, for example through setting and using company purpose, wide external engagement and explicit consideration of non-financial benefits.	Our plan looks at best value, rather than just cost. Value is measured across a range of metrics including natural capital, biodiversity, flood mitigation, agriculture and climate regulation. Through our extensive customer engagement we have shared these principles with our customers and they are supportive of assessing whole impacts rather than cost alone.
3	Companies should be open with information and insights on operational performance and impacts (both good and bad). This will support stakeholder engagement, facilitate collaboration and help identify opportunities for delivering additional social and environmental value.	We will look to share our performance against our WRMP and will continue our customer and stakeholder engagement. We will look to expand on the information we share with our customers and we further explore open data and the opportunities it provides.
4	Delivery of social and environmental value outcomes should not come at greater cost to customers without customer support.	We have undertaken extensive customer engagement throughout the development of this plan to understand customer properties and willingness to pay. We believe our plan aligns with these priorities and customer support for key areas such as leakage and environmental improvements.
5	Companies should consider where and how they can collaborate with others to optimise solutions and maximise benefits, seeking to align stakeholder interests where possible, and leveraging a fair share of third-party contributions where needed. Companies' public value activities should not displace other organisations who are better placed to act.	Through our involvement and contribution to Water Resources West, we have ensured alignment and consistency in approaches which in turn will deliver a more consistent customer experience. We have identified new supply options and worked together to create efficiencies e.g., joint development of key areas of the plan which has in turn reduced costs. Through the WRW environmental destination workstream where we have collaborated to create a regional wide view of the environmental needs and improvements and are proposing to work jointly with Severn Trent Water on our environmental destination investigations to ensure a thorough consistent view of each catchment and deliver it more cost efficiently for our customers.
6	Companies should take account of their capability, performance and circumstances in considering the scope for delivering greater social and environmental value.	As a smaller water only company, we recognise that our size could hinder some of our ambitions. To ensure this does not happen, we have, and will continue to, worked collaboratively with other water companies in our region and outside of it. We are keen to create additional third-party partnerships to enable additional resources and opportunity to delivery more environmental benefits. Our plan is

		focused on demand management, and we know that Covid-19 has had a significant impact on our ability to deliver against some of these measures in AMP7. However, we are confident that we have robust and extensive improvement plans in place that will deliver our required outturn by the end of AMP7 and therefore have confidence that our plan is deliverable.

10. Our proposed programme

Summary

Our proposed programme focuses solely on demand management to address the future supply deficits. By achieving the industry commitments outlined below, we do not need any supply options to ensure we maintain a positive supply demand balance throughout the planning period.

Our plan will achieve:

- 50% reduction in leakage (from 207/18 levels) by 2050
- 110 l/h/d household consumption by 2050
- 9% reduction in non-household consumption by 2038
- 20% reduction in DI per capita by 2038

Key enablers for this delivery are:

- Delivery of the Government's water labelling scheme for white goods by 2025
- Universal metering installed across the region by 2035

We acknowledge that our demand management includes key dependencies, both on customer behaviour and government intervention, and as such must be closely monitored at annual reviews to ensure that delivery is being achieved. The costs provided will be directly reflected in our PR24 submission.

Our customer engagement shows that our customers prefer a demand focused plan. They are also supportive of universal metering; however, there is a strong theme that we need to ensure we have the appropriate support mechanisms in place to protect vulnerable and large families. This is a notable concern in the South Staffs region where we have a level of deprivation that is larger than the national average, and we have developed our support packages and plans as part of our business plan submission PR24.

We have stress tested our preferred plan against various scenarios, as reflected in the Ofwat common reference scenarios produced for PR24. These include:

- Demand reduction activities only deliver 50% of their projected savings
- Ofwat compound high scenario e.g., high climate change, high environmental destination
- Ofwat compound low scenario e.g., low climate change, low environmental destination

Our plan has shown that in two of these scenarios we do have a deficit in the planning period, and therefore we have produced an adaptive plan which outlines the actions we would take if we saw either of these scenarios develop into reality.

Since producing our draft plan, we have updated our demand forecasts and as a result we have updated our preferred programme of activities. Specific activities include:

- Updated benefits associated with installing smart AMI meters.
- Reviewed and updated costs for activities.
- Run additional scenarios to explore the best value plan, as well as alternative options.

- Detail around how we will deliver this ambitious demand management programme.

This section also includes detail about the impact our preferred plan has our on greenhouse gas emissions, broken down into key activities. We also share our plan to achieve net zero operational carbon by 2030. Finally, we share the bill impact of our preferred programme, both for the next five years, and in total.

10.1 Demand management proposals

10.1.1 Metering

At WRMP19, our customer engagement found that customers did not support a compulsory metering approach. Since then, South Staffs Water region has been declared an area of serious water stress by the Environment Agency. As a result, we have again explored the concept of compulsory metering with our customers for WRMP24.

It is important to understand the background changes since our last round of customer engagement at WRMP19. Energy smart meters are now commonplace in homes as technology over the last five years has increased. With the recent energy price rises, customers are turning more and more to smart meters to have better information and take control of their usage. Having access to this level of data is now seen by customers as necessary, rather than a nice to have. Throughout our surveys, those customers with smart meters acknowledged that they had changed their behaviours as a result to reduce their usage and save money.

As a result, we saw a change in attitude to compulsory metering among our customers at WRMP24. It should be noted that we have used the term “universal metering” to customers, although we have explained the link to compulsory metering. This is because our aim would be to achieve universal metering over a set period in order to better inform our own activities and to help customers change their behaviours.

As evidenced in chapter 4, customers viewed increased metering as a necessary and important approach for us to undertake. They believe it to be a fair way for all and we did receive majority support from our customers for universal metering. However, they did raise concerns around affordability especially in the most recent customer engagement completed in the summer of 2022 as the cost-of-living crisis intensified and wanted South Staffs to ensure they made provisions to support vulnerable and large families. We discuss our planned approach to support our customers through this transition in section 10.1.1.3.

Smart networks, and smart metering in particular, are a key enabler for other demand management activities. An example would be innovative tariffs – without smart metering in place we are unable to create green or community tariffs that incentivise customers to use less water. Not only does smart metering enable new and innovative activities, but it also enables us to build on our existing activities to make them more efficient and cost effective, particularly for leakage reduction activities. For example, the increased data available to us will allow us to target our activity better which reduces costs, resources and response times. The additional data also provides us with clearer information to better target our education and communication campaigns, as well as our individual customer support offerings in order to influence customer choices and deliver behavioural change for water usage and consumption.

Therefore, our plan looks to install smart metering across our entire customer base, achieving 100% penetration (or as close to this as feasibly possible, accepting there will be properties where this is not possible, such as shared supplies), by 2035. This 10 year roll out programme will be achieved efficiently by rolling out meters geographically, focusing on DMAs with high water usage first in order to make the biggest impacts.

We continue to assume the same rate of customer optants during AMP8 and AMP9 as we have planned for in AMP7, circa 9000 per year, and this programme will run alongside our universal rollout programme.

Table 29 HH metering rollout programme (including optants)

	AMP8					AMP9				
Meter numbers	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35
Optants	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Universal programme	9,795	22,037	22,038	22,037	22,038	19,893	19,893	19,893	19,893	19,893
Total	18,795	31,037	31,038	31,037	31,038	28,893	28,893	28,893	28,893	28,893
Benefit Ml/d	7.40					7.80				

Our plan assumes the meters we will fit as part of our universal metering programme will be fully functional AMI smart meters, and that those fitted through the optants programme will be AMI ready meters and so will not be able to transmit data at this stage and will still need data to be downloaded from them at periodic intervals. Setting up a new network provision for only one meter at a time, as would be required for optants, would be incredibly expensive if not almost impossible in a timely manner. Achieving AMI meter reading in our universal metering programme is possible as we will be able to set up network provision which can capture meters sited within a concentrated proximity (aligning to our batch fitting geographical approach).

As we undertake geographical rollouts of the AMI network in AMP8, we believe we will enable better coverage across our area and hence why we are proposing to install AMI ready meters that are easily, and cheaply, converted to fully functioning data self-transmitting meters. We expect that during AMP9 this network will be far more significant and this is reflected in the split of meter installs we're proposing from 2030 as we assume all meter installs, including optants, will be AMI from this point onwards. AMI meters will deliver 15% reduction in demand for each household fitted, as identified by Anglian Water and Thames Water through their programmes in AMP7.

Year one shows a reduced installation profile. This is because our original plan was to install AMI ready meters; however, through the business planning process, Ofwat's draft determination on our PR24 plan awarded us funding to undertake AMI metering (which is higher cost than AMR or AMI ready). As a result, we have updated our plans to implement AMI metering, but as we are changing strategy with less than 9 months until we commence the programme it means it will delay the start of our programme in year 1 of AMP8 as we need to re-develop our programme and undertake further procurement for the support in the networks, portal and other infrastructures requirements for AMI metering. Our programme looks to catch up these meters over the remainder of the AMP and so we deliver the same total number of meters in AMP8.

We will prioritise the highest usage DMAs first for installation. This will enable us to deliver the maximum benefits quickly and provide useful information to further explore customer side leakage and provide bespoke water efficiency advice to customers. We will also deliver our programme geographically to ensure it is as efficient and cost effective as possible. To this end, we also propose to combine the non-household enhanced meter technology rollout that we discuss in section 10.1.3 in order to deliver both programmes as efficiently as possible. Many of our non-household customers are very close to households, for example shops and hairdressers, and will be more efficient to do both activities in a geographical area at the same time. It will also enable clearer communication to all our customers and a more successful behavioural change campaign associated with the rollout. We will develop the detail of this rollout plan before 2025 and ensure we develop an extensive communications plan to engage with our customers. We have engaged with the companies already doing this work in AMP7 and will take on board lessons learned to ensure we deliver the best possible customer support and experience through the process.

10.1.1.1 Defra Accelerated Infrastructure Spend – impact on programme

In section 9.9 we detailed our successful application to accelerate our household metering programme through the Defra accelerated infrastructure development programme. This decision was communicated in March 2023, potentially allowing two years of acceleration of our programme.

Acceleration of our metering programme would be unfunded work in year 5 of AMP7. In AMP7 we identified the need to be joint developers of the Fens Reservoir strategic resource option, which is needed to provide circa 50% of the water to our Cambridge Water region in the 2030's and beyond. Both the Cambridge Water and South Staffs Water regions operate under the business plan meaning funding is determined and balanced across both regions. This AMP, we have struggled to absorb the Fens development costs as they were not accounted for within the Price Control. Our credit agencies do not recognise true ups in our ratings, therefore Fens Reservoir investment has put our metrics under significant pressure. Therefore, it has prevented us from accelerating investment on metering through the Defra fund, as supporting another true-up funded investment was not possible. We believe that Fens is the best value solution, and therefore prioritized this investment despite the challenges it caused. Therefore, we are not proposing to accelerate any household metering into AMP7.

10.1.1.2 The cost of metering

We have included the cost of our proposed household metering programme in the following table. These include the costs to achieve universal metering – it does not take into account any replacement of meters at the end of their life; this will be picked up through business plan submissions in future AMPs. There are also costs associated with the required smart metering infrastructure to enable the AMI capability e.g. transmission, portals, antennae etc, and these are also included in the table below.

Table 30 Cost of our proposed household metering programme

	AMP8	AMP9
Metering costs	£28.44m	£28.74m
Smart metering infrastructure	£11.03m	£6.04m

10.1.1.3 Supporting our customers through the transition

In our draft WRMP we acknowledged the concerns raised by our customers and highlighted that we were working through our plan to support customers as part of our PR24 process. We take the issue of affordability extremely

seriously and we have now undertaken further customer research on the potential options and have agreed the following approach:

- We aim to have a maximum of 3% of our customers in water poverty by 2035.
- We will expand our existing Assure programme to support nearly twice as many customers in AMP8 as we are supporting in AMP7.
- We will provide a 2 year grace period for meter rollout. Customers will have 2 years from the date of meter installation before we switch to metered billing so we can provide them with regular consumption and proposed bill data. This will enable them to understand the impacts and plan for the potential changes were required.

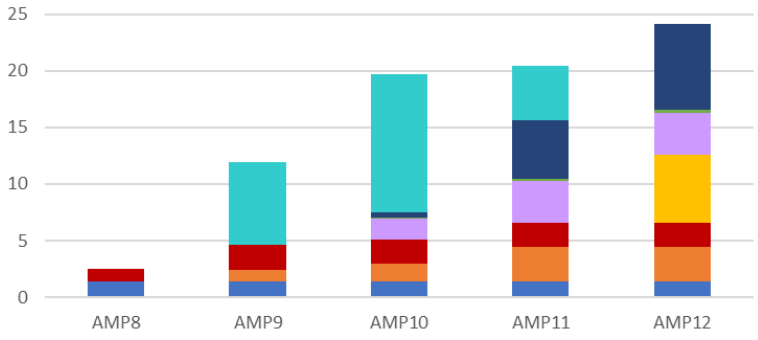
10.1.2 Leakage reduction

We are including delivery of the 50% leakage reduction by 2050 in our proposed plan, as well as the interim targets of 20% reduction by 2027, 30% by 2032 and 37% by 2038. As detailed in section 9.5.1, we explored several scenarios for achieving the targets and made changes to key dependencies such as pace of smart metering rollout and assumptions around water labelling. The below graphs show how the combination of activities is proposed in order to deliver the 50% reduction, as per the results from the optimiser.

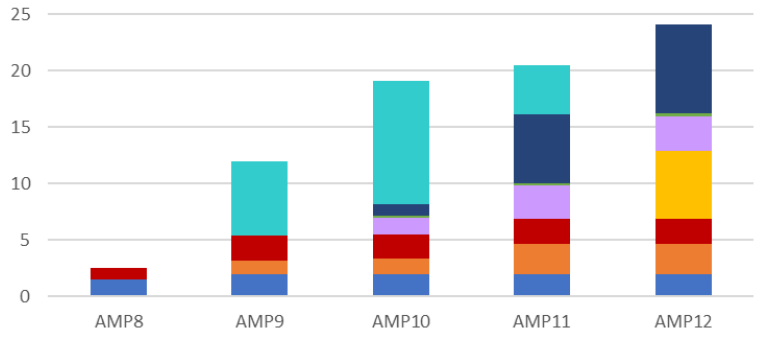
Figure 14 Leakage reduction activities for draft WRMP

For the revised draft plan, we have also explored two more scenarios which look at ensuring we now achieve the interim Environment Act targets which have been published since the draft plan was submitted. For each scenario, we looked at the impact of having a smart network in place at the end of AMP8, end of AMP9 and end of AMP10. One of these scenarios looks to achieve all the targets, termed “scenario 2”, whilst another looks at achieving all scenarios after 2030 and slowing down the leakage profile in AMP8, termed “scenario 1”. Whilst this scenario is not as ambitious as the others, it was an important check for us due to the significant metering programme we are proposing in AMP8 which would be a sizeable proportion of our enhancement budget for our PR24 submission. As discussed in section 9.8, we must ensure that our PR24 plan is both financeable and affordable, and so it was valuable to understand the impacts of changing the pace on large scale programmes. The outputs of these are shown below.

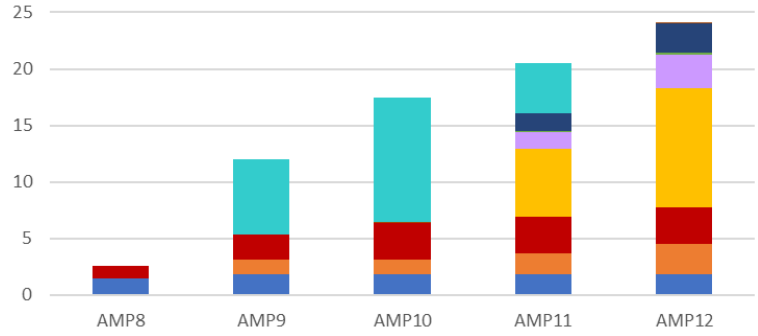
Figure 15 Additional scenarios run to meet interim Environment Act targets



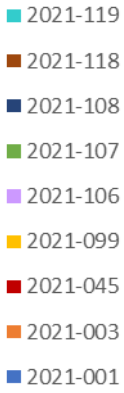
Scenario 1 – AMP8

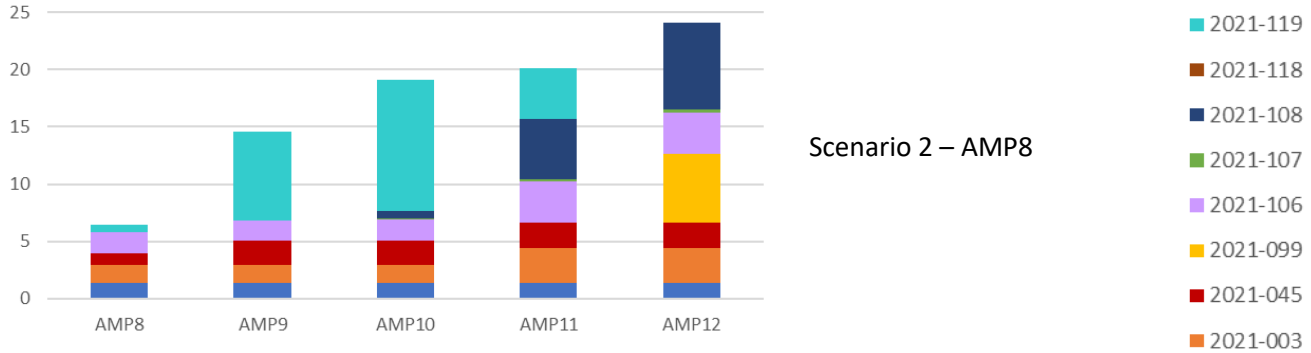


Scenario 1 – AMP9

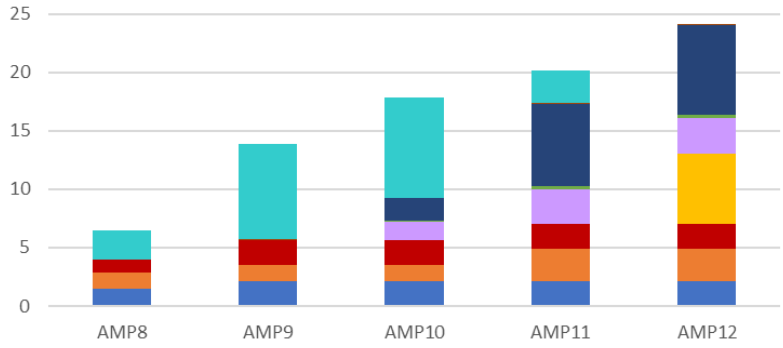


Scenario 1 – AMP10

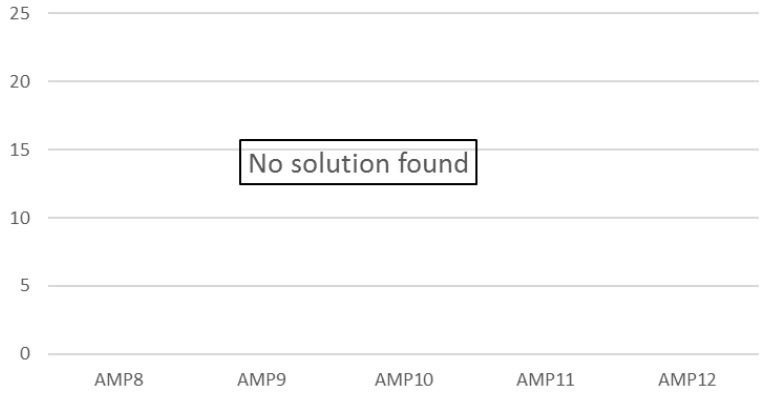




Scenario 2 – AMP8



Scenario 2 – AMP9



Scenario 2 – AMP10

These outputs, plus the previous ones run, highlighted a concern around proactive trunk mains leakage reduction. This activity was very high cost per megalitre of water saved, and so we reviewed both the costing and whether this activity is best value for the revised draft WRMP.

Our costing was based on some work undertaken at the end of AMP6 in our Cambridge Water region. Here we undertook a trunk main renewal programme on the A505 due to leakage volumes and frequency, which in turn delivered 0.5 Ml/d of benefit. Our trunk main approach for this WRMP was to identify similar opportunities and replicate this. Hence the higher cost due to long lengths of trunk main replacement.

We have been reviewing this process over the last 18 months and now found there are no other trunk main large scale renewal projects that we can identify in our area. We have also used new technology in AMP7, such as satellites, which has enabled us to better pinpoint leakage and undertake localised repairs.

As such, our preferred plan does not include the specific trunk main option identified (2021-001) and instead we continue to use our active leakage control (ALC) approach for trunk mains as well as regular mains and comm pipes. Therefore, trunk main leakage detection and repair is now incorporated into this activity.

The optimiser showed that we need a smart network (including smart metering) to be in place for all of the interim targets to be achieved. Smart metering enables additional options to help reduce leakage after AMP9 which help us to meet the long-term targets, and a key option here is the introduction of innovative tariffs.

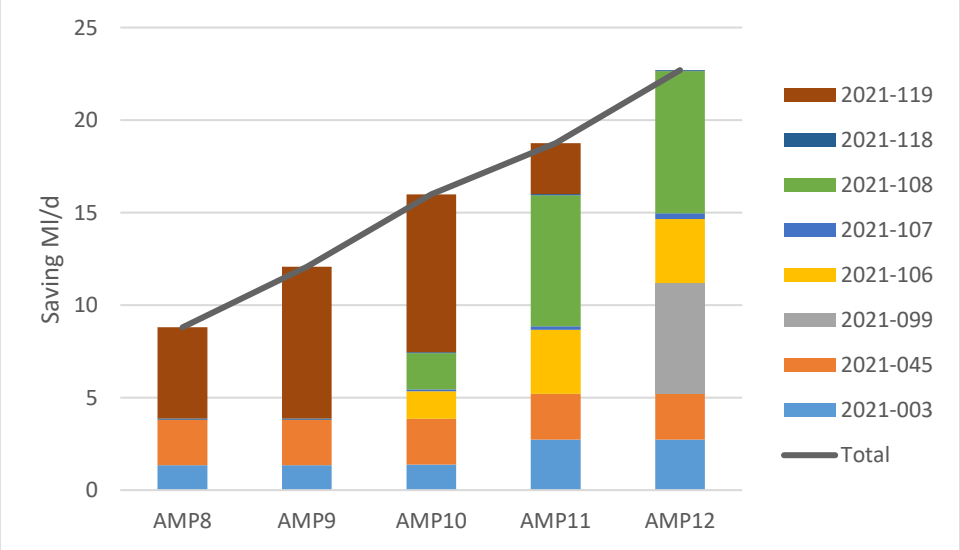
As evidenced in chapter 4, our customers have been very clear on their preferences regarding levels of leakage. In our draft plan, we proposed a 6.6% reduction in leakage between 2025 and 2030. Whilst this scenario still ensured we hit all of the Environment Act targets for leakage, our customers said we were not going fast enough and we should do more sooner.

- Reducing our leakage levels emerges as a clear and consistent priority among most customers.
- There is a strong and consistent view that we need to do more to reduce leakage from current levels.

As such, for our final we have chosen to adopt the scenario that delivers 15% leakage reduction in AMP8 and ensures we meet all the interim targets as well as the 2050 target, assuming we have a smart network in place by 2035. The graph below shows the profile of our leakage reduction, as well as the contribution of individual activities. We can see some activities feature heavily at the start of the planning period – these are more "traditional" leakage reduction methods that we must utilise until we have a smart network in place. As a result, these tend to be more expensive than some of their later equivalents. We can also see some options playing more of a role as we progress through the planning period, and these are options that rely on having installed smart meters and the smart networks, and so generally come into use from AMP10 onwards.

Our scenarios show that the quicker we can introduce smart metering to all of customers then the lower the overall cost of the leakage reduction programme. However, as described in section 9.8, we have to assess the deliverability, financeability and affordability of this, which we discuss in more detail in the following section.

Figure 16 Leakage reduction profile



The table below shows the benefit each individual activity provides over the lifetime of the plan for our preferred approach:

Table 31 Demand savings per leakage activity

				Cumulative benefit by AMP				
Activity	**ID**	**Year activity starts**	**Total benefit by 2050 Ml/d**	**AMP 8**	**AMP 9**	**AMP 10**	**AMP 11**	**AMP 12**
Advanced pressure optimisation	2021-003	2025	2.74	1.35	1.35	1.39	2.74	2.74
Customer supply pipe repair or replacement (without smart networks)	2021-045	2025	2.46	2.46	2.46	2.46	2.46	2.46
Distribution Mains/Comms pipe replacement	2021-099	2045	6	0	0	0	0	6
Customer supply pipe repair or replacement (with smart networks)	2021-106	2035	3.64	0	0	1.5	3.46	3.46
DMA MOT (with smart networks)	2021-107	2035	0.3	0	0	0.1	0.2	0.3
DMA ALC plus (with smart networks)	2021-108	2035	7.68	0	0	1.95	7.08	7.68
DMA MOT (without smart networks)	2021-118	2025	0.06	0.06	0.06	0.06	0.06	0.06
DMA ALC plus (without smart networks)	2021-119	2025	0	4.93	8.21	8.52	2.75	0
		Total	**22.7**	**8.8**	**3.28**	**3.90**	**2.77**	**3.95**
				In AMP reduction				

Our preferred programme includes customer supply pipe repair or replacement activities. This is a hugely important area of leakage reduction as private side leakage accounts for approximately 30% of the total leakage we have. We currently have a policy for customer side repair and replacement activities and propose to maintain this policy moving forwards. Our policy states that if we identify a leak on a customer property, although the supply pipe is the responsibility of the customer to repair, we want to help out where we can. As such, we offer an assisted leak repair service to help ensure the leak can be fixed as quickly as possible. This process involves:

- Visiting the property, identify the leak and ensure the customer is aware who is responsible for the repair.
- Guide customers to the Watersafe website so they can find a local contractor who can complete the repair.
- Provide advice to the customer on replacing the pipe and how to claim a contribution should they relay the pipe.
- Provide information on how to claim a burst allowance for household customers on a water meter.
- An “Assisted repair” – here we would carry out the repair if the situation is appropriate.

For an assisted repair, we will not repair leaks on rented properties, or for customers who have insurance policies that cover this work. We will also only repair one leak per property and will not undertake repairs that are under buildings or permanent structures.
As part of our approach, we are able to assist vulnerable and water dependent customers, something which we are keen to expand as we move forward in the planning period. We will also look to replace lead supply pipes where we identify them as part of this work.

10.1.2.1 Leakage reduction costs

We have included the cost of our proposed leakage reduction programme in the following table.

Table 32 Cost of our proposed leakage reduction programme

	Option ID	AMP8 £M	AMP9 £M	AMP10 £M	AMP11 £M	AMP12 £M	Total £M
Advanced pressure optimisation	2021-003	0.23	0	0.01	0.23	0	*0.47*
Customer supply pipe repair or replacement (without smart networks)	2021-045	0.81	0.29	0.20	0.20	0.20	*1.70*
Distribution Mains/Comms pipe replacement	2021-099	0	0	0	0	20.1	*20.1*
Customer supply pipe repair or replacement (with smart networks)	2021-106	0	0	0.56	0.81	0.30	*1.67*
DMA MOT (with smart networks)	2021-107	0	0	0.25	0.25	0.25	*0.75*
DMA ALC plus (with smart networks)	2021-108	0	0	1.2	2.59	0.60	*4.39*
DMA MOT (without smart networks)	2021-118	0.25	0	0	0	0	*0.25*
DMA ALC plus (without smart networks)	2021-119	4.06	1.74	0.90	0.40	0	*7.1*
	Total	**5.35**	**2.03**	**3.12**	**4.48**	**21.45**	**36.43**

10.1.2.2 Compliance with Environment Act Target for leakage

The Environment Act target looks to reduce leakage by 50% from the 2017/18 baseline level. For South Staffs Water, this level was 73.6 Ml/d. The below table shows how our plan delivers against this target and the interim targets defined in the Act.

Table 33 Performance of our leakage reduction plan against the Environment Act 2021 targets

Date	WRMP leakage level Ml/d	WRMP % reduction from 17/18	Env Act requirement Ml/d
31/03/2025	61.5	16%	n/a
31/03/2027	56.0	24%	20%
31/03/2032	49.4	33%	30%
31/03/2038	45.2	39%	37%

31/03/2050	36.8	50%	50%

10.1.3 Non-Household Consumption

In the South Staffs Water region, we have nearly 34,000 non household properties and they constitute just over 20% of the overall demand for water. As such, there is an important role for these customers in helping us to drive down demand through reducing consumption, wastage and leakage. We are conscious that retailers own the relationship with non-households since the market opening in 2017, but we see a key role for water companies to play to support demand reduction in this area.

As such, following the introduction of the new Environment Act and the proposed targets within, we have included the reduction to non-household consumption by 9% by 2038 and 15% by 2050 in our preferred plan. During AMP7 we have not undertaken any proactive work to reduce demand among our non-household population, but we believe there is significant opportunity here that can be explored through collaborative working.

We worked with Artesia in the development of our NHH options for our draft WRMP and have included the enhanced metering technology for all NHH as one of these options using the benefits identified in their report for MOSL delivered in 2022.

The optimisation work by Artesia showed that the majority of this saving could be achieved through fitting Enhanced Meter Technology to all of our existing non-household customer base. This would provide 8.98 Ml/d demand saving. The below table shows the annual profile of delivery. We will develop the detailed rollout plan over the next 12 months and ensure we engage with both retailers and non-household customers to communicate this. We will prioritise those properties with no existing meter and will look to combine our NHH and household rollout programmes, where appropriate, to deliver a more efficient rollout programme.

Table 34 NHH metering rollout programme

	AMP8					AMP9				
	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35
Meter no's.	1687	3796	3796	3796	3795	3374	3374	3374	3374	3374

We have undertaken some engagement with retailers throughout the WRMP process, and continue to do so, in order to understand how we can better work with them to support and incentivise water efficiency proposals to non-household customers. This could be supporting with on-site audits for non-households, providing leakage detection and water efficiency advice. We will continue to work with other water companies and retailers to agree the best way to help deliver support and incentives in this area.

We undertook a club retailer engagement Club project with the other WRE companies to identify the best mechanisms to reduce water efficiency and how best to engage with retailers and non-householders in order to deliver our plan.

Key learnings from the club project include:

- High volume users are open to hearing about water recycling; for them it's about saving money
- An accreditations approach was not seen as useful
- In person audits allows businesses to understand where savings can be made
- The proposition to reduce leakage demonstrates clear benefits to businesses

Through research reviews, retailer discussions and NHH interviews, the following diagram outlines the summary of NHH barriers to water saving.

Capability barrier (skills/ knowledge)		Lack of accessible & accurate **consumption data**
		No sense of **how** to be (more) water efficient
Opportunity barrier (time or money)		No sense of **when** to be (more) water efficient
		No/inadequate **cost benefit** to save water
Motivation barrier (why want to do it)		Lack of **awareness of water scarcity** context / need
		Water restrictions/bans not seen as a **business threat**
		**Deferred responsibility**: looking to the industry and government to promote/implement water efficiency
		Lack of **incentives to save** (or disincentives not to)
		Limited **consequences** if NHH do nothing (e.g. customers not demanding this)

We believe this is important that retailers can expect a consistent approach from the various Wholesalers with whom they work. This will lead to the most efficient way of engaging and operating with both retailers and non-household customers in order to deliver the maximum benefits. To this end, we are part of the RWG Water Efficiency Group with retailers to help drive forward water efficiency initiatives in a consistent way across the country.

We have engaged separately with several retailers such as Business Stream, Pennon and Wave to discuss water efficiency initiatives and discuss how we might work together to deliver such schemes through AMP8 and beyond.

In addition, we are part of an Ofwat innovation bid with Waterscan looking at NHH behavioural change to deliver water efficiency working with six large nationwide companies such as John Lewis and Greene King.

We are committed to continuing exploring the barriers and opportunities and working with MOSL and retailers to develop these further.

Throughout AMP7, Thames Water have undertaken a substantial programme to fit NHH enhanced meter technology and deliver water efficiency visits to NHH customers to identify potential water savings and leakage. They have seen significant success through this approach, finding approximately 3000l/prop/day average savings for 3000 visits per year with an average cost of £250k per Ml/d saving. We have reviewed this and adapted it for our modelling. We have far fewer NHH customers, and therefore much fewer larger users in our area. Therefore, we believe it is more appropriate to assume a reduced saving of 500 l/prop/day. This is because our average NHH consumption is 1,630 l/prop/day. Whilst there will be obviously some very large users where the savings potential is much greater, we are keen to ensure we look at all NHH customers with specifically tailored programmes based on the size of the

customer. We also believe that our costs will be higher as we start up a new activity and develop the programme, in addition to the lower benefits we are expecting. Therefore, we have modelled a cost of £750k per Ml/d saving.

We have worked with retailers to identify the highest consumers for water efficiency reviews and leakage detection. We will look to prioritise our support to the highest water users initially. We believe this will enable to us to identify the largest savings first. As the programme progresses, we will move to medium users.

Many of our large multi-site customers have sustainability leads who have a strong focus on energy and water and therefore we will work with these teams to provide advice and support. In reality, there may be few gains to be had here, and we will focus on large single site users who may not have the internal support for this activity already.

We will look to incorporate the smaller NHH customers with our household water efficiency audits as the requirements are similar e.g., leaky loos, and it will be more efficient to address these on a geographical basis, prioritised by reviewing DMAs of high usage. Likewise, we will also align our metering programmes for NHH and household in order to maximise the efficiencies and enable clearer communication for our customers and more successful water saving education and advice that will be undertake at the point of rollout.

Thames Water have also seen significant success from undertaking a review of continuous flow. Continuous flow is classified as a minimum of one litre per hour registered on the meter every hour for 14 consecutive days, indicating that if there may be a leak or wastage event on the premises. Twenty-five per cent of all water used by businesses is classed as continuous flow, and MOSL's report estimates that 10% of this would be reduced through self-fixes if the information was shared with businesses. This is something we propose to incorporate into the water efficiency audit programme as the smart meters are rolled out and can provide us with this data, so will likely start this work in earnest at the end of AMP8 and start of AMP9. We plan to continue our work with retailers and other stakeholders to determine how we most efficiently enable the delivery of these programmes, and whether retailers may be best placed to undertake some of this activity.

Table 35 Demand savings per NHH consumption reduction activity

				Cumulative benefit by AMP				
Activity	**ID**	**Year activity starts**	**Total benefit by 2050 Ml/d**	**AMP 8**	**AMP 9**	**AMP 10**	**AMP 11**	**AMP 12**
Enhanced meter technology	2021-116	2025	8.98	3.37	5.39	8.98	8.98	8.98
Non-household water efficiency programme	2021-015	2025	2.06	0.75	1.5	1.5	2.06	2.06
		Total	**11.04**	**4.12**	**2.77**	**3.59**	**0.56**	**0**
				In AMP reduction				

10.1.3.1 Non-household consumption reduction costs

We have included the cost of our proposed non-household reduction programme in the following table. We have assumed a 20-year life span for the meters, and so have included costs from AMP12 for replacing these meters.

Table 36 Cost of our proposed non-household programme

	Option ID	AMP8 £M	AMP9 £M	AMP10 £M	AMP11 £M	AMP12 £M	Total £M
Enhanced meter technology	2021-116	2.94	2.94	0	0	2.94	8.82
Non-household water efficiency programme	2021-015	0.56	0.56	0	0.63	0	1.75
	Total	**3.50**	**3.50**	**0**	**0.63**	**2.94**	**10.57**

10.1.3.2 Defra Accelerated Infrastructure Spend – impact on programme

In section 9.9 we detailed our successful application to accelerate our household metering programme through the Defra accelerated infrastructure development programme. This decision was communicated in March 2023, potentially allowing two years of acceleration of our programme.

As detailed in section 10.1.1.1, the need for the development of Fens Reservoir in AMP7, unfunded at PR19, has led to costs of circa £22m in AMP7 that has put pressure on our financial metrics and means there is no opportunity to undertake any further unfunded work in AMP7. Therefore, we are unable to accelerate the NHH metering programme in AMP7 and will deliver as planned through AMP8 and AMP9.

10.1.3.3 Compliance with Environment Act Target for NHH consumption reduction

The Environment Act has the following targets relating to NHH consumption reductions:

- 9% reduction from 2019/20 baseline by 2038
- 15% reduction by 2050

The below table shows how our plan delivers against this target and the associated interim targets defined in the Act.

Table 37 Performance of our NHH consumption reduction plan against the Environment Act 2021 targets

Date	NHH water delivered Ml/d	WRMP % reduction from 19/20	Env Act requirement %
2019/20 baseline	60.98	-	-
31/03/2038	53.79	12%	9%
31/03/2050	51.83	15%	15%

Our proposed plan outperforms the non-household targets. This is due to the benefits we can realise from the enhanced metering programme, and this early intervention will also enable the delivery of the 20% reduction to DI per capita target. We have not undertaken water efficiency work in AMP7 and therefore are keen to deliver swift benefits in an area that we feel can play a significant role in demand management.

10.1.4 Water efficiency

It is important to note that PCC reductions in AMP7 remain a challenge following the Covid-19 pandemic. Whilst levels of household usage are reducing, we are not yet seeing pre-Covid levels despite extensive water efficiency work above our proposed WRMP19 programme. The uncertainty of what the new "normal" will be, with hybrid working more established as a working pattern since the pandemic, will be monitored through our annual WRMP reviews.

As a result of the change in consumption patterns that we saw as a result of Covid-19, we undertook a significant review and update of our day-to-day water efficiency activity during AMP7. Early in the AMP we focused on offering water efficiency audits to customers as well as providing advice and water saving devices through the platform Get Water Fit. We also had an extensive schools education programme, as well as attending local events in our area such as food festivals and summer fayres in order to share water saving advice and products. We also utilised our customer hub in Wednesbury to promote the benefits of metering and provide water efficiency advice. Once the pandemic was underway, most of this activity had to stop and we moved our education and Get Water Fit to purely online offerings, which hindered our ability to maximise savings. Coupled with increased hygiene practices and more customers working from home, we needed to take a different approach post pandemic in order to reduce PCC back to our target levels. We utilised evidence and best practice from across the industry to develop a challenging plan for 2023 to 2025, which involves two key phases:

- Phase 1 - "Summer Ready" quick wins
    - Increase meter reading frequency
    - Expand innovative trials e.g., bin lorry trial for smarter reading
    - Better targeting of initiatives based on the impact of Covid
- Phase 2 - Establish and embed new projects
    - Installation of flow regulators
    - Home efficiency visits
    - Leaky loos find and fix
    - More ambitious "meter my street" campaign

We have a similar approach for our Cambridge Water area with different elements in the plan, so that we can analyse the success of all activities and look to expand successful elements into each region. For Cambridge Water we are delivering the following:

- Phase 1 - "Summer Ready" quick wins
    - Open data demand sprints
    - Behavioural change campaign
- Phase 2 - Establish and embed new projects
    - Eco tariff trial
    - Sustainable village campaign

We have participated in several Ofwat Innovation fund bids relating to water efficiency and were successful in obtaining funding for our lead bid relating to water efficiency in faith and diverse communities. The project seeks to establish a deeper understanding and evidence base on how water is used and valued in different faiths and cultures. The aim is to develop a more comprehensive water efficiency engagement and support framework which water companies can adopt in the future. It will introduce new bespoke water saving interventions and behaviour change campaigns linked to faith/culture. This could be revolutionary and lead to significant environmental and social benefits, such as reducing per capita consumption, building trust and public value, as well as supporting hard to reach vulnerable customers by opening new channels of engagement and communication. We propose to take the learnings from all the above into AMP8 and beyond as we look to build on the successes and refine our programme.

Our plan assumes that this baseline activity will be maintained and that we continue our activity using the Get Water Fit online platform, education visits and community engagement through attendance at events, local campaigns and community engagement. This is incorporated into our baseline PCC performance which sees a gentle fall over the planning period before the addition of the additional water efficiency interventions mentioned in the following sections.

10.1.4.1 Water Labelling

As mentioned, the introduction of water labelling provides large volumes of proposed savings to household efficiency. By providing information on water consumption to customer buying white goods and bathroom fittings, evidence from a similar scheme in Australia and the rollout of the energy labelling scheme in the UK has shown that it does drive changes in customer behaviour.

It is therefore critical that the Government progresses with the proposed scheme. We are also keen that the scheme should develop to include minimum standards for buildings, as this would help deliver additional savings in the future. These are key elements in the Government's Plan for Water released in early 2023, which enables a higher level of confidence in the delivery of this option.

The below table highlights the level of savings proposed through water labelling.

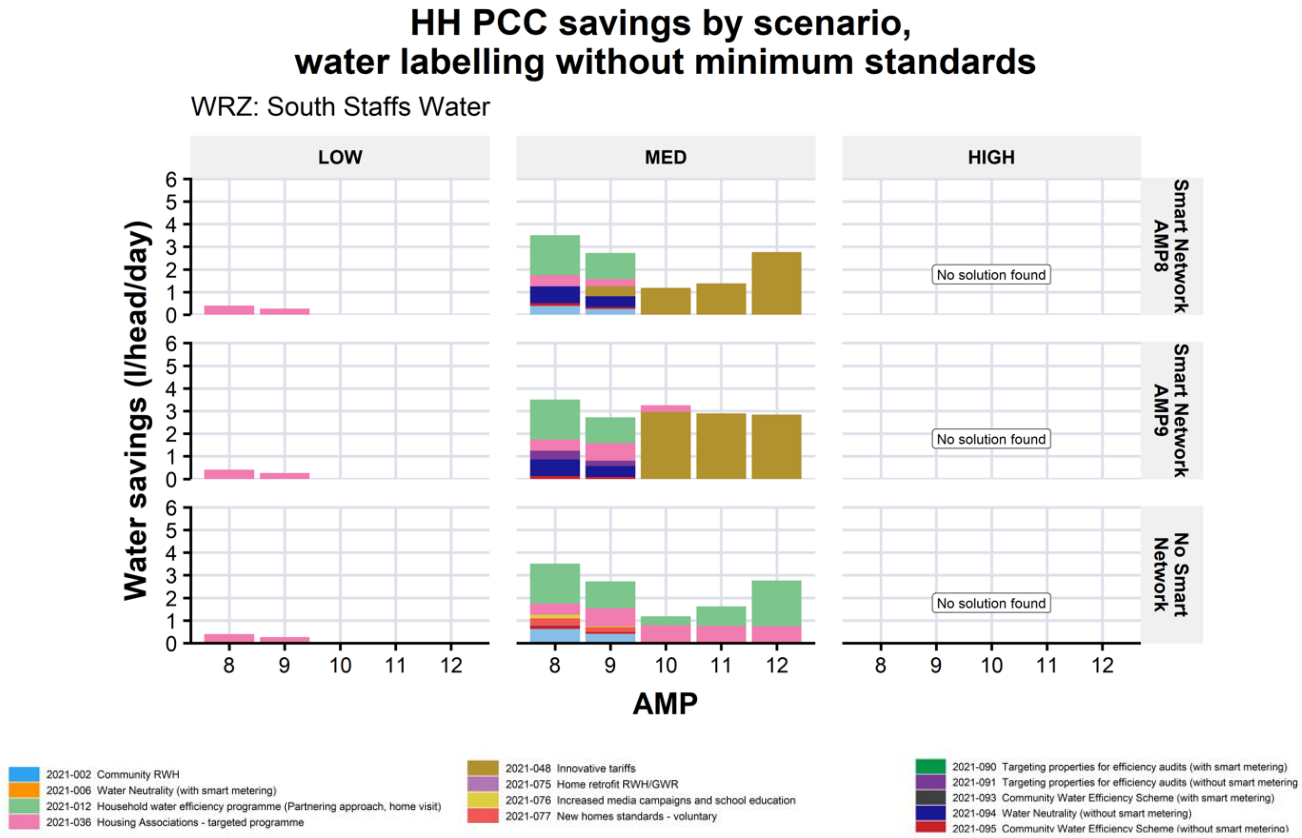
Table 38 Water labelling demand savings for South Staffs

				Cumulative benefit by AMP				
Activity	**ID**	**Year activity starts**	**Total benefit by 2050 Ml/d**	**AMP8**	**AMP9**	**AMP10**	**AMP11**	**AMP12**
Water labelling no minimum standards	WL_02	2025	20.4	2.29	7.21	13.67	17.86	20.4

10.1.4.2 Our proposed water efficiency plan

We are including delivery of 110 l/h/d by 2050 in our proposed plan, including delivering the interim Environment Act target of 122 l/h/d by 2038. The below graph shows the output of the different scenarios we explored at the draft plan stage, where we assumed that metering delivered no direct demand savings and outlines how the combination of activities is proposed in order to deliver this household consumption reduction.

Figure 17 Water efficiency activities



For the revised draft plan, we have updated our assumptions around the benefits delivered by metering, meaning that a programme delivering universal metering will deliver its own direct benefits, as well as enable others. As a result, we ran updated scenarios to understand the impact this has on the water efficiency targets, and to then look at what additional activities are required to meet the targets.

The optimiser continued to show that we need a smart network (including smart metering) to be in place for the target to be achieved. As detailed in section 10.1.1 above, our plan looks to deliver this by the end of AMP9 as we cannot achieve the leakage targets if we take a longer period of time, and it is not cost beneficial or deliverable to do it in a shorter period of time. Smart metering enables utilising innovative tariffs on a larger scale once deployed, and this forms a large part of our water efficiency programme from AMP10 onwards when we have universal metering in place. These innovative tariffs explored are rising block and seasonal. The rising block tariff works by increasing charges when volume consumed exceeds a set threshold. In seasonal tariffs, charges are varied during seasons with high or low consumption. When combined with smart meter data, variable tariffs could also be introduced based on peak times and seasons. This option incentivises reduced consumption, leading to improvements in PCC. It is estimated that the saving will be around 2% of household consumption.

Before then, we look to build on the existing programmes we have and undertake water efficiency home audits and work with housing associations to deliver a targeted programme of water efficiency advice and water efficient device installation.

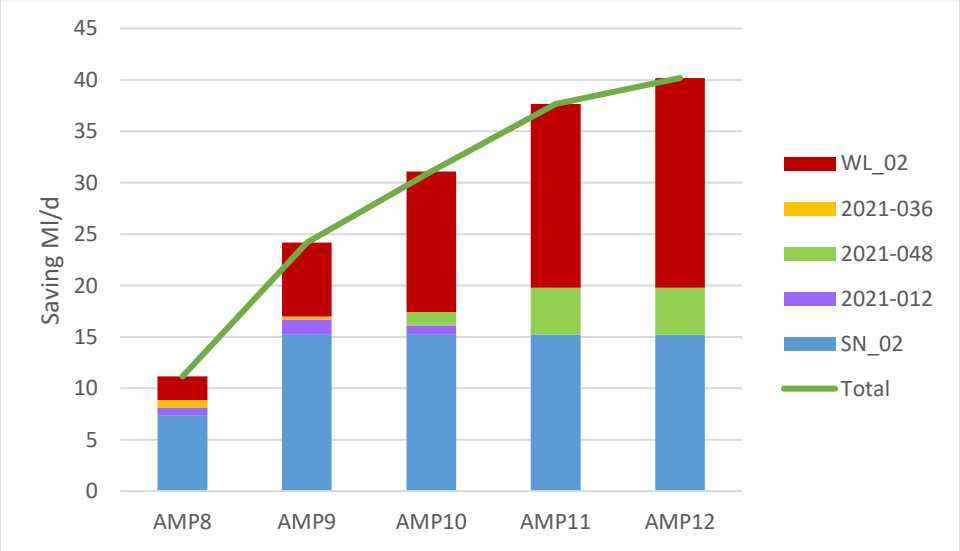
As evidenced in chapter 4, our customers have stated that they want us to do more to educate customers in their water usage and the ways to save water. As well, they want us to share more information to all of our customers of why this is so important; so, to share more on our water stress status, the future challenges and the link between demand and the environment.

The table and graph below show the benefit each individual activity provides over the lifetime of the plan.

Table 39 Water efficiency demand savings for South Staffs

				Cumulative benefit by AMP				
Activity	**ID**	**Year activity starts**	**Total benefit by 2050 Ml/d**	**AMP 8**	**AMP 9**	**AMP 10**	**AMP 11**	**AMP 12**
Universal metering rollout	SN_02	2025	15.2	7.40	15.20	15.20	15.20	15.20
Household water efficiency programme (partnering approach, home visit)	2021-012	2025	0	0.75	1.50	0.90	0	0
Innovative tariffs	2021-048	2035	4.59	0	0	1.32	4.59	4.59
Housing associations - targeted programme	2021-036	2025	0	0.71	0.28	0	0	0
Water labelling	WL_02	2025	20.40	2.29	7.21	13.67	17.86	20.40
		Total	**40.19**	**11.15**	**13.04**	**6.90**	**6.56**	**2.54**
				In AMP reduction				

Figure 18 Water efficiency profile



We also propose to continue with our developer incentive programme, which has helped to deliver reductions in proposed demand throughout AMP7 and we will include these proposals in our PR24 submission. Examples include:

- Incentivise developers to build more efficient homes through reduced connection charges.
- Work with developers to install water butts at all new properties.
- Working with developers to develop rainwater harvesting systems and approaches.

10.1.4.3 Water efficiency costs

We have included the cost of our proposed water efficiency programme in the following table.

Table 40 Cost of our proposed water efficiency programme

	Option ID	AMP8 £M	AMP9 £M	AMP10 £M	AMP11 £M	AMP12 £M	Total £M
Universal metering rollout	SN_02	39.47	34.78	0	0	0	**74.25**
Household water efficiency programme (partnering approach, home visit)	2021-012	4.04	4.04	0	0	0	**8.08**
Innovative tariffs	2021-048	0	0	1.49	0	0	**1.49**
Housing associations - targeted programme	2021-036	3.25	0	0	0	0	**3.25**
Water labelling	WL_02	0	0	0	0	0	**0**
	Total	**46.76**	**38.82**	**1.49**	**0**	**0**	**87.07**

10.1.4.4 Compliance with Environment Act Target for water efficiency

The Environment Act target looks to reduce PCC to 110/l/p/d by 2050, with an interim target of 122 l/h/d by March 2038. Our plan outperforms the interim target by reaching 116.5 l/p/d by 2038 and goes on to deliver 110 l/h/d by 2050 and therefore achieving the targets set in the Act.

The Act also introduces a new target for the distribution input per capita – this means it includes all of the water that we put into our networks that is either then used by our customers (consumption), lost as leakage, or used for operational use e.g., network mains flushing for water quality. The measure covers both household and non-household population and accounts for increases in population – the target looks to ensure that the water entering our system per person reduces by 20% by 2038 from the 2019/20 baseline position.

The below table shows how our plan delivers against this target and the associated interim targets defined in the Act. Our programme, whilst achieving all other demand management interim targets, falls slightly short of the 2027 interim target for DI per capita. This is due to the modest reduction between 2020 and 2025 where our activities and funding had been set before the targets we developed. As the demand management activities and funding for these were set before the Environment Act target came into being, there is little scope to affect this, other than to significantly accelerate our demand management programmes in the first two years of AMP8. Having reviewed this, we do not think this is efficient or deliverable, and as we meet all the component demand activities' interim reductions, we are not proposing to change our plan to hit the 9% in 2027. From 2025 however, we include new streams of work such as non-household demand reduction programmes, and we quickly catch up so we that we meet the target by 2032. Our overall programme also outperforms the Environment Act target by delivering a total of 23% reduction by 2038.

Table 41 Performance of our water efficiency plan against the Environment Act 2021 targets

Date	WRMP DI per person l/day	WRMP % reduction from 19/20	Env Act requirement l/d
2019/20 baseline	221.8	-	-
31/03/2027	209.7	5.5%	9%

31/03/2032	190.4	14.2%	14%
31/03/2038	170.0	23.4%	20%

10.2 Delivery of our demand management options

Demand management is the bedrock of our plan. We do not use any supply options and rely on it to ensure we have a positive supply demand balance throughout the planning period. We also need to ensure we meet ambitious demand reduction targets as expected by our customers and as outlined in various Government plans.

Therefore, it is critical that we have a robust process for the delivery of the various activities, as well as the monitoring and reporting of our performance. This will ensure we are able to react quickly should we meet any challenges or issues relating to the delivery of or the benefits recognised by any of the activities.

There are various risk factors that may impact our delivery:

- Weather – increased dry weather spells or freeze thaw events may have a material impact on the level of leakage on our network due to ground movement.
- Government delays – delays to the rollout of the water labelling scheme may lead to a delay in the benefits being recognised.
- Third party influence – some of our activity relies on collaborative working with retailers and developers. Where priorities and goals are not aligned, this could reduce the benefits recognised.
- Customer behaviour – we have an ambitious programme that looks to provide advice and support to customers to influence behavioural change, as well as practical measures, but this is an element not wholly within our control and must be sustained for the benefit to continue.
- Current affairs – all companies have substantial smart metering campaigns and sourcing these meters is currently challenging due to external factors in other countries. This has the potential to delay the rollout of programmes and the benefits recognised as a result.
- Covid #2 – by this we mean the next significant unforeseen event that has a significant impact on demand for water. Covid-19 saw PCC increase significantly and has had a lasting impact on the level of demand.

We plan for some uncertainty through our headroom assessment which allows us some scope for small changes to profiles across the planning period. We also test our plan against various different scenarios to understand the impact these would have on our plan. These allow us to ensure our plan is robust and can cope with uncertainty. However, we do not want to include expenditure to ensure our plan can meet all scenarios as this may lead to unnecessary investment in options that have little or no utilisation. This is not best value for our customers or the environment. However, we do need to ensure we have a way to adapt should some of these scenarios come to pass. Therefore, we use the outputs of these scenarios to develop an adaptive pathway that we can take should we see the scenario come to pass. Our adaptive pathways have clear trigger points. This is the stage where we would need to switch onto the adaptive pathway. We discuss the scenario testing we've undertaken on this plan in section 10.6 and the adaptive pathway we have developed as a result, including the trigger points, in section 10.7.

The critical first step though is to ensure we understand and monitor our performance closely and reliably. This means we can react quickly to any changes we see that are impacting on our plan. We have several mechanisms for monitoring our performance as shown in the table below.

Table 42 Demand management reporting

Mechanism	Frequency	Reported to who?
Weekly status overview for leakage performance	Weekly	Internal – Head of Leakage and Director of Customer Operations
Monthly reporting for key components: DI Leakage PCC NHH consumption	Monthly	Internal – reported monthly to Exec and Board
Quarterly reporting of performance against Performance Commitments for PCC and leakage	Quarterly	Internal – reported monthly to Exec and Board
WRMP annual review	Annual	Environment Agency
Annual Performance Review, including Performance Commitments for PCC and leakage	Annual Monthly progress is reported to Exec and Board	Ofwat

Where delivery or benefits are identified as off track, this is managed through internal action plans and increased reporting. These action plans will identify the appropriate action to take to rectify the issue, and these may include (but are not limited to):

- Deep dive into performance issue to identify improvements.
- Review benefits and costs of activities and compare to WRMP assumptions. Understand factors negatively influencing this and adjust accordingly.
- Review balance of activities – if one delivers less benefit than assumed, adapt the programme to ensure delivery of the required benefits for the cost identified.
- Increasing resource to enable additional capability.

From our planning work, we know that other options have potential to deliver more benefit e.g. innovative tariffs could deliver more savings if we expand our operation of this. We would look to utilise these areas to bring back any delivery that is off track.

In addition, we will continue to identify additional opportunities for partnership and collaborative opportunities to deliver benefits in this area. We will continue to seek and support innovation to enable delivery, reduce the risk profile and deliver the benefits required more cost efficiently. We have already actively participated in the Ofwat innovation fund for demand management ideas and have been successful in a bid we led on this. We are continuing to explore these opportunities and welcome the Ofwat fund to boost new approaches towards water efficiency.

We have also participated in the WaterUk leakage roadmap and are part of the group working towards the water efficiency roadmap. We are actively engaged in the Waterwise Water Efficiency Forum, as we seek to work across the industry to deliver the required benefits.

Demand management is a huge focus for all water companies, and we firmly believe that we need to work together across the sector in order to deliver the ambitious targets. We will have a higher level of success in key areas such as

influencing customer behaviour to reduce consumption if we are all delivering the same message at the same time. This consistency is important for both our household and non-household customers, and a combined effort will also be the most cost beneficial. We will continue to strive for this collaboration through groups such as WaterUk, and involvement in industry wide projects by Artesia and UkWir. We will also continue our work in club engagement projects working with other companies to engage retailers in order to establish ways of working that can deliver benefits for all.

We are therefore supportive of the proposal for a demand management equivalent of the regulatory alliance RAPID, that is being proposed by CCWater. We are seeing large scale progress on new water resource projects through the alliance of regulators RAPID (Regulators Alliance for Progressing Infrastructure Development) working together with regional water resource planning groups under a clear governance regime, an agreed funding stream, and explicit government support. We believe a similar approach focused on demand management is required to support the ambitious programmes required across the industry. ARID (Accelerating Reductions in Demand) would ensure that demand management measures are understood in terms of their impact on water use and that innovative measures are developed and tested, as well as increase the awareness of the importance of water to society, economy and the environment.

10.3 Strategic Environmental Assessment (SEA) of Programme

We have undertaken a Strategic Environmental Assessment on all our options, both for supply and demand. These are included in appendix P.

Our demand measures were bundled together for the purposes of the SEA review. This means that an SEA was undertaken on leakage reduction, consisting of the activities detailed above, and given an overall assessment for that. Hence the values are not included in the planning tables as they are not broken down to individual activity levels. However, they can be seen in appendix P.

Our demand management programme SEA is found in section 6.3 of appendix P and raises no concerns.

10.4 Final planning demand forecast

As a result of our ambitious demand management proposals the final planning demand forecasts 67.35 Ml/d lower than the baseline forecasts by 2050. The savings are broken down as follows in the below table.

Table 43 Summary of demand management savings by option

Demand Management Option	Saving by 2050 / Ml/d
50% leakage reduction	22.70
110 l/h/d (including water labelling)	40.19
9% NHH reduction	11.04

10.5 Supply proposals

We do not propose any additional supply options within our plan due to the needs of our customers and the environment being met through demand management options.

10.6 Scenario Testing

The Ofwat common reference scenarios look at various different factors and the impact they may have on planning. It is important that our plan is based on the most likely scenarios to ensure that it is robust and doesn't over- or under-estimate investment needs. We have outlined below our view of the most likely scenarios for each of the Ofwat common reference scenarios:

- **Climate change** – The high climate change scenario looks at RCP8.5 from the UKCP18 projections, whilst the low climate change scenario represents RCP2.6. Our preferred plan is based on RCP6.0. This is because we believe this to be the most likely scenario based on current commitments and ambitions on global warming. When reviewing the high and low climate change scenarios against our preferred plan, the low scenario reduces the climate change impact by 2.01 Ml/d, and the high scenario increases it by 6.57 Ml/d.
- **Technology** – This scenario looks at the impact that technological advancement may have on our ability to deliver benefits relating to carbon reduction and more efficient and effective demand management. The high scenario includes 100% smart meter penetration by 2050, smart networks in place by 2035 and low-emission HGVs and fleet by 2030. The low scenario has a smart network in place by 2040, with low emission fleet by 2040 and carbon-free baseload electricity by 2035. Our proposed plan is more aligned with the high technology scenario as this represents our existing trajectory through AMP7 and beyond, with many elements already in progress. Slower delivery increases the overall cost of the programme as it takes longer to recognise the efficiencies that new technology can unlock.
- **Demand** – The impact of different growth projections is the key factor of this scenario. The high scenario looks at using local plan data published by local councils and authorities, whilst the low scenario uses ONS population and household projections. Our preferred plan uses local plan data, as per the water resource planning guidelines, which is in line with the high demand scenario. This is because this represents proposed local developments as agreed in local council plans and so we deem this to be the most accurate and appropriate, especially in the short to medium term. The low demand scenario leads to a demand forecast which is 10.7 Ml/d lower by 2050 than our preferred plan.
- **Environmental ambition** – These scenarios look at the different ranges of abstraction reductions that may be required to meet long term sustainable abstraction. The low scenario represents that BAU scenario, whilst the high represents the enhanced scenario. Our preferred plan includes BAU+, which for our area is the same as BAU, and therefore aligned with the low scenario. This is due to the high level of uncertainty around the true scale of reductions required, and the BAU+ volumes best align to our no-deterioration investigation outputs we undertook in AMP7. The high scenario would increase reductions by 11.6 Ml/d.

In order to ensure that our plan is robust and capable of dealing with changing circumstances, we have stress tested this plan against different combinations of the above scenarios, as agreed across the regional planning groups. The key areas we have tested are:

- What if we our demand management activities only deliver 50% of the demand savings we're proposing?
- Ofwat Compound High scenario
- Ofwat Compound Low scenario

As our plan is solely dependent upon demand reductions, and some of these elements rely on third parties influences such as customer behavioural changes and government led initiatives, it is critical to understand the impact of not being able to achieve these ambitious targets.

The detail of the compound scenarios is included in the table below.

Table 44 Compound scenarios

Scenario	Environment	Demand	Climate change
Low	BAU+ scenario and use local reviews to remove waterbodies with significant uncertainty about whether the reduction is needed	ONS 2018 principal projections	RCP 2.6
High	Enhanced	Local plan based projections Retain policy target 110PCC and 50% leakage reduction	RCP 8.5 (RCM)

Through discussions with the Environment Agency local team, the low environmental destination scenario we have tested is the BAU+ scenario. This is because the local team felt there were no reductions suitable for removal to create a lower scenario.

In order to test our plan based on these scenarios, we update the supply and demand figures based on the differing elements within each scenario. If there is a supply demand balance deficit as a result of these changes, we utilise Valuestream to understand both the low cost and best value supply plan to resolve this.

The table below shows the impact that these three scenarios have on the preferred plan and the output required. We remove the D4 component from headroom in the demand management scenario as this relates to uncertainty around delivery, otherwise we are double counting some impact.

Table 45 Scenario Outputs

Scenario	Impact to demand or supply by 2050 Ml/d	SDB deficit in planning period?	Action required	Expenditure Impact
Ofwat Compound High	-6.57 (SDB = 10.7)	Yes – commencing 2029/30 but resolves by 2036	9.1 Reduce levels of service (2029-2036)	None
Ofwat Compound Low	+12.72 (SDB = 27.4)	No	None	None – our programme delivers mandatory demand management targets and therefore no opportunity to reduce expenditure

50% demand management achieved	-38.11 (SDB = -18.9)	Yes – commencing 2029/30	9.1 Reduce levels of service (2029-2036) 2.2.2.1 Increase storage at Blithfield - increase dam height by 2m (2036) 7.1.2.1 Third Party Option: Cana & River Trust, Birmingham Blithfield surplus (2036)	£101.63m

The compound low scenario improves the supply demand balance, so we must look to see if we would be able to reduce our level of investment in that scenario. However, as our plan only has expenditure to reach the Environment Act demand management targets, there is no opportunity to reduce the amount of demand management we do otherwise we will not meet the targets. Therefore, if either of the compound scenarios came to pass, our plan would continue as proposed.

The compound high and 50% demand management scenario would present a deficit in the planning period. We discuss the impact of this in the section below.

10.7 Adaptive Planning

As shown in section 10.6 above, two of the scenarios we tested created a deficit in the planning period, and so we need to create an adaptive plan. These are outlined in the sections below.

10.7.1 Compound High Scenario

In this scenario, we would see a deficit in our supply demand balance in 2029/30. Our data shows this deficit is only temporary until 2035/36 where the level of demand management activity we're proposing brings the supply demand balance positive again.

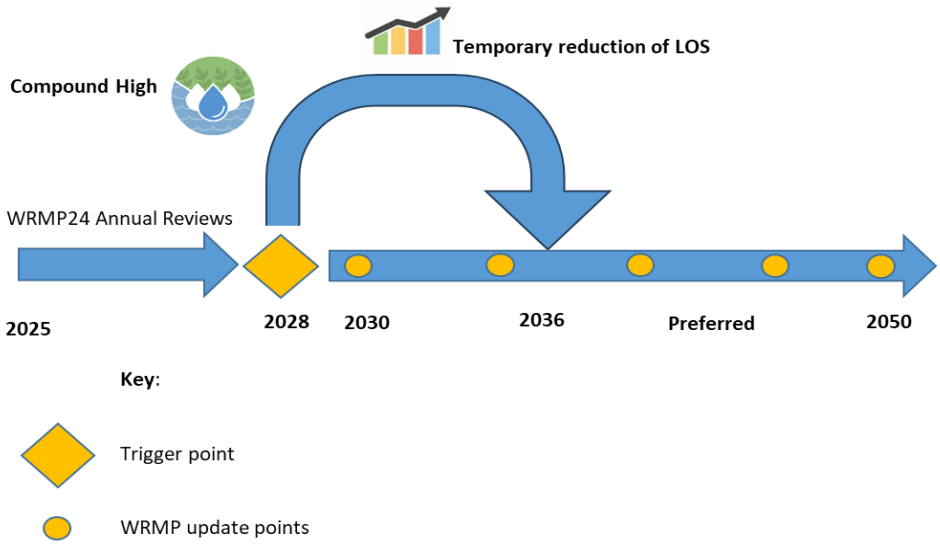
In this situation, we would normally identify a supply side option to resolve the deficit; however, all of our supply side options have lead in times which mean they would not be ready in time for 2029/30. As a result, we looked at a new feasible option that would see us temporarily lower our levels of service which would in turn provide a higher baseline DO. Our supply zone is already resilient to a 1 in 500 year drought event, but our level of service for TUBs (at 1 in 40 years) is actually the constraint with a lower DO than the extreme drought event. So, our option looked at reducing our TUB level to 1 in 13 and reducing our overall resilience to a 1 in 200 year event level. This option provides an addition 9.29 Ml/d of baseline DO.

When included in our best value planning tool, Valuestream, it selects this option until 2036. This is a temporary selection which is reversed in 2036 when the deficit is positive again. This also means that our plan would not look at

a higher cost supply side option that would only be required temporarily, and therefore would not be best value for our customers or the environment.

As this option has no lead in time, it can be deployed as and when required. In this scenario, it suggests it would be required in 2029 and so our trigger point for identifying whether we would need to deploy this alternative pathway would be in 2028, as outlined in the diagram below.

Figure 19 Compound High Scenario Adaptive Pathway



10.7.2 50% Demand Management Effectiveness Scenario

If our demand management activity only delivers 50% of the benefits we're forecasting, this would create a deficit in our supply demand balance in 2029/30, which increases to -16.4 Ml/d by 2050 at the end of the planning period.

We need to be able to analyse our demand management performance with robust data which means we need at least three years performance analysis to ensure we do not progress with building a supply side scheme too early and unnecessarily i.e. due to a single year dip in performance or without suitable time to resolve any areas of reduced performance. With this in mind, and the length of time supply side options take to develop, we need alternative options in the short term should our demand management only prove to be 50% effective.

Valuestream selects option 9.1 in 2029/30 which looks to reduce our levels of service. Valuestream only utilises this option until 2036 when it can utilise supply side options that require time to develop and build. It then deselects this option, thereby reverting these temporary changes so we have a 1 in 40 TUB level and return to 1 in 500 drought resilience before the 2040 date the WRMP planning guidelines state this must be achieved.

However, even with this option, there would still be a deficit until 2036 when the first supply side option could become available. Therefore, we would need to delay implementing the environmental abstraction reductions from 2030 and start in 2036 when alternative supplies have been established.

Valuestream selects option 2.2.2.1 in 2036 which looks to increase this size of the dam at Blithfield Reservoir in order to provide additional storage and an increase of supply of 16.37 Ml/d per day. This supply side option has a development and build time of seven years. As the water would be required in 2035/36 in this scenario, this means work would need to commence on this scheme in 2029. This means, we'd need to determine whether the scheme is required or not in 2028 – this is called the trigger point.

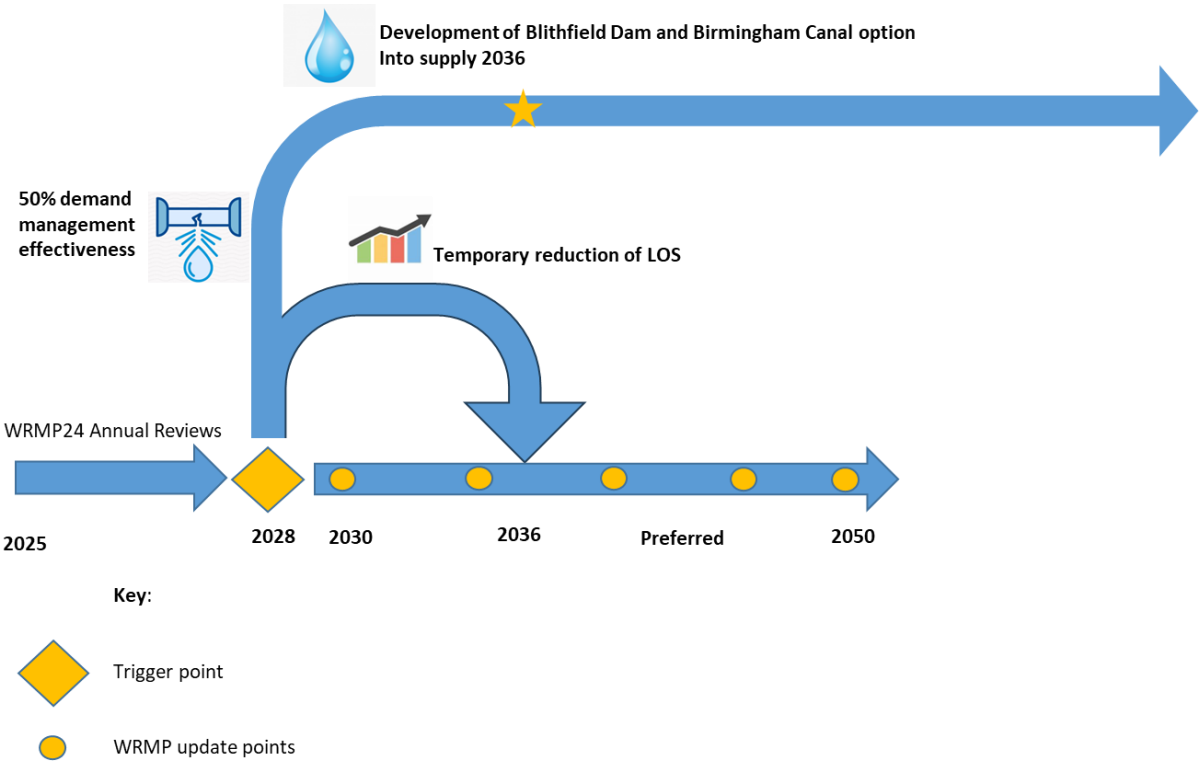
However, the Blithfield option does not resolve the full deficit at this stage and so Valuestream selects option 7.1.2.1 at the same time. This has the same trigger point as the Blithfield Reservoir option, enabling the scheme in 2036. This scheme looks at utilising surplus water in the Birmingham canal network and moving it to Blithfield to increase the yield and DO by 15 Ml/d.

Once both of these schemes are in place, we are able to then commence all of the environmental destination abstraction reductions at pace and deliver these by the original planned date of 2040.

Every year we undertake an annual review of our WRMP to determine whether the assumptions we made on elements such as growth, climate change and demand management were accurate, and then assess any variances and the impact they have on the plan. As part of this, we report on how we're performing against the commitments we made in our plan and if we are off track, we will include a plan to rectify this for delivery in the coming year and the rest of the AMP. We would only look to trigger the pathway if the improvement plans developed at the annual reviews have proved unsuccessful and we are seeing continued low levels of performance.

If our demand management has only delivered 50% of the benefits, then in 2028 we would start progression of these options to ensure the supply side scheme is developed and able to provide water when we need it. This is represented in the diagram below.

Figure 20 Demand Management Adaptive Pathway



We may see a scenario where the demand management reductions are not as low as 50% of expected targets but are still lower than expected. If we see this, we will update our forecasts annually to understand the impact of any reduced performance to determine when a negative SDB position would be reached and therefore when the supply side option is required and its corresponding trigger point and update the above diagram accordingly.

We believe the likelihood of this scenario is low; leakage reduction forms a large part of our demand reduction and is an activity we understand and perform well, having delivered against our leakage targets successfully throughout

AMP7. We have extensive experience in demand management and comprehensive plans to monitor and rectify any issues, as outline in section 10.2.

However, as our plan has an adaptive pathway that could see us starting the development of a supply side option in AMP8, we need to ensure we are suitably prepared should this scenario come to pass. As a result, we have included funding in our PR24 business plan to undertake feasibility into this supply scheme in early AMP8. This will mean we are ready to go with full development of this scheme should we determine it is needed at the trigger point.

10.7.3 Enhanced Environmental Destination Scenario

We have also developed an alternative pathway to represent the potential options relating to environmental destination. We have included the BAU+ scenario in our preferred plan due to the high level of uncertainty around the level of abstraction reductions that will be required. These will be confirmed in AMP8 through investigations as part of our WINEP programme, and at WRMP29 we will represent these reductions identified along with the timescales and priority for delivery.

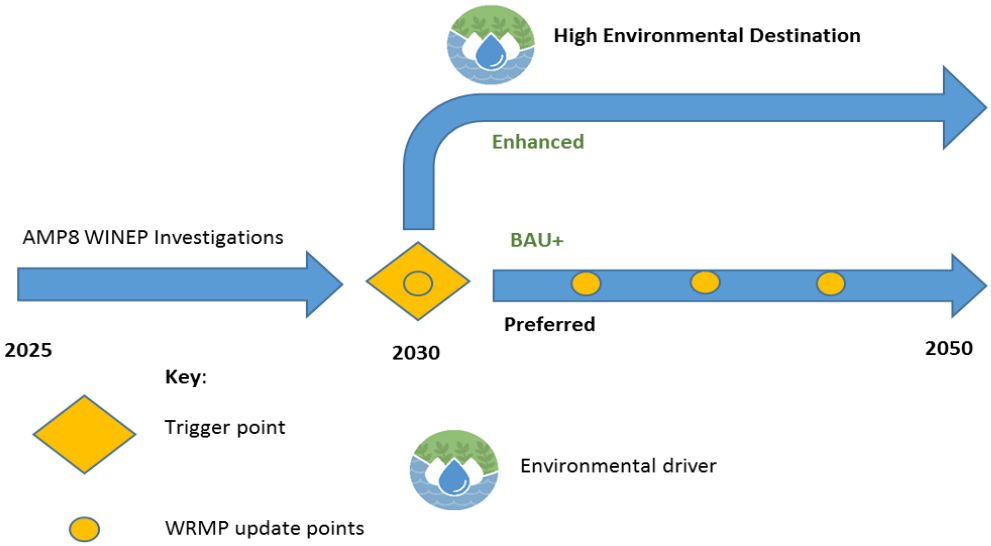
Due to this uncertainty, it is important to understand the impact of any change to those abstraction reductions. The current enhanced scenario looks at reducing abstraction by 59.61 Ml/d. Our final plan SDB with no environmental destination is shown below:

Table 46 Final SDB with no environmental destination

Year	2030	2035	2040	2045	2050
SDB (Ml/d)	21.38	42.82	53.00	60.62	67.17

Ensuring we maintain a healthy SDB, we can achieve the enhanced scenario by 2050 with no additional supply side options. The trigger point for this adaptive pathway would come at WRMP29 as we analyse the results of our AMP8 investigations and determine the necessary abstraction reductions for our region. If the investigations show we need to undertake the enhanced scenario level of reductions, we will switch onto our alternative pathway, and we would confirm in our WRMP29 the exact timing and priority for each licence. The diagram below shows this adaptive pathway and the trigger point.

Figure 21 Environmental Destination Adaptive Pathway



10.8 Alternative plans

Ofwat's definition of the core pathway looks at the investment that is necessary to meet future low scenarios, as well as any investment required to keep future options open (such as enabling work). The core pathway also includes no and/or low regrets investments, e.g., investments that are required in both low and high scenarios.

The compound low scenario would give us a more favourable supply demand position of 11.03 Ml/d by 2050. If our core pathway represented this, we could reduce the amount of demand management required to maintain a positive SBD. However, in this situation, we would not be able to meet the Environment Act demand targets, and therefore this pathway would not achieve all the elements we need to as defined in the water resource planning guidelines (WRPG).

Our preferred plan represents the most likely scenario. Whilst this is not the true definition of a core pathway, our true core pathway would not meet the WRPG. Therefore, we believe our preferred plan is our core pathway because it includes low regrets actions that allow for further feasibility in the future, should that come from worsening climate change or an increased environmental ambition (as detailed in the previous section). Our adaptive plan has a clear trigger point for the alternative pathway should a more adverse scenario recognised and does not require any enabling works. In addition, the compound high scenario would adversely affect our supply demand position by 17.96 Ml/d by 2050. However, it is still a positive SDB and therefore does not warrant any additional investment.

The investments included will deliver under a wide range of plausible future scenarios, as shown previously. Examples of this low regrets investment include:

- Smart metering – smart metering is a key enabler of demand reductions as we currently have over 50% of our customer base unmetered. In addition, it enables a range of water efficiency and leakage activities that deliver demand savings at a lower cost that traditionally, as the smart meter data allows us to be more efficient and effective. It also enables new options, such as innovative green tariffs, where we can potentially deliver large savings for very low cost. Through this delivery of both direct and indirect benefits, it is a low regrets option.
- Customer supply pipe leakage repair and replacement – 30% of all leakage is on customer properties and so it is important that we step into this leakage challenge as well as that on our own network. As we can work directly with customers, offering different levels of support and assistance depending on the

situation, this is also a lower cost leakage option. Through this engagement with customers, we can share water efficiency messaging and raise awareness, and therefore there are multiple benefits to this lower cost demand reduction activity, hence its low regrets status.

- Innovative tariffs – these rely on the installation of smart meters and look to incentivise customers to reduce their consumption by charging less for lower water use or provide community funding for local green projects for communities that can reduce their water use below a certain level. This is a low-cost activity that helps raise awareness and delivers benefits to the customer, the company and the environment.

The optimisation of activities described previously means our preferred plan is also our least cost plan.

We also need to look at a version of our plan that is best for the environment and society. This means it should deliver real quantifiable benefit for the environment and society, as well as delivering multiple benefits such as improvements to water quality or reduction in greenhouse gases. There are three key approaches to this:

- Biodiversity net gain
- Natural capital
- Strategic Environmental Assessment

We have completed an SEA for our plan which reviews our options. We have also undertaken natural capital and biodiversity net gain assessments for all supply options. There are particular challenges around assessing demand management options, particularly using natural capital assessment and biodiversity net gain. This largely relates to the difficulties of valuing water left in the environment. This includes both the value to the environment and wider society. Due to these complexities, we have not undertaken a natural capital assessment of demand side options.

As policy is a large driver of demand management, we have considered our demand management programme selection separately in our decision-making. As we do not need any supply options in our programme, there is no separate plan that is best for environment and society.

The WRMP has a 25-year planning horizon; however, the Water Resources West regional plan has a 50 year planning horizon. Whilst the scenarios tested do not create deficits in the WRMP planning horizons, they do create deficits before 2085. Our preferred plan also shows a deficit in 2068. We need to resolve these deficits for the regional plan.

For the preferred plan and each of the scenarios tested, we have assumed that additional demand management activity ceases at the end of the WRMP planning period of 2050. This means we hold the demand management at the level we achieve at the end of the plan, but do not reduce it further. We then utilised Valuestream to determine the best value options for resolving the deficits in each case, and have detailed these in the table below:

Table 47 Post 2050 options selections for WRW regional plan

Scenario	Deficit date	Deficit by 2085 (Ml/d)	Valuestream Option choice	When option(s) required	Cost of option(s) (£m)	Lead in time for option (years)	WRMP trigger point
Preferred plan	2063/64	-23.48	2.2.2.1 7.1.2.1	2064 2078	57.76 43.87	7 7	2060 2075

50% demand	2029/30	-33.35	9.1 2.2.2.1 7.1.2.1 6.1.3	2029 2036 2036 2062	0 57.76 43.87 230.11	0 7 7 10	2028 2028 2028 2052
Ofwat compound low	None	None	n/a	n/a	n/a	n/a	n/a
Ofwat compound high	2029/30	-34.04	9.1 2.2.2.1 7.1.2.1 6.1.3	2029 2060 2072 2083	0 57.76 43.87 230.11	0 7 5 10	2028 2052 2056 2072

These adaptive pathways will be represented in the WRW regional plan.

10.9 AMP8 Water Industry Environment Programme (WINEP)

We have submitted our proposed AMP8 WINEP programme and are working with the Environment Agency to agree the final plan. There are key elements that relate to the WRMP as detailed below:

- Environmental Destination Investigations – we will undertake extensive investigations during AMP8 to understand the true nature of the abstraction reductions required to achieve the required environmental destination. This will involve working with Severn Trent Water, as we share catchments, to understand the specific needs of particular waterbodies and determine the priority and scale of reductions required.
- Environmental Destination Improvements – we are keen to ensure we take positive action to contribute to the environmental destination in the short term, so we do not wait until the outcome of the investigations to make positive environmental improvements. Through our catchment prioritisation work undertake through the WRW environmental destination workstream we have identified some short-term measures we could support, such as hydromorphological changes or fish passes.

Previously, our catchment management programme has formed a large part of our WINEP programme. For AMP8, this work now moves into our BAU activity and will be included in our PR24 business plan. We propose to continue our efforts in our region to deliver improvements to groundwater quality at source. Our Spring programme, working with local farmers and landowners, has seen significant success in reducing nitrates and metaldehyde, and we plan to expand both the area we cover with this scheme, but also the range of pollutants we tackle. This will help deliver improved raw water quality which will ensure we are able to maximise our existing raw water resources.

We are also looking to develop a 25-year environment plan over the next couple of years that will align with the Government 25-year environment plan and will provide a clear line of sight for the environmental protection and improvements we wish to deliver over the lifespan of this WRMP.

Our plan also looks at supporting other key areas such as delivering biodiversity improvements, supporting removal of invasive species such as mink, the protection of species and river restoration work.

10.10 Greenhouse gases and our journey to Net Zero carbon

We commissioned Atkins to identify and produce embodied and operational carbon cost data for each of our feasible supply options. This data then fed into our ValueStream (section 9.3) modelling to better determine our best value plan. The operational carbon costs for supply options have been derived from each options' total power (kWh) usage multiplied against a grid carbon factor (tonnes CO2e/kWh) over the 80-year period from 2025. This grid carbon factor has been taken from the government's 'Greenbook supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal', data tables 1 to 19[3]. From this spreadsheet, Table 1's electrical emission factors provide long-run marginal estimates for commercial and public sector consumption base.

For demand management options, we have calculated the impact on carbon based on the saving each generates in Ml/d. This is because we understand our carbon impact for each megalitre of water we produce, and so every megalitre less that we need to produce, there is a direct saving of power and chemicals that can be quantified in tonnes of carbon and cost of carbon.

Using the Defra intensity metrics, we have updated the 2021/22 calculation of kg of carbon per megalitre of water produced (kgCO2e/Ml) by including an uplift for purchased electricity and estimated chemical usage. We calculate our carbon output to be 319.77 kgCO2/Ml.

As required by Direction 3(d) we have described the "the emissions of greenhouse gases which are likely to arise as a result of each measure which it has identified in accordance with section 37A(3)(b)." The following table shows in numerical format our estimates of greenhouse gases that are likely to result from our current and future operations. These estimates show the difference between our baseline and our final plan, this difference incorporates the impact of the options selected in our preferred plan.

Table 48 Greenhouse gas comparison of current operations and preferred plan

Total annual carbon /tonnes	2021/22	2024/25	2029/30	2034/35	2039/40	2044/45	2049/50
Current operation & baseline plan	38,095	37,274	38,669	38,158	38,438	38,782	39,065
Preferred plan	-	-	35,858	33,111	31,701	30,885	30,436
WRMP19 plan	37,662	37,181	37,771	38,052	38,357	37,853	n/a

[3] Reference: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

Our plan is based on demand management alone. These activities, such as leakage reduction and consumption reduction, lead to reductions in carbon emissions due to reduced water abstraction, treatment, chemicals and pumping. Our journey to net zero emissions is included in section 10.9. The table below details how each activity contributes to the overall reduction in carbon.

Table 49 Estimated greenhouse gas emission reductions from our selected final plan options

tCO2e saved (cumulative)	Year 5	Year 10	Year 15	Year 20	Year 25
	2029/30	2034/35	2039/40	2044/45	2049/50
Household customer metering	864	1,774	1,774	1,774	1,774
Leakage reduction	1,027	1,410	1,865	2,188	2,649
Water efficiency commitment	438	1,049	1,855	2,620	2,917
Non-household consumption reduction	481	804	1,223	1,289	1,289

Whilst our plan does not include any new supply options, we are committed to ensuring that our options development focuses on how we can reduce carbon emissions through design. In AMP7, we have been progressing with our major upgrade at our River Severn Works. Upon commencement of the project, we identified a greener solution, and we were successful in our bid for Green Recovery funding. As a result, will have installed the largest ceramic membrane treatment plant in the UK by the end of AMP7. This will reduce our carbon emissions and shows our ambition to drive forward innovation in our options development to ensure reduced carbon.

Also, to signpost where further information on this can be found outside of our WRMP, we as the South Staffordshire group, report our estimates of greenhouse gas emissions in our annual reports.

10.10.1 Our journey to Net Zero operational carbon by 2030

Net zero means achieving a balance between the greenhouse gases put into the atmosphere and those taken out. When what we add is no more than what we take away, we reach net zero.

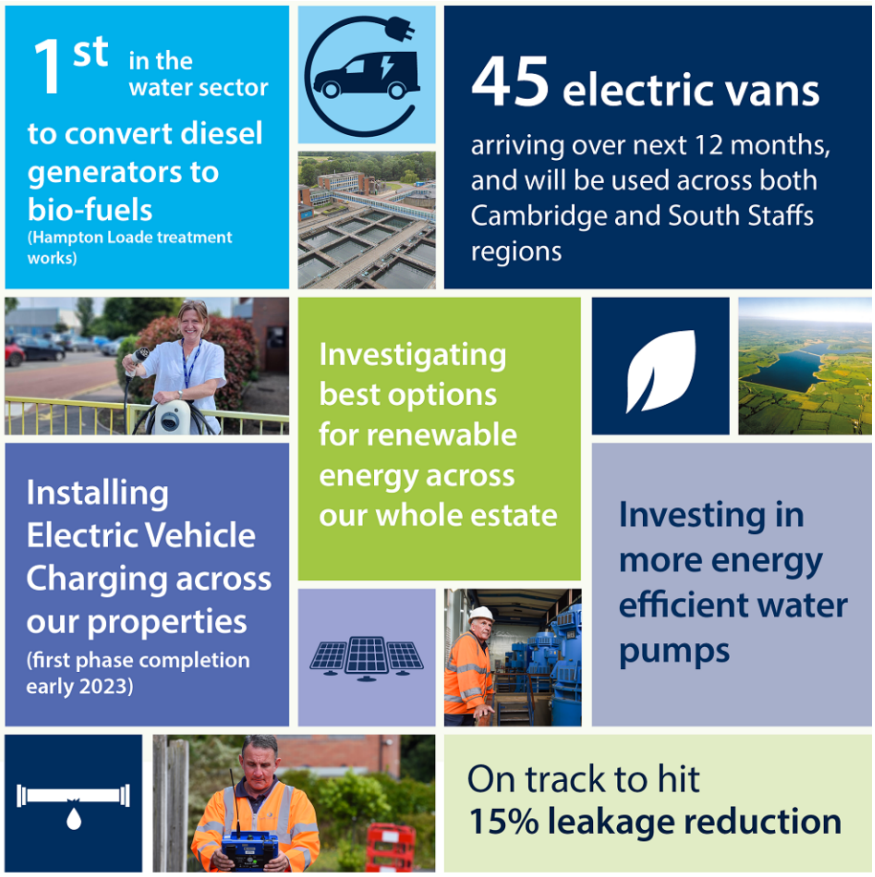
Water companies are not like other businesses. We provide a vital public service hinged on major infrastructure and yet we're also a large landowner and custodian of the natural environment. Moving and treating water is an energy-intensive process leading to millions of tonnes of greenhouse gas emissions each year.

In November 2020, water companies unveiled a ground-breaking plan to deliver a net-zero water supply to customers by 2030 in the world's first sector-wide commitment of its kind.

Our plan focuses on gross operational emissions associated with:

- Wholesome water (extraction, treatment, pumping and transport for maintenance).
- Bioresources/sludge management (treatment and transportation). *Note: Sludge to land emissions not included.*
- Administration activities and business travel

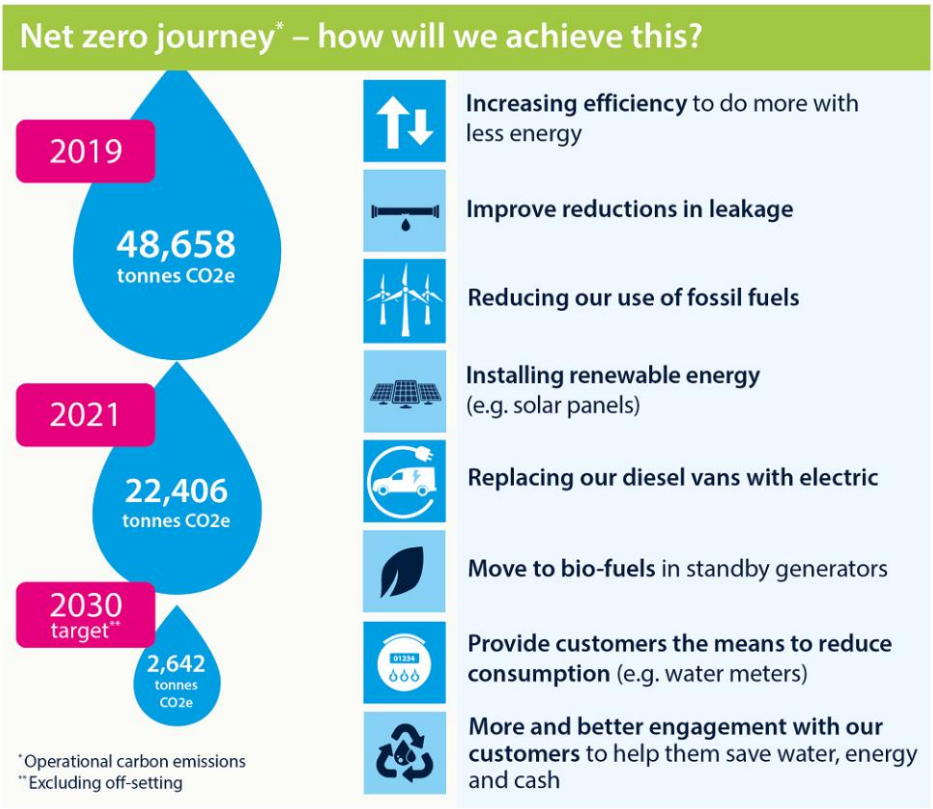
The below infographic shows what we have achieved so far on this journey to net zero during AMP7:



We are currently:

- Deploying Vauxhall e-combo electric vans to replace diesel across both regions (we have 14 electric vans in service at end March 2023).
- Carrying out a full estate assessment renewable energy assessment which will be completed by June 2023.
- Assessing all energy efficiency opportunities including existing programs (conversion of standby generation to biofuels, re-use of heat from existing operations rather than replacing boilers, installing low energy lighting, installing metering and energy management controls, etc.).
- Assessing, prioritising and accelerating leakage reduction projects.
- Benchmarking across the sector best practice in order to learn and replicate at pace and least cost.
- Continuing to deploy our Pump Efficiency Program (PEP) – 10 sites have been identified and surveyed for 2023.
- Reviewing and updating our systems to better measure and analyse the true cost (£, energy and carbon) of each litre of water.
- Targeting better engagement with our customers e.g., through our new initiative called “the Net Zero Citizens Jury”.

However, we recognise there is much still to do. We have demonstrated above that through reducing the demand for water, we in turn reduce the greenhouse emissions we make as a business, and this supports our journey to net zero. The below infographic shows the key additional activities we are delivering to achieve the operational net zero commitment by 2030.



10.11 Summary of our proposed programme

The table below summarises the key activities within our plan, and the demand savings associated with each throughout each AMP during the planning period.

Table 50 Summary of our proposed programme

		Cumulative benefit by AMP Ml/d				
Activity	**Total benefit by 2050 Ml/d**	**AMP8**	**AMP9**	**AMP10**	**AMP11**	**AMP12**
Water labelling no minimum standards	20.40	2.29	7.21	13.67	17.86	20.40
Universal Metering	15.20	7.40	15.20	15.20	15.20	15.20
PCC 110 l/h/d by 2050 (excl WL & metering)	4.59	1.46	1.78	2.22	4.59	4.59
50% leakage reduction by 2050	22.70	8.80	12.08	15.98	18.75	22.70
9% non-household consumption reduction by 2037	11.04	4.12	6.89	10.48	11.04	11.04
Total	**73.93**					

Our proposed programme is included in table 5 of the accompanying WRMP tables.

10.12 Bill Impact

The below table shows the AMP8 cost of our plan, as well as the total cost of the plan, and the impact this will have on customer bills as a result.

Table 51 Summary of programme costs and bill impact

	AMP8	Total WRMP24
Cost of programme (£m)	62.47	153.36
Benefits delivered (Ml)	24.07	73.93
Unit cost (£m/Ml)	2.60	2.07
Bill impact (£)	£7.74 (by 2030)	£11.78 (by 2050)

We can see that the unit cost per megalitre of benefit delivered reduces across the lifetime of the plan. This is due to our smart networks and metering programme which enables more efficient delivery of some activities we do today as well as unlocking new more cost beneficial activities.

The scale of our programme is below the threshold for delivery by alternative commercial mechanisms such as DPC. Our core programme is delivered primarily by us, but have various activities where we are working with stakeholders to deliver:

- Environmental destination investigations – we will work jointly on these to ensure we deliver an efficient and comprehensive view for each catchment.
- Water efficiency with developers – we have several proposals and activities where we will work with developers to deliver demand reduction, including incentivisation.
- NHH with retailers – we will work with retailers to deliver the benefits on non-household demand and continue to explore additional mutually beneficial mechanisms.

11. Final supply/demand balance

Our proposed demand management programme delivers a 73.93 Ml/d reduction in demand by 2049/50. This offsets the growth in demand associated with population increases in our region, as well as the necessary abstraction reductions we must make to protect the environment. As such, we have no need for additional supply options to meet the deficit.

The chart below shows the final planning supply/demand balance for the DYAA scenario. A healthy surplus will be created and maintained.

Figure 22 Final planning DYAA supply/demand balance and components of demand