TMS06 Our Long Term Delivery Strategy

October 2023

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Executive summary

Water is essential to life. From people to plants, birds to bees, farms to factories, we all need it to thrive. Every day, we supply top-quality water to over 10 million customers and take away 4.6 billion litres of wastewater from 15 million customers. But this job is becoming harder. From scorching summers to wetter winters, extreme weather is more common than ever. A growing population means more kettles boiling, showers running and toilets flushing.

Our purpose is to deliver life's essential service so our customers, communities and the environment can thrive.

Over the next 25-30 years, the water sector will face a series of major challenges, such as:

- Climate change – driving greater variability in rainfall patterns.
- Population growth – increasing the need for water resources and network capacity.
- Ageing assets – We have identified a deficit that is impacting on service and costs. This needs to be urgently addressed. This will require major replacement programmes, over many AMPs, to avoid asset health and service deterioration.
- Changing customer expectations – including rising service expectations, an increased focus on social purpose, sustainability and digitisation.
- Policy and regulation – changing societal views are already being reflected in a changing policy and regulatory environment.

In recent years, our customers' and stakeholders' expectations have been increasing, but our performance has in some areas fallen short. To close this gap and to meet future expectations will require fundamental transformation.

Our ambition: where will the company be in 25 years?

As the world around us changes, we can only deliver our purpose if we change too. Our ambitious vision imagines a world where we've learnt from the past and adapted to the future so our customers, communities and the environment can thrive.

It starts with tackling the issues that matter most to our customers right now: providing better customer service, finding and fixing leaks more quickly and reducing pollution.

And it goes beyond our core services to help us become a force for good: equipping local communities with new skills, restoring rivers and producing more green energy than ever before.

Our Vision for 2050 is structured in line with three pillars:

Figure 1: 'A Clear Future' – our Vision for 2050 summary

To achieve our vision, we are radically changing how we think and act. We are working smarter and working together because the challenge we're facing affects our entire industry.

We will bring our vision to life by:

Working smarter	Working together
To deliver our services more efficiently and effectively, we'll invest our time in: • Building a culture of innovation, enhancing our skills and thinking digital first • Helping to shape the future of the UK water industry • Transforming how we work with local partners • Securing funds and investing our customers' money wisely in our assets and communities	By shaping new partnerships and valuing insights outside our business, we can tackle big challenges like: • Keeping taps flowing for the future • Inspiring customers to save water, save money and prevent blockages • Joining forces to prevent flooding across our region • Restoring river health together

In 2021, we defined our Vision for 2050. This followed extensive engagement with customers, key stakeholders, and our Board. We can confirm that our Board fully supports our Vision for 2050.

As part of the 2024 price review (PR24), Ofwat has required all water companies to set out 25-year plans showing how they intend to meet their long-term ambitions. Vision 2050 serves as a key input and anchor point to our long term delivery strategy (LTDS).

Our LTDS takes us towards our Vision for 2050 and sets out how we will deliver for customers, communities, and the environment. There are a few areas where we do not have a plan today to achieve our vision, but we are challenging ourselves to unlock the pathway to Vision 2050. One example is sewer flooding, where eradication targets are an immense challenge particularly in parts of London where there are combined sewers. Section 6.2 outlines the areas where we have identified under 'working smarter' which will enable us to course correct our trajectory and deliver the stretch to our Vision 2050.

Our LTDS is aligned to Strategic Planning Frameworks and which set out how we will achieve a secure supply of water for our customers while protecting and enhancing the environment (WRMP) and to improve drainage and environmental water quality (DWMP).

Achieving the 2050 outcomes will mean significant improvement across most of Ofwat's common performance measures. A summary of our 2050 ambition across these measures is shown below.

Performance measure	Units	2022/23 performance	2050 ambition
For customers			
Customer contacts about water quality	Contacts per 1,000 population	0.43**	0.30
Compliance risk index	Numerical score	10.96	0.5
Water supply interruptions	Minutes per property per year	10:55	05:00
Mains repairs	Number per 1,000 km of mains	316.8	116
Unplanned outage	%	2.65	1.1
Sewer collapses	Number per 1,000 km of sewer network	3.55	3.89
Internal sewer flooding	Number per 10,000 sewer connections	1.91	0.40
External sewer flooding	Number per 10,000 sewer connections	18.49	5.00
For communities			
n/a – no common performance commitments relate to this theme. Instead, we will monitor a series of company-specific KPIs, reflecting the needs of the communities we serve			
For the environment			
Leakage	% reduction in Ml/d for a three year average from 2019/20	11	50
Per capita consumption	% reduction in litres per person per day for a three year average from 2019/20	-0.1	27.6
Business demand	% reduction in Ml/d for a three year average from 2019/20	N/A	15%
Total pollution incidents	Number per 10,000 km of wastewater network	56.7	11
Serious pollution incidents	Total number	17	0
Bathing water quality	%	50%	100%
River water quality (phosphorus)	Percentage reduction of phosphorus from 2020 baseline	6.19%	80%
Storm overflows	Average number of spills per overflow	16.80	5
Discharge permit compliance	%	99.48	100
Operational greenhouse gas emissions (water)	Tonnes CO2e	159,094.98	14,808.87
Operational greenhouse gas emissions (wastewater)	Tonnes CO2e	372,829.29	549,608.77
Biodiversity	Biodiversity units per 100km^2 for which the company provides monopoly services	0	0.56 (to 2035)

Table 1: Summary of common performance commitments

**Based on the methodology including contacts via social media and new communication channels

The above performance commitment ambitions flow from our vision, statutory planning frameworks, and other engagement with customers and stakeholders. We have also tested 'the package in the round' with our customers and stakeholders, discussing example overall bill implications and example options for the mix and sequencing of investment over time.

In delivering our Vision 2050, we create social and public value. We have started to implement a new approach to guide and measure both the public value we create and the delivery of our purpose. Our public value framework helps us identify, evaluate and deliver public value, inside of our core service, and balances cost and value to customers, community and the environment over the long-term. Our approach aligns with Ofwat's six principles of public value, making sure public value outcomes do not come at a greater cost for customers, unless supported.

The public value framework has been used to optioneer solutions to derive our best value plan, as part of our long-term delivery strategy. Therefore, our Public Value Framework has been used to inform our Best Value Plans.

Accordingly, delivering our LTDS enhancement expenditure will make a lasting positive impact to our customers, communities, colleagues and environment.

[1]Our strategy: how will the company get there?

Much of the required service improvement can be delivered through our base cost allowances (providing there are sufficient cost allowances set for base). However, there are instances where incremental enhancement expenditure will be required. Our key long-term enhancement areas are summarised below grouped by outcome area.

Enhancement area	Benefit delivered
For customers	
Lead pipe replacement	Eradicate all lead communication pipes to the boundary of all primary schools and nurseries by 2035 and replace all lead pipes by 2050
Cryptosporidium risk reduction	Risk at our 4 large London process sites mitigated by 2035
Water supply resilience	No supply interruptions (>48 hours) by 2050
Reducing risk of basements flooding from trunk mains	Protect 37,545 London basement properties by 2050 (renewing over 340 km trunk mains)
Reducing the risk of sewer flooding	Protect c187,000 properties from sewer flooding
For communities	
N/a	Refer to communities section 3.2
For the environment	
Develop new water resources	Secure resilient supplies to meet demand over 2025 to 2050
Reducing sewage spills to rivers and improving river health	We will deliver a step change in storm overflow performance, deliver our statutory improvements programmes, and maintain treatment works

Phosphorus reduction in rivers	compliance despite the challenges that population growth and climate change will bring.
Sewage treatment works growth	

Table 2: Summary of enhancement cases and associated benefits

These long-term enhancement areas have been subject to adaptive planning and represent £71bn of a total of £75bn of enhancement expenditure under our best value pathway (BVP). The expenditure profile for all enhancement cases following our BVP is set out below.

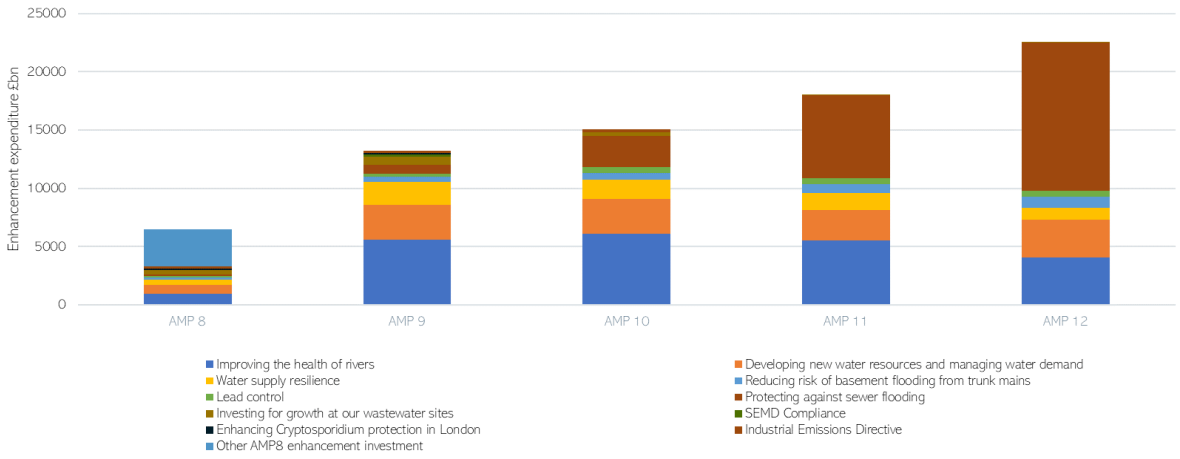


Figure 2: Enhancement expenditure - best value pathway, 2022/23 prices

Our best value pathway is very similar to our core pathway over the short and medium term. As shown in figure 2, a constrained AMP8 means a ramp up in investment for the next four AMP periods, in particular, as we track towards ambitious performance targets on improving river health, protecting from sewer flooding and securing the provision of safe water. We cannot achieve ambitious targets alone and in the longer term we aspire to meet our goals via partnership solutions helping to ensure bills remain affordable. The expenditure profile for our core pathway is set out below.

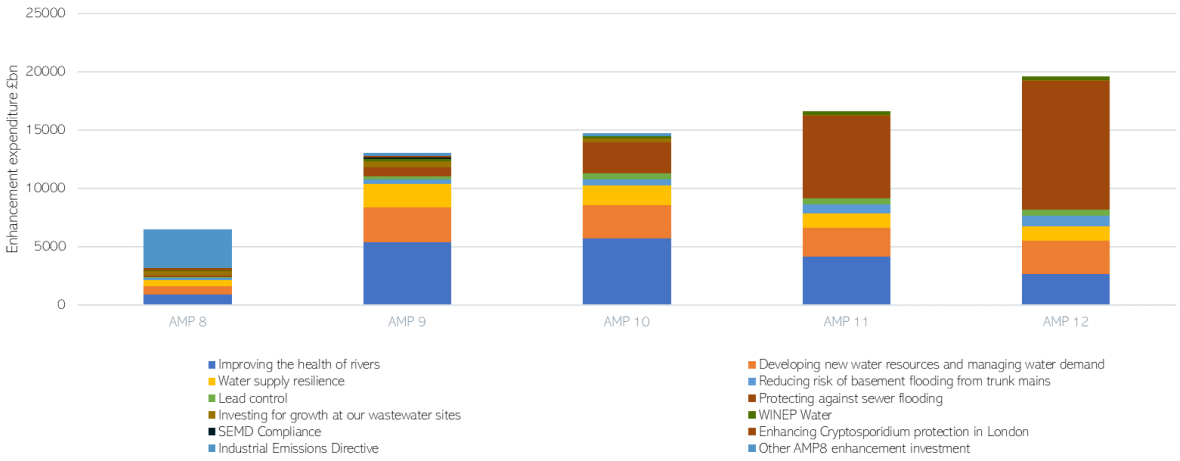


Figure 3: Enhancement expenditure - core pathway, 2022/23 prices

As can be seen from the above, the investment requirements for our infrastructure will continue to increase after 2025-30. We will continue to work with our supply chain and via partnerships, to ensure sufficient capacity to deliver on this large program of work. We will also need to continue to focus on providing support to vulnerable customers so that bills remain affordable. The average bill forecast of our core pathway is shown below:

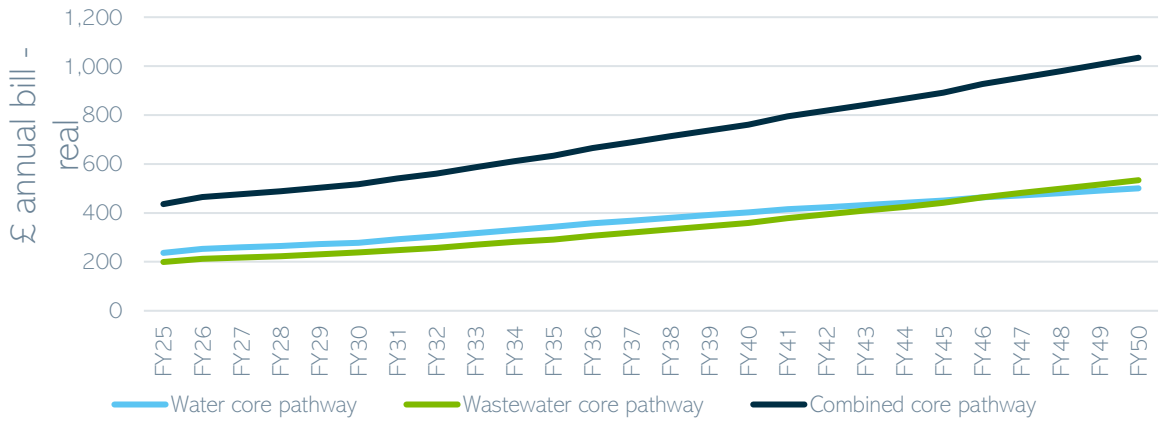


Figure 4: Average real bills (combined), with long term enhancement impact - core pathway

Rationale: why is the strategy the best way of getting there?

Central to Ofwat's expectations for companies' LTDSs, is the concept of adaptive planning – i.e., as the external environment changes, different solutions may be required in order to achieve our vision.

We have identified a number of alternative pathways, and points at which they are triggered, to show how certain events or emerging changes in key external factors would require a material departure from the core pathway. We have also detailed how we will monitor against our LTDS trigger points as part of our annual business planning cycle in section 7.

Our decision to adopt an alternative pathway will not be a simple mechanistic response to a metric reaching a certain threshold. The metrics we identify are important in understanding whether a change in strategy is likely to be required but are not the sole determinants of future strategy. In addition, changes in strategy are not necessarily constrained by the regulatory cycle, especially in those areas of investment which are inherently modular and allow us to flex our response to emerging trends over a shorter timescale.

We have developed a series of adaptive plans starting from the customer 'want' we are trying to meet, developing a wide range of options for consideration, considering a wide range of factors beyond just expenditure (using our Public Value Framework, in line with Ofwat's public value principles and other planning requirements).

For water and wastewater, we modelled the impacts of climate change, growth, technological change and abstraction. We also identified a company specific scenario of the South East Reservoir Strategic Resource Option not proceeding through planning – this resulted in a +£4bn increase compared with the water core plan, rising to £5.4bn with adverse climate change. For wastewater, we found that climate change also had the most impact on investment required in the long term for our wastewater service, with adverse forecasts requiring +£7bn above our core plan.

In most cases, our plans are modular and relatively small-scale individual investments (e.g., our storm overflow programme is comprised of many different individual interventions). This means we are able to develop plans that can be easily scaled up or down – i.e., they are low regrets and are conducive to minor course corrections as the external environment continues to evolve, as opposed to fundamentally different investment pathways.

We have tested our plans with customers and stakeholders who are in broad agreement with our plans. Further details on how we engaged customers is found in section 2.

Foundation: what is underpinning the strategy?

Plans are underpinned by a series of key enablers / dependencies, a key component of which will be the PR24 final determination, and the 2025-30 components of the enhancement cases.

As per Ofwat's guidance, we have focused on key areas of enhancement expenditure in our long term delivery strategy. However, a key enabler to achieving the longer-term outcomes will be receiving sufficient base cost allowances as part of future price reviews. We have an ageing asset base that will require a step up in maintenance and renewals activity over the next 25 years – this will likely include a multi-control period investment programme. We have begun conversations with Ofwat regarding the nature of the asset challenge. Addressing and reducing any 'asset deficit' will need to be a key component of business plans spanning multiple control periods – supporting the delivery of our long-term ambitions.

Further details on the key components of the plan can be found in the WRMP, DWMP, and supporting enhancement cases.

Board assurance

Our Board has been closely involved in the development of our plans. This has included directly shaping many of the core inputs, such as Vision 2050, the WRMP, and the Drainage and Wastewater Management Plan (DWMP).

Full details of the Board's approach to challenging the plan are set out in Chapter 7 of this document.

Our LTDS is a 'living plan' that will form a key input into how we plan our asset strategy in the long term. It will be subject to regular review, and where appropriate, amendment. We have set out the monitoring framework and the associated governance oversight that will apply to determine whether assumptions have materially changed, and if we may need to pursue an alternative pathway.

Our monitoring framework will be embedded within our existing approach to monitoring and managing enterprise risk. This involves at least annual reporting internally to the relevant senior management / Board governance groups, with clear owners and executive sponsors identified for each risk area.

In addition, we will report annually as part of the Annual Performance Reports as to whether there have been any material changes in the LTDS monitoring metrics. This will give a high degree of transparency to customers and stakeholders.

Key messages

We have listened to our customer and stakeholders and developed an ambitious vision for 2050 We received widespread support for our plans.

Service improvement will be delivered through a combination of base and enhancement spend. For enhancement required to deliver our ambition, we have developed a best value plan and core pathway. In doing so, we have considered a range of different options in line with Ofwat's guidance.

Our plan is modular and flexible, meaning that for many areas we can quickly ramp up or slow down investment to suit the changing operating environment.

Our Best Value Plan is closely aligned to our core pathway. Both show a major step up in investment is required both in AMP8 and beyond in order to meet statutory requirements, and the key priorities of our customers.

Reduction of our asset deficit is a key foundation of our long term plan and will span multiple AMPs.

Our Board has been engaged and involved throughout and fully supports our long term delivery strategy.

1 Introduction

Our Long Term Delivery Strategy (LTDS) for the PR24 price control period sets out the long-term outcomes that our company aims to deliver. This draws on a series of long-term plans that the company has already developed. Our LTDS complies with the requirement set by Ofwat for water companies to set out their five-year business plans in the context of a long-term delivery strategy, that is tested against specific external scenarios.

We present our LTDS through six key chapters that set out the context for change and our vision for 2050, our detailed plan of action for delivering that vision through three key pillars, and how we will make sure our plans are delivered for customers.

1. Introduction

2. Context and approach

In the context of a rapidly changing world, we have set a vision for 2050. To achieve this vision, we have created plans in our LTDS through a robust approach.

2.1 Our changing world
Economic, social and environmental conditions are rapidly changing, as are the expectations of customers, communities and stakeholders.

2.2 Our vision for 2050
Vision 2050 sets out what we will deliver by 2050 across three key themes: customer, community, and the environment.

2.3 Our approach to the LTDS
We set our the robust approach adopted for developing a LTDS that sets out to achieve our vision for 2050.

3. Our plans

For each of the three pillars in our Vision 2050, we present our ambition and how we will deliver on that ambition through a strategy and rationale underpinned by enhancement cases.

3.1 Customer
Our plans for providing outstanding service and value for all our customers; motivating them to save water and prevent flooding; making sure everyone always has access to top-quality drinking water and an effective waste system.

3.2 Community
Our plans for earning our place as a force for good: equipping local communities with the skills they need to thrive; using our land to benefit surrounding communities; enabling everyone at Thames Water to deliver our purpose.

3.3 Environment
Our plans for preventing wastewater pollution; leading wider efforts to restore river health; investing in our network to prevent leaks and keep water flowing.

4. Aggregate plans

The plans we set out imply a set of core and alternative pathways ahead for our company.

5. How LTDS differs from previous long term plans

We summarise the differences between our LTDS and previous long-term plans and performance commitment forecasts so customers and other stakeholders can see why things have moved on.

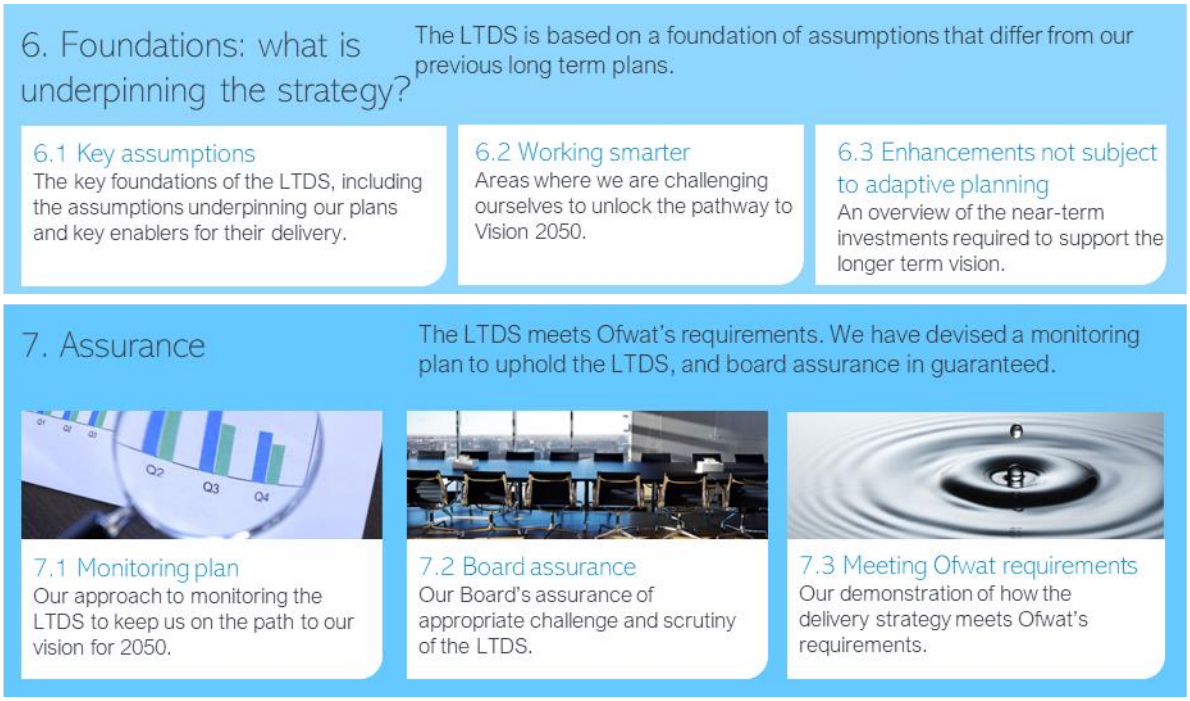


Figure 5: Structure of our LTDS

We also set out a short conclusions chapter, summarising the key messages from our LTDS.

As part of our plans (Chapter 3), we set out each of our enhancement strategies. For each enhancement strategy, we set out;

- Ambition: where will the company be in 25 years?
- Strategy: how will the company get there?
- Rationale: why is this strategy best?

Ofwat's LTDS guidance focused on defining the no / least regrets pathways for enhancement expenditure. As such, we have focused on the key strategic choices associated with our enhancement programmes. Parts of our plans do not require any enhancement expenditure. In such cases, we have not provided extensive details of our strategies for meeting our long term vision.

Our LTDS is a key component of our business plan. It collates and presents analysis undertaken under different long term planning frameworks, a wide range of customer research, and analysis of specific enhancement areas. As such, this document should be read alongside our:

- Water Resource Management Plan
- Drainage and Wastewater Management Plan
- Customer Research
- Enhancement business cases

2 Context and approach

2.1 Our changing world

As we look ahead to the next 30 years, it is evident that our business will encounter a distinct set of challenges compared to those of the past. Anticipating and addressing these new hurdles will be crucial to ensuring our continued success and growth in the ever-changing market

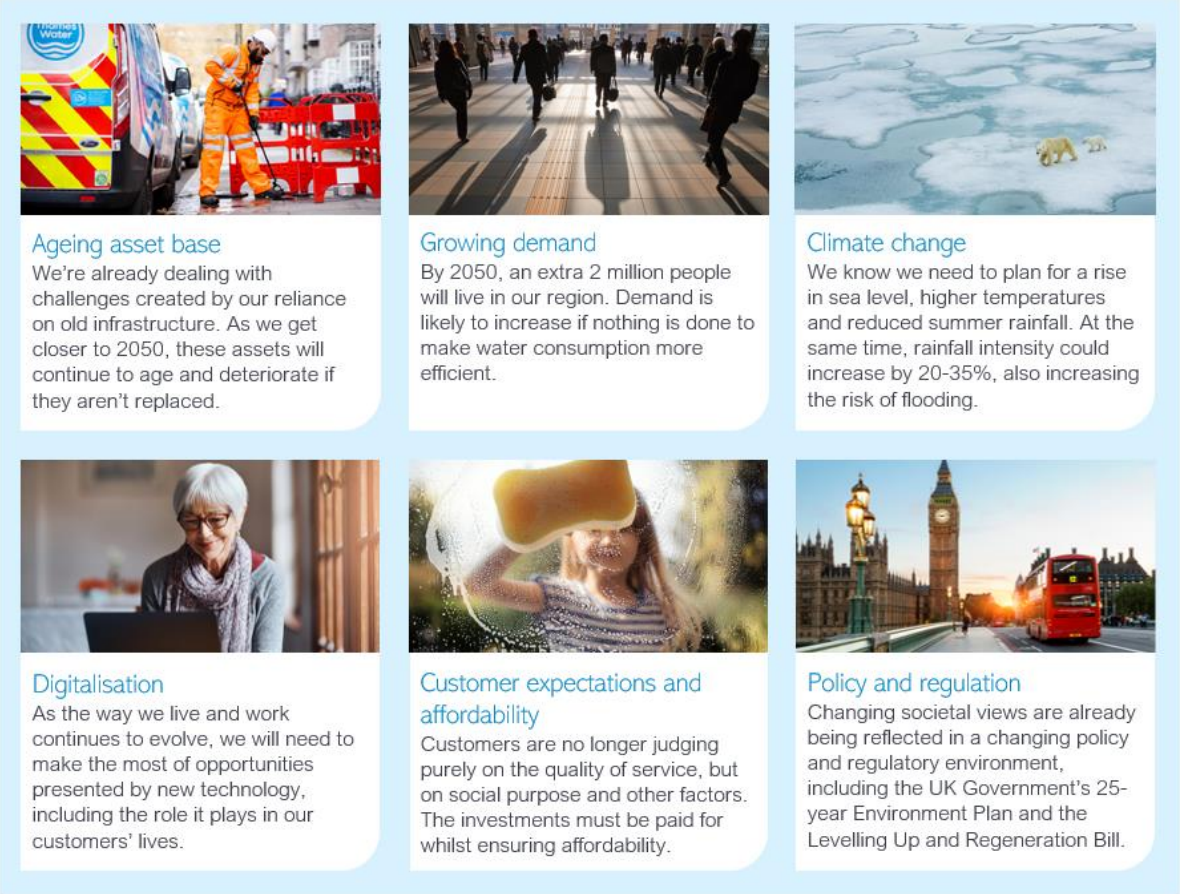


Figure 6: The context for change

We have ageing infrastructure and the health of our assets has been declining over recent decades. This decline is the root cause of most of our performance challenges and it poses an increasing risk to public safety, water supply, and to the environment. We use the term 'asset health deficit' to refer to the value of the investment needed to bring our assets back to a healthy state. Our deficit acts as a drag on our performance, which in turn impacts our financial position through performance penalties. The cost of managing our ageing assets and dealing with failures are substantial and make us appear inefficient.

Against this background, we see a growing demand for water. By 2050, four million extra people are expected to be living in the South East, which is why the region is expected to account for around 50% of the UK's future need for public water supplies alone. The National Infrastructure

Commission found that the UK needs to find an extra 4 billion litres per day to keep up with customer demand over the next 30 years,[2] with 25% of the population in our region.

Climate change is creating uncertainty over how and when resources will be replenished, and extreme events appear to be happening with increasing frequency. Without action, we are likely to have a supply that is roughly 30% below water demand. At the same time, winter rainfall intensity could increase by 11% in London with increased risk of property (including basement) flooding. Although safe, reliable and affordable drinking water remains our customers' top priority, they do not want to see it achieved at the expense of societal or environmental health.[3]

Digitisation is also changing industrial processes and the nature of businesses across our economy, which changes their demand for water and wastewater. This is illustrated through the growing demand from data centres in our service area. All of these developments will move quicker, further and faster with the aid of quantum computing and developments in condensed matter physics, which today are in their infancy but are highly likely to penetrate everyday life within the next three decades.

Customer expectations in light of these challenges are changing. Customers are no longer judging organisations purely on the quality of a product or service, but how they are led and governed, and their ethical and social commitments – their social purpose.[4] There is rising awareness around the impacts of the climate and nature emergencies with seven in 10 people in the UK concerned about climate change[5] and more than a third citing Combined Sewer Overflows (CSOs) as one of their top three environmental issues affecting the UK.[6] We are experiencing widespread expectation (more than two-thirds of the population) that our rivers will meet bathing water quality standards; a very much higher standard than is legally permitted today.

To meet their needs, customers increasingly expect personalisation and experiences with competitive organisations.[7] We have the opportunity to expand our offer, to do more to meet the wants of our customers and communities, going beyond delivering our core services. Some of our customers' priorities do not require a step change in investment in order to achieve substantial improvements. For example, over the coming years, we will make better use of behavioural data to deliver a personal and individual service to our customers. This can largely be delivered through data that we can collect through business-as-usual operations.

However, much of the change our customers and stakeholders expect will require significant investment – all of which ultimately needs to be paid for against a backdrop of ensuring affordability. Our combined water and wastewater bill is around the average level for the industry at £456 for year 2023/24. However, we have some highly deprived areas within our region. The current cost of living crisis serves to show how critical it is to keep bills affordable. It is vital that our plans are efficient and avoid any unnecessary expenditure in solutions that could be made redundant depending on future circumstances. We also need to challenge ourselves on how much we can deliver from the cost allowances that are currently set by Ofwat.

These changing societal needs are already being reflected in a changing policy and regulatory environment. The UK Government's 25-year Environment Plan has strong focus on sustainable land

[2] National Infrastructure Commission, 2018. Preparing for a drier future: England's water infrastructure needs.
[3] Thames Water's WRMP 2023
[4] Harvard Business Review (2017). Competing on Social Purpose
[5] National Centre for Social Research (2017), European Attitudes to Climate Change
[6] UK Government (2021), Storm Overflow Evidence Project
[7] Ipsos. Great Expectations: Are service expectations really rising

management, nature recovery, and on connecting people with the environment to improve health and wellbeing. The Environment Act 2021 requires water companies to make "progressive reduction in the adverse impacts of discharges from storm overflows"[8] so that no storm overflows operate outside of unusually heavy rainfall or cause any adverse ecological harm by 2050[9] with significant progress required by 2035. In parallel, the Levelling Up and Regeneration Bill is looking to place a new legal duty on water companies in England to upgrade wastewater treatment works by 2030 in 'nutrient neutrality' areas to the highest achievable technological levels. The water sector has committed to achieving a 50% reduction in leakage by 2050 (from 2018 levels),[10] and the government expects water companies to contribute towards helping water customer reduce personal water consumption to 110 litres per head per day, on average by 2050.[11]

All of this creates the case for transformative change across the water sector over the next 30 years.

[8] UK Government (2021), Environment Act 2021
[9] UK Government (2022) Storm Overflows Discharge Reduction Plan 2022
[10] Water UK (2022), 'A Leakage Routemap to 2050'
[11] Defra (2021). 'The government's strategic priorities for Ofwat'

2.2 Our Vision for 2050

As the world around us changes, we can only deliver our purpose if we change too. Our ambitious vision imagines a world where we've learnt from the past and adapted to the future so our customers, communities and the environment can thrive. It starts with tackling the issues that matter most to our customers right now: providing better customer service, finding and fixing leaks more quickly and reducing pollution. And it goes beyond our core services to help us become a force for good: equipping local communities with new skills, restoring rivers and producing more green energy than ever before.

Figure 7: Our Vision for 2050

Bringing our vision to life

To achieve our vision, we're radically changing how we think and act. We are working smarter and working together because the challenge we're facing affects our entire industry. Whether it's the government making longer term investments, regulators establishing more achievable goals or customers helping to make the most of every drop, we can all help take care of everyone's water.

Working smarter	Working together
To deliver our services more efficiently and effectively, we'll invest our time in: • Building a culture of innovation, enhancing our skills and thinking digital first • Helping to shape the future of the UK water industry • Transforming how we work with local partners • Securing funds and investing our customers' money wisely in our assets and communities	By shaping new partnerships and valuing insights outside our business, we can tackle big challenges like: • Keeping taps flowing for the future • Inspiring customers to save water, save money and prevent blockages • Joining forces to prevent flooding across our region • Restoring river health together

Figure 8: How we are bringing our Vision 2050 to life

Our vision was developed with customers, stakeholders and the Board

From the very start of our work on Vision 2050, we have been guided by what our customers and other stakeholders expect us to deliver. We used these insights to create the outcomes for each of our themes.

We created our Vision 2050 themes and outcomes based on feedback from our customers and stakeholders. We then tested Vision 2050 with stakeholders at our Annual Stakeholder Review meeting in July 2021. We tested our updated Vision in April 2022 with customers to understand whether they supported our level of ambition and to get feedback on the Outcomes and Goals to establish those that matter most to them, both in terms of importance and urgency. In Spring 2023 we framed our Vision outcomes around our three themes, customers, communities and the environment, and tested how we communicate our Vision and strategy with employees, customers and key stakeholders.

The Thames Water Board has been actively engaged to ensure high quality throughout this process.

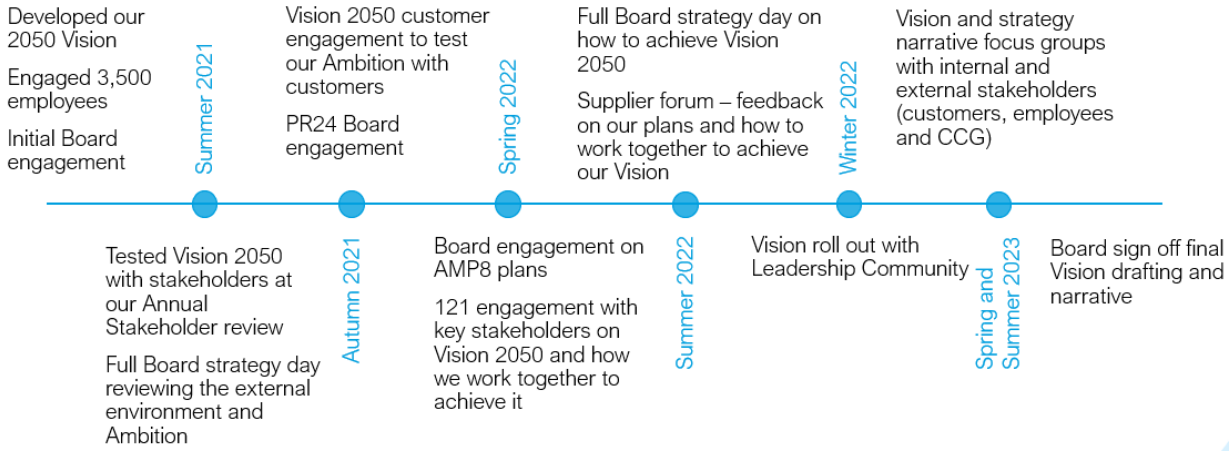


Figure 9: Development timeline for Vision 2050

We developed our vision through a robust process

Since 2022, we have been sharing and testing our Vision and strategy with stakeholders and starting to share and embed the vision and messaging internally. Feedback has highlighted the need to be able to simplify and summarise the messaging to make sure that we express the substance of our Vision 2050 in the clearest way.

A total of nine focus groups were conducted in early June 2023, with five to eight participants representing:

- Internal stakeholders: including employees representing the following departments: Central Functions and External Affairs, Customer, Operations and Assets, Engineering and Capital Delivery as well as member of employee Networks.
- External stakeholders: members of the Customer Challenge Group (CCG), Thames Water Customers based in London and in Thames Valley.

Testing focused on the general structure and flow of the narrative, as well as its language and resonance of the key messages, to provide clear insights and recommendations on how it should be best articulated so that its main points land effectively with key audiences.

Our vision will deliver for customers across three key themes

From the very start of our work on Vision 2050, we have been guided by what our customers and stakeholders expect us to deliver. We have used these expectations to create the customer outcomes for each of our three themes.

Figure 10: Three themes of our Vision 2050

Foundational customer research was completed in October 2021. This discussed in detail what customers want from Thames Water and what their core expectations are. Deep dive research into eight potential enhancement areas for PR24 was then completed in April 2022. Customers discussed in detail what they thought of Thames Water's proposed initiatives for 2025-30.

Research from April 2022 confirmed that most customers feel we have captured what matters to them. They also believe the timescales for Vision 2050 are reasonable but want us to make progress as quickly as possible.

Between March and June 2023, we consolidated customer, community, and stakeholder insights from a range of engagement activities. This included:

- PR24 Enhancement Case Deep Dive Research
- Acceptability and Affordability Testing (qualitative results only, quantitative findings available in September)
- Vulnerability Deep Dive Research
- DWMP and WRMP Consultations

Everything included in our vision is important to customers, but their priorities are having a safe, clean, and reliable water supply. As a result, we need to prioritise reducing leaks, guaranteeing the quality of our water and making sure we can meet future demand without taking too much water from rivers.

The next biggest customer priorities are keeping bills affordable and stopping sewage from entering homes or rivers. Community and energy initiatives are seen as worthwhile, but customers made it clear they do not want these projects to get in the way of improvements to our core services.

Customers told us that they want a service that 'just works' today and in the future, provided in an environmentally responsible way, by a company that always has good customer service and gives back to the society and community it touches. They consider that our goals for 2050 are important and should be a focus for our improvement. We have reflected these expectations in our Vision 2050, which is split into three key themes with distinct outcomes.

We have set credible long-term performance targets towards our 2050 vision

Our Vision 2050 sets the context for this Long Term Delivery Strategy. Achieving the 2050 outcomes will mean significant improvement across most of Ofwat's common performance measures. Our Vision 2050 is aspirational and reflects the outcomes of improvements from planned base and enhancement expenditure, but our targeted performance improvement should be credible in the light of current performance levels, and the challenges facing us, including the need to meet statutory requirements for environmental improvement, the need to have regard to customer affordability and the current lack of resilience of our aged networks and treatment assets. In some asset classes we face a deficit of allowed investment in past maintenance expenditure which needs to be addressed over the long term and which will inevitably restrict our ability to improve performance quickly without very substantial additional investment. See Chapter 6 for a further discussion of our views of the asset deficit.

A summary of our 2050 targets across these measures is shown below together with the rationale in relation to our ambition.

Performance measure	Units	2022/23 performance	2050 forecast
For customers			
Customer contacts about water quality	Contacts per 1,000 population	0.43**	0.30
Our long-term forecasts builds on our current upper quartile performance. Improvements will be delivered through our Public Health Transformation Programme and customer water quality self-help portal on our website.			
Compliance risk index	Numerical score	10.96	0.5
Our 2050 forecast of 0.5 reflects the reality that failures will still occur at customers' taps and we have no control over the condition of these. Our plan to improve CRI includes upskilling our operatives, enhanced hazard reviews, real time chlorine dosing, addressing turbidity at groundwater sites and enhanced inspection of structures.			
Water supply interruptions	Minutes per property per year	10:55	05:00
This forecast reflects the relative improvements that we consider are stretching for us to deliver, rather than an industry upper quartile assessment. Our assets will lack resilience until our long-term enhancement programmes deliver benefits. Short-term, our plan is to continue to improve how we respond to incidents.			
Mains repairs	Number per 1,000 km of mains	316.8	116
In AMP8 we will deliver a 15% reduction in mains repairs through CLAM, improving our find and fix strategy and by delivering a total of 500km mains replacement (including our cost adjustment claim). In AMP9 and beyond we will deliver a further 50% reduction through mains replacement required in our WRMP.			
Unplanned outage	%	2.65	1.1
Improvement will be delivered by addressing automatic shut-downs (due to water quality issues), equipment failures and power outages.			
Sewer collapses	Number per 1,000 km of sewer network	3.55	3.89
Our plans over AMP8 and coming years is to maintain our current performance. Our investment will focus on addressing an aging and deteriorating asset base to maintain serviceability. Analysis of our performance across flooding and pollutions demonstrates that sewer collapses is a minority driver and investment should focus in other areas.			

For communities			
No common performance commitments relate to this theme. Instead, we will monitor a series of company-specific KPIs, reflecting the needs of the communities we serve			
For the environment			
Leakage	% reduction in Ml/d for a three year average from 2019/20	11	50
Leakage improvements are fully aligned to our WRMP demand reduction forecast and will be achieved through CALM/ pressure management, customer repairs identified through smart metering and mains replacement.			
Per capita consumption	% reduction in litres per person per day for a three year average from 2019/20	-0.1	27.6
PCC is fully aligned to WRMP demand reduction and delivered via smarter home visits on the back of our metering programme as well as establishing a digital relationship with customers. Over the long-term we are expecting significant benefits from government water policy (such as water labelling) to hit 110 l/hd/d by 2050.			
Business demand	% reduction in Ml/d for a three year average from 2019/20	N/A	15%
Business demand is fully aligned to WRMP demand reduction and achieved through smarter business visits on the back of our metering programme and establishing a digital relationship.			
Internal sewer flooding	Number per 10,000 sewer connections	1.91	0.70
Key to improving our performance is reducing blockages – which we will achieve through customer education, digitising our network, improving our speed of response and removing sewer interceptors. We will also need to improve resilience to flooding from heavy rainfall through managing surface water and implementing SuDS – this element aligns to our Drainage & Wastewater Management Plan			
External sewer flooding	Number per 10,000 sewer connections	18.49	17.28
We have not made a performance commitment for external sewer flooding over the last 10 years. Improvement will be achieved via the same initiatives as external sewer flooding.			
Total pollution incidents	Number per 10,000 km of wastewater network	56.7	11
From the beginning of AMP8 the Environment Agency will reclassify Category 4 incidents as Category 3. We have back cast this change and are forecasting a 30% reduction in AMP8 in line with WISER guidance. Over the long-term we will reduce pollution by 80%, aligned to the Environment Act 2011 ambition to reduce spills. We'll focus on reducing blockages, sewer collapses, third party incidents, human error and hydraulic overload.			
Serious pollution incidents	Total number	17	0
We are not forecasting to meet the WISER target for zero serious pollution by 2030. Our forecast reflects our current circumstances and is ambitious but credible. Focus beyond AMP8 will be on reducing pollution from the network once pollution from sewage treatment works and pumping stations is minimised.			
Bathing water quality	%	50%	100%
There are two designated bathing waters within our region: Frensham Great Pond, Surrey; and Wolvercote Mill Stream, Oxfordshire. Historically, Frensham Great Pond has had excellent status every year, whereas Wolvercote Mill Stream, which has only just been designated is considered poor status.			
River water quality (phosphorus)	Percentage reduction of phosphorus from 2020 baseline	6.19%	80%
Our plan is to achieve the 80% reduction in sewage effluent by 2038 (when compared to the 2020 baseline) as per the government target laid out in the Environment Act.			
Storm overflows	Average number of spills per overflow	16.80	5
Our long-term aspiration has been aligned to the government's target of ensuring no overflow has any ecological impact by 2050. The Environment Act states that there can be no more than 10 spills per overflow by 2050, however, we believe that the target will need to be closer to 5 spills per overflow in order to meet the more stringent target of no ecological impact. This will be validated through the investigations programme in AMP8.			
Discharge permit compliance	%	99.48	100

We recognise that due to increased complexity and cost we are unable to deliver the entire AMP7 WINEP by 2025 and up to 105 outputs will be delayed into AMP8. Beyond this, we expect to be fully compliant with our permits.			
Operational greenhouse gas emissions (water)	Tonnes CO2e	159,094.98	14,808.87
At this time, the forecast includes only benefits from our base plan (in the case of water this is predominantly a reduction in electricity grid imports). We have excluded all other potential benefits from the bidding process and will continue to work on a roadmap to net zero.			
Operational greenhouse gas emissions (wastewater)	Tonnes CO2e	372,829.29	549,608.77
In 2023/24, we are forecasting a sharp rise in reported emissions from our wastewater treatment processes, in line with the adoption of the IPCC emissions factor recommended to DEFRA. At this time, the forecast includes only benefits from our base plan to offset this increase (such as a move to electrical fleet vehicles). We have excluded all other potential benefits from the bidding process and will continue to work on a roadmap to net zero.			
Biodiversity	Biodiversity units per 100km2 for which the company provides monopoly services	0	0.56
This is a 10-year forecast to 2035. We will need to reassess our land beyond 2035 to complete the forecast to 2050.			

Table 3: Summary of common performance commitments.

***Based on the methodology including contacts via social media and new communication channels*

The above will result in a step level improvement for customers and the environment.

In delivering our Vision 2050, we also create social and public value. For us, public value is made up of all the things we do to make life better – through our essential services, the delivery of top-quality drinking water and an effective waste system, and our wider impact.

We recognise that creating public value is fundamental to delivering our purpose 'to deliver life's essential service, so our customers, communities and the environment can thrive'. To deliver our purpose, we have committed to incorporating public value within all relevant decision-making. With this approach we can identify every opportunity to make the biggest positive difference to customers, colleagues, communities and the environment, inside the delivery of our core service.

We are starting to implement a new approach to guide and measure both the public value we create and the delivery of our purpose. Our public value framework helps us identify, evaluate and deliver public value which balances cost and value to customers, community and the environment over the long-term. Our approach aligns with Ofwat's six principles of public value, making sure public value outcomes do not come at a greater cost for customers, unless supported.

The public value framework has been used on some of our non-statutory cases as a framework to optioneer solutions for best value, inputting to our best value plan, as part of our long-term delivery strategy.

Vision 2050 serves as a key input and anchor point to our LTDS – the approach we have followed to develop the delivery strategy is set out below.

2.3 Our approach to the LTDS

2.3.1 Long-term delivery strategy requirements

As part of the 2024 price review (PR24), Ofwat requires all water companies to set out 25-year plans showing how they intend to meet their long-term ambitions. These plans need to be adaptive – i.e., as the external environment changes, different solutions may be required to achieve our vision.

We already have a series of long-term plans that have been developed and iterated over a number of years, including:

- Water Resource Management Plan – this reflects the Water Resource South East (WRSE)'s regional plan, setting out how we intend to provide a secure and sustainable water supply over the next 50 years.
- Drainage and Wastewater Management Plan – this was developed collaboratively with other organisations and groups that have a shared responsibility and/or interest in drainage, flooding and environmental protection. The plan sets out how we will enhance our assets and networks over the next 25 years.

In developing our plans, we have considered a wide range of future scenarios, including in relation to climate change, population growth, abstraction reductions and environmental ambition.

For the purposes of our PR24 submission, Ofwat has asked that we test our plans against eight 'common reference scenarios', and to identify a 'core pathway'. The core pathway is a series of 'no and/or low regrets' investments / activities that are required:

- in both benign and adverse scenarios;
- across a wide range of plausible scenarios; or
- need to be undertaken to meet short-term requirements

The core pathway also includes investments required to keep future options open (such as enabling work or learning and monitoring).

In addition to the core pathway, we have identified a series of alternative pathways. These each comprise a series of investments / activities that are required to meet our 2050 outcomes should specific external trigger events occur.

The overall approach we have followed in developing our LTDS is set out in Figure 11. Inputs are derived from both statutorily defined processes, such as WRMP and DWMP, as well as specific approaches tailored to particular investment needs in our region. Additionally short-term or small enhancement investments have not been subject to adaptive planning and are described in Section 6.3. Each of these approaches is supported by customer and stakeholder engagement. Planning inputs also include Ofwat's Common Reference Scenarios and company-specific scenario against which we test our best value plans.

The LTDS analysis involves stress testing our best value plans against each of the defined scenarios. The nature of the scenario testing is bespoke to each enhancement area (specific approaches are described in Chapter 3). This allows us to determine whether specific scenarios would likely result in the need for any material change to our best value plan, either in terms of the investments required or its cost.

A summary of the approach we have followed is set out below:

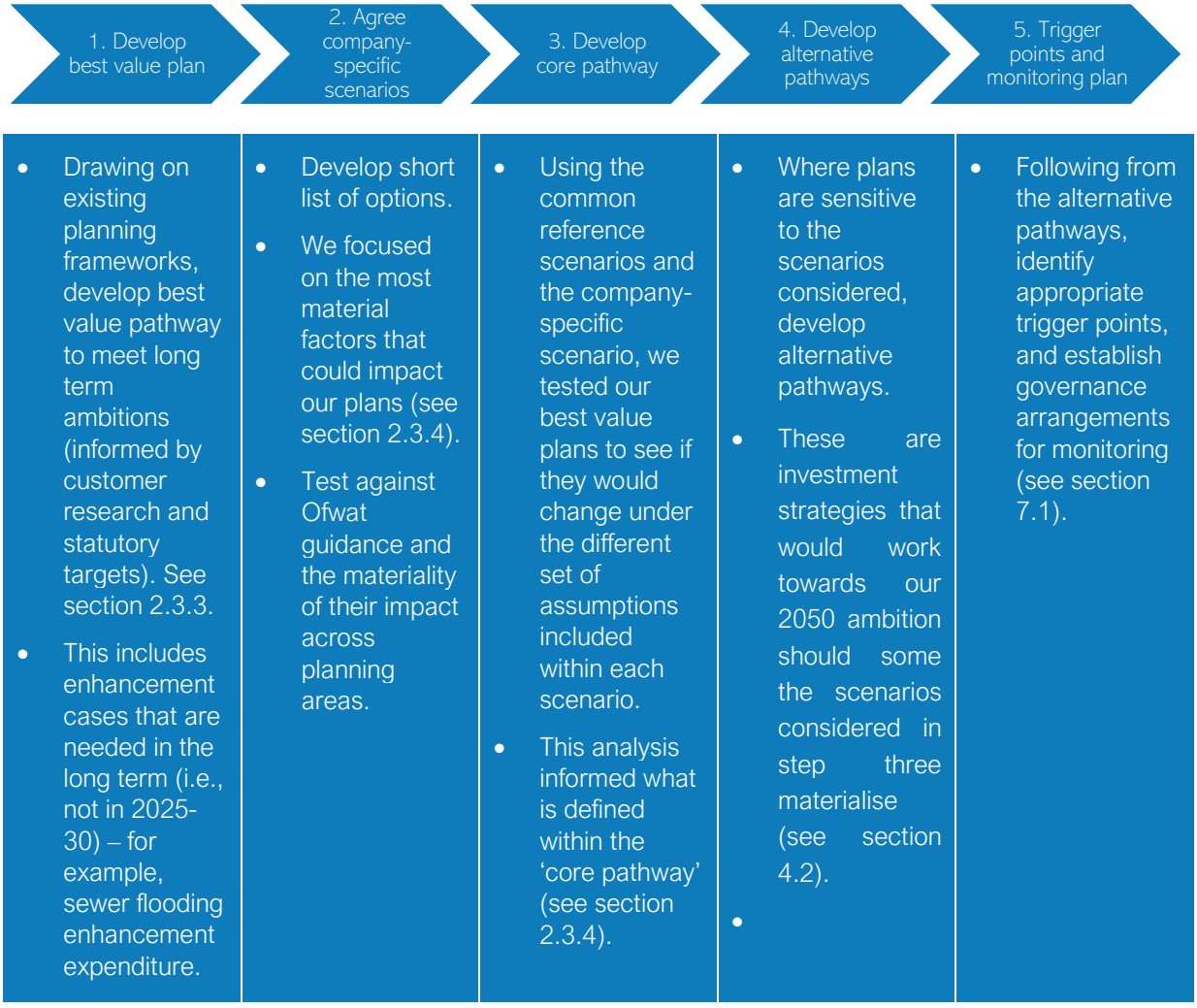


Figure 11: LTDS development approach

The above process summary simplifies the LTDS process. In many cases there are feedback loops, additional customer / stakeholder engagement, and multiple iterations of the plans. The approach also varies in specifics across different planning areas – further details of which are provided in Chapter 3.

The LTDS provides companies with an opportunity to communicate the holistic long-term strategy when all the different plans come together. Plans like the WRMP and DWMP have already been subject to extensive customer / stakeholder scrutiny. However, there is no statutory framework that requires an aggregate assessment of the bill impact, and the overall implication of the plans.

The size of the required investment to meet the company's ambition is significant. As such, there are material challenges in terms of affordability, deliverability, and financeability. These challenges are particularly acute over the next five years, where there will be a step change in investment.

We have not reflected deliverability or financeability constraints on our plan beyond 2030. This is because both constraints are, to a large degree, influenced by decisions over the next five years and are dependent on the regulatory framework. This is a key assumption, which we will need to keep under constant review. We have, however, considered affordability challenges within the profiling of many of our investments. This is to help avoid unacceptably rapid bill increases. We have also tested our plan at the aggregate level with our customers – see section 2.3.2 below for further details.

2.3.2 Customer and stakeholder engagement

The priorities and preferences of our customers are fundamental in developing our long-term ambition and strategy. Ofwat's long-term delivery strategy guidance sets out the requirement to ensure we engage with our customers, understand their priorities and preferences, both now and in the future, and use these to inform the development of our LTDS.

Customer engagement for our LTDS has focused on those areas where customers can have a meaningful impact on our plan. A large proportion of our long-term enhancement investment is driven by statutory obligations. For example, reducing the number of storm overflow discharges is now a statutory target. However, in many areas customers do have choices, for example on the types of solutions or on the pace of delivery of planned non-statutory investment. For example, our water quality improvement and water supply resilience programmes.

To understand customer and stakeholder views and priorities, we use an insights triangulation approach based on best-practice guidance, a wide range of sources, and robustness assessment to create customer and stakeholder insights. We have followed best practice guidance from the Consumer Council for Water (CCW), and we include additional elements used by other water companies at PR19 and by energy networks during RIIO-2. Each insight source is scored to assess robustness of engagement activity and feedback gathered, which also highlights any divergence of views by groups or regions.

To ensure our plans and strategies continue to deliver what customers, communities and stakeholders want, including consideration of important material or urgent issues, we periodically undertake further engagement, gather additional insights and iteratively update our evidence base which provides a consistent approach for our decision making.

When developing our PR24 business plan and LTDS, we have made use of a wide range of inputs, that go beyond solely engagement insights. This has included over 300 insights sources including PR24-specific research, targeted research on our long-term proposals, strategic planning research on DWMP and WRMP, research from PR19, ongoing insight gathering and insight from relevant external sources. A full list of sources used is available our What Customers, Communities and Stakeholders Want (WCCSW) document[12] which is our single unifying customer insight framework, underpinned by detailed insight.

In Figure 12 we set out the activities that make up our ongoing and PR24-focused customer research and engagement programme as we develop our business plan submission.

[12] What Customers, Communities and Stakeholders Want v18.3, Sia Partners, September 2023.

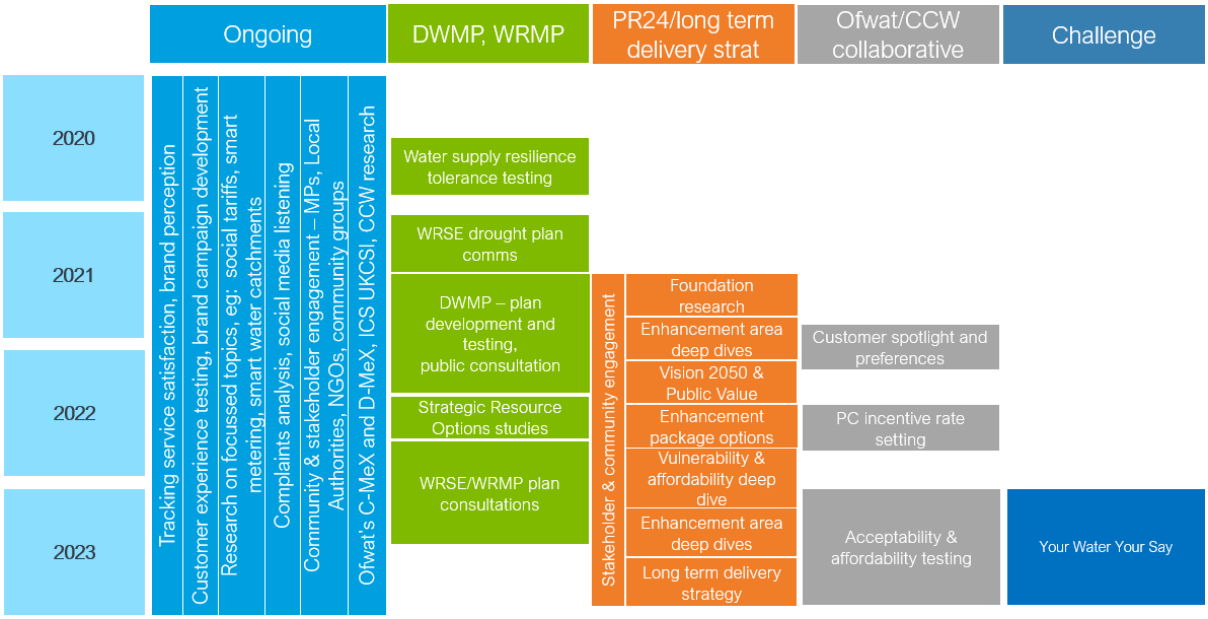


Figure 12: Ongoing and PR24 customer research and engagement activities

Source: Thames Water, Customer Research & Insight and Stakeholder Relationship teams

As part of this wider programme of engagement, several sources have been key in directly informing our informing the development of our LTDS. We summarise these key sources in the table below.

Source	Engagement description	Number of customers engaged	When were customers engaged
WRMP19	WRMP19 consultation	863	Feb-Nov 18
PR19 stakeholders	Summary of PR19 Stakeholder Engagement	200+ (stakeholders)	Nov 16-Apr 18
Water Club Strategic Resource Options	Testing change of source and added value of SROs	2,600	Jan–Jun 22
Water Supply Resilience	Customer resilience to water supply interruptions	1,481	Nov 20-Jan 21
WRSE regional water resources plan	Testing region wide water resource plans with customers	1,797	Aug 20–Jun 23
Vision 2050 and Public Value Research	Customer prioritisation for the elements of our V2050 and Public Value framework	722	Mar-Apr 22

Source	Engagement description	Number of customers engaged	When were customers engaged
Water Resources Management Plan 24	Customer consultation on WRMP24	123	Feb-Apr 23
Drainage and Wastewater Management Plan 24	Customer preferences for DWMP24	1,902	May 21–Jul 22
PR24 Enhancement case deep dives (Phase 1)	Customer research to gather views on potential enhancement cases, both the need and potential solutions	232	Jan-Mar 22
PR24 Enhancement Package Options	Customer priority research on different packages of enhancements	1,579	Jul-Sep 22
PR24 Enhancement case deep dives (Phase 2)	Customer research to gather views on potential enhancement cases, both the need and potential solutions	1,522	Mar-May 23
Long term affordability	Customer research testing example options for the mix and sequencing of key investments, and the fairness and affordability of an example bill profile, to 2050.	74	Sept 2023

Table 4: Customer engagement inputs to our LTDS

In addition to using the insight gathered from our 2050 Vision, WRMP, DWMP and Enhancement case deep dives and enhancement package options research to inform our ambition and the phasing of enhancement investments over future AMPs, we also directly tested with customers example options for the mix and sequencing of key investments to 2050 and whether an indicative example bill profile to 2050 was considered to be fair and affordable for current and future customers.

Our long-term delivery strategy aims to deliver intergenerational fairness and affordability in a range of plausible futures. As such, a key objective of our targeted research on the LTDS was to gain insight into customer preferences and priorities both now and in the future. This provides us with a clear line of sight between customer priorities and our long-term objectives, and enables us to balance costs and benefits between current and future customers.

In Table 6 below, we first provide a summary of what we heard from customers on our enhancement investments and how this insight informed our LTDS. In the section that follows, we provide a summary of findings from our direct engagement on the LTDS, including the views of vulnerable and future customers, and the implications of this research on our final LTDS.

Type	Vision 2050 outcomes	Enhancement investment area	What our customers have told us (insights)	How the insight informed our LTDS
For customers	We provide safe, clean drinking water	• Replacing lead pipes • Enhancing *Cryptosporidium* protection at SSF LPPs	• Customers expect to always have reliable, safe, clean, and "wholesome" drinking water: it remains their first priority. • Customers want Thames Water to replace all lead pipes by 2050 and they support proposed initiatives to replace lead pipes in homes and schools.	• Our multi-control period risk-based investment programme, will eliminate lead from our water network entirely by 2050, and by 2035 for primary schools, so that younger children, who are at higher risk, are protected sooner. • Raising the bar further on quality of final treated water from our WTWs in the medium term (to AMP10)
	We always maintain a reliable supply	• Improving water supply resilience • Reducing risk of basements flooding from trunk mains	• Reliability and the provision of a constant water supply is one of the highest priorities for our customers Our customers have helped us define unacceptable impact as a supply interruption greater than 48 hours. • Customers prioritise dealing with the safety risk in trunk mains over other potential enhancements and support regular, proactive renewal of our water network, starting with pipes most at risk.	• Our programme will mitigate risk above the risk appetite threshold determined by customers (>48 hours) by 2050. • Our programme will address 328km of our trunk mains over the period to 2050, which are those representing the greatest level of risk.
	We protect customers from sewer flooding	• Improving resilience to sewer flooding in homes	• Reducing sewage flooding is the highest priority for customers. For many, the impact of sewage flooding feels most severe, tangible and dangerous given the potential for personal belongings and property to be damaged in the long term as well as the potential for health risks from the bacteria. As a result, many feel the targets could be even more ambitious both in terms of timelines and overall targets	• We will undertake a phased programme of investment, under our DWMP, to install new sustainable drainage, line sewers and increase network capacity which will protect 187,000 properties.
For communities	N/A - we are not seeking any enhancement for meeting the communities' outcomes – improvements will be covered by base			

Type	Vision 2050 outcomes	Enhancement investment area	What our customers have told us (insights)	How the insight informed our LTDS
For the environment	We meet the changing needs of our customers and the world around us	• Develop new water resources and reducing abstraction from vulnerable sources • Demand management (metering and water efficiency)	• Customers want us to be more 'self-reliant' around water supply in the Thames area, for example by reducing leakage and educating customers on how to save water, ahead of building strategic / regional resource water transfers. Customers fear that focusing on water transfers too quickly could create an over-reliance on such methods.	• We will implement a comprehensive programme of demand management interventions to reduce leakage and improve water efficiency by 2050, enabled by a programme of smart metering due to complete by 2035. • We will invest in a series of major and minor water resources over the period, with our plan designed to adapt as the effects of demand, climate change and abstraction reductions become clearer.
	We collaborate with others to improve the health of rivers	• Reducing sewage spills to rivers and improving river health • Sewage treatment works (STW) growth	• Customers and stakeholders have made it clear that they expect 'Rapid Progress' on improving our storm overflow performance. • Over half of households support more stringent storm overflow targets at added cost, but not at the expense of efforts to reduce sewer flooding. Non-household respondents were more unambiguously in favour of reducing spills • Stakeholders encouraged us to be more ambitious in relation to our 2050 target of 10 spills per storm overflow per annum. They called for storm overflows in the most sensitive catchments and/or discharge greatest volumes or cause the most pollution to be prioritised.	• The DWMP programme should reduce the average annual number of spills per sewage discharge overflow to 10. • Our programme will tackle the highest impact and highest risk storm overflow discharges first. • Our infiltration programme will reduce the impact of groundwater infiltration sewers contributing to storm overflows with the greatest environmental harm. • Our STW growth programme will provide additional capacity at our treatment works to meet the forecast growth needs and remain compliant with our discharge permits.

Table 5: Customer outcomes and enhancement investment area

Insight from vulnerable customers

Our engagement with vulnerable customers has shown us that vulnerable customers expect us to understand and respond to their specific needs. Water quality, pressure and interruptions to supply are of particular concern to customers with specific medical conditions or disabilities, and they want us to prioritise services to them. Those with high water use (e.g., due to a medical condition) may rely on an uninterrupted supply for their treatment and these customers want us to appreciate the potential risk to their health and prioritise them during outages.

For more detailed insight from vulnerable customers, please see section 6 of What Customers, Communities and Stakeholders Want v18.3, Sia Partners, September 2023.

'In the round' engagement

As well as carrying out research for key components of the LTDS (Vision 2050, approach to public value, WRMP, DWMP, and the enhancement cases), we also consulted customers on our overall long term delivery strategy in the round.

In September 2023 we tested with customers indicative options for the mix and sequencing of the key investments and outcomes to 2050, theoretical options for phasing investment and bill impacts over the longer-term, and whether an indicative example bill profile for our proposals to 2050 was considered to be fair and affordable for current and future customers.

The findings from the qualitative discussion groups showed that:

- Most customers thought our long-term plans were broadly acceptable in terms of priorities for investment identified and coverage of improvements to be delivered.
- However, many customers would like targets to be met quicker and/or to be more stretching for reducing the risk of lead in drinking water, pollution of rivers and bathing waters, reducing sewage spills into rivers and sewage flooding of properties.
- The vast majority of customers preferred gradual and predictable bill increases. This was perceived to be the fairest option as it does not place excess burden on either future or current customers, is most in line with customer expectations and therefore is easier to budget and plan for.
- When presented with an indicative example bill profile including bill amounts to 2050, most customers reluctantly agreed that bills will need to increase, and that they would be able to manage their water bill in future.
- Affordability was difficult to assess for some, with so many unknowns this far into the future, and in particular future customers struggled to imagine how they might be able to afford the 2050 prices.
- Even amongst those customers who found the bill projections unaffordable, they could not identify improvement areas they would want to remove or reduce in order to lower bills – once they were aware of them, customers thought they were all needed.

We use customer insight from multiple sources, including from our insight testing, to inform our LTDS. We have developed a plan that balances customers' priorities alongside improvements to our performance and asset resilience, whilst keeping bills fair and affordable. For example in our AMP8 plan we have prioritised enhancement to continue our provision of safe, clean drinking water and improve water quality in our rivers.

Our LTDS is flexible to multiple futures, and our core pathway is designed to allow modifications to our plan in the future, if our operating environment changes. Due to the modular nature of our enhancement spend, we are able to reprofile investment delivery to meet customers' priorities whilst

remaining acceptable, affordable and deliverable, for customers now and in the future. The projected bill increases required up until 2050 to deliver our long term investment show a gradual and predictable rise, which is aligned to customers preferences and expectations. For more information on the aggregate bill impact of our LTDS enhancements, see section 4.

Our long-term plans will provide fair and consistent outcomes for customers who are struggling to pay their bill, whilst working to protect customers from the burden of bad debt. To make bills more affordable for all, we will introduce various tariff measures, including consumption-based tiering, and optimise social tariffs to help those most in need of support and utilise new smart technologies to engage and incentivise customers to reduce their consumption and lower their bills.

Our specific proposals for addressing the overall affordability of our plans and the provision of support to customers who are struggling to pay can be found in TMS07 'Bill impact, affordability and vulnerability'.

2.3.3 Developing best value plans

Our approach to developing best value plans varies depending on the planning area. For example, WRMPs have a series of specific planning requirements and consultation formats. However, common themes include:

- Starting from the 'customer want' that we are trying to meet.
- Developing a wide range of options for consideration.
- Considering a wide range of factors beyond just expenditure, using the Thames Water public value framework, in line with Ofwat's public value principles and other planning requirements.
- Putting adaptive planning at the heart of the approach – i.e., considers low / least regret options, modular solutions, and enabling investment / actions.
- Testing draft plans with customers and stakeholders, and where appropriate, refining based on feedback / insights.

Further details of the specific approaches used are included in Chapter 3, our WRMP, our DWMP, and the supporting enhancement cases.

Our plans contain several different pathways and options – our adaptive plan is the overall set of pathways. However, within each plan is a headline 'best value' pathway also known as our 'preferred plan'. For example, the WRMP sets out nine distinct pathways (with many other sensitivities considered), but only one is the 'preferred plan'.

We have taken the headline best value pathway as the starting point to be tested in line with the scenarios for the purposes of defining the LTDS 'core pathway'. See section 2.3.4 below for further details of the scenarios the approach used to define 'core'.

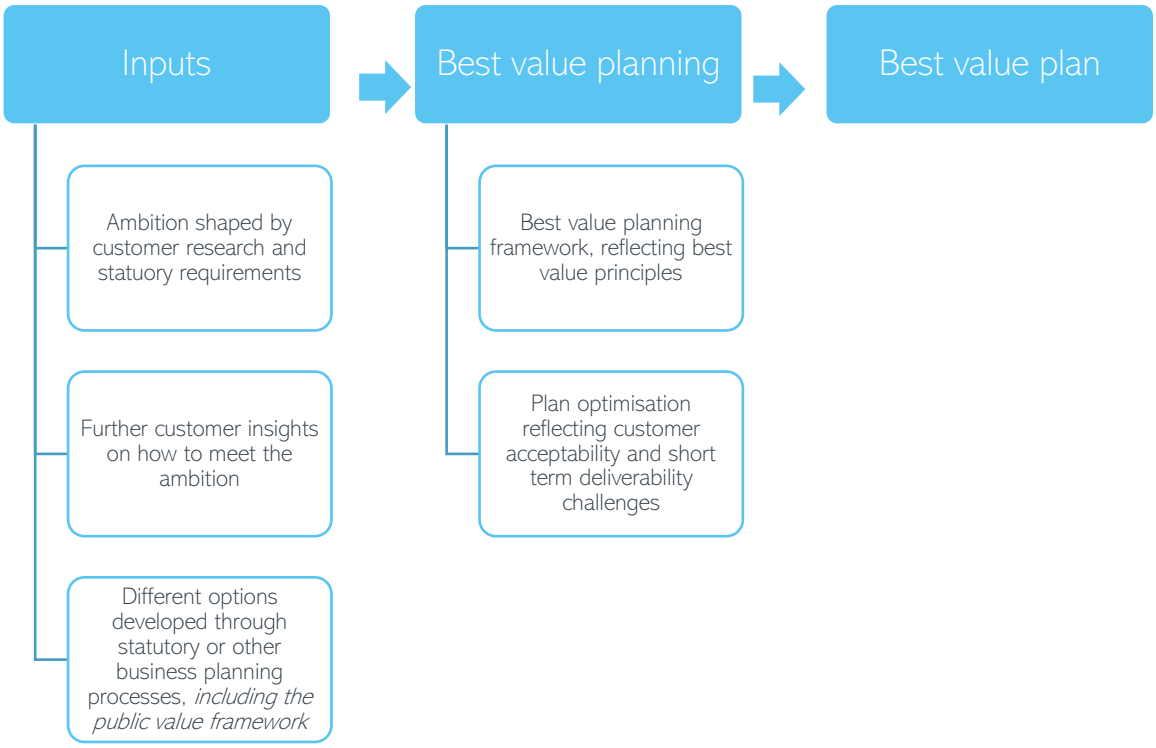


Figure 13: Generic Best Value Planning approach

2.3.4 Scenario development and testing

Two types of scenarios are important in the development of our LTDS: the four sets of benign and adverse common reference scenarios defined by Ofwat in its guidance, and one further "company-specific" scenario which we have identified as particularly relevant to our plan.

Common Reference Scenarios

Ofwat's guidance defines adverse (or slow) and benign (or high) scenarios for climate change, technology, demand and abstraction reduction, and as required, we have used these scenarios to develop our LTDS. The precise way in which we have used the common reference scenarios varies for different areas of our plan – this is explained later in this document when we set out the strategy and rationale for our plan.

Our use of the common reference scenarios across the plan can be summarised as follows:

- For each area of our plan, we evaluated which of the eight benign and adverse scenarios are relevant, based principally on the likely materiality to our plans and to outcomes for customers. See Table 6 below for a map of which scenarios are relevant in each area.
- We used the common reference scenarios defined by Ofwat in developing our plans. The common reference scenarios have been used within the detailed modelling within our WRMP and DWMP. The parameters defined under these scenarios have been central to our planning and in defining the resulting alternative pathways.
- We have used the scenarios to test and define the core pathway for each of the investment areas we describe below. Specifically, we have evaluated whether the elements of our plans are required in all or most of the common reference scenarios as one of the criteria for determining the core pathway.

The parameters used to define climate change, demand and abstraction reduction scenarios are generally well understood, and derive from established planning processes. Therefore, they have

been relatively straightforward to operationalise and incorporate in our established modelling processes or to use as the basis for developing new models.

The technology common reference scenario is rather different in nature, as it defines types and dates of introduction of specific technologies and/or cost impacts. While some of this can be modelled, this common reference scenario lends itself to a more qualitative assessment. Therefore, we have undertaken an exercise to work through and gauge the impact of the particular technology scenarios defined in the guidance and variants on it by gathering experts from within and outside the business. In considering the future impact of technology in relation to a no or low regrets plan we have been guided by a fundamental generic question: what investment would be inefficient if technology solutions developed in the future?

Company specific scenario

In addition to the common reference scenarios specified by Ofwat, we went through a process to identify whether there are any major externally-driven factors that may materially change our plans over the next 25 years. This built on the existing scenario / sensitivity analysis that we had already undertaken as part of the long-term planning described above.

We held a series of workshops with planning experts across the business to develop a long list of potential 'company-specific' scenarios. In deciding whether the factor should be included within our long term delivery strategy as an explicit scenario, we assessed each factor in terms of potential materiality, definability, and practicality of modelling. In many cases, we identified important assumptions, risks, and enablers, which we have captured as key assumptions (see section 6.1 for further details).

As a result of this process, we have included one further company-specific scenario, detailed below, within our long term delivery strategy. We used this scenario to test our plans and develop alternative pathways for relevant enhancement investment as set out in Chapter 3 below.

SESRO Permission

This scenario is to imagine a future in which the South East Strategic Reservoir Option (SESRO), as set out in our WRMP, is unable to proceed. This could arise as the result of a public enquiry or other planning restriction, which could be known as early as 2026, shortly after the start of the next regulatory control period.

In this scenario, other major water resource schemes including strategic transfers, re-use or desalination, would be needed to meet demand. Therefore, the main impact would be on new water resource investment. However, there may be other second-order effects such as the need for different solutions to improve water resilience (because different sources are being used) and the potential need to deal with the accelerated impact on the quality of water imported to the region as transfer schemes are brought into use earlier.

If the SESRO were unable to proceed, then a revised version of our water resource management plan would need to be developed and subject to regulatory approval.

Other scenarios that have not been tested

In developing our LTDS, we have followed Ofwat's guidance and used common reference scenarios and the company-specific scenario described above. However, we would like to stress that these do not cover all future uncertainties that we and other regulated water companies face. Notable exceptions that have neither specifically been tested in this iteration of our LTDS nor addressed in the guidance are:

Government Policy	New policies and policy changes from across government can have a significant impact on water company operations and planning from time to time. A good example is the 2050 per capita consumption target of 110 litres per person per day. This target began life as part of building regulations[13], but has now been embedded in our Water Resources Management Plan as it forms part of the WISER guidance[14]. Achieving this will require significant benefits to be achieved through other government initiatives (such as white goods water labelling). Any change in government also introduces uncertainty in policy.
New Regulations	We have worked with the Environment Agency to translate the Environment Act 2011 into a statutory programme of work. The programme includes a wide range of new investigations and this could result in future statutory programmes of that are as yet unknown. In particular, the industry still has much to learn about the impact of certain chemicals in wastewater on the environment.
Supply chain capability and capacity	We have conducted a thorough deliverability assessment in defining our AMP8 plan. For the purposes of LTDS, our working assumption is that the supply chain will be able to respond and develop the capability and capacity that we and the rest of the industry will need beyond 2030, to deliver the environment improvements that are needed. But the scale of the task is substantial and in many cases we will need to develop solutions that go beyond the current limits of technology.

The scenarios we have presented in our LTDS are those that are consistent with Ofwat's guidance that drive materially different alternative pathways.

Which common reference and company specific scenarios are relevant?

Table 6 below shows which of the scenarios are material to each area of enhancement investment. Our assessment of material relevance was initially a top-down exercise but has been validated during the development of detailed cases for enhancement investment for 2025-30 and beyond. In each area we considered whether each of the scenarios were materially relevant and undertook analysis which supports this judgement. We also considered the many second-order effects of these and other scenarios on our cases for enhancement.

[13] Part G of Schedule 1 and Regulation 26 to the Building Regulations 2010
[14] Water industry strategic environmental requirements (WISER): technical document, May 2022

Enhancements	Common reference scenarios								Company specific scenario: SESRO Permission
	Climate change		Technology		Demand		Abstraction reductions		
	Adverse	Benign	Adverse	Benign	Adverse	Benign	Adverse	Benign	Adverse
Replacing lead pipes									
Reducing risk of basements flooding from trunk mains									
Resilience to sewer flooding									
Water supply resilience									
Reducing sewage spills to rivers and improving river health									
Phosphorus Reduction in Rivers									
Sewage treatment works growth									
Developing new resources									

Table 6: Relevance of scenarios to enhancement investment

Where we identified that there might be the potential for the scenarios to have a material impact on our enhancement areas (both in terms of the actions that would be required and the total cost), we have presented analysis to quantify the impact for each area. This involved a range of techniques – for example, re-running optimisers having adjusted for total demand needs, and commissioning specific engineering assessments.

For each enhancement area, Section 3 summarises the impact of the scenarios on expected outputs and costs of investment. While the methods of quantification vary, we have presented the impact consistently across the enhancement areas as shown in this example (sewer flooding).

Best Value Pathway			Impact of applying selected scenarios					
	Planning Horizon	Output	Climate Change Benign	Climate Change Adverse	Demand Benign	Demand Adverse	Tech Benign	Tech Adverse
Surface Water Management (Hectares Managed)	2025-2040	760	740 (-3%)	770 (+1%)	760	760	760	760
	2040-2050	5,710	5,670 (-1%)	5,750 (+1%)	5,700	5,710	5,700	5,710
Network Improvement (Storage - 000' m3)	2025-2040	158	120 (-24%)	193 (+22%)	153 (-3%)	159	152 (-4%)	159
	2040-2050	1,757	1,586 (-10%)	1,923 (+9%)	1,734 (-1%)	1,759	1.730 (-2%)	1,758
Network improvement (new sewers km)	2025-2040	70	59 (-16%)	86 (+23%)	68 (-3%)	70	66 (-6%)	70
	2040-2050	903	811 (-10%)	1,007 (+12%)	886 (-2%)	909 (+1%)	875 (-3%)	903
Sewer Lining (km)	2025-2040	1,190	1,190	1,190	1,190	1,190	1,190	1,190
Totex impact (£bn)		23.4	21.8	24.6	23.4	23.4	23.4	23.4
		The scope (and cost) of solutions is the same or more than the best value plan						
		The scope (and cost) of solutions is less than the best value plan						

Table 31: Impact of different scenarios on Best Value Pathway solutions – Sewer Flooding

The table summarises the outputs of Best Value Plan categorised at a high level by types of output and period of investment and shows the overall totex impact. It then shows the impact on outputs and costs of the relevant scenarios. Where the scope and costs are less than in the best value plan, typically in some benign scenarios, this is highlighted in orange.

In calculating the impact of each of the scenarios we have tested we have been mindful of Ofwat's guidance to avoid combining extreme scenarios which could result in an implausibly high or low investment requirement. The impact of each of the scenarios is therefore tested independently of the other scenarios, typically resulting in "plausibly extreme" scenarios. This is achieved in different ways depending upon the underlying techniques. For example, in the case of sewer flooding above

the adverse climate change scenario is calculated while holding assumptions for demand and technology at central estimates.

2.3.5 Core and Adaptive Pathways

What is the difference between 'Best Value' and 'Core' Pathways?

These are subtly different concepts.

Our best value plans reflect the result of our extensive planning processes. In many cases, these involve testing against a wide range of scenarios, and ensuring sufficient resilience to a wide range of factors.

The core pathway reflects a specific definition of investment that is needed in most of Ofwat's common reference scenarios, or is either required in the short term or to keep future options open. This is an important pathway to understand, as it reflects a low / least regrets course of action. However, it may not always be the pathway that our customers want, or that our regulators require.

In many cases, our best value plan is the same as the core pathway. However, this can only be confirmed (or otherwise) having undertaken the robust scenario testing analysis described above.

Determining the core pathway

To determine the core pathway, following scenario analysis we then assessed each enhancement area in terms of whether it is needed:

- In all scenarios
- In most scenarios
- To keep future options open
- In the short term

Enhancements that met at least one of the above core criteria were selected for inclusion in the core pathway. We also undertook a further check that the core pathway, as defined by this approach, was at least able to meet our 2050 ambition under the benign scenarios. Where our scenario analysis (above) indicated that under one or more benign scenarios the scope and level of investment was less than the best value pathway (highlighted in orange above), this indicated that the core pathway would likely involve a lower level of investment.

In Chapter 3, for each enhancement area we present the results of applying the core pathway criteria. The example here (sewer flooding) illustrates this. It shows the best value plan, again split by type and period of investment. It also shows whether each of the criteria is met for each element of the plan, recognising that the criteria may not apply equally to all elements. For the investment to be included in the core pathway then at least one of the criteria should apply for each element of the planned investment as shown by the table. In addition, the table includes

Investment	Planning Horizon	Best value Plan	Needed in all scenarios	Needed in most scenarios	Needed to keep future options open	Needed in the short term	Core pathway
Surface Water Management (Hectares Managed)	2025-2040	760	Yes	No	No	Yes	740
	2040-2050	5,710	Yes	No	No	No	5,660
Network Improvement (storage m³)	2025-2040	175	No	Yes	No	Yes	114
	2040-2050	1,757	No	Yes	No	No	1,559
Network improvement (new sewer km)	2025-2040	70	No	Yes	No	Yes	55
	2040-2050	903	No	Yes	No	No	786
Sewer Lining (km)	2025-2040	1,190	Yes	No	No	Yes	1,190
Total cost	**£bn**	**23.4**					**21.8**
		The scope (and cost) of solutions is the same or more than the best value plan					
		The scope (and cost) of solutions is less than the best value plan					

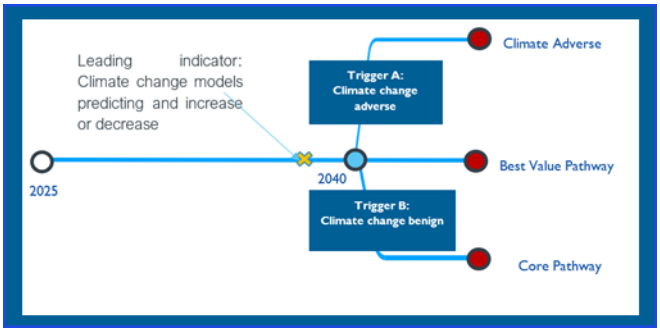
Table 32: Core Pathway Criteria: Sewer Flooding

the lower scope and cost of investment in the core pathway (highlighted in orange), which is designed to be at least capable of meeting the most benign scenario.

Determining adaptive pathways

Our scenario analysis for each enhancement area was a key input in determining if material alternative adaptive pathways were needed to enable our LTDS to respond adequately to external pressures. The process of determining the need for adaptive pathways, what changes in the external environment would trigger moving to each pathway, and the timing of the trigger and decision points was not a mechanical one but the scenario analysis provided a strong indication by showing which were the key factors driving change and when the material impacts could be felt. The scenario analysis was therefore used to inform a series of iterative in-depth review and engagement activities involving experts from across the business, which resulted in the development of a set of alternative pathways for each enhancement area. While the investment impact of the different scenarios was an important input, we also considered a wide range of other factors including customer "want", policy, regulatory and deliverability. We sought to balance the inherent complexity of the enhancement areas with the desire to present adaptive pathways which highlight the most material points of inflection over the long-term. In many cases, our plans are modular and relatively small-scale individual investments so that plans that can be easily scaled up or down as the external environment continues to evolve, as opposed to fundamentally different investment pathways.

As a consequence, some of our adaptive plans for each are relatively simple. In other cases, the adaptive pathways need to be more complex because of the timing and nature of the different factors. We used "tube maps" like the example here (water resilience, a relatively simple example) to present the core and adaptive pathways, including the decision and trigger points and key monitoring indicators in a comprehensible way.



Further details on each enhancement area, including the estimated impact of the scenarios, and our derivation of the core and adaptive pathways are set out in Chapter 3. We summarise the arrangements for monitoring the indicators which may cause a switch between pathways in Chapter 7.

2.3.6 What base buys

Ofwat's LTDS guidance focuses on enhancement cases. The LTDS data tables require enhancement expenditure forecasts for the core and alternative pathways up to 2050 – no equivalent requirement exists for base. The data tables also require a stylised calculation of customer bills only assessing the incremental impact resulting from enhancements.

As such, our LTDS focuses primarily on the need for, and the pathways associated with enhancement expenditure. However, it is not possible to solely consider enhancement expenditure in abstraction from base expenditure. In developing our enhancement cases, we have had to assess the level of improvements to be delivered from base expenditure as well as any key interdependencies with our enhancement cases.

In practice, in most instances we have started with an assessment of how much service improvement can be delivered from base, with the remaining gap to our 2050 ambition needing to be closed through enhancement investment and enabled by our approach to working smarter.

Over the next 25-years, we will deliver a step change in performance across nearly every metric of service. Much of the service improvement can be delivered through our base cost allowances. However, there are instances where incremental enhancement expenditure will be required.

Base and enhancement funding considerations for our long-term performance commitment targets are considered in a hierarchy as follows:

i) If we can achieve our performance targets by maintaining our assets, then funding comes from base cost allowances.
ii) If we can optimise our existing asset base by improving processes, leveraging ongoing efficiencies and new innovations then funding also comes from base cost allowances.
iii) If we cannot achieve our targets through maintaining or optimising our existing assets, then we require additional investment which needs to come from enhanced funding allowances.

We have identified 8 key areas where enhancement expenditure will be required to meet our longer-term ambition. These are:

Pillar	Vision 2050 outcome	Enhancement area
For customers	We provide safe, clean drinking water	• Lead pipe replacement
	We always maintain a reliable supply	• Improving water supply resilience • Reducing risk of basements flooding from trunk mains
	We protect customers from sewer flooding	• Reducing sewer flooding
For communities	N/A - we are not seeking any enhancement for meeting the communities outcomes	
For the environment	We collaborate with others to improve the health of rivers	• Reducing sewage spills • Reducing phosphorus to improve river health • Sewage treatment works growth
	We meet the changing needs of our customers and the world around us	• Developing new water resources

Table 7: 2050 outcomes mapped to enhancement area

Each of these enhancement areas are further detailed in Chapter 3 below.

3 Our plans (Ambition, Strategy, and Rationale)

We have structured our plans in line with the three pillars from Vision 2050 and key outcomes that are required to deliver against our vision.

For each area that requires enhancement investment in order to meet our vision, we set out our:

- Ambition: where will the company be in 25 years?
- Strategy: how will the company get there?
- Rationale: why is this strategy the best?

This Chapter steps through each outcome area and those supporting enhancement cases subject to adaptive planning. Chapter 4 presents the aggregate plans when taken together. Underpinning assumptions, enablers, and dependencies are set out in Chapter 6.

The below figures map the line of sight from our vision to key outcomes by 2050 to the supporting enhancement cases. Not every outcome has enhancement expenditure, as we consider we can deliver our vision from base activities.

	For customers					
Our Vision 2050	Making sure everyone always has access to top-quality water and a reliable waste system			Providing outstanding service and value for all our customers		Motivating customers to save water and protect the environment
Key outcomes for 2050	We provide safe, clean drinking water	We always maintain a reliable supply	We protect customers from sewer flooding	We offer customers value for money and send them affordable, accessible bills	We provide a proactive, personal service	We help customers understand how to protect the planet
Enhancement cases	Lead pipe replacement	Water supply resilience Reducing risk of basement flooding from trunk mains	Reducing sewer flooding	-	-	-`

Figure 14: Line of sight between our vision 2050 and enhancement cases: for customers

	For communities		
Our Vision 2050	Using our land to benefit surrounding communities	Equipping local communities with the skills they need to thrive	Championing our people to deliver our purpose
Key outcomes for 2050	We enrich community life for current and future generations	We champion what we do and create opportunities for everyone to be part of it	We trust each other to do the job
Enhancement cases	-	-	-

Figure 15: Line of sight between our vision 2050 and enhancement cases: for communities

	For the environment			
Our Vision 2050	Investing in our network to prevent leaks and keep water flowing	Preventing all wastewater pollution and leading wider efforts to restore river health and increase biodiversity	Producing all the green energy we can to power what we do	
Key outcomes for 2050	We meet the changing needs of our customers and the world around us	We collaborate with others to improve the health of rivers	We make every watt count	We leave a net-zero carbon legacy
Enhancement cases	Develop new water resources Demand management	Reducing sewage spills to rivers and improving river health Sewage treatment works growth	-	-

Figure 16: Line of sight between our vision 2050 and enhancement cases: for the environment

3.1 For customers

Our ambition for customers

Our vision
- Making sure everyone always has access to top-quality drinking water and a reliable waste system
- Providing outstanding service and value for all our customers
- Motivating customers to save water and protect the environment

Performance commitments
- Customer contacts about water quality
- Compliance risk index
- Water supply interruptions
- Mains repairs
- Unplanned outage
- Sewer collapses
- Internal sewer flooding
- External sewer flooding

Our enhancement investments
- Lead pipe replacement
- Water supply resilience
- Reducing risk of basements flooding from trunk mains
- Reducing the risk of sewer flooding

How we developed our plans for customers

WRMP24 and DWMP24

Other enhancement cases

1 **Identified options and solutions**
We undertook an extensive process of identifying options for potential enhancement investments to achieve our ambition.

2 **Identified our best value plan**
Options costs and benefits were evaluated to develop our best value plan

3 **Tested our plan against different scenarios**
Our best value plan was stress tested against future plausible scenarios

4 **Identified our core and alternative pathways**
Low and no-regrets solutions form our core pathway. Alternative pathways allow us to adapt to changing futures.

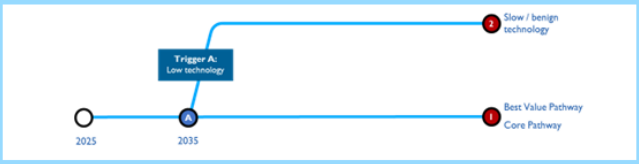
Our investment pathways under our plans for customers

We have identified four enhancement investment areas that will help us achieve our 2050 ambition for customers.

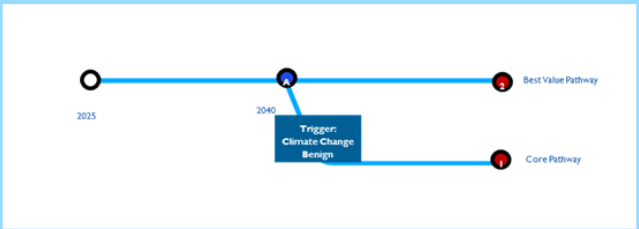
There are a number of alternative investment pathways that we may follow, which will be dependent on how the external environment changes.

Each have identified trigger points and associated monitoring metrics to inform when we may need to shift to an alternative pathway.

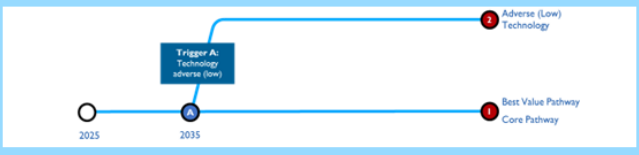
Lead pipe replacement pathways



Water supply resilience pathways



Basement flooding risk reduction pathways



Reducing the risk of sewer flooding pathways

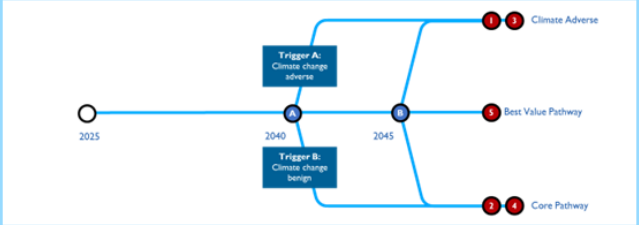


Figure 17: Long-term delivery strategy summary: for customers

3.1.1 Customers trust us to provide safe, clean drinking water

Ambition: where will the company be in 25 years?

Our vision outcome is that we provide safe, clean drinking water.

Every day we supply high quality drinking water to 10 million customers. Our water is amongst the highest quality in the world. However, we cannot be complacent. Customers expect to always have reliable, safe, clean, and "wholesome" drinking water: it remains their first priority in water.[15]

To support our ambition, we will proactively tackle any challenges to the high quality of our drinking water, including accelerating work to replace lead pipes.

The common performance commitments that Ofwat requires all companies to measure are set out below.

Performance measure	Units	2022/23 performance	2050 ambition	From base spend	From enhancement
Customer contacts about water quality	Contacts per 1,000 population	0.43**	0.30	All	None
Compliance risk index	Numerical score	10.96	0.50	All	None

Table 8: Safe, clean drinking water performance commitments

***Based on the methodology including contacts via social media and new communication channels*

In order to achieve the customer theme of our vision, we have identified the need for enhancement spend on lead pipe replacement over the next 25 years.

Enhancement area	Benefit delivered
Lead pipe replacement	Eradicate all lead customer supply pipes to the boundary of all primary schools by 2035 and replace all lead pipes by 2050

Table 9: Safe, clean drinking water – enhancement

Lead pipe used to connect properties to the treated water network was banned in 1970 as it is a neurotoxin. There are around 1.2 million lead communication ('comms') pipe connections and an unknown length of lead pipe on the customer supply side.

The Drinking Water Inspectorate (DWI) has stated that every person has a right to lead-free drinking water by 2050.

No level of lead in water is safe, and chemical dosing cannot eradiate the risk that lead poses. Internal corrosion of lead pipework can expose customers to harmful levels of lead. Therefore, action is required to accelerate the replacement of lead pipes.

As water quality is a top priority for our customers, our strategy is to replace all lead pipes, targeting high risk customers first. We will eradicate all lead customer pipes for all primary schools by 2035.

Strategy: how will we get there?

Our strategy will be achieved by:

[15] See 'TMS04 What Customers Communities and Stakeholders Want v.18.3' for further details

- Replacing lead communications ('comms') pipes supplying the highest risk customers first, either by targeting specific customers (e.g., primary schools) or supply areas (e.g., those with more infants living there).
- Trialling a significant customer side lead replacement initiative in control period 2025-30 to shape the future for how to achieve the most effective way to replace lead pipework downstream of our comms pipes. Using this learning to develop a best value programme for period 2030-35 and beyond, taking a leading role in the cross-industry approach to tackling the lead risk in drinking water systems.
- Improving mapping and risk profiling tools to 2035, working with external agencies to ensure that we use all available insight and collaboration opportunities to target those most at risk first.
- Upskilling our delivery team by integrating them within our current planning function to ensure aligned programmes of work, and build the skillsets of those involved in the end-to-end replacement of lead pipes, including expanding the smarter home visits remit to include water quality advice, improving the customer journey.
- Collaborating with innovators to develop; effective alternatives to chemical dosing to mitigate lead corrosion, new technology to identify buried lead pipes and no-dig solutions; optimise bulk chemical dosing over time as risk reduces (e.g., by moving to "in zone" chemical dosing to reduce costs, preferably with an alternative to orthophosphoric dosing[16]).

Base expenditure is part of a hierarchy of measures to address lead (Figure 18). Our base programme funds orthophosphate dosing and sampling programmes. Chemical dosing will not eliminate the risk that lead poses. The only way to achieve a lead-free supply is by replacing the lead via additional enhancement funding.

Figure 18 : Hierarchy of activities for reducing the risk of lead in drinking water

Our plan is to continue the replacement of our pipework during the 2025-30 period at a similar rate to the 2020-25 period whilst prioritising replacement for pipework serving more vulnerable customers. However, if we continue at the current pace of replacement would take until circa 2135 to replace all of Thames Water owned communications pipes, and it does nothing to tackle the customer side risk and extends the risk to public health beyond a level of acceptability. So, we will then increase our rate of replacement from the 2030-35 period where we would expect to see replacement of customer-side pipes based on approaches trialled in 2025-30. Future periods will benefit from the trialling and innovation during the 2025-30 period.

[16] Orthophosphate dosing chemically stabilises the surface of the lead pipe in contact with drinking water

Our enhancement activity and spend profiles under our best value plan are summarised below.

		2025-30	2030-35	2035-40	2040-45	2045-50
Lead Control	Number of Lead comms pipes replaced	54,000	150,000	315,167	315,167	315,167
	Replacement costs, £m	91.9	237.2	498.6	498.6	498.6
	Customer trial cost, £m	2.2	5.0	-	-	-
	Total cost, £m	94.1	242.3	498.6	498.6	498.6

Table 10: Lead pipe replacement enhancement spend summary

Rationale: why is the strategy the best way of getting there?

We set out below how we developed our investment plans, tested against different scenarios, determined our core pathway, and then summarise the alternative pathways.

The main aspects of our approach which ensure a best value plan are:

- We considered a range of solutions including point of use filters. Our optioneering has found that lead pipe replacement is the only option to resolve the long-term need. Tap filters rely on customers maintaining the filter so are not a reliable way of securing supply compliance.
- We developed six different delivery profiles over 25 years (see Figure 19). The best value plan (Option 6) steps up the replacement rate after 2030, and then again from 2035. This way we hit the 2050 ambition; allowing two control periods to fully work out and implement (across the industry) the customer side approach, while maintaining a reasonable replacement programme – retaining the skills, supply chain capacity, etc, to enable it to be scaled up when required. It also allows for innovation and technology to improve and provide cost and programme benefits to the "step ups".
- The scale and timing of this approach is supported by customers and stakeholders including the DWI who want a lead-free position by 2050.

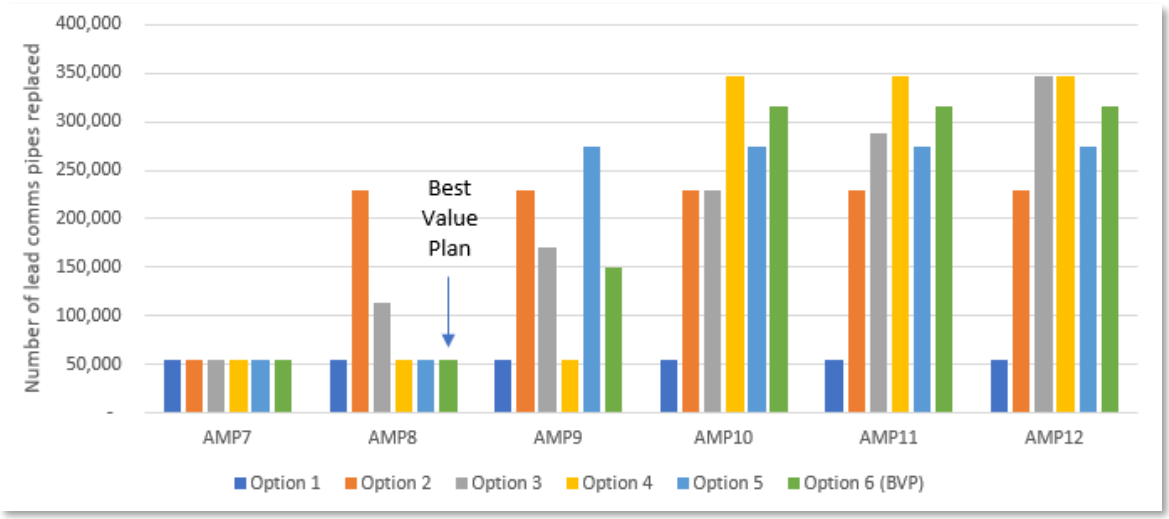


Figure 19 : Different profiling options considering in developing a best value plan

This approach:

- enables us to make best use of the new technology needed to deliver the work efficiently and effectively;
- starts to address customers' desire for us to take action and deliver immediate performance benefits while being affordable and deliverable in the short term; and
- enables us to step up activity as a lead free to tap targeted solution becomes clear.

The best value plan has been assessed against the Thames Water public value framework to ensure we account for wider benefits (see Figure 20). Our plan strongly benefits social capital across the nineteen measures. Improving our drinking water quality to protect public health, particularly for the vulnerable, in turn improves customer and stakeholder trust.

Figure 20 : Public Value assessment for Lead Control

How we developed the best value plan | How we tested against different scenarios | How we determined the core pathway | How we determined the alternative pathways

We followed Ofwat's LTDS guidance by assessing how our investment could be impacted by different scenarios to test the best value plan. A workshop held with our innovation department and other key stakeholders identified that the technology scenario would be the only scenario impacting on our lead programme. Table 11 shows the workshop outcome whereby Technology was considered the only scenario to significantly impact on a long-term lead control programme.

Reference scenario	Summary of discussion and conclusion	Decision

Climate change	More sustained, hotter weather could have a slight impact on water chemistry, which could possibly affect how warmer water interacts with lead pipes and/or the effectiveness of chemical dosing mitigation. These potential impacts were assessed as being negligible.	Discount
Technology	Technology could have a marked impact on how we model, locate and fix lead pipes (both comms and supply side), impacting the effectiveness and efficiency of any delivery programme, moving towards a lead-free network more or less quickly at lower or higher costs. It could also impact alternatives to current mitigation methods. These potential impacts were considered tangible and potentially significant.	Progress
Growth	As the presence of lead is historical and based on property age, population growth does not have an impact on the case.	Discount
Abstraction reductions	Reductions in abstraction rates across the system(s), even if this leads to changing supply routes (e.g., if the current water treatment works supply route is shut down and source routes change), this will not impact the delivery programme or public health risk from the current position.	Discount

Table 11 : Summary of the impact of Common Reference Scenarios on Lead Control

Technology could have a marked impact on how we model, locate and fix lead pipes (both comms and supply side), impacting the effectiveness and efficiency of any delivery programme, moving towards a lead-free network. It could also impact alternatives to current mitigation methods. While costs and mitigation methods may change, we do not envisage there being a technology developed any time soon that would fully forego the need for lead pipe replacement.

The key considerations for how a technology scenario might impact our 25-year delivery strategy are presented below.

Common reference scenarios		Moving to a lead-free water network
Technology	Fast/Benign	Fast innovation and associated technological advances will increase more rapidly throughout the next 25 years, providing consistent opportunities for innovative no-dig / low dig replacement methods (including the customer side). This will result in more significant cost efficiencies from 2030 onwards. Improved cross-stakeholder, open data, and insight on risk profiling of properties and customers, linked to improved modelling to determine presence of lead pipes in the network, will aid a prioritised and effective delivery programme from 2030. Improvements in "lead location" devices and methods from 2030 (could include customer-led water quality sampling) will improve contractor performance and confidence around cost efficiencies. Alternative mitigations are found from 2040 and delivered to provide sustained and effective protection at lower lead concentrations, to enable the delivery of the programme up to 2050. However, at some point all lead pipes will need to be remediated.
	Slow/adverse	Replacement methods (and therefore unit rates) will remain largely unchanged in the medium to longer term, using a combination of open cut and moling methods, as per AMP costed schemes, and no customer side pipe replacement innovation become available. Improvements in cross-stakeholder, open data, and insight on risk profiling of properties and customers, with improvements in modelling to determine presence of Lead pipes in the network, much slower, impacting the efficiency of the delivery

		programme. This is particularly impactful from 2040 as the prevalence of Lead in the network is much reduced. The same impact occurs if improvements in "Lead location" devices and methods are not realised, not allowing for improved contractor performance and confidence around cost efficiencies. If alternative mitigations are not found from 2040 and delivered to provide sustained and effective protection at lower Lead concentrations, then costs would have to increase to accelerate replacement and/or the public health risk is heightened as the programme is not delivered by 2050.

Table 12: Lead enhancement scenario testing

Our best value plan assumes a level of technological improvements and innovation in finding and fixing lead pipes as well as mitigating the lead by 2050. We estimate that there would be an increase in cost of the order of 9% under a slow technology scenario[17]. The table below summarises the impact on the enhancement areas under different technology scenarios.

Best Value Pathway			Impact of applying selected scenarios	
Investment	Planning Horizon	Best Value Pathway	Technology slow/adverse	Technology fast/benign
Customer Side Replacement Trial	2025-2035	Yes	Yes	Yes
Lead Comms Pipe Replacement [nr]	2025-2030	54,000	54,000	54,000
	2030-2035	150,000	150,000	150,000
	2035-2040	315,167	315,167	315,167
	2040-2045	315,167	315,167	315,167
	2045-2050	315,167	315,167	315,167
Total Cost	£m	1,832 *	1,974 **	1,832

The scope (and cost) of solutions is the same or more than the best value plan

The scope (and cost) of solutions is less than the best value plan

**includes customer trial costs in AMP8 & 9 **applying the 9% uplift on costs for an adverse or low technology scenario*

Table 13 : Impact of Scenarios on Best Value Pathway: Reducing Lead Control

The below figure illustrates the sensitivity of the enhancement expenditure to the scenarios – i.e., it is only the slow technology scenario that has a material impact.

[17] Established through analysis by Innovation teams using horizon scanning and technical judgement

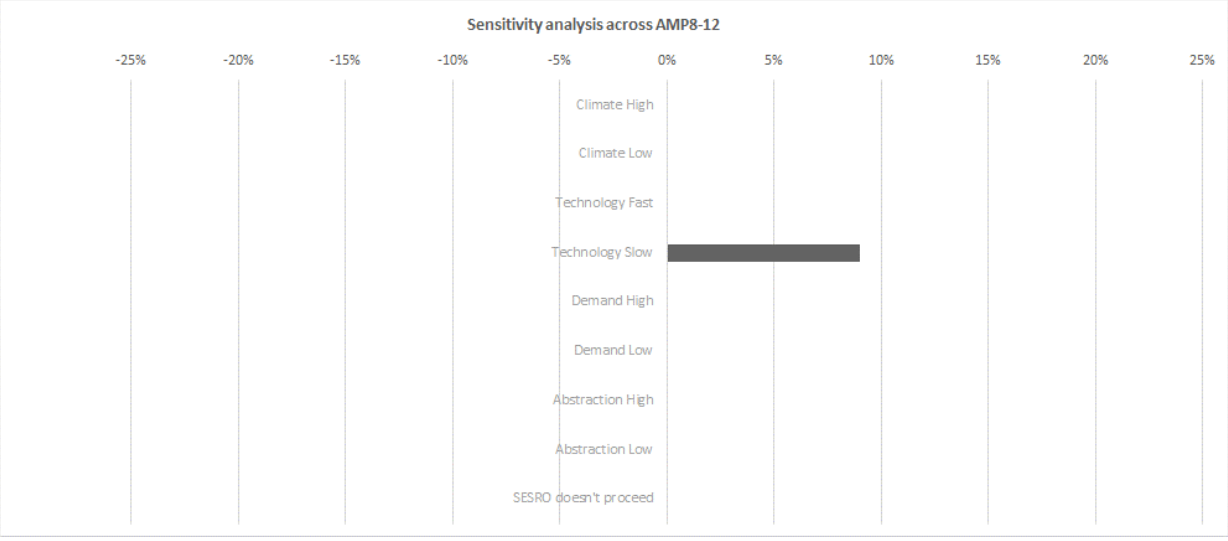


Figure 21: Comparing our best value plan to the scenarios we tested - lead

How we developed the best value plan | How we tested against different scenarios | How we determined the core pathway | How we determined the alternative pathways

The core pathway generates a no-regrets investment plan. For Lead control the core pathway assumes a Fast Technology scenario. The means that under a core plan non-dig and targeting technologies will have sufficiently advanced to lower plan costs. As our best value plan already assumes these developments will happen in the future it aligns to a core pathway approach. The table below sets out our best value/core pathway plan in terms of the different activities over the 25-year period.

Investment	Planning Horizon	Best value	Needed in all scenarios	Needed in most scenarios	Needed to keep future options open	Needed in the short term	Core Pathway? ('000 pipe replacements)
Customer Trial	2025-2035	Yes	Yes	Yes	Yes	Yes	Yes
Lead comms Pipe Replacement	2025-2030	54k	Yes	Yes	Yes	Yes	54k
	2030-2035	150k	Yes	Yes	No	No	150k
	2035-2040	315k	Yes	Yes	No	No	315k
	2040-2045	315k	Yes	Yes	No	No	315k
	2045-2050	315k	Yes	Yes	No	No	315k
Total cost	£m	1,832					1,832
		The scope (and cost) of solutions is the same or more than the best value plan					
		The scope (and cost) of solutions is less than the best value plan					

Table 14: Core Pathway Criteria: Moving to a lead-free water network

Having established our best value plan and core pathway, we developed and tested an alternative pathway that meet our long-term ambition over a range of plausible futures.

The slow (adverse) technology scenario has the most material impact on our best value plan, so we have used this as our alternative pathway. This means slow development in identification and no-dig technologies would generate a higher investment trajectory from 2035 onwards.

There are no specific one-off "hard" triggers for considering moving to an alternative pathway. We will continue to monitor industry best practice and in particular lead replacement unit rates. For the purposes of compliance to LTDS guidance we show a nominal trigger point of 2035 in our adaptive planning tube map (see Figure 22).

The programme to eliminate lead from our drinking water network is highly adaptable. The lead pipe replacement rate can be accelerated or decelerated as different risk profiles or technologies emerge which allow for improvements on mitigation, targeting, finding, and replacing lead pipes.

Our 2025-30 lead comms replacement programme will run alongside customer trials and provide the ability to step up activity as a 'lead free-to-tap' targeted solution becomes clear. We aim to maximise potential benefits via synergies with other network programmes such as smart metering.

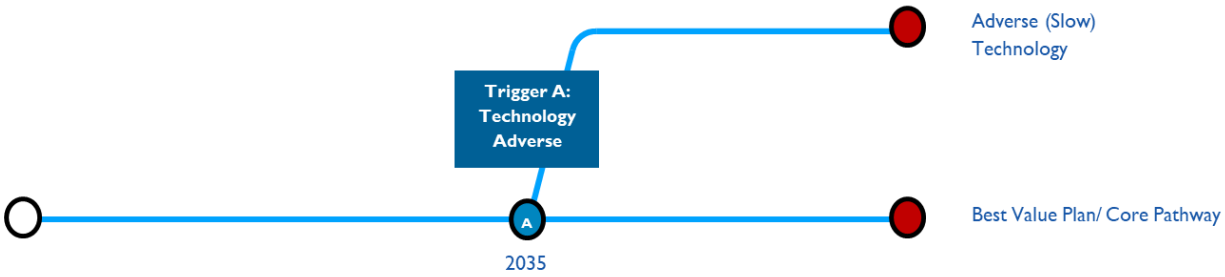


Figure 22 Graphic showing alternative pathway to best value and core pathway – lead control

Pathway Name	Decision/Trigger Dates	Description
Core Pathway / Best Value plan	N/a	As described above. It assumes a fast technology scenario
Slow technology	2035	Technology has been identified as having a potential material impact on our plans. We have front end loaded trials in order to maximise the benefits from technology change. Should technological efficiencies not occur, this could materially increase the cost of our plans from 2035 onwards.

Table 15: lead pipe replacement alternative pathways

Conclusion

In order to meet our vision outcome that customers trust us to provide safe, clean drinking water, we are going to need a multi-control period investment programme to accelerate the replacement of lead pipes.

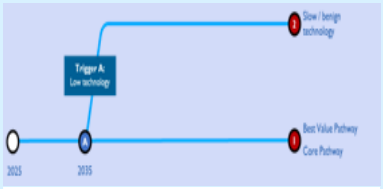
Strategy

Our strategy involves accelerating the replacement of lead comms pipes.

We have developed a strategy of modular investment to make best use of new technologies / insights from trials.

Scenarios

We have tested the best value pathway against different scenarios. The technology scenario has a potentially material impact on our strategy. Our lead pipe best value plan is the same as our core pathway.



Adaptation

We may switch to an alternative pathway in 2035 should expected benefits of innovation be slower than expected.

3.1.2 Customers count on a reliable supply of water

Ambition: where will the company be in 25 years?

Our vision outcome is that we always maintain a reliable supply.

Reliability and the provision of a constant water supply is one of the highest priorities for our customers. Customers also prioritise dealing with safety risks associated with our water network.

To support our ambition, we will invest in innovation so that no one is let down by our network.

This will involve targeted investment to remove the risk of unacceptable interruptions to supply, and critical risks to health and safety that burst trunk mains represent to basement properties.

The common performance commitments that Ofwat requires all companies to measure are set out below.

Performance measure	Units	2022/23 performance	2050 ambition	From base spend	With enhancement
Water supply interruptions	Minutes per property per year	10:55	05:00	08:00	05:00
Mains repairs	Number per 1,000 km of mains	316.8	116.0	228.2	116.0
Unplanned outage	%	2.65	1.10	1.10	1.10

Table 16: Reliable supply of water performance commitments

In order to achieve the customer theme of our vision, we have identified the need for enhancement spend over the next 25 years in two areas (see Table 17).

Enhancement area	Benefit delivered
Water supply resilience	No supply interruptions (>48 hours) by 2050
Reducing the risk of basement flooding from trunk mains	Fully mitigate the risk of basement flooding by 2050

Table 17: Reliable supply of water – enhancement

It is our 2050 ambition to develop a resilient network for our customers, where no customer shall be without water for more than 48 hours once in in their lifetime by 2050. Our customers support this ambition.

The risk of flooding of basement properties resulting from a failure of our trunk mains poses a critical risk to the health and safety of our customers. Therefore, action is required to mitigate the risk of basement flooding by 2050. We require a new, proactive strategy to rehabilitate trunk mains where customers are at the highest risk of basement flooding to reduce the likelihood of a fatality occurring. Customers unanimously support a move towards more proactive trunk main rehabilitation to address this risk.

We describe the strategy and the rationale for each enhancement area below.

<u>Water supply resilience</u>

Strategy: how will the company get there?

Water supply resilience is the ability of the water networks to responds to change (climate or growth) or recover from shocks so no major supply interruptions occur. Resilience risks are features of a network or an asset that make them vulnerable to supply interruptions e.g., single failure points.

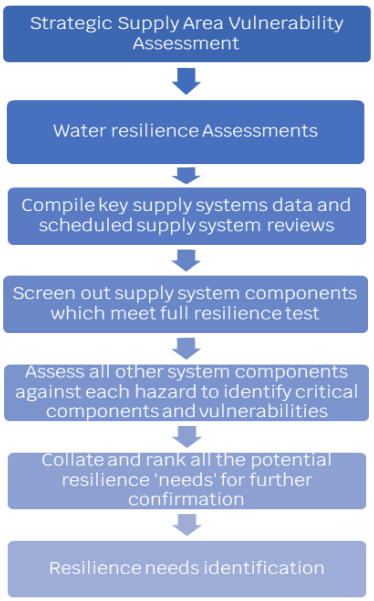
Resilience risks exist across a wide range of asset types, including pumping stations, reservoirs, treatment works, and specific water mains. Failures on these critical assets can lead to major supply interruptions. Measures to reduce risk include dualling mains to remove single points of failure, asset upgrades, and system re-configuration. Our strategy to achieve our ambition is to incrementally address the resilience risks targeting the risks resulting in the largest supply interruptions to customers first ('worst-first').

We have a mature risk targeting framework developed in AMP7 as part of the Conditional Allowance framework for our Water Supply System Resilience Programme (WSSRP). This framework is comprehensive and has been independently assured to demonstrate value for money. Two key aspects are:

- Establishing the risk appetite: developed by our customers, stakeholders, and our board, who have told us that supply interruptions equivalent to or greater than 48 hours once in a customer's lifetime are unacceptable and must be mitigated. We set with customers thresholds to trigger action plans based on properties impacted and duration.
- Use of criticality modelling knowns as Failure Modes Effects and Criticality Analysis (FMECA) to identify hazards, link them to asset vulnerability and score risk. A resilience risk score factors in duration, impact, and likelihood. It follows the 4Rs framework of resilience[18]. Where a risk exceeds thresholds it is promoted to a resilience need to generate a programme of work.

Figure 23 gives an overview of process used to target risk and how it has generated an appropriate sequenced programme of addressing resilience needs.

Figure 23 : An overview of targeting resilience risks



Base and enhancement expenditure are both required in delivering our programme of risk reduction. Base expenditure focuses on reducing the impact of a system failure with for example enhanced recovery responses. Enhancement expenditure improves resilience against hazards for example by removing single points of failure that cannot be achieved through maintenance,

[18] 4Rs of resilience: – Resistance – Reliability – Redundancy – Response & Recovery

ensuring a higher level of resilience in the future. Figure 24 shows the positioning of base and enhancement expenditure as part of a hierarchy of measures to improve supply resilience.

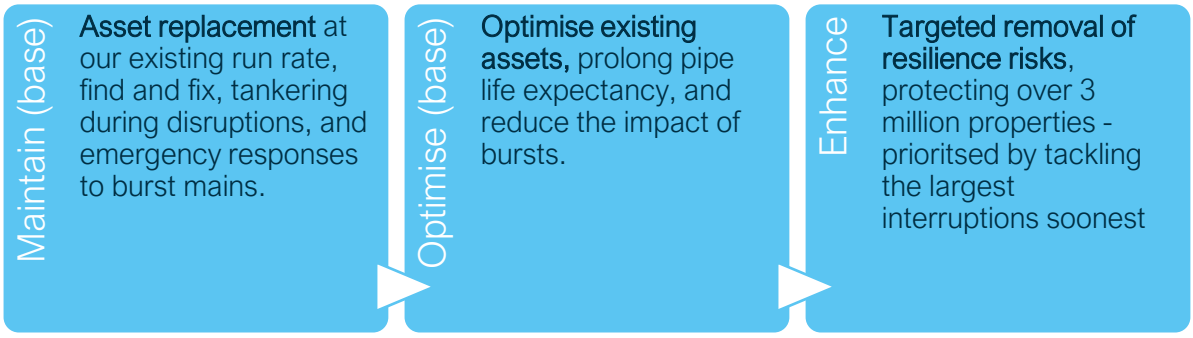


Figure 24: Hierarchy of activities for improving supply resilience

A summary of our enhancement spend required to deliver resilience is given below. Activities are evenly spread across 2030-2050 planning period. However, for AMP8, activities in the near term are constrained. This is due to the size of the environmental programme (WINEP) and the deliverability and financeability challenges this has placed on other sector requirements.

Category	Unit	2025-30	2030-35	2035-40	2040-45	2045-50
Solutions delivered	nr	5	89	89	89	89
Properties protected (±20%)	nr	690,000	1,200,000	990,000	610,000	140,000
Improving water supply resilience	£m	464.8	2027.3	1,649.4	1,487.0	1,022.9

Table 18: Water supply resilience enhancement spend summary (TOTEX Price Base Sept 2023).

Rationale: why is the strategy the best way of getting there?

Resilience investment in AMP8 is a continuation of our AMP7 WSSRP programme. All remaining water systems and their respective resilience needs will be assessed and delivered from 2030 onwards across our multi-AMP resilience programme.

To develop our best value plan, we followed five steps in sequence.

1. **Used customer insights to identify all the resilience needs above our risk appetite threshold.** This identified 219 resilience needs to date, with a further 37 water systems remaining to assess. To build a complete picture of our resilience needs over the long-term, we have estimated the number of needs expected in the 37 remaining systems. The average number of needs discovered by asset cohort from completed assessments was extrapolated to project the needs for the 37 systems.
2. **Sequenced the resilience needs on a worst-first basis** to reduce risk of the very largest interruptions as soon as possible for customers. To do this we used the total risk score, which represents the combined duration, impact and likelihood score, and ranked these

high to low. Our customers have told us that they support us prioritising needs based on worst-first to bring greatest value for customers[19].

3. **We then identified a wide range of solutions,** which could reduce the risk to an acceptable threshold for all resilience needs. While engineered design costs were produced for 2025-30 resilience needs, for future years, we have used a top-down extrapolation. For solutions in the 2025-30 period, we considered a wide range of factors beyond just expenditure using our public value framework, in line with Ofwat's public value principles. For each resilience need, an assumed solution and assumed cost band was generated using historical cost and solution profiles. Each need was then taken through our internal engineering technical governance forum where the assumed solution and assumed cost band were reviewed and rejected/accepted.
4. **Constrained the 2025-30 programme** to reflect short term deliverability challenges. The short term programme comprises of the highest scoring resilience risks to customers.
5. **Allocated activity out to 2050** using a smooth profile of solutions to be delivered per five-year control period.

We followed Ofwat's LTDS guidance by assessing how our investment could be impacted by different scenarios to test the best value plan. After a peer review, abstraction impacts were discounted as having no material impact on the severity of our resilience needs. This left the impact of three sets of scenarios, which are potentially materially relevant to the requirement for investment in water resilience (see Table 19).

Common reference scenarios		Water supply resilience
Climate change	High and Low	Elevated temperatures will impact on a range of failure modes across our estate. Ofwat's benign Common Reference Scenario is based on global average temperature rise of 1.6°C by 2100. We assessed 16 failure modes such as flooding, M&E failures, power failures and ground movement, against the impact of increased temperatures. This identified what the impact in risk scores of a resilience need.
Demand	High and Low	Demand for water can have an impact on water resilience as increases in customer numbers, changes in the distribution of demand and network enhancements put additional pressure on already vulnerable assets. We have tested our best value plan against adverse and benign demand scenarios consistent with Ofwat's Common Reference Scenarios, using local authority planned growth and ONS population and household projections respectively.
Technology	Faster and slower	We have considered implementation of smart water supply network technology during the 2025-30 period following trialling in the 2020-25 period. This should have material benefits for water resilience risk, for example by allowing for detection and rectification of network faults before catastrophic failure. Alongside other technological advances, such as voltage and current monitoring on pumps, this is assumed to reduce the likelihood of asset failures by 20%, and duration of failures by 10%. Ofwat's fast technology scenario assumes smart network roll-out by 2035 and our technology scenario is consistent with this. Other aspects of the technology Common Reference Scenarios are less relevant.

Table 19: Water supply resilience enhancement scenario testing

[19] PR24 Enhancement Case Deep Dive research. May 2023

The table below summarises the impact of different scenarios on our water supply resilience investment.

Best Value Plan		Impact of applying selected scenarios (£m costs)					
Investment	Best Value Plan (m)	Climate Change High	Climate Change Low	Technology Fast	Technology Slow	Demand Adverse	Demand Benign
2025-30	£465	-	-	-	-	-	-
2030-35	£2,207	-	-	-	-	-	-
2035-40	£1,649	-	-	-	-	-	-
2040-45	£1,487	-	-£18m	-	-	-	-
2045-50	£1,023	-		-	-	-	-
Total Cost (£m)	6,652	6,652	6,634	6,652	6,652	6,652	6,652

Table 20: Water supply resilience enhancement testing against scenarios (Price Base Sept '23)

Our scenario analysis showed that our best value plan was most sensitive to different climate change scenarios. Different demand and technology scenarios are immaterial in terms of changing the size of the investment plan. The benign scenario for climate change affected the plan most, by decreasing the total spend by £14 million. A summary of the outputs from the sensitivity analysis is shown in Table 20 and shows that more benign climate change scenarios are forecast to have the most significant impact on the size of investment required.

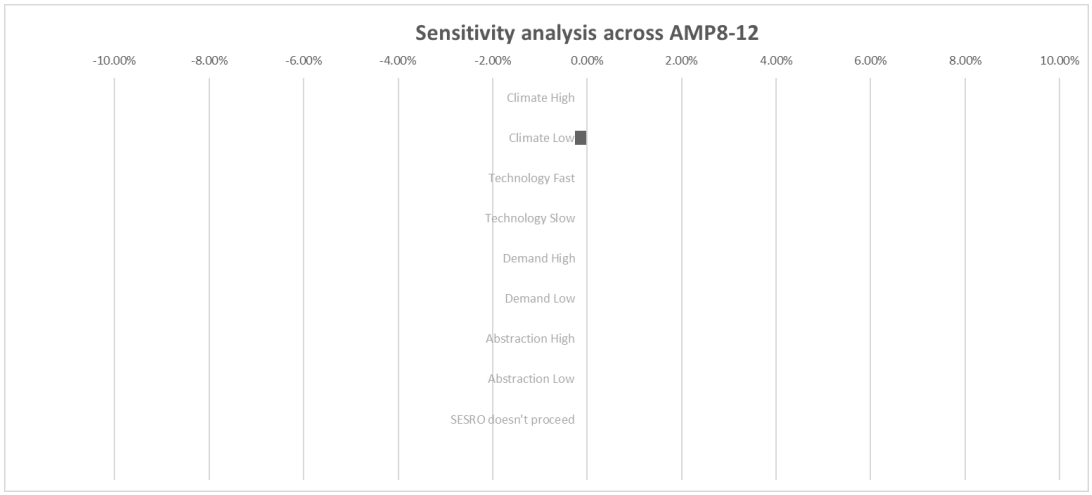


Figure 25: Comparing our best value plan to the scenarios we tested – water resilience

How we developed the best value plan | How we tested against different scenarios | How we determined the core pathway | How we determined the alternative pathways

The core pathway drives a programme of no- and low-regret investments, as per Ofwat's LTDS guidance. Following the sensitivity analysis, the core pathway was set to track the most benign climate change scenario over the 25-year planning period.

Investment	Planning Horizon	Best value plan (No. of solutions)	Needed in all scenarios	Needed in most scenarios	Needed to keep future options open	Needed in the short term	Meet at least one of the core criteria	Core Pathway? (No. of solutions)
Water Resilience Solutions	2025-2030	5	Yes	Yes	No	Yes	Yes	5
	2030-2035	89	Yes	Yes	No	No	Yes	89
	2035-2040	89	Yes	Yes	No	No	Yes	89
	2040-2045	89	Yes	Yes	No	No	Yes	86
	2045-2050	89	Yes	Yes	No	No	Yes	85
Total cost	£m	£6,652±21%						£6,634±21%
			The scope (and cost) of solutions is the same or more than the best value plan					
			The scope (and cost) of solutions is less than the best value plan					

Table 21: Reliable supply enhancement testing against scenarios (Price Base Oct '21)

In the near term our best value and core pathway are the same up to 2040. This means our near term investment plan is future proofed by taking a conservative view of changing climate change forecasts. In the longer term our best value plan tracks more adverse climate change forecasts. This pathway is the right strategy to achieve our 2050 vision as we have selected no regret investments in the near term whilst planning for alternative futures in the long term.

From 2040 onwards we have an alternative pathway from core pathway. This is driven by the benign climate change scenario as shown in the "tube diagram" below. Our plan is able to accommodate future change because solutions to meet resilience are scalable as they are modular and relatively small, even accounting for the time needed to secure permissions and access and to deliver even the most complex schemes.

At a risk level changes scenario changes could have the following impact:

1. An existing risk is found to have a higher risk score and needs to be moved higher in the prioritisation.
2. New risk is identified that needs to be incorporated into the programme based on a risk score above the risk appetite threshold.
3. Combination of both changes to new and existing risks and associated risk scores.
4. Change to risk appetite threshold.

A single trigger point has been assigned to determine whether we need to scale up beyond the core pathway in the future. This is set at 2040 where current climate change forecasts start to significantly diverge. This trigger points includes a review to be carried out at PR29 to re-evaluate the benign and adverse climate change scenarios to align with the global increase in temperature at the time.

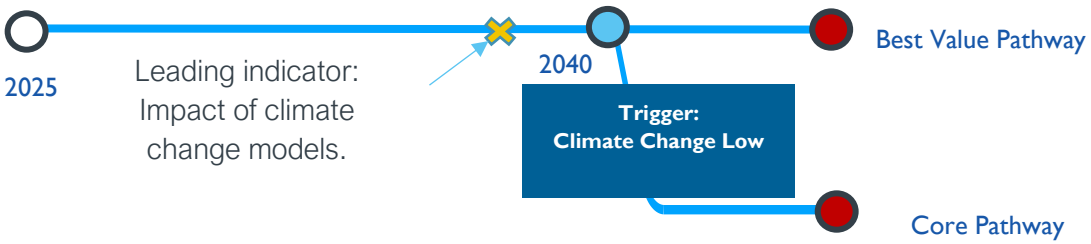


Figure 26: Tube map schematic of BVP with trigger point indicating point to assess whether an adaptive pathway should be adopted over the best value pathway.

Reducing risk of basement flooding from trunk mains

Strategy: how will the company get there?

We have identified 37,545 properties across our network at risk of basement flooding due to the proximity of 343 km of trunk mains. Our long-term goal to 2050 is to mitigate the safety risk associated with our assets for all of these basement properties through a phased programme of trunk main rehabilitation. For the 2025-30 period, our investment will address the most critical sections of trunk main, which pose a risk to the largest number of basement properties and carry the highest likelihood of failure.

Reducing the risk of basement flooding is separate from our base trunk main management programme activities which typically comprise;

- valve maintenance and installation,
- enhanced inspection and monitoring capabilities,
- reactive repair work to improve interruptions to supply,
- leakage and mains bursts performance.

Activities other than mains rehabilitation, would not reduce the risk sufficiently at any of the sites at risk of basement flooding, where if a main were to fail catastrophically, basements could be completely flooded within seconds, and we would be unable to respond reactively in time.

We therefore plan a specific programme of enhancement to address the safety risk associated with our trunk mains. We will invest £170 million in 2025-30 and a total of £2.5 billion out to 2050 in addition to our base programme. Our strategy will address 343 km of trunk mains and reduce risk of basement flooding for over 37,500 properties by 2050 – i.e., all basements at risk of flooding.

We will prioritise investment towards those mains which hold the highest basement flooding risk first.

Our enhancement spend profiles under our best value plan are summarised below.

		2025-30	2030-35	2035-40	2040-45	2045-50
Reducing risk of basement flooding from trunk mains	Trunk mains renewal (km)	12	31	62	94	129
	Properties with risk reduced	4,154	3038	6076	9329	12,794
	£m	216	398	558	761	940

Table 22: Trunk mains enhancement spend summary

Our trunk mains programme involves a steady and increasing ramp-up of activity as our capital delivery capability increases and we take advantage of technological advances and efficiencies, to deliver more for our customers and communities AMP-on-AMP.

Our best value plan has been developed following the steps below:

1. We undertook a technical review which considered 12 different possible options to reduce the risk of basement flooding across our trunk main network, including:
   - **capital investment** – trunk main replacement and trunk main slip-lining;
   - **operational interventions** – cross connections, enhanced trunk main monitoring, proactive trunk main valve checks, transient investigations, fix-on-fail;
   - **nature-based solutions** – sustainable drainage systems;
   - **partnership working** - utilising third-party infrastructure to monitor assets and reduce risk (dark fibre);
   - **catchment management** – enhanced surface drainage systems and flood protection barriers; and
   - **behavioural change** such as property type changes installing.
2. Trunk main replacement and trunk main slip-lining were deemed to be the only viable options. We have considered the public value generated by both open-cut and slip-lining rehabilitation methodologies as part of our optioneering. The speed in which basement properties would be flooded in the event of a catastrophic failure means that other measures would not be sufficient to mitigate the risk.
3. We engaged with over 1,600 current household customers, 500 current non-household customers and 70 future customers via in person workshops, online surveys, and community discussions to discuss the risk and the pace with which we address it.
4. Customers supported a move towards more proactive trunk main rehabilitation, favoured a 'prevention over cure' approach and supported a programme of regular, proactive renewal of our water network, starting with pipes most at risk. London customers saw this issue as a top priority.
5. We determined our 2025-30 scope by balancing risk against cost and deliverability constraints. We recognise the current cost of rehabilitation is high, and these are complex and time-consuming schemes to deliver. Therefore, our 2025-30 plan seeks to address the risk outliers and has been prioritised based solely upon risk of basement flooding.
6. Under our best value plan, we assume that innovation will increase significantly in the industry throughout the next 25 years, providing consistent opportunities for innovative no-dig/low-dig rehab methods, which will result in more significant cost efficiencies from 2030 onwards. Therefore, we assume a modest percentage increase control period to control period of km that we can deliver at a more efficient unit rate.
7. We will seek to rehabilitate all 343 km of trunk mains at risk of causing basement flooding to 37,545 properties by 2050.

This investment is guided by our public value framework which notes that proactive interventions generate public value over the long term while under a reactive approach public value diminishes over time. The investment strongly benefits social capital. Reducing the risk of basement flooding

protects vulnerable customers, improving customer and stakeholder trust and reduces economic, transport and recreation disruption caused by flooding and remediation. An extract of our public value framework is shown below.

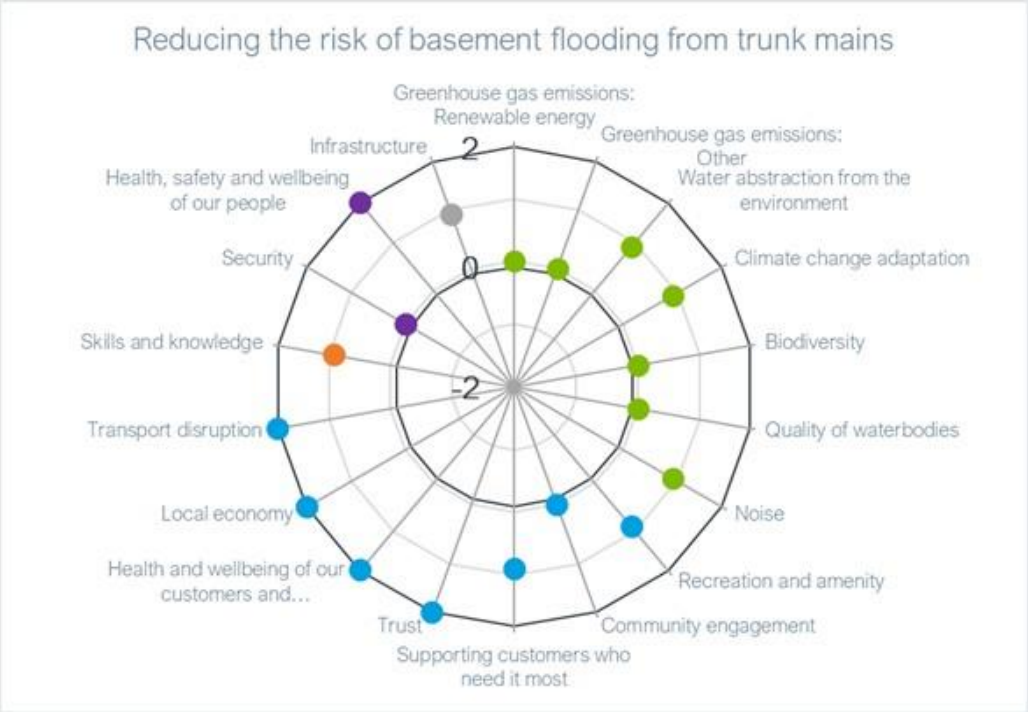


Figure 27 : Public value qualitative assessment for reducing the risk of basement flooding

How we developed the best value plan | How we tested against different scenarios | How we determined the core pathway | How we determined the alternative pathways

We followed Ofwat's LTDS guidance by assessing how our investment could be impacted by different scenarios to test the best value plan.

Of the common reference scenarios, we considered in detail the benign and adverse climate change and technology scenarios. Demand and abstraction reduction are expected to have negligible impact on trunk main safety risk, as the risk stems from the proximity of our large trunk main network to basement properties and the condition of those assets. Reductions in demand or abstraction would not reduce the impact of the consequence nor significantly change the likelihood of the consequence occurring.

Common reference scenarios		Trunk mains
Climate change	High and Low	Climate change may impact this investment area due to failure of our assets, caused by the frequency and scale of extremities in wetting and drying cycles, as well as drought risk and subsequent change in soil moisture deficit. Our AMP8 Enhancement Case contains details of the impact of these two scenarios compared to our base assumptions. We have determined that the scenarios are unlikely to have a major impact on the overall scope of the plan over the long term because the fundamental need to address the risk remains. However, it may affect the pace of investment over time if there appears to have been impact on rate of pipe failure.

Common reference scenarios		Trunk mains
Technology	Faster and slower	Technology may impact our plans because improved risk evaluation or intervention techniques may help better targeting or cheaper mains renewal in the future. This is likely, all else equal, to reduce the costs to alleviate the risk of basement flooding. Under a fast technology scenario there should be consistent opportunities for innovative no-dig / low-dig mains rehabilitation methods resulting in cost efficiencies AMP-on-AMP from 2030 onwards. We assume this leads to a 10% AMP-on-AMP cost efficiency from the initial 2025-30 unit rate (£/km), resulting in a 40% efficiency over the 25 year period. More accurate, reliable and precise asset condition information through innovative inspection methods should enable a more targeted risk-based investment programme from 2035 onwards, allowing us to targeting only the poor condition sections of pipework and leave 'healthy' sections of pipe in-situ. This results in a step-change in efficiency of around 20% from 2035. Combined we estimate this leads to overall improvement in efficiency compared to AMP8 rates of c50% across the period. Our slow technology scenario assumes that these improvements are not as great and/or delayed. Specifically, we assume that rehabilitation methods (and therefore unit rates) will remain largely unchanged in the short to mid-term, using a similar combination of replacement and slip-lining, as per the 2025-30 costed schemes. In addition, we assume that improvements in asset condition assessment will only impact the plans from 2040, rather than 2035, resulting in an overall cost efficiency across the period of c20% compared to 2025-30 rates.

Table 23: Reducing the risk of basement flooding enhancement scenario testing

The table below summarises the impact on the enhancement areas under different scenarios.

Best Value Pathway			Impact of applying selected scenarios			
Investment	Planning Horizon	Best Value Pathway	Climate Change High	Climate Change Low	Technology slow	Technology fast
Trunk Mains Renewal (£m)	2025-2030	216	216	216	216	216
	2030-2035	352	513	371	443	421
	2035-2040	492	770	511	885	579
	2040-2045	672	927	736	1074	834
	2045-2050	830	978	1,150	1474	1303
Total Cost	£m	2,874	18.4%	16.7%	42.4%	0%
		The scope (and cost) of solutions is the same or more than the best value plan				
		The scope (and cost) of solutions is less than the best value plan				

Table 24: Impact of Scenarios on Best Value Pathway: Reducing Risk of Basement Flooding from Trunk Mains

As can be seen from the above, the adverse technology scenario has the most material affect, significantly increasing costs over the 25 years.

The costs profiles over the 25 years are shown in the following diagram. These are the figures by year not cumulative.

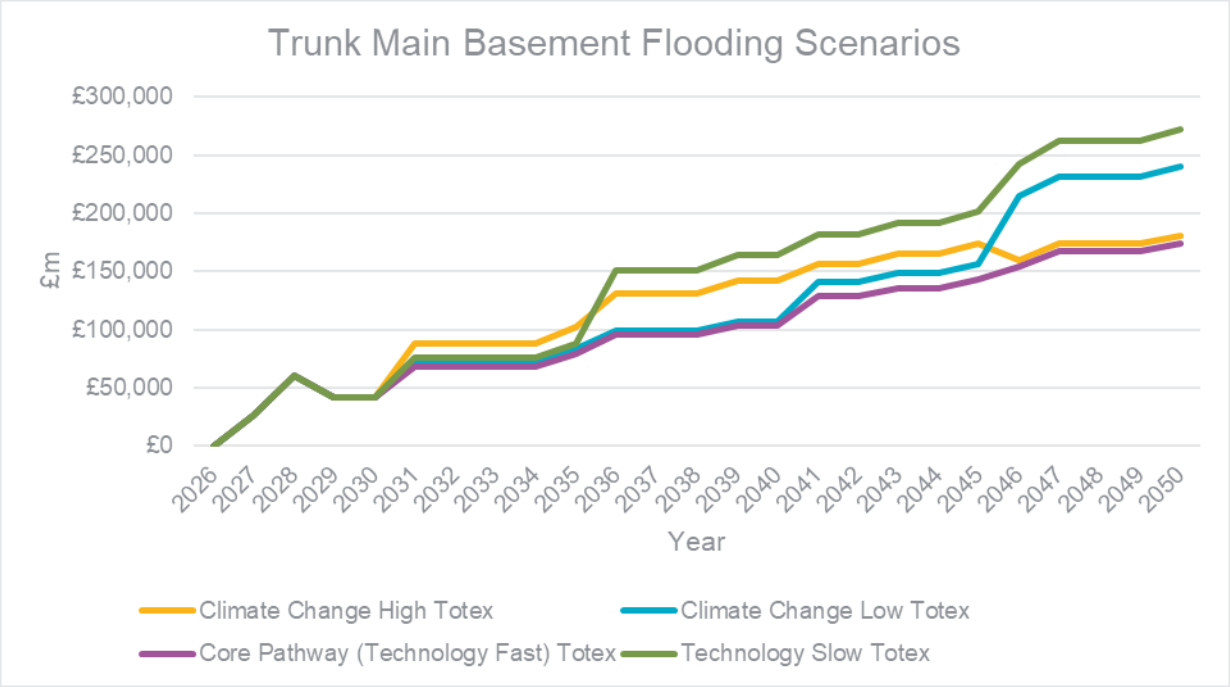


Figure 28: Spend on trunk mains to reduce risk of basement flooding under different scenarios

The figure below illustrates the sensitivity of the enhancement expenditure to the scenarios – i.e., the technology scenario is the most impactful, in particular, the low scenario.

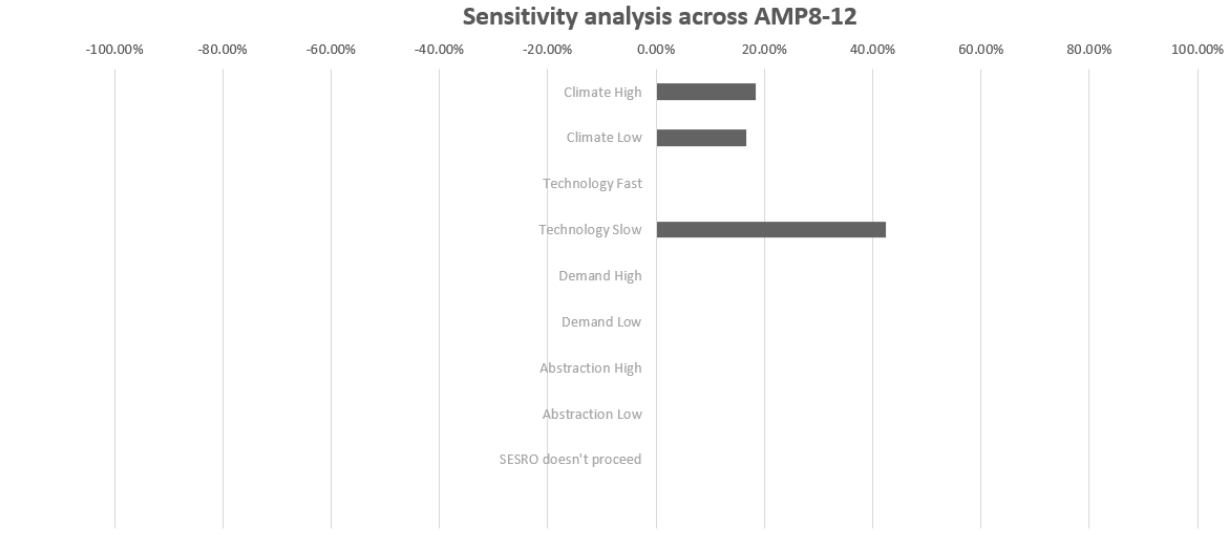


Figure 29: Comparing our best value plan to the scenarios we tested – reducing flooding risk from trunk mains

The core pathway represents no-regret investment. Following on from our sensitivity assessment a plan that factors in the efficiency that improved technology generates is no-regrets. Therefore, our core pathway is aligned to a Fast (or benign) Technology scenario. This means our core pathway incorporates future developments in targeting and mains renewals.

As our best value plan incorporates the latest, proven technologies to ensure best value for customers and factors in future technology efficiencies, it is following the core pathway.

We are currently investing in trialling long-length condition assessment technologies and innovative no dig solutions and believe the step change represented in the high technology scenario to be realistic from 2035 onwards.

Table 25 shows the best value plan and the core pathway are one and the same.

Investment	Planning Horizon	Best value plan	Needed in all scenarios	Needed in most scenarios	Needed to keep future options open	Needed in the short term	Meet at least one of the core criteria	Core Pathway Km
Trunk Mains Renewal (km)	2025-2030	12	Yes	Yes	No	Yes	Yes	12
	2030-2035	31	Yes	Yes	No	No	Yes	31
	2035-2040	62	Yes	Yes	No	No	Yes	62
	2040-2045	94	Yes	Yes	No	No	Yes	94
	2045-2050	129	Yes	Yes	No	No	Yes	129
Innovation	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total cost	**£m**	2,874						2,874
		The scope (and cost) of solutions is the same or more than the best value plan						
		The scope (and cost) of solutions is less than the best value plan						

Table 25: Core Pathway Criteria: Reducing Risk of Basement Flooding from Trunk Mains

Having established our best value plan and core pathway, we developed and tested alternative pathways that meet our long-term ambition over a range of plausible futures.

For simplicity as the slow (adverse) technology scenario has the most material impact on our best value plan we have used this as our alternative pathway. The impact of the slow technology scenario is primarily due to long-length asset condition assessments benefiting our investment programme at a later point in time than assumed in our best value plan (2035). This means slow development in condition assessment would generate a higher investment trajectory from 2035 onwards.

We are currently investing in trialling different in-pipe technologies now, to be able to develop this technology sufficiently and roll it out in line with our best value plan.

There are no specific one-off “hard” triggers for considering moving to an alternative pathway. We will continue to monitor industry best practice and will monitor our adherence to the best value plan through ongoing monitoring of trunk main rehabilitation unit rates. For the purposes of compliance to LTDS guidance we show a nominal trigger point of 2035 in our adaptive planning tube map (see Figure 30).

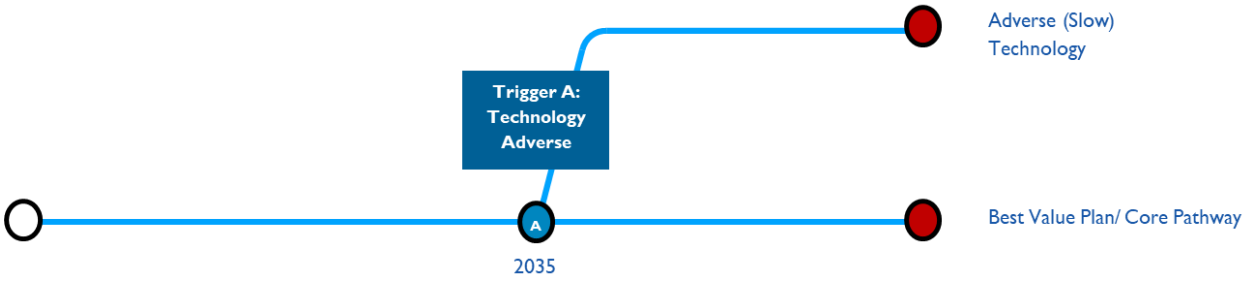


Figure 30: Adaptive plan for Trunk Mains replacement

Pathway Name	Decision/Trigger Dates	Description
Core Pathway / Best Value plan	N/a	As described above. It assumes a fast technology scenario
Slow technology	2035	Technology has been identified as having a potential material impact on our plans. Should technological efficiencies not occur, this could materially increase the cost of our plans from 2035 onwards.

Table 26: trunk mains replacement alternative pathways

Conclusion

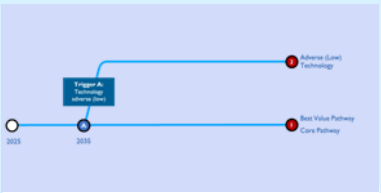
In order to meet our vision outcome that customers count on a reliable supply of water, we are going to need a multi-AMP investment programme to reduce major supply risks, and critical safety risks from trunk mains.

Strategy

Our strategy involves a series of targeted investments to improve supply resilience and to address high risk trunk mains. We have used detailed risk models to determine our best value plans to reduce risks to acceptable levels, based on customer and stakeholder engagement.

Scenarios

We have tested the best value pathway against different scenarios confirming that climate change could have material impact on water resilience investment after 2040 and slower than expected technological improvement could result in materially greater costs of trunk mains from 2035.



Adaptation

Our investments to reduce risks relating to resilience of water supplies and the safety of trunk mains are modular and adaptable. Adaptive paths have been identified triggered by technology and climate change.

3.1.3 We protect customers from sewer flooding

Ambition: where will the company be in 25 years?

Our vision outcome is to protect customers from sewer flooding. This means making sure no home, workplace or public space is at risk of sewer flooding by changing how we manage water from source to surface.

Customers view sewer flooding in homes and business as unacceptable and strongly support goals to eradicate this risk. Preventing sewer flooding by 2050 is an immense challenge and due to the shared ownership of drainage with other parties it is not something we can do alone. For our long term planning we have translated this ambition into what we can achieve with our asset base. So we focus on eliminating flooding up to a 1 in 50 year return period storm which is the objective stakeholders agreed to in DWMP.

The common performance commitments that Ofwat requires all companies to measure are set out below.

Performance measure	Units	2022/23 performance	2050 ambition	From base spend	With enhancement
Internal sewer flooding	Number per 10,000 connections	1.91	0.40	1.18	0.40
External sewer flooding	Number per 10,000 connections	18.49	5.00	16.82	5.00
Sewer collapses	Number per 1,000 km of sewer network	3.55	3.89	3.98	3.89

Table 27: Protect against sewer flooding performance commitments

In order to achieve the customer theme of our vision, we have identified the need for enhancement spend over the next 25 years.

Enhancement area	Benefit delivered
Reducing the risk of sewer flooding	Protect c187,000 properties from sewer flooding

Table 28: Protect against sewer flooding – enhancement

Strategy: how will the company get there?

Sewer flooding occurs mostly either because sewers are blocked or do not have the hydraulic capacity to cope with rainfall events. Blockages on average account for over 80% of incidents, so in the near term it makes sense to focus on blockage removal funded by base to drive incident numbers down.

The long-term context provided by our drainage and wastewater management plan (DWMP) shows that hydraulic incapacity flooding will have an increasingly significant impact on performance as extreme rainfall events become the norm.

Therefore, our strategy to protect customers against sewer flooding is;

(a) proactively remove blockages
(b) help customers make the right choices to prevent hundreds of blockages a year

(c) work in partnerships to ensure effective surface water management so our sewers do not become overloaded in storms.

We cannot efficiently or sustainably keep building bigger and deeper sewers or tanks to manage the risk of sewer flooding, especially in London. This is demonstrated in our DWMP and reinforced by the findings of the London Flood Review – hence the need for partnership solutions. Increases in the capacity of our network are a part of a range of measures required to meet the growing risk of sewer flooding.

Base expenditure is part of a hierarchy of measures (see Figure 31) to address sewer flooding. We will continue to invest to remove blockages and to maintain and optimise the hydraulic performance of our sewers through activities such as sewer cleaning and Smart Network approaches. Our view is that whilst better targeted sewer cleaning using predictive analytics will reduce the number of blockages and sewer flooding incidents, it does not address the underlying lack of hydraulic capacity to deal with the volume of rain from intense storms. Our DWMP modelling demonstrates that maintenance activities alone cannot offset the impact of climate change on hydraulic incapacity. If we do not start addressing hydraulic incapacity by 2050 over 187,000 properties in our region will be at risk of sewer flooding in a 1 in 50-year return period storm[20].

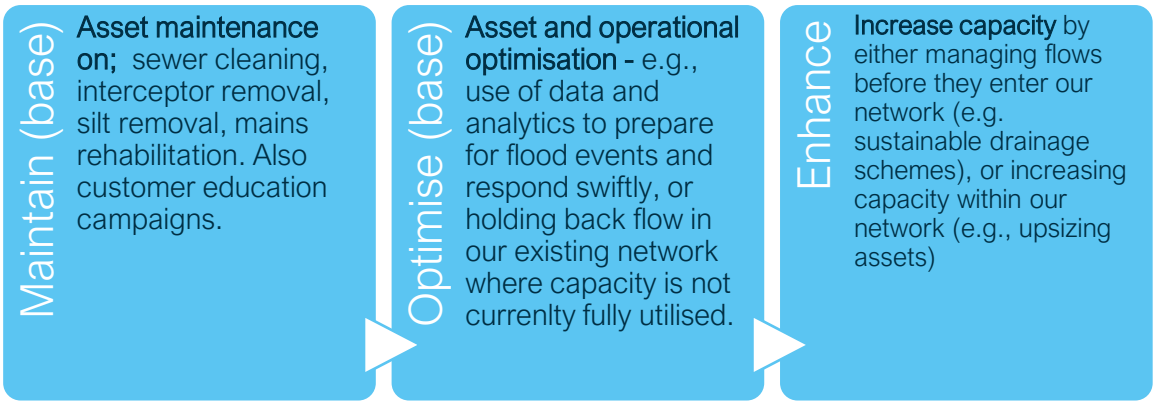


Figure 31: Hierarchy of activities for reducing the risk of lead in drinking water

Our strategy to address hydraulic incapacity sets out a 'SUDS first' plan learning from "sponge city" principles used elsewhere, which means that we will prioritise considering a Sustainable Urban Drainage Systems (SuDS) solution first. Our region is highly concentrated with roads, pavements and buildings, making it harder for water to soak in at the surface. We will partner with local communities to install rain gardens and permeable pavements that ease the pressure on our sewers. Our DWMP forecasts that approximately 7,598Ha of land will need to be drained to SuDS by 2050, 6,914Ha of which in the capital. This is in addition to the current hectares controlled by SuDS,

Our main enhancement activities to address sewer flooding are:

- Building sustainable drainage schemes to attenuate surface water flows before they enter our network, or so that surface water can be managed at source and does not need to enter our network.

[20] Drainage and Wastewater Management Plan_The Plan_June 2023

- Building new surface water sewers, to remove surface water flows from the combined network.
- Upsizing assets.
- Protecting properties for surcharge from a sewer by a non-return valve, or pumped system.
- Enhancing sewers where the physical condition of the sewer does not meet industry standard criteria for requiring maintenance.

Our 25-year delivery plan shows that over £20 billion investment is required from Thames Water and other Risk Management Authorities to address sewer flooding risk over the next 25 years. This will address hydraulic sewer flooding by alleviating 187,000 properties. A summary of the delivery profile is given below.

	Unit	2025-30	2030-35	2035-40	2040-45	2045-50	Total
Enhancement Totex	£m	136*	785	2,662	7,113	12,719	23,415
Properties protected in a 1:50	No.	1,013	17,961	15,737	26,180	126,128	187,019

Table 29: Reducing the risk of sewer flooding enhancement expenditure and property risk reduction

* Note: Total spend on hydraulic flooding is £204m in AMP8 with £136m assigned to enhancement (see TMS32).

We have phased our investment in tackling the enormous challenge of eliminating sewer flooding. The measured pace of change in the 2025-30 period reflects the constraint of keeping our plan deliverable whilst achieving ambitious targets in other sectors (particularly for storm overflows) . It also allows us to develop a better understanding about surface water interactions, improve our modelling and mature our partnership approaches which should lead to a better value and better targeted approach overall.

Rationale: why is the strategy the best way of getting there?

Our plan for hydraulic sewer flooding resilience was delivered using the DWMP framework which incorporates a best value assessment of the options to derive a balanced plan.

The main aspects of the framework which ensure a best value plan are:

1. A broad range of 25 generic options were considered in DWMP planning relating to sewer flooding risk. We sought customer views on type of solutions. Key findings from this customers research were that no options were either universally supported or rejected. Customers preferred options that they considered were already proven to work and the right thing to do for the community, such as managing rainwater (green infrastructure).
2. Our options were narrowed down using a structured framework that considered the wide range of value criteria agreed with stakeholders and weighted using customer research.

3. A bespoke decision support tool was built to optimise multiple criteria. The optimiser was set to select the least cost plan for a set of criteria. The optimiser balanced plans for sewer flooding alongside plans for spills and STW compliance. Over 70 alternative plans were assessed which were narrowed down to four different sewer flooding portfolios; "maintain", "resilient constrained", "unconstrained, maximum benefits" "accelerated".
4. The "resilient constrained" plan was selected as the preferred best value plan as it was the optimum balance of the value criteria and also pragmatically meet the deliverability constraint in the near term.
5. The best value plan was developed with stakeholder with a consultation process over 12 weeks. There was overall support for the best value plan, albeit some stakeholders would like us to do more sooner.

A full account of the derivation of a preferred plan using a best value framework is provided in our DWMP. Below is an extract showing an example of the main balancing outputs. This radar plot shows that the plan which performs best cross all criteria and can be practically delivered in the near term is the "resilient constrained" plan.

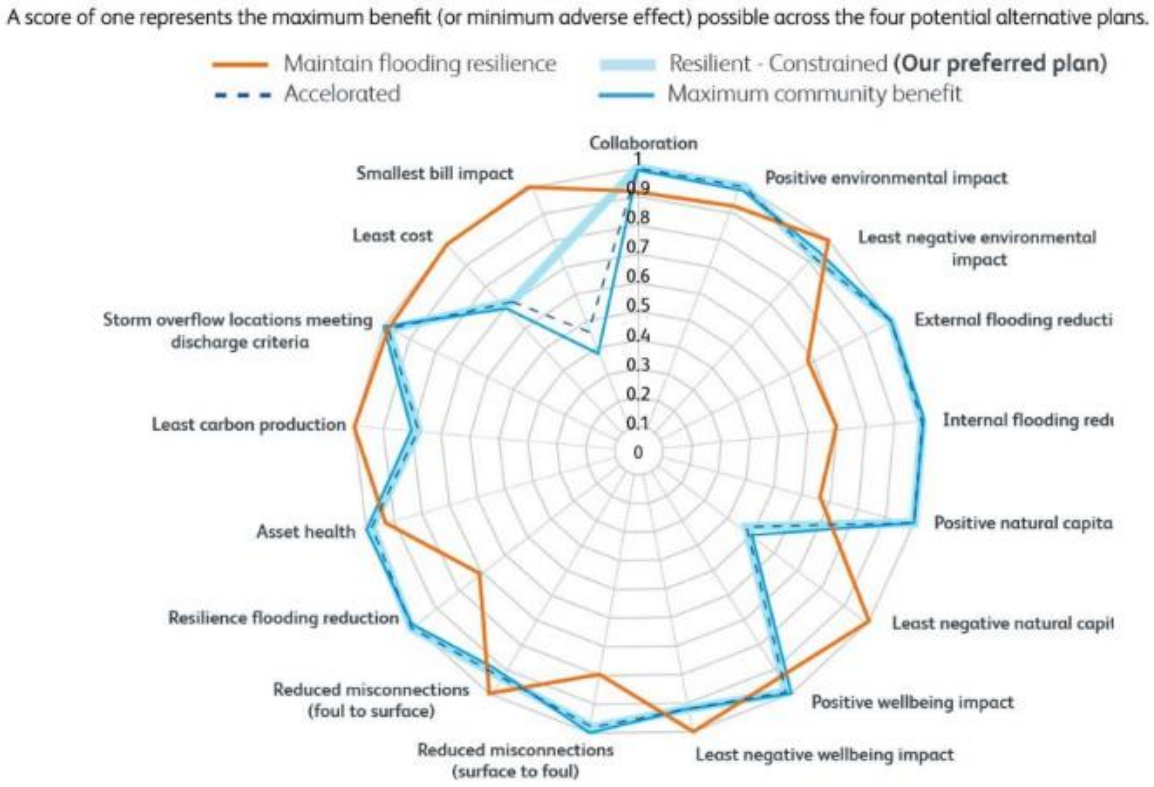


Figure 32: Extract from DWMP showing how different plans performed against a best value framework

In the near term (2025-20) our best value plan then had to be further constrained to reflect the deliverability challenges against the overall 2025-30 plan due to size of the National Environment Programme (WINEP). We ensured that alleviation of the highest consequence flooded properties were reprofiled in the 2025-30 period (typically where property owners are displaced due to the extent of flooding). The hectares of surface area attenuated by SUDs features via partnership working was also further constrained in the 2025-30 period. This was set at a level to encourage a market response to launch a substantially scaled up programme in decades to come.

We followed Ofwat's LTDS guidance by considering 'common reference scenarios' to test against our best value plan. Climate change, growth and technology were identified as having a material impact on this investment programme. Abstraction reductions were assessed to have a negligible impact.

Table 30 summarises how we defined the forecast for the different scenarios. For climate change our Best Value plan assumes a 15% rainfall intensity uplift by 2050 which is in the middle of the high/low range for climate change. For the technology scenarios we focused on smart meter penetration. Network sensor technological innovations will improve performance but are currently insufficiently developed to solve the scale of the issues that our sewer flooding solutions are addressing. Smart networks offer potential to increase capacity but only in certain types of catchments and locations.

Common reference scenarios		Protection of properties from sewer flooding
Climate change	High	2050 rainfall intensity uplift increased to 20% compared to our best value plan forecast of 15%
	Low	2050 rainfall intensity uplift decreased to 8% compared to our best value plan forecast of 15%
Demand	High and Low	Forecasts used: • Local Plan: the use of forecasts based on Local Plan data, as prepared by the Local Planning Authority • Office of National Statistics: the use of forecasts derived by the Office of National Statistics, which are based on extrapolation of historical trends When considering the best value plan at a company-wide level, Local Plan forecasts provide a high (adverse) scenario, but when considering at a catchment level, the opposite may be true. So we separately assessed every catchment against Local Plan and Office for National Statistics forecasts, to create a new adverse (high) or benign (low) forecast, depending on which forecast was used in our Best Value plan
Technology	Faster and slower	We compared the forecasts in our best value plan for a large sample of catchments, against forecasts representative of the definitions for adverse and benign scenarios in the Ofwat LTDS guidance (arising from variation in the extent of smart water meters installed in properties). From this analysis, we created a new adverse (high) or benign (low) forecast for all catchments, depending on which forecast was used in our best value plan.

Table 30 : Detail of different scenarios used in testing

The below figure summarises the change in cost when comparing our best value plan to each common reference scenario we tested. Climate change has the greatest impact on our best value plan (plus or minus 6%). Demand and technology scenarios show a significantly lower impact compared to climate change scenarios. This is because the timing and scale of solutions in our best value plan is driven primarily by future flood volumes (due to hydraulic overload of our sewer network) and storm overflow discharge volumes. Flood and storm overflow volumes will be significantly impacted by rainfall under future climate change scenarios. This significantly outweighs

the potential impact of future demand and technology scenarios on wastewater generated by our customers.

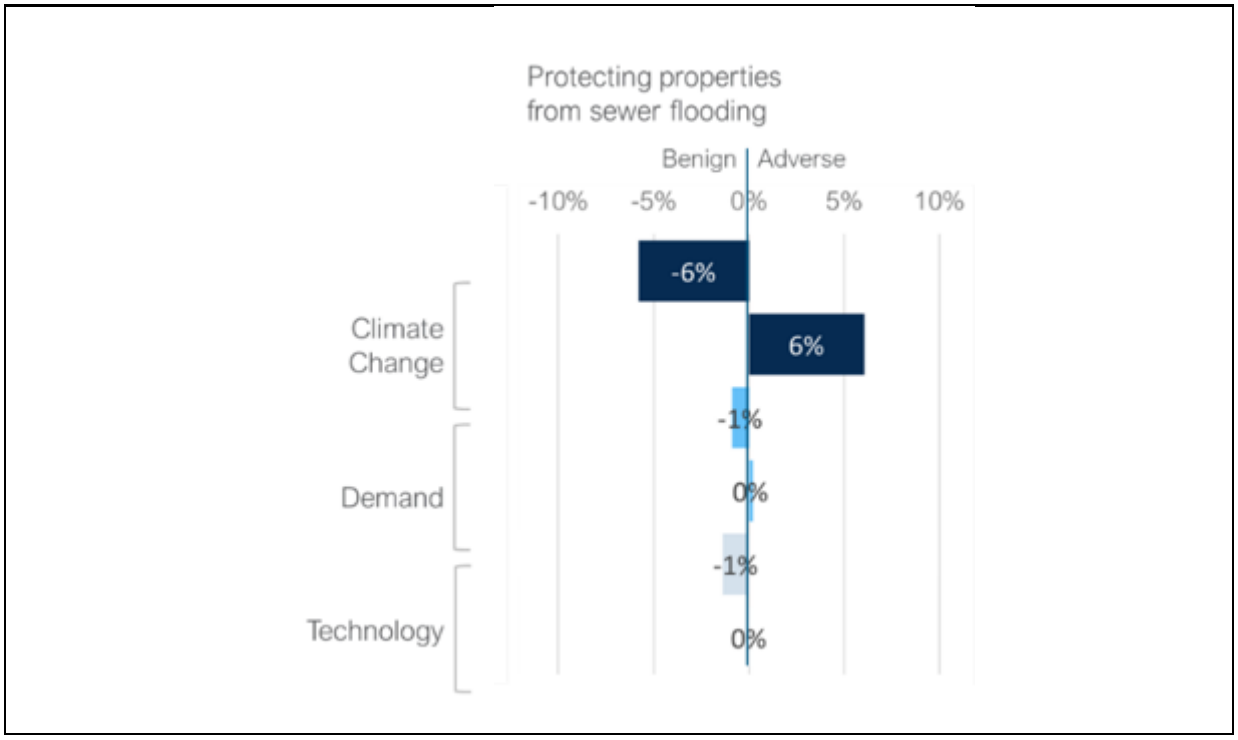


Figure 33: Comparing our best value plan to the scenarios we tested

Table 31 shows the impact of individual scenarios on solution types. The impact of climate change is seen largely in the last ten years of the planning period and results in the need for more network improvement, such as new tanks or sewers. The impact before 2040 is not very significant in absolute terms. Climate change has relatively little impact on our plans for surface water management. This is because we have sought to maximise the potential for implementation of SUDS. Therefore, the programme is constrained by what is practically implementable and thus relatively consistent across scenarios.

Best Value Pathway			Impact of applying selected scenarios					
	Planning Horizon	Best value plan	Climate Change Benign	Climate Change Adverse	Demand Benign	Demand Adverse	Tech Benign	Tech Adverse
Surface Water Management (Hectares Managed)	2025-2040	760	740 (-3%)	770 (+1%)	760	760	760	760
	2040-2050	5,710	5,670 (-1%)	5,750 (+1%)	5,700	5,710	5,700	5,710
Network Improvement (Storage - 000' m3)	2025-2040	158	120 (-24%)	193 (+22%)	153 (-3%)	159	152 (-4%)	159
	2040-2050	1,757	1,586 (-10%)	1,923 (+9%)	1,734 (-1%)	1,759	1.730 (-2%)	1,758
Network improvement (new sewers km)	2025-2040	70	59 (-16%)	86 (+23%)	68 (-3%)	70	66 (-6%)	70
	2040-2050	903	811 (-10%)	1,007 (+12%)	886 (-2%)	909 (+1%)	875 (-3%)	903
Sewer Lining (km)	2025-2040	1,190	1,190	1,190	1,190	1,190	1,190	1,190
Totex impact (£bn)		23.4	-6%	+6%	-1%	0%	-1%	0%
		The scope (and cost) of solutions is the same or more than the best value plan						
		The scope (and cost) of solutions is less than the best value plan						

Table 31: Impact of different scenarios on Best Value Pathway solutions – Sewer Flooding

We have identified a 'core adaptive pathway' based on our testing of the best value plan against the common reference scenarios. This is a pathway that drives a programme of no- and low-regret investments. Our core is assessed from the low climate change scenario, adjusted to reflect a central forecast for the demand and technology scenarios and also including investment in monitoring, investigations and other activities to ensure other options can be efficiently implemented should the need to switch pathways arise in the future.

The table below shows that our best value plan is aligned to a no- and low-regret (core) pathway up to 2040. The package of investments we have profiled in the near term shows limited variation and the forecasts have a similar impact across the scenarios we tested. Surface water management is required in all scenarios, supported by more traditional approaches in the long term. Sewer lining is required in all scenarios and is also needed to meet short-term needs. The table shows that all of the elements of our best value plan fulfil at least one of the criteria for being part of the core pathway.

Investment	Planning Horizon	Best value Plan	Needed in all scenarios	Needed in most scenarios	Needed to keep future options open	Needed in the short term	Core pathway
Surface Water Management (Hectares Managed)	2025-2040	760	Yes	No	No	Yes	740
	2040-2050	5,710	Yes	No	No	No	5,660
Network Improvement (storage m^3)	2025-2040	175	No	Yes	No	Yes	114
	2040-2050	1,757	No	Yes	No	No	1,559
Network improvement (new sewer km)	2025-2040	70	No	Yes	No	Yes	55
	2040-2050	903	No	Yes	No	No	786
Sewer Lining (km)	2025-2040	1,190	Yes	No	No	Yes	1,190
Total cost	£bn	23.4					21.7
		The scope (and cost) of solutions is the same or more than the best value plan					
		The scope (and cost) of solutions is less than the best value plan					

Table 32: Core Pathway Criteria: Sewer Flooding

Having established our best value plan and core pathway we developed and tested alternative pathways that meet our long-term ambition over a range of plausible futures. For simplicity we include our most adverse pathway for comparison which uses a high climate change scenario adjusted to reflect a central forecast for the demand and technology scenarios to ensure plausibility.

Pathway Name	Decision/Trigger Dates	Description
Best Value Plan		The plan which we believe best addresses future uncertainties.
Most Adverse	2035/2040	An adverse climate change scenario, adjusted to reflect a central forecast for the demand and technology scenarios. It includes more investment in network improvements and STW storage to address the risk of sewer flooding.
Core Pathway	2035/2040	A benign climate change scenario, adjusted to reflect a central forecast for the demand and technology scenarios. It includes reduced investment in network improvements and STW storage to address the risk of sewer flooding.

Table 33: Description of alternative pathways

The figure below compares the cumulative cost of different plans driven by pathways with different plausible future scenarios. The graph shows that there is little difference between the overall cost to 2040 following any pathway; the departure in investment to address future drivers of uncertainty occurs between 2040 and 2050, principally due to significant divergence in the forecasts for climate change scenarios. This is because in the near-term meeting ambitious long term targets drive the trajectory. Only when climate change scenarios significant diverge towards the end of the planning period does this have an impact on the plan.

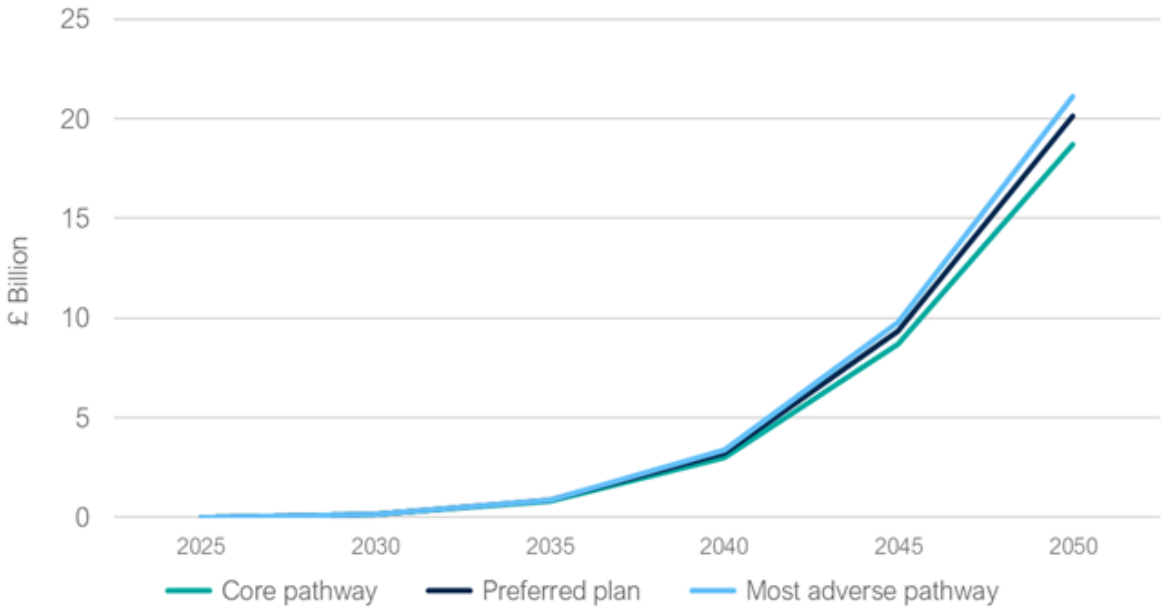


Figure 34 : Best value plan cumulative costs compared to the core and adverse pathways

The investment needed to address sewer flooding comprises network solutions such as sewer relining, as well as multiple small to medium surface water management solutions that can be scaled up or down, or delivered sooner or later. This means our programme is capable of being deployed flexibly and adaptably and we will be able to re-evaluate the pace and scope of investment frequently.

As climate change forecasts drive most change to the best value plan, these forecasts drive a switch to a different pathway. We expect similar climate change forecasts in the near term but in 15 years the forecast might diverge, meaning the 2035-40 planning period is when we need to decide whether to follow a new pathway from 2040 or remain on the best value plan pathway. Similar decisions will be required during the following planning period (2040-45), depending on the pathway taken during the previous planning period. Accordingly, we have identified four alternative pathways to the best value plan (see figure below) with the following switch points:

- Switch from the best value plan to the most adverse pathway in 2040 (Pathway 2)
- Switch from the best value plan to the core pathway in 2040 (Pathway 4)
- Switch from the best value plan to the most adverse pathway in 2045 (Pathway 3)
- Switch from the best value plan to the core pathway in 2045 (Pathway 5)

Based on current forecasts key decisions need to be made ahead of our trigger points in 2040 and 2045 (see Figure 35 below). These are the points at which an alternative adaptive pathway might

need to be followed. Our decisions will be informed by the climate change forecasts available at the time.

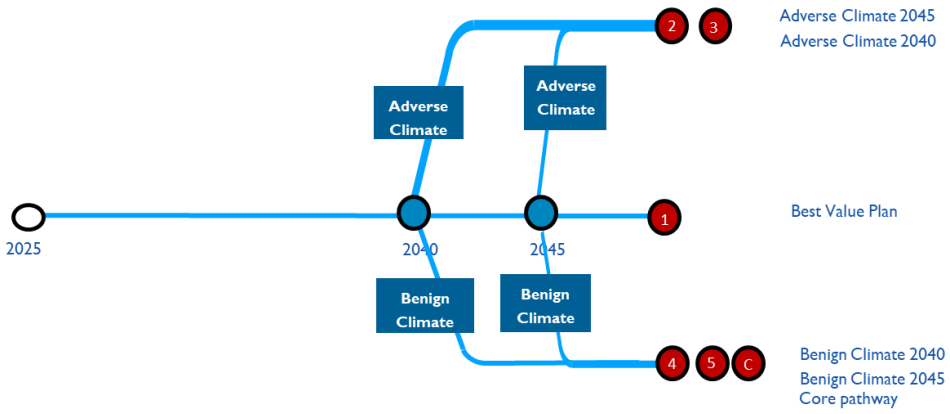


Figure 35: How trigger points drive different pathways

Conclusion

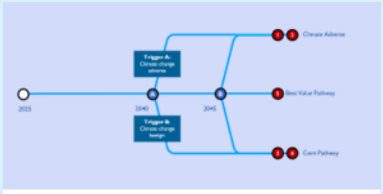
In order to meet our vision outcome of protecting customers from sewer flooding, we are going to need a multi-AMP investment programme improving sewers, increasing storage, and expanding surface water management.

Strategy

Our strategy involves extensive deployment of nature-based surface water management solutions, enhancements to network capacity and a programme of sewer lining to prevent infiltration. We have determined the best value pathway through the DWMP process.

Scenarios

We have tested the best value pathway against different scenarios. Our core scenario reflects the lower level of investment from 2040 associated with a plausibly low climate change scenario.



Adaptation

We are able to deploy our solutions adaptably and flexibly in response to emerging future conditions. We have identified alternative pathways from 2040 or 2045 which would be followed if adverse climate change scenarios emerge.

3.2 For communities

Our ambition for communities

Our vision

- Using our land to benefit surrounding communities
- Equipping local communities with the skills they need to thrive
- Championing our people to deliver our purpose

Key outcomes for 2050

- We enrich community life for current and future generations
- We champion what we do and create opportunities for everyone to be part of it
- We trust each other to do the job

Our plan for delivering for communities

Right now, our performance isn't meeting our customers' expectations – or our own. That's why we've launched our turnaround plan to fundamentally change for good.

By 2030, we've committed to launching a new Thames Water Academy and to deliver on commitments that use our land and team to deliver our purpose for communities.

Using our land to benefit surrounding communities

By 2030, we are committed to using our land to benefit surrounding communities.

By 2050, our land and assets will be central to community life. We'll create new opportunities to go green, welcoming more people to our outdoor spaces and increasing biodiversity through our rewilding projects.

Equipping local communities with the skills they need to thrive

By 2030, we will launch the new Thames Water Academy to equip us with new skills to improve our service to the community.

By 2050, our people will represent a wide range of communities. In addition, our 'earn and learn' apprenticeships and early careers opportunities will continue to open the door to great careers for future generations.

Championing our people to deliver our purpose

We are committed to enabling everyone at Thames Water to deliver our purpose.

A big focus will be our digital and data skills, which will help us make the most of the latest technology. Many of our people will also develop expertise in building and working in partnerships, creating closer ties with our communities and helping us deliver our purpose.

Figure 36: Long-term delivery strategy summary: for communities

We have developed a series of long-term plans to deliver for communities.

None of these plans require material enhancement expenditure. Therefore, in line with Ofwat's LTDS guidance, we have not provided details in this document. For further details on how we will deliver for our communities please see TMS01 PR24 Business Plan – chapter 8 Our plan to deliver for communities.

In addition to our targeted plans for communities, we create social and public value holistically inside of our core service delivery, which acts to enrich community life. Accordingly, delivering our LTDS enhancement expenditure will make a positive impact to our communities.

For us, public value is about finding ways to make the biggest positive difference to customers, colleagues, communities and the environment as we provide water and wastewater services. We have applied this thinking to our plan, including our enhancement expenditure. For example, our demand management plans introduce additional opportunities for direct engagement with customers. With support and training, our installation workforce can enable affordability assistance and priority services identification and registration, improving the support we can give to our vulnerable customers.

The below figure highlights where our LTDS delivers value for our communities. A detailed view of public value creation can be found in each of our enhancement cases.

Figure 37: Key actions for delivery for our customers

While not associated to Enhancement expenditure, our proposed bespoke performance commitment for street work collaboration continues to drive benefit for communities.

3.3 For the environment

Our ambition for the environment

Our vision
- Investing in our network to prevent leaks and keep water flowing
- Preventing all wastewater pollution and leading wider efforts to restore river health and increase biodiversity
- Producing all of the green energy we can to power what we do

Performance commitments
- Leakage reduction
- Reduced demand
- Lower pollution
- Improved bathing water quality
- Fewer storm overflows
- Reduced discharges
- Lower greenhouse gas emissions

Our enhancement investments
- Develop new water resources
- Demand management
- Reducing sewage spills to rivers and improving river health
- Sewage treatment works growth

How we developed our plans for the environment

WRMP24 and DWMP24

Other enhancement cases

1 **Identified options and solutions**
We undertook an extensive process of identifying options for potential enhancement investments to achieve our ambition.

2 **Identified our best value plan**
Options costs and benefits were evaluated to develop our best value plan

3 **Tested our plan against different scenarios**
Our best value plan was stress tested against future plausible scenarios

4 **Identified our core and alternative pathways**
Low and no-regrets solutions form our core pathway. Alternative pathways allow us to adapt to changing futures.

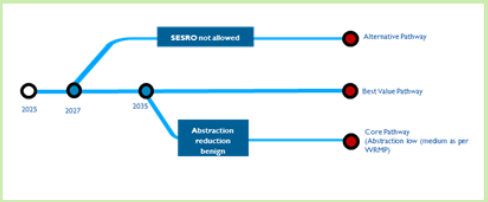
Our investment pathways under our plans for the environment

We have identified three enhancement investment areas that will help us achieve our 2050 ambition for the environment.

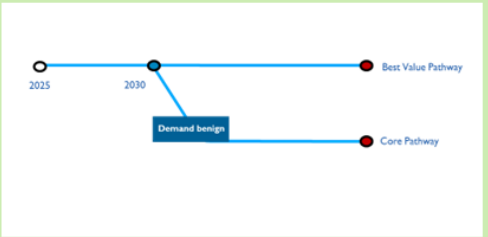
There are multiple alternative investment pathways that we may follow, which will be dependent on how the external environment changes.

Each have identified trigger points and associated monitoring metrics to inform when we may need to shift to an alternative pathway

Develop new water resources and demand management



Sewage treatment works growth



Reduce sewage spills to rivers and improve river health

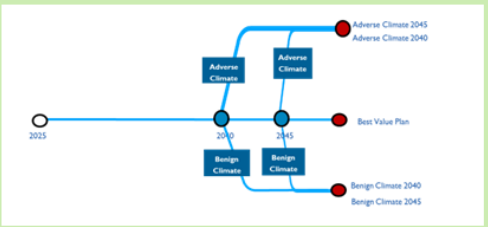


Figure 38: Long-term delivery strategy summary: for the environment

3.3.1 We meet the changing needs of our customers and the world around us

Ambition: where will the company be in 25 years?

Our vision outcome is that we meet the changing needs of our customers and the world around us.

Many people think there is plenty of water in the UK, but the South East of England is one of its driest regions and London gets less rain than Rome, Istanbul and even Sydney. The water resources we rely on are under pressure, and this is increasing all the time. We must find ways to adapt to our changing climate, supply water to more people as our population grows and reduce the amount of water we take from our rivers to protect the environment.

The common performance commitments that Ofwat requires all companies to measure are set out below.

Performance measure	Units	2022/23 performance	2050 ambition	From base spend	With enhancement
Leakage	% reduction in Ml/d for a three year average from 2019/20	10.7	50.0	24.2	50.0
Per capita consumption	% reduction in litres per person per day for a three year average from 2019/20	-0.1	27.6	12.8	27.6
Business Demand	% reduction in Ml/d for a three year average from 2019/20	17	15	-3.6	15

Table 34: Water supply performance commitments

In order to achieve the customer theme of our vision, we have identified the need for enhancement spend over the next 25 years. There will also be the need for demand management enhancement over 2025-35. Our metering programme will be largely complete by this time, so we have not subjected the forecast to any scenario testing in this submission – we consider all of this investment to be no or low regrets. It is the water resources component of the supply demand balance that has a long-term enhancement need with associated adaptive pathways.

Enhancement area	Benefit delivered
Develop new water resources	Secure resilient supplies to meet demand over 2025 to 2050.

Table 35: Water supply – enhancement

We describe the strategy and the rationale for each enhancement area below.

Strategy: how will the company get there?

Our strategy will be achieved by progressing the development of:

- The South East Strategic Reservoir Option (SESRO) – a reservoir in the Upper Thames catchment, south west of Abingdon in Oxfordshire. The reservoir will be filled with water from the River Thames in winter. It will act as a strategic asset for the south east.
- Teddington Direct River Abstraction (DRA) – a new river abstraction on the River Thames close to Teddington Weir. Water abstracted from the river would be transferred via an existing underground tunnel to the Lee Valley reservoirs in East London. Highly treated recycled water would be moved from Mogden sewage treatment works upstream to

compensate for the additional water taken from the river to protect the environment and wildlife.

- Other schemes – the development of other smaller supply options and network connectors that will enable greater movement of water around our network.
- Investment to keep future options open at Beckton water recycling, and Severn-Thames transfer, should any of the best value schemes not be able to be progressed.

Large parts of our WRMP will be delivered from base expenditure (i.e., leakage and per capita consumption reduction expenditure). However, enhancement expenditure is required to invest in the major supply schemes identified above.

Figure 39: Hierarchy of activities for water supply

Our enhancement spend profiles under our best value plan are summarised below.

Enhancement	Unit	2025-30	2030-35	2035-40	2040-45	2045-50
Supply and Demand (Totex)	£m	739	2,966	3,012	2,580	3,267

Table 36: Water supply enhancement spend summary

Rationale: why is the strategy the best way of getting there?

The Water Resources Management Plan (WRMP) maintains the long-term balance of supply and demand. It identifies a preferred programme that contains a of number of demand and supply-side measures.

All investment justified through our WRMP, is based on the outputs of the adaptive, best value modelling carried out at regional level as part of Water Resources in the South East (WRSE). Our approach complies with the Water Resources Planning Guidance (WRPG). We have developed our approach to adaptive planning through WRSE in dialogue with our regulators, government and the public. We believe that this protects our customers and the environment from an uncertain future.

We set out below how we developed these plans, tested against different scenarios, and determined our core pathway for each area, and then summarise the alternative pathways.

We developed our plans in collaboration with the five other water companies working through WRSE. Our WRMP is consistent with the WRSE plan but focuses on our supply area only. Key aspects of our plan development framework:

- Developed in compliance with legal and regulatory requirements and policies covering the period to 2075.
- Developed within an adaptive planning framework in which possible futures were considered, based on different scenarios for population and housing growth, the effects of climate change and required levels of environmental protection. The plan can adapt to these different possible futures via alternative plan pathways involving differing selection of schemes.
- Used 'least cost' and 'best value' criteria to develop a best value plan. In order to develop a Best Value plan, we first need to set its objectives with stakeholders. We've used insight from water company customers and stakeholders across the South East to help us understand their priorities, so our objectives are representative of what matters most to them. Each objective is represented by a set of value criteria (i.e. categories against which the objective can be tested) which, in turn, have an associated metric that will measure the additional value it delivers. The value criteria represent a broad range of assessment criteria, for example Strategic Environmental Assessment benefits and disbenefits, natural capital and biodiversity net gain.
- Involved subjecting potential plans to stress testing against future scenarios and sensitivities, and were evaluated for environmental performance and against a resilience framework.
- Selected a "best value" plan using robust programme appraisal including applying value criteria developed from customer preferences.
- We have carried out public consultation. We have published statement of responses detailing our consideration of and response to the feedback provided.

An overview of our best value planning methodology is shown in Figure 40. It was developed through Water Resources South East (WRSE) and has been subject to external audit, as outlined in the WRSE quality assurance method statement.

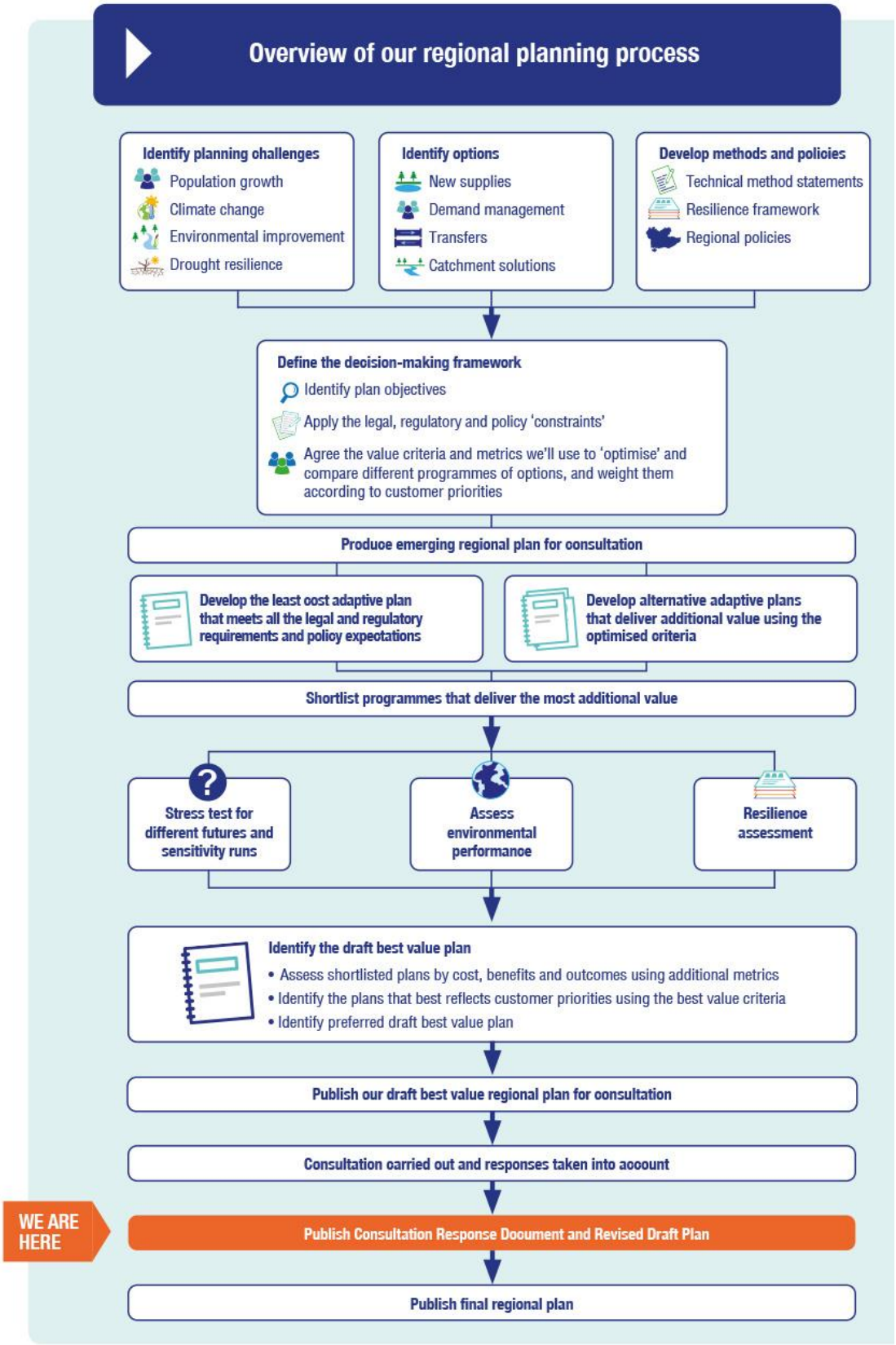


Figure 40 : Best value framework for water resource planning

We have selected 'pathway 4' as the preferred/reported pathway. This is primarily because it aligns with the approach set out in the WRPG, which is the regulators' policy guidance as to how a WRMP should be prepared and attracts significant weight:

- It uses Local Authority housing plan-based forecasts
- It includes 'High' environmental destination (according with the approach set out in the National Framework, Regional Plan and WRPG, when read together)

Before developing a plan and testing it, it is necessary to consider which tools and methods are used to develop future scenarios and solve any supply demand problems identified. The Water Resources Planning Guideline (WRPG) advocates a risk-based approach. Our problem characterisation stage of WRMP concluded that the region as a whole is at high risk and that complex methods for examining and solving the problems identified are warranted.

As such, we developed a more complex technical approach to adaptive planning than that set out in the LTDS. The main difference is that our approach can model multiple different futures, upfront, simultaneously, then brings them together to justify a preferred plan. Both techniques seek to identify low regret solutions through an adaptive planning approach.

Our WRMP and the Regional Plan for Water Resources on which it is based considers 50-year projections for population growth, environmental need, climate change impacts. It also considers key policy dates, such as for increasing drought resilience to a 1:200 return period as soon as possible, and a 1:500 return period by 2039/40.

We have derived:

- Five different population growth scenarios (Housing-plan based and trend-based)
- Twenty-eight (+ median) climate change scenarios
- Four different environmental scenarios

There is considerable uncertainty on how these different scenarios may combine in the future, presenting a wide range of potential future challenges that we need to plan for. We continue to monitor and update these scenarios over future iterations of the plan, but we need to plan now for the full range of potential futures we face.

To ensure that the full range of potential future challenges is planned for, we combine the population growth, climate change and environmental scenarios together in differing combinations. This results in a large number of different potential future water need pathways, covering the full range of challenges that we face (see Figure 41).

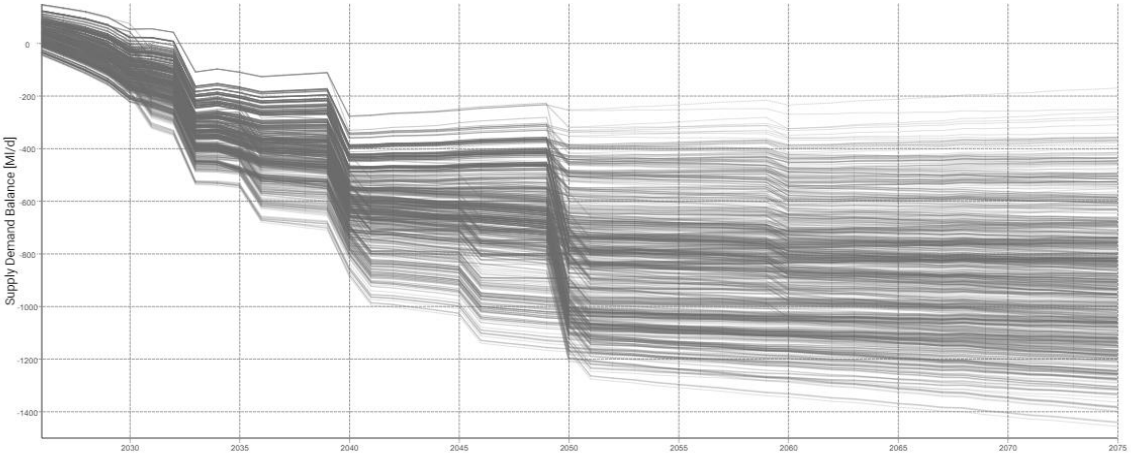


Figure 41: Range of future forecast supply demand balances (TWUL, DYAA)

We can see that in the early part of the planning period the lines are relatively closely grouped, as there is less variability in the forecasts in the short term. However, by the middle of the planning period the spread between the lines increases, as the range of potential futures, and the corresponding impacts on the supply demand balance, increases. By the end of the planning period the range between the most challenging and least challenging future is very significant.

It is therefore not only the magnitude of the individual potential future challenges, but also the range between them and how this could change over time, which drives investment choices.

We can test individual futures (as per the LTDS framework) or we are able to choose a set of branched pathways (nine) across the range of futures and solve them simultaneously (as is done for the WRMP). With the WRMP approach:

- there is a single core pathway between 2025 and 2035
- from 2035 there are three pathways are based on high, medium and low scenarios for demand
- from 2040 each of these pathways subdivides into three pathways based on assumptions for high, medium and low climate change and environmental destination assumptions. Maximum and minimum demand assumptions are also factored in to the most adverse and most benign of the nine pathways from this date.

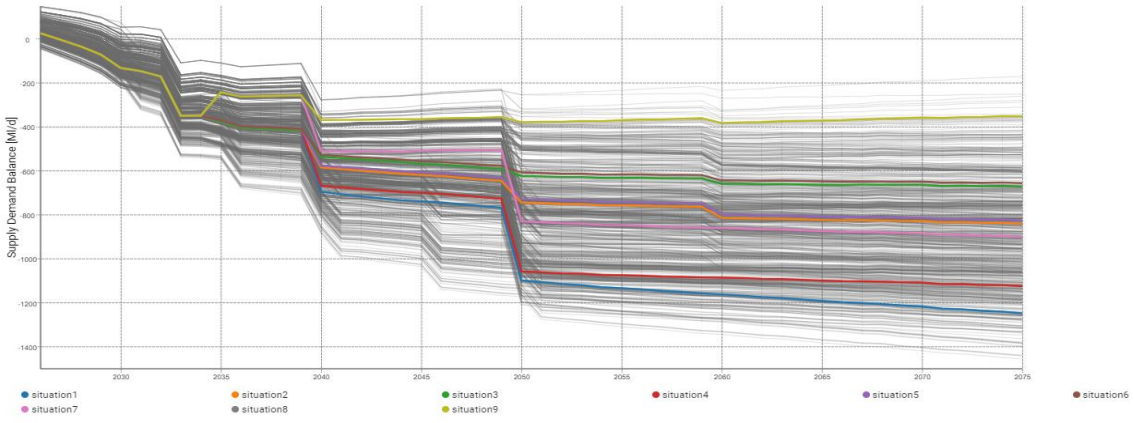


Figure 42 : Range of future forecast supply demand balances, with pathways highlighted (TWUL, DYAA)

The LTDS common reference scenarios are a set of benign and adverse scenarios covering four material drivers of uncertainty (climate change, technology, demand and abstraction reductions). How these align with the WRMP/WRSE scenarios (in red) is shown in the figure below.

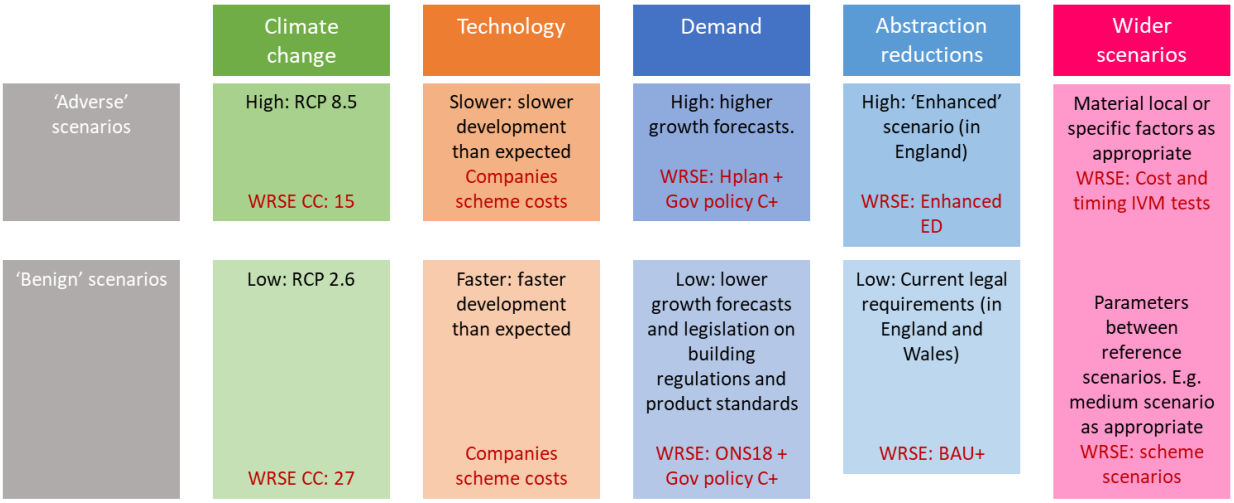


Figure 43 Mapping LTDS and WRMP scenarios

Given the combination of growth, climate change, delivery dates and technology solutions there are 120 different scenarios. The range of future challenges considered by the LTDS compared with those in the WRMP / Regional Planning process are different, with LTDS only considering a narrower range in the upper quartile of the possible ranges.

The table below sets out the supply enhancement investment under different LTDS common reference scenarios. Technology is not included as this scenario is about the speed of solution delivery and is more directly applicable to demand management measures rather than supply enhancement.

	Benefit, Date Online					
Investment	Climate Change Adverse	Climate Change Benign	Demand Adverse	Demand Benign	Abstraction Reductions Adverse	Abstraction Reductions Benign
Drivers						
Demand	Benign	Benign	Adverse	Benign	Benign	Benign
Abstraction Reduction	Medium	Medium	Medium	Medium	Adverse	Benign
Climate Change	Adverse	Benign	Median	Median	Median	Median
Supply options						
Teddington DRA*	67Ml/d 2033	67Ml/d 2033	67Ml/d 2033	67Ml/d 2033	67Ml/d 2033	67Ml/d 2033
SESRO (South East Strategic Reservoir Option)		30 Mm^3 36 Ml/d 2040	30 Mm^3 36 Ml/d 2040	30 Mm^3 36 Ml/d 2040	75 Mm^3 82 Ml/d 2040	
Severn-Thames Transfer	104 Ml/d 2060			-		104 Ml/d 2055
Beckton Desalination				-		
Other supply schemes 2025-35			*			
Other supply schemes 2035-40						
Other supply schemes 2040-50					1 scheme 4.5 Ml/d By 2050	

	Benefit, Date Online					
Investment	Climate Change Adverse	Climate Change Benign	Demand Adverse	Demand Benign	Abstraction Reductions Adverse	Abstraction Reductions Benign
Cost						
All Plan NPV	5,113	5,272	5,578	5,260	5,528	5,170
Variance to base (%)	-3%	+0.2%	+6%	Base	+5%	-2%
Totex to 2075 (£m)	1,521	1,051	1,722	1,051	1,702	1,572
Variance to base (%)	+45%	0%	+64%	Base	+62%	+50%

Table 37 : Outputs for LTDS scenarios (single future)

* Our decision support tool does not automatically select Teddington DRA under each of the scenarios listed above. Instead, the model opts for many small schemes and a reliance upon other companies' leakage reduction. We are concerned about the deliverability and resilience risks associated with this selection. In the round, we firmly believe that Teddington DRA is the most appropriate project to be selected, as it leaves us with greater certainty of becoming resilient to a 1:200-year drought by 2033. Therefore, it is included in the option section of the scenarios shown above (i.e., where Teddington DRA is selected, there is no credible alternative in that scenario).

From this we can see that demand adverse is a key trigger for resource development in the period to 2035, abstraction reduction adverse is a key driver for the size of the SESRO scheme in 2040 and that in some cases, Severn-Thames Transfer is selected instead of SESRO, later in the planning period.

The table above is a helpful mechanistic view of the impact of individual scenarios on the plan. It flags that abstraction reduction and demand could have most impact on the plan. Our WRMP models a more complex reality that considers the likely combination of adverse and benign scenarios that could occur, as shown in Table 38.

The table below sets out the supply enhancement investment (overall BVP) under the 9 different adaptive pathways developed for the WRMP. When finding a solution, our investment model considers all pathways at the same time rather than considering pathways individually. As such, the model determines whether it is better to hedge against future adverse scenarios or better to wait to develop short lead time solutions in adverse pathways only.

The modelling suggests that it is better to build large cost effective, long lead time solutions to manage the risk of adverse future scenarios and therefore the Teddington DRA and SESRO 150 Mm^3 options are selected across all pathways. Because SESRO has a circa 15-year lead time, and because there is a need for water by 2040, a decision about whether to develop this option needs to be made now.

In adverse scenarios, additional investments that are not common to all pathways are made (mostly) post 2040. These investments connect these large schemes to additional parts of our supply network to provide greater resilience across the Region. It is primarily these network investments that account for the difference in totex between the pathways from 2040 onwards.

Further detail can be found in WRMP Section 10.

	Benefit, Date Online								
Investment	Pathway 1	Pathway 2	Pathway 3	Pathway 4	Pathway 5	Pathway 6	Pathway 7	Pathway 8	Pathway 9
Drivers									
Demand	Max	Adverse+	Adverse+	Adverse	Adverse	Adverse	Benign	Benign	Min
Reductions	Adverse	Medium	Benign	Adverse	Medium	Benign	Adverse	Medium	Benign
Climate Ch.	Adverse	Median	Benign	Adverse	Median	Benign	Adverse	Median	Benign
Supply options									
Teddington DRA	67 Ml/d 2033	67 Ml/d 2033	67 Ml/d 2033	67 Ml/d 2033	67 Ml/d 2033	67 Ml/d 2033	67 Ml/d 2033	67 Ml/d 2033	67 Ml/d 2033

	Benefit, Date Online								
Investment	Pathway 1	Pathway 2	Pathway 3	Pathway 4	Pathway 5	Pathway 6	Pathway 7	Pathway 8	Pathway 9
SESRO	150 Mm^3 149 Ml/d 2040	150 Mm^3 149 Ml/d 2040	150 Mm^3 149 Ml/d 2040	150 Mm^3 149 Ml/d 2040	150 Mm^3 149 Ml/d 2040	150 Mm^3 149 Ml/d 2040	150 Mm^3 149 Ml/d 2040	150 Mm^3 149 Ml/d 2040	150 Mm^3 149 Ml/d 2040
Severn-Thames Transfer	-	-	-	-	-	-	-	-	-
Beckton Desalination	133 Ml/d 2050	-	-	-	-	-	-	-	-
Other supply schemes 2025-35	2 - 52 M//d	2 - 52 M//d	2 - 52 M//d	2 - 52 M//d	2 - 52 M//d	2 - 52 M//d	2 - 52 M//d	2 - 52 M//d	2 - 52 M//d
Other supply schemes 2035-40	4 - 29 M//d	1 - 15 M//d	1 - 15 M//d	2 – 17 Ml/d	1 – 5 Ml/d	1 – 5 Ml/d			
Other supply schemes 2040-50	6 – 55 Ml/d			6 – 53 Ml/d			2 – 34 Ml/d		
Cost									
All Plan NPV	7,162	5,851	5,848	6,249	5,863	5,860	5,964	5,820	5,820
Variance to Core (%)	+23%	+0.5%	+0.5%	+7%	+0.7%	+0.7%	+2%	Core	0%
Totex to 2040	1,777	1,692	1,691	1,783	1,715	1,715	1,661	1,652	1,652
Totex to 2075 (£m)	6,635	2,119	2,108	3,437	2,136	2,128	2,511	2,050	2.050
Variance to Core (%)	+324%	+3%	+3%	+68%	+4%	+4%	+22%	Core	0%

Table 38 Outputs for WRMP scenarios (adaptive)

How we developed the best value plan | How we tested against different scenarios | How we determined the core pathway | How we determined the alternative pathways

We have used the LTDS, single future, scenarios as a first step to understand the relative importance of each key driver of the supply demand balance. To derive the core pathway, we have assessed the nine pathways developed under the complex WRMP adaptive planning approach.

We have identified ‘pathway 8’ as being the ‘core pathway’, as it is required due to the lead in times that would be needed to meet more adverse scenarios. If we do not start with these enhancement cases now, there will be no efficient means of solving future supply gaps should the adverse scenarios materialise. This aligns to the ‘needed in the short term’ and ‘needed to keep future options open’ criteria of the core pathway definition.

Importantly, because of the adaptive basis of the assessment the outcomes of the first 10 years of the assessment are stable, with significant programmes of demand management (company and government-led) supported by the Teddington DRA scheme and the transfer of licence from Affinity Water (associated with their Grand Union Canal transfer scheme) and minor groundwater development in the Thames Valley.

How we developed the best value plan | How we tested against different scenarios | How we determined the core pathway | How we determined the alternative pathways

Having established our reporting pathway (4), core pathway (8), and 7 other adaptive pathways based on combinations of projections for key supply demand drivers at the outset of our assessment, we model the outcomes adaptively across all pathways, based on cost and on best value performance (environmental and societal metrics and resilience). We also undertake sensitivity testing to understand variations caused by changes to:

- the availability of resource development options to form the solutions (e.g., SESRO, Teddington DRA, Severn-Thames Transfer, Beckton water recycling scheme)
- the potential for underperformance in company and government-led demand management measures
- key policy dates (e.g., Dates for achieving uplifts in drought resilience)
- base supply capabilities (e.g., Gateway desalination, Lower Thames risk and the availability of the West Berkshire Groundwater Scheme).

In all, hundreds of alternatives have been run in the WRSE modelling, which are used to support the overall outcomes put forward and justified in the Regional Plan for Water Resources and individual company WRMPs. This includes sensitivity testing to investigate plans based around alternative strategic solutions.

The investment profile of the nine adaptive pathways within the Overall Best Value Plan, and three alternative pathway 4s containing different option availability, is shown in the table below.

Pathway	Cumulative totex cost (£m) up to					
	End 2030	End 2035	End 2040	End 2045	End 2050	End 2075
1	305	1280	1777	2283	3169	6635
2	305	1280	1692	1721	1750	2119
3	305	1280	1691	1720	1748	2108
4 – Selected	322	1312	1783	1935	2298	3437
5	305	1295	1715	1743	1771	1887
6	305	1295	1715	1742	1770	2128
7	305	1275	1661	1717	1910	2511
8 – Adaptive Core	305	1275	1652	1679	1704	2050
9	305	1275	1652	1679	1704	2050
Sensitivity testing - Different option availability						
4 – No SESRO	123	609	1750	2468	3387	9021
4 – Low Gov-led Demand Management	334	1392	2052	3111	6136	10799
4 – Beckton 100 (2033)	621	1825	2334	2825	3721	6286

Table 39 : Cumulative totex cost (£m) of each pathway (supply enhancement cost only, price base 20/21)

As discussed above, the development of the two large strategic resource options (SESRO and Teddington DRA) is common to each pathway and provides a cost-effective core to our plan. The costs across all pathways are broadly the same until 2040. The costs diverge at this point, and our selected pathway (pathway 4) includes additional investment in infrastructure to enable the connection of these large schemes to more widely across the supply network to provide greater resilience.

The sensitivity testing on our selected pathway confirms that developing Teddington DRA rather than Beckton water recycling scheme is the most cost-effective option for meeting the 2030s requirement. It confirms that developing SESRO rather than the alternative of the Severn Thames Transfer is the best value option because of lower operating costs. It also shows the importance of achieving the significant demand reductions that will be delivered through the company and government led demand management programmes.

We have simplified this into 3 pathways for LTDS reporting purposes: Adaptive core (pathway 8), Reporting/best value (pathway 4) and no-SESRO (pathway 4 but with no SESRO options available in the option set), as shown in the figure below.

Figure 44 : A simplified adaptive plan for water resources

Our WRMP incorporates key decision points related to changes in baseline projections in 2030 (growth) and 2035 (abstraction reduction). We have also developed and published a Monitoring Plan as part of our WRMP that incorporates these dates and timelines related to the development of key options such as Teddington DRA and SESRO.

Our monitoring plan contains two parts: a short-term and long-term plan:

- Short-term monitoring plan:
  - Aims: ensuring that the decisions to progress with the selected Strategic Resource Options are robust, and that consenting is successful
  - Focus: reacting to new information
- Long-term monitoring plan:
  - Aim: identifying whether additional investment, beyond our preferred programme, is required to ensure resilient supplies
  - Focus: assessing progress with delivery, appraising new information, and responding if required

For further information please refer to Section 114 of the WRMP Main Report.

Conclusion

In order to meet our Vision of there always being enough water, we are going to need a multi-AMP investment programme.

Strategy

Our strategy involves a major reduction in leakage and per capita consumption, as well as investments in major supply solutions including the SESRO reservoir. We have determined the best value pathway through the WRMP process.

Scenarios

We have tested the best value pathway against different scenarios. The core pathway differs from our best value plan because it assumes a benign demand, climate change and abstraction reduction which impacts the selection some supply side investments after 2040.

Adaptation

Alternative pathways are suggested from 2035 if permission for SESRO is not granted. This would require the Severn Trent transfer to be operational from 2040 rather than 2050 as well as other smaller changes to schemes. If demand proves to be highly adverse (at a "maximum" level) then SESRO may need to be of larger capacity (from 2040) and a further major scheme at Beckton (desalination or re-use) may be needed from 2050.

3.3.2 We collaborate with others to improve the health of rivers

Ambition: where will the company be in 25 years?

Our vision outcome is that we collaborate with others to improve the health of rivers.

We are fully committed to our future plan to reduce harm to river water. This includes only discharging high-quality treated effluent, using fewer storm overflows and working with key partners.

Our ambition and strategy have been heavily developed through the course of the DWMP and WINEP planning processes.

The common performance commitments that Ofwat requires all companies to measure are set out below.

Performance measure	Units	2022/23 performance	2050 ambition	From base spend	With enhancement
Total pollution incidents	Number per 10,000 km of wastewater network	56.7	11.0	22.11	11.0
Serious pollution incidents	Number per 10,000 km of wastewater network	17	0	0	0
Bathing water quality	Percentage score	50%	100%	50%	100%
River water quality (phosphorus)	percentage reduction of phosphorus from 2020 baseline	6.19%	80%	3.86%	80%
Storm overflows	Average number of spills per overflow	16.80	5.00	25.09	5.00
Discharge permit compliance	%	99.48	100	100	100
Biodiversity	Biodiversity units per 100km2 for which the company provides monopoly services	0	0.56 (to 2035)	All	0.56

Table 40: Improving the health of rivers performance commitments

In order to achieve the customer theme of our vision, we have identified the need for enhancement spend over the next 25 years in the areas shown in Table 41.

Enhancement area	Benefit delivered
Reducing sewage spills to rivers and improving river health	We will deliver a step change in storm overflow performance, deliver our statutory improvements programmes, and maintain treatment works compliance despite the challenges that population growth and climate change will bring.
Phosphorus reduction in rivers	
Sewage treatment works growth	

Table 41: Improving the health of rivers – enhancement

We describe the strategy and the rationale for each enhancement area below.

<u>Reducing sewage spills to rivers and improving river health</u>

Strategy: how will the company get there?

Storm overflows can have a significant impact on our river health and we consider untreated sewage discharges to the environment as unacceptable. This therefore requires a change in approach to our sewerage infrastructure and our AMP8 plan is the start of the multi-billion pound investment needed over the next 25 years to facilitate this change. We have a phased, risk based, multi-amp approach with the following key parts:

- Asset Health. Ensure we maintain our assets, so that equipment failure or blockages do not result in storm overflows.
- Sewage treatment works. A focus on spills from our sewage treatment works where they occur at least twice as frequently as at other asset cohorts. The means upgrades to ensure sufficient capacity. Also a focus on flow compliance so that we are always treating the required "flow to full treatment" before storm discharges occur. During AMP8 we will invest at all sites to reduce the risk of this non-compliance.
- Network. For our sewerage network we will identifying opportunities to remove surface water from our sewer systems and direct rainwater to local rivers and streams.
- Infiltration. In some areas of our region, groundwater infiltration is one of the key reasons for prolonged storm discharges. We will reduce groundwater and surface water inflow (from sewer misconnections and inundation). This involves a package of activities including; detailed mapping of the sewers to detect misconnections, sewer sealing, manhole chamber sealing and making manhole covers watertight.
- TTT. Complete the commissioning of The Thames Tideway Tunnel. We are on track for commissioning to start in the last year of AMP7. With an investment of £4.6 billion, it represents the largest and most significant wastewater project since Sir Joseph Bazalgette created London's sewerage system in the 1860s. The tunnel will prevent millions of tonnes of untreated sewage, mixed with rainwater, from entering the tidal reaches of the River Thames via storm overflows each year.
- Monitoring. We are committed to ensuring all permitted storm overflows are monitored by the end of December 2023. Once complete the monitors will provide further insight which we will use to update and refine our action plans.

Our strategy requires both base and enhancement expenditure (see Figure 45). We understand the importance of maintaining our assets, so that equipment failure or blockages do not result in premature storm overflows. This maintenance activity is funded from our base expenditure and will ensure the current position. Our performance over the last three years shows that during drier weather storm overflows reduce significantly, demonstrating that changes to our base operation and maintenance associated with our existing asset base will not drive the significant reduction in storm overflows our stakeholder expect. Enhancement funding to build in capacity and tackle unwanted flows is required.

Figure 45 : Hierarchy of activities for improving the health of rivers

Rationale: why is the strategy the best way of getting there?

We set out below how we developed each of these plans, tested against different scenarios, and determined our core pathway for each area, and then summarise the alternative pathways.

We have developed our programme of work towards river health based on two key planning processes: our Drainage and Wastewater Management Plan (DWMP) and the Water Industry National Environment Programme (WINEP)

Our best value plan for storm overflows was developed using a multistage approach to select the storm overflow assets, identify the solution options, and profile the investigation and improvement actions over multiple AMP cycles. Key aspects are:

- **Establishing need** – Application of the Environment Act driver guidance to identify permitted overflows and high priority sites (high priority sites include Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SAC), Urban Wastewater Treatment Regulations sensitive areas, chalk streams and waters currently failing ecological standards due to storm overflow discharges).
- **Optioneering** – We undertook a comprehensive exercise to identify and develop a long list of wide ranging, generic options that could potentially address the storm overflow discharge reduction driver. 138 options were identified including conventional capex, operation expenditure, catchment and nature-based solutions. The long list was reviewed to screen out options that would not provide a sufficient level of benefit for the risks identified. Through consideration of the WINEP requirements the options were reduced to an unconstrained short list of 13.
- **Benefits assessments** – To assess WINEP solutions for best value, we considered the primary and wider benefits of each option and compared it against the option's costs. Benefits were considered using a natural capital framework. In most cases, least-cost solutions were also best value, however we prioritised best value options in favour of least cost options where there was evidence and specific customer support for this approach.
- **Stakeholder engagement** – We have carried out deep dive research for PR24. All customer groups are concerned about raw sewage entering rivers as a result of storm overflows, due to the potential harm to health from low quality water. Many are also concerned about harm to

wildlife and the environment. Customers told us they felt discharges occur too frequently and want faster progress on their reduction.

Reducing sewage spills in rivers	2025-2030	2030-2035	2035-2040	2040-2045	2045-2050	Total
Totex (£m)	815	2,529	4,099	3,774	2,255	13,473
% of total storm overflows improved	14%	28%	52%	76%	100%	100%

Table 42: Reducing spills enhancement spend summary

How we developed the best value plan | How we tested against different scenarios | How we determined the core pathway | How we determined the alternative pathways

We tested our storm overflow plan against different scenarios for climate change, growth and technology (e.g., monitoring and smart meter penetration) in line with Ofwat's requirements. The figure below shows the sensitivity of our storm overflows investment to different future scenarios.

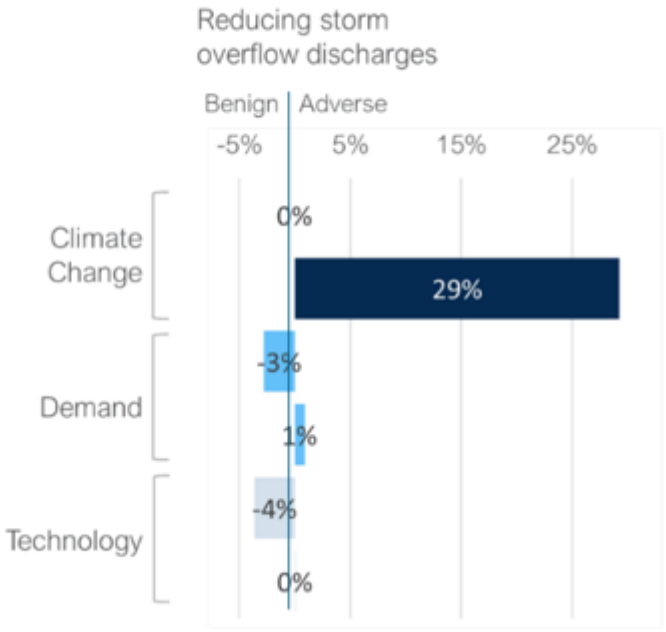


Figure 46: Impact on investment to 2050 in reducing storm overflow charges under different scenarios

Climate change has by far the most substantial impact on our programme of reducing storm overflow discharges. A high global emissions climate change scenario may require over 29% more investment in the longer-term (up to 2050) to achieve our ambition of reducing storm overflow discharges, compared to our best value plan. High climate change scenarios may lead to storms of a far greater intensity and with consequent need for our networks and treatment works to handle much higher flows of surface water leading to higher storm overflow discharge volumes.

The table below shows how different scenarios impact at an activity level. The network storage solutions volume is most sensitive to diverge climate change forecasts in the long term. SuDS is less sensitive as the rate of increase is determined by the pragmatics of the deployment rate primarily.

Preferred solution type	Unit	Planning horizon	Preferred plan	Climate change benign	Climate change adverse	Demand benign	Demand adverse	Tech benign	Tech adverse
Surface Water Management	Hectares managed	2025-2030	57	57	57	57	57	57	57
		2030-2035	20	20	20	20	20	20	20
		2035-2040	360	360	360	360	360	360	360
		2040-2045	190	190	190	190	190	190	190
		2045-2050	470	470	470	470	470	470	470
Network Improvements (storage)	000's of m3	2025-2030	77	77	77	77	77	77	77
		2030-2035	1,448	1,448	1,454	1,446	1,448	1,445	1,448
		2035-2040	1,574	1,574	1,734	1,554	1,584	1,545	1,574
		2040-2045	1,391	1,391	1,639	1,347	1,410	1,334	1,393
		2045-2050	311	311	1,511	240	323	216	311
Network Improvements (new sewers)	km	2035-2040	4	4	4	4	4	4	4
		2045-2050	10	10	48	8	10	7	10
Storage at STWs	000's of m3	2025-2030	670	670	670	670	670	670	670
		2030-2035	289	289	289	289	289	289	289
		2035-2040	481	481	526	475	484	473	481
		2040-2045	621	621	831	582	638	574	623
		2045-2050	15	15	74	12	16	11	15
Sewer Lining	km	All	661	661	661	661	661	661	661
Total impact	**£bn**		13.5	0%	+29%	-3%	+1%	-4%	0%

	The scope (and cost) of solutions is the same or more than the best value plan
	The scope (and cost) of solutions is less than the best value plan

Table 43 : Core and pathway criteria: Reducing sewage spills to rivers

We used the sensitivity analysis above to consider plausible futures that would drive different pathways of investment. This allowed us to determine a core pathway of low and no-regrets investment and to identify alternative pathways.

Our core pathway has been assessed from the benign climate change scenario, adjusted to reflect a central forecast for demand and technology scenarios. Our best value plan tracks the core pathway until the last decade of the planning period where it tracks a less benign climate change forecast.

The table below compares the core and best value pathways in terms of their impact on the scale of activity and solution type. It shows that the best value plan would require more traditional network storage solutions in the later part of the planning period, compared to the core. These solutions are relatively small scale and dispersed so are readily scalable if the climate change forecasts are

different. The analysis shows that in the near term, our best value plan activities are 'no regrets' as if climate change forecast change towards the end of the planning period, we can scale up the existing solutions.

Preferred solution type	Unit	Planning horizon	Best value	Needed in all scenarios	Needed in most scenarios	Needed to keep future options open	Needed in the short term	Core pathway
Surface Water Management	Hectares managed	2025-2030	57	Yes			Yes	57
		2030-2035	20	Yes				20
		2035-2040	360	Yes				360
		2040-2045	190	Yes				190
		2045-2050	470	Yes				470
Network Improvements (storage)	000's of m3	2025-2030	77	Yes			Yes	77
		2030-2035	1,448		Yes			1,445
		2035-2040	1,574		Yes			1,545
		2040-2045	1,391		Yes			1,332
		2045-2050	311		Yes			222
Network Improvements (new sewers)	Km	2035-2040	4	Yes				4
		2045-2050	10		Yes			7
Storage at STWs	000's of m3	2025-2030	670	Yes			Yes	670
		2030-2035	289		Yes			289
		2035-2040	481		Yes			473
		2040-2045	621		Yes			570
		2045-2050	15		Yes			11
Sewer Lining	Km	All	661	Yes			Yes	661
Total cost	**£bn**		13.5					13.0

	The scope (and cost) of solutions is the same or more than the best value plan
	The scope (and cost) of solutions is less than the best value plan

Table 44: Core and best value plans: Reducing sewage spills to rivers

How we developed the best value plan | How we tested against different scenarios | How we determined the core pathway | How we determined the alternative pathways

From 2040 onwards we have alternative pathways driven from different climate change forecasts. The alternative pathways are generated from amalgamated scenarios which when combined represent a plausible future. For example, an adverse climate scenario adjusted to reflect a central forecast for the demand and technology scenarios.

The figure below shows the different investment trajectories the alternative pathways generate. There is little difference between the overall cost to 2040 following any pathway; the departure in

investment to address future drivers of uncertainty occurs between 2040 and 2050, principally due to significant divergence in the forecasts for climate change scenarios.

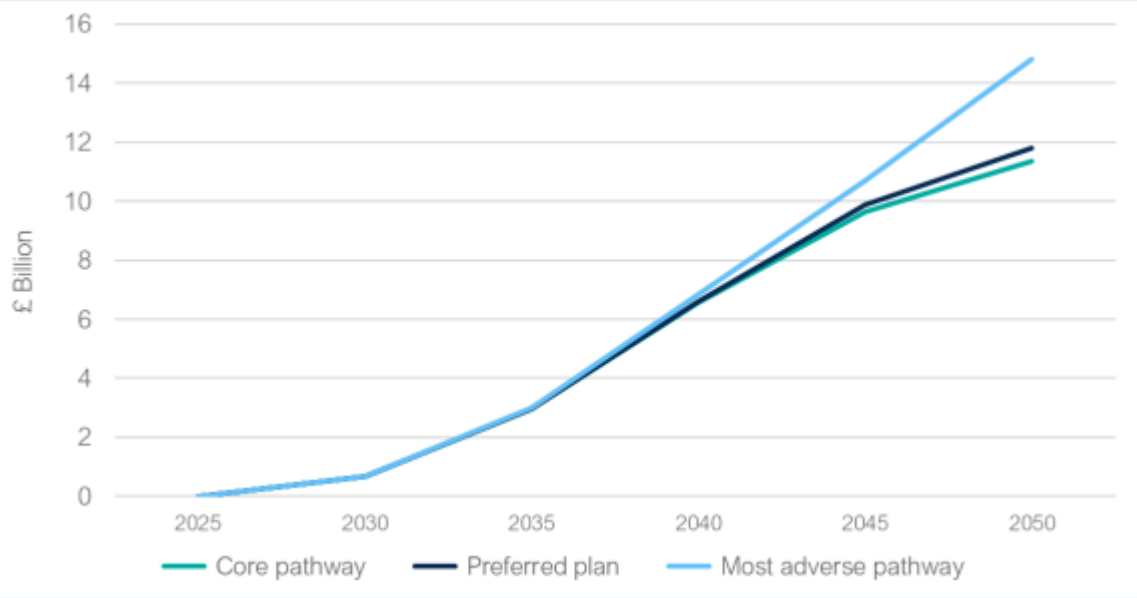


Figure 47 : Reducing sewage spills in rivers : comparison of different pathways

Therefore, the forecast for climate change might drive a switch to a different pathway. We expect similar forecasts in the near term but in 15 years the forecast might diverge, meaning 2035-2040 is taken as the planning period when we need to decide whether to follow a new pathway (starting at 2040) or remain on the preferred plan pathway. Similar decisions will be required during the following planning period (2040-2045), depending on the pathway taken during the previous planning period. This approach generates four alternative pathways to the best value plan (See Figure 48) with the following switch points:

- Switch from the best value plan to the most adverse pathway in 2040 (pathway 2)
- Switch from the best value plan to the core pathway in 2040 (pathway 4)
- Switch from the best value plan to the most adverse pathway in 2045 (pathway 3)
- Switch from the best value plan to the core pathway in 2045 (pathway 5)

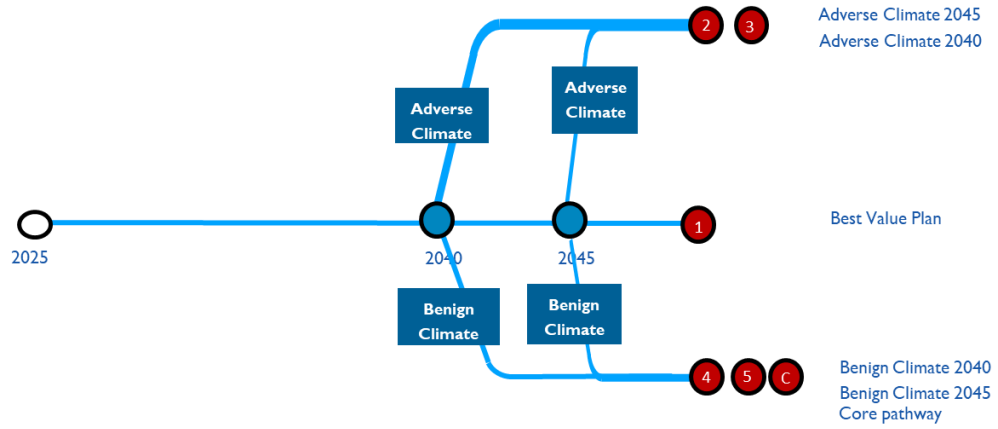


Figure 48 : Reducing sewage spills : an adaptive plan

Phosphorus Reduction in Rivers

Strategy: how will the company get there?

Improvements are needed to reduce the risk of eutrophication in rivers, lakes and canals, which in turn impacts on the quality of rivers for wildlife and recreation. In the Thames catchment, phosphorus is the main problem, and a large proportion of this comes from human wastewater. Eutrophication can also lead to increased water treatment costs. In some cases, investment is needed to counteract impacts of growth (within permit), preventing waterbodies from deteriorating.

The requirements are driven by multiple regulatory drivers, including Water Framework Regulations, Environment Act, Habitats Regulations and Urban Wastewater Treatment Regulations. Two requirements are to achieve "nutrient neutrality", a legal requirement anticipated to be included in the forthcoming Levelling Up and Regeneration Act.

Our strategy for phosphorus reduction In the longer term is to support the national target of 80% reduction in sewage effluent by AMP10 (2037). This will be achieved using a combination of end-of-pipe sewage treatment works upgrades, nature-based solutions, and catchment management measures.

The key aspects of our plan which means it offers the best value to customers to achieve our long-term regulatory targets are:

- **Broad range of options**: We have considered 14 different potential options types, narrowed this down to six constrained options (five on-site options and one catchment option).
- **Wide benefits assessment**. We assessed best value on a site-by-site level by considering a wide range of benefits following the WINEP options appraisal methodology. This includes benefits relating to amenity, access and engagement, the natural environment, greenhouse gas emissions and catchment resilience.
- **Impact of base.** The programme assumes that all assets are currently operating within their permit conditions, with costs and benefits assessed simply on the enhancement element of the investment requirements.

Due to both financeability and deliverability challenges associated with a significant investment programme in AMP8, phosphorous reductions beyond those being delivered through the AMP7 WINEP are being re-profiled for delivery in AMP9. In combination with the planned AMP9 spend to achieve the Environment Act target, this comprises more than 100 STW upgrades and four catchment solutions.

Further investment may be needed beyond AMP9 to address impacts of population growth, climate change and outcomes of investigations into potential phosphorus impacts.

Phosphorus reduction	2025-2030	2030-2035	2035-2040	2040-2045	2045-2050	Total
Totex (£m)	0	1,786	705	105	105	27012,701

Table 45 : Phosphorus reduction spend summary

We assessed how the LTDS common reference scenarios could impact our plan. We assessed that climate change and technology scenarios would have most impact on our plan. Table 46 summarises how we assessed scenarios.

The adverse climate change scenario is based on an average flow reduction of 14% in rivers. The Environment Agency's PR24 SAGIS-Simcat model was used, with river flows reduced by 14% to determine phosphorus concentrations in TWUL discharges that are consistent with Polluter Pays load reductions. It was assumed that the volume of each discharge remained unchanged. This is likely to be a conservative or "worst case" scenario as there is a strong correlation between reduced rainfall and reduced discharge volumes.

The benign climate change scenario assumes river flows will not be significantly different from current flows and that incremental improvements can be made.

Common reference scenarios		Phosphorus reduction in rivers
Climate change	High (Adverse)	• Reduced flows by 14% • Adverse climate change driver of uncertainty: UKCP18 probabilistic projections, RCP8.5 • Based on the UK centre of Ecology and Hydrology eFLaG dataset • The data comprise an ensemble of 11 time series of projected flows driven by 11 different climate models, all using the same emissions pathway of RCP 8.5 • RCM_08 was identified as the most suitable ensemble member as it produced the median percentage change between baseline and future flows at two sample sites in the TWUL catchment of all 11 members • Across 10 sample sites in the TWUL catchment, mean flows are predicted to reduce by between 0 and 24%, with an average reduction of 14%, in the period 2041-70 relative to the baseline 2015-2020
	Low (Benign)	• No material change from current flows.
Technology	Faster	• No change to technically achievable limit (TAL) of 0.25mg/l • Policy change effected through increased evidence availability at catchment level provided by Rethinking Rivers breaks requirement for phosphorus to be treated within the curtilage of our operational sites (or upstream). • Lower value end of pipe phosphorus schemes are replaced either entirely or partially with better value catchment interventions.
	Slower	• No change from core-pathway.

Table 46 : Phosphorus reduction scenario assessment

Our Best Value plan assumes for climate change that river flows will not be significantly different from current flows and that incremental improvements can be made as climate change impacts

materialise. For technology, our best value plan assumes that the nationally agreed TAL does not alter and that alternative approaches using more catchment-based approaches are not available due to constraints within the Environment Act. The impact of different scenarios on the best value plan is shown in Table 47.

Investment	Planning horizon	Best Value Plan (£m)	Climate Change Low (£m)	Climate Change High (£m)	Tech Faster (£m)	Tech Slower (£m)
Phosphorus reduction in rivers	2025-2030	0	No change	No change	No change	No change
	2030-2035	£2087m	No change	+£100m	-£3m	No change
	2035-2040	£5614m	No change	+£300m	-£10m	No change
	2040-2045	0	No change	No change	No change	No change
	2045-2050	0	No change	No change	No change	No change
	Total impact	£2,701m	No change	+£400m	-£13m	No change
		The scope (and cost) of solutions is the same or more than the best value plan				
		The scope (and cost) of solutions is less than the best value plan				

Table 47 : Summary of scenario testing for phosphorus

For climate change, our testing found that reducing river flows by 14% resulted in the need for considerably tighter permit limits for phosphorus to meet equivalent river quality objectives as the core plan achieves. This is because there is less flow to dilute the phosphorus loads from our operations. There is considerable uncertainty around this assessment as the future flow dataset contains very limited points for predicted flows, so heavy extrapolation has been employed.

To achieve this potential additional load reduction, further actions would be required compared to our plan. This would vary on a site-to-site basis – some locations would need upgrades to the existing phosphorus programme with additional capital equipment (such as tertiary filtration units) others could be adapted though increased ferric dosing (opex only) and some others would require upstream interventions to counter the impacts of decreased dilution. In some cases, no conventional pathway was identified to fully counter the impacts.

We also assessed the impact of this adverse climate scenario on sites that are not scheduled for improvement to meet environmental targets through WINEP. This revealed that some sites would need first time phosphorus treatment and others would fall into the same categories as above – amendments to processes or upstream interventions.

We also reviewed the impact of the fast and slow technology scenarios. Overall, there would be little impact on the programme selected. Additional technology considerations are:

- Lower flows in sewers will result in more concentrated flows. Alkalinity dosing will become critical to achieving nitrification as alkalinity is reduced through ferric dosing.
- Space for future modular installations will be important.
- With the rise of electrocoagulation instead of ferric doing, ferric dosing equipment could be re-purposed for alkalinity dosing.
- As data becomes more accessible, partial and whole catchments could be operated at river basin level. This could allow performance blips to be compensated by using the headroom on other works in the catchment. This has the potential to reduce standby equipment requirements

such as tertiary treatment typically provided. This approach is currently gated behind Environmental Performance Assessment ratings, with a minimum of 3* required to proceed.

- In the short term, if construction techniques continue to decarbonise new build biological phosphorus removal may become viable in more locations. This would particularly be the case if retrofit intensification options that can free up existing aeration basin capacity to allow accommodation of anaerobic zones within existing structures prove successful on commercial scale.
- Electrocoagulation may also offer an alternative to conventional ferric dosing, although this is yet to be established. This approach may enable a degree of phosphorus recovery from liquor treatment, so could offer circular economy advantages.
- As most phosphorus treatment equipment has a 20-year design-life, new technologies can be installed in 2050, in line with the expected timeline for availability.

We also considered how opportunities for employing more catchment-based solutions could be realised to reduce costs and/or increase benefits if rules around how Environment Act targets are achieved are amended. This found potentially up to £13m of savings could be achieved by 2037.

Our core pathway for phosphorus sees investment commencing in AMP9, with AMP8 constrained by deliverability and financing limitations.

Further research is planned to improve modelling to decrease uncertainty around local climate change impacts and their timing before solutions are implemented.

We have assumed that:

- The Technically Achievable Limit is not lowered, with use of stretch permits employed to enable improvements without excess regulatory risk.
- Climate change impacts, while potentially material, can be adapted for through modular technology design, top-up catchment interventions and additional upstream upgrades.
- Significant advances in technology can be employed as replacements for existing assets as they are life-expired, with similar timelines.
- Phosphorus permits are calculated considering maximum permitted dry-weather flow, therefore sites with permit headroom for flow will be outperforming target load reductions, significantly limiting climate change risk to the environment in the short to medium term.

We have therefore built our core pathway around the current river flow regime, where accurate SIMCAT-SAGIS models have been deployed. This avoids the risk of installing excessive scope that may not be needed either at all, or too soon.

The solutions we have identified to achieve long-term phosphorus targets have been assessed to consider if they are adaptable, with a modular approach employed to enable upgrades where climate change impacts have materialised. We assess that the options selected were adequately flexible within the context of phosphorus removal, however if a phosphorus site also has future chemical limits that require micro-filtration with membranes, there could be a risk of making tertiary filtration for phosphorus redundant.

Due to the uncertainties around the climate change impacts, and the flexibility available to adjust the core plan as it materialises locally, we have not developed a specific alternative pathway to represent high or low climate change scenarios.

While the impact could be as high as an additional £400m, there would not be a single trigger point for an alternative pathway. Some locations will be more sensitive to change than others due to local drainage features and other physical catchment characteristics, dry-weather flow permit headroom and variations in observed rainfall patterns.

Further research will be undertaken to better understand catchments at risk in advance of investment being undertaken.

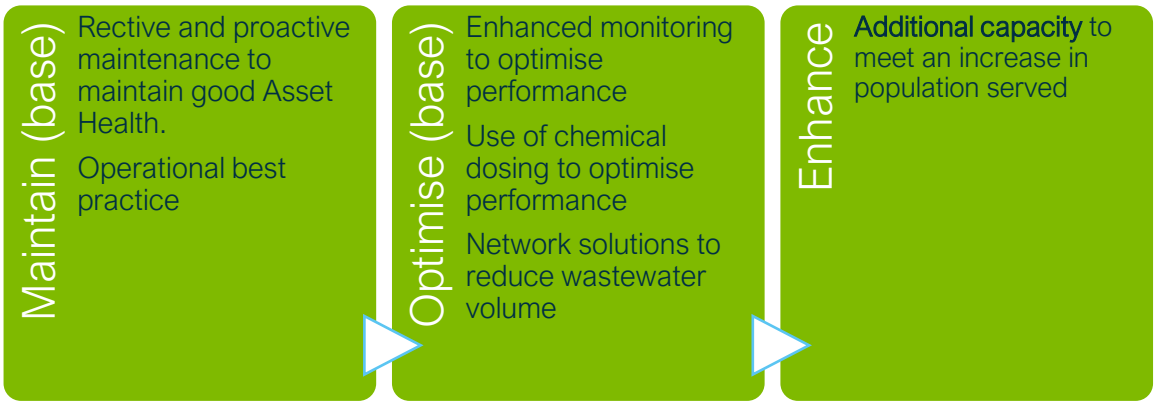
Sewage treatment works growth

Strategy: how will the company get there?

The population in our area is forecast to increase by 17% from 2025 to 2050. In order to meet our 100% sewage treatment works compliance ambition, we need to invest to provide additional treatment capacity to accommodate this growth.

Our strategy is to invest just ahead of growth forecasts for larger sites. This is because it takes time to put in place upgrades and extensions for these types of sites. For smaller sites we can be more reactive and invest 'just in time'. Overall, this is a low / least regrets approach as it avoid excess capacity, while ensuring capacity needs can be met in time. Key solutions to deliver our strategy are typically site extensions or upgrades to support intensive treatment processes.

Investing in growth is part of a hierarchy of measures to ensure sewage works remain compliant. This requires both base and enhancement investment as shown in the diagram below. We only require additional investment via enhancement funding where our process modelling shows that we have insufficient existing capacity/headroom after asset health and process optimisation considerations.



The below table shows the forecast growth profile with the associated investment requirement. Our larger sites require upgrades in the 2030-35 period when our expenditure for this programme will peak. In addition, spend between 2025 and 2040 is significantly greater than between 2040 and 2050 this is mainly because delivery of upgrades at our largest STWs are required in the near term to comply with updated guidance from the Environment Agency related to dry weather flow and flow to full treatment. Also, by 2040 we will have invested to be more resilient to growth and to have upsized many of our STWs to deliver other benefits (e.g., storm overflows).

STW Compliance	2025-30	2030-35	2035-40	2040-45	2045-50
PE increase	498,123	378,912	466,522	517,119	565,667
Totex (£m)	355	717	351	52	77

Table 48: Best value pathway

We have developed a best value plan, informed by the strategic DWMP, but built bottom up in the near term by modelling the additional capacity required at our 354 STWs. The key aspects of our best value plan are:

- We have considered a broad range of options, with 11 different solution types in our unconstrained optioneering phase. These option types were agreed with stakeholders as part of the optioneering stage of DWMP.
- We have narrowed this down to a hierarchy of four key options as illustrated below:

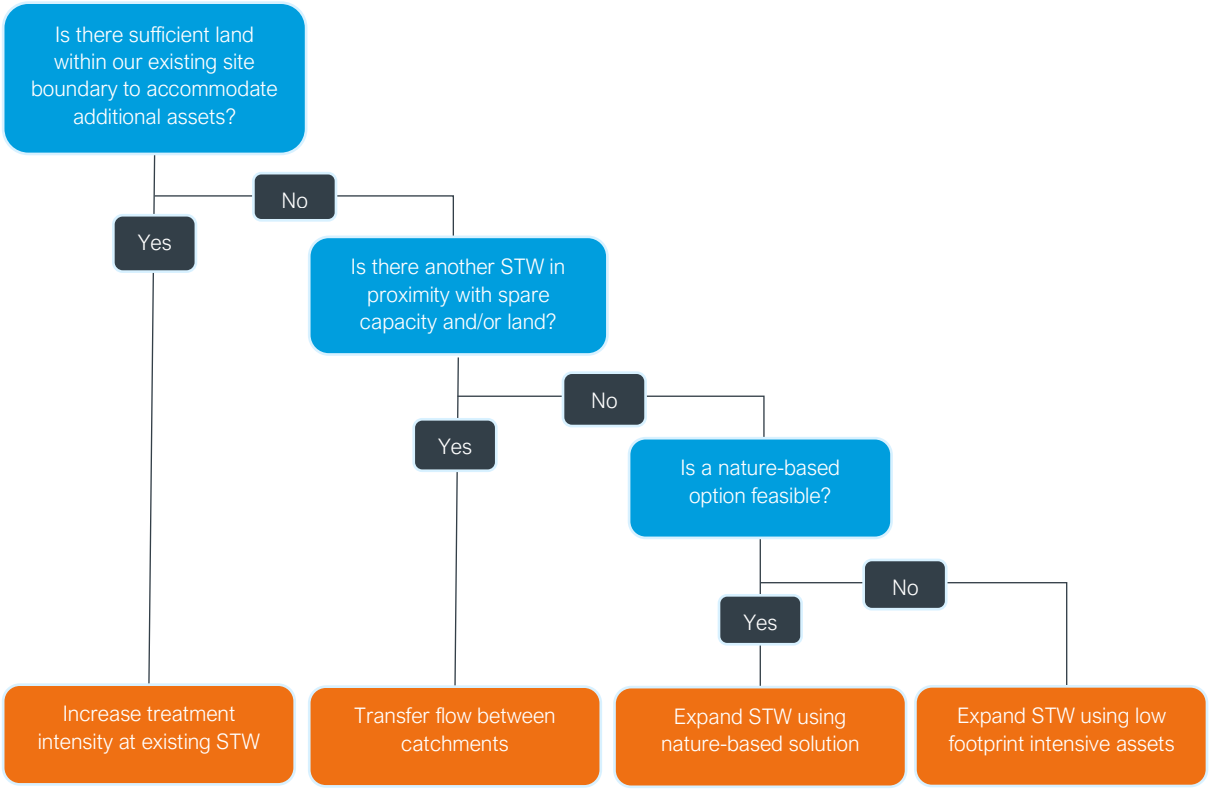


Figure 49: Option screening process

- We have included a wide range of benefits in our assessment of best value options including wellbeing, carbon, biodiversity, greenhouse gas emissions and traffic disruption.

- We have selected a plan that scores highest in our multi-criteria framework used in DWMP and in the near term the optimum balance in our public value framework as illustrated in the figure below.
- Our plan has considered the role of base with benefits from asset maintenance and process optimisation built into our process modelling such that we only request additional funding when models show that we cannot offset growth via base.

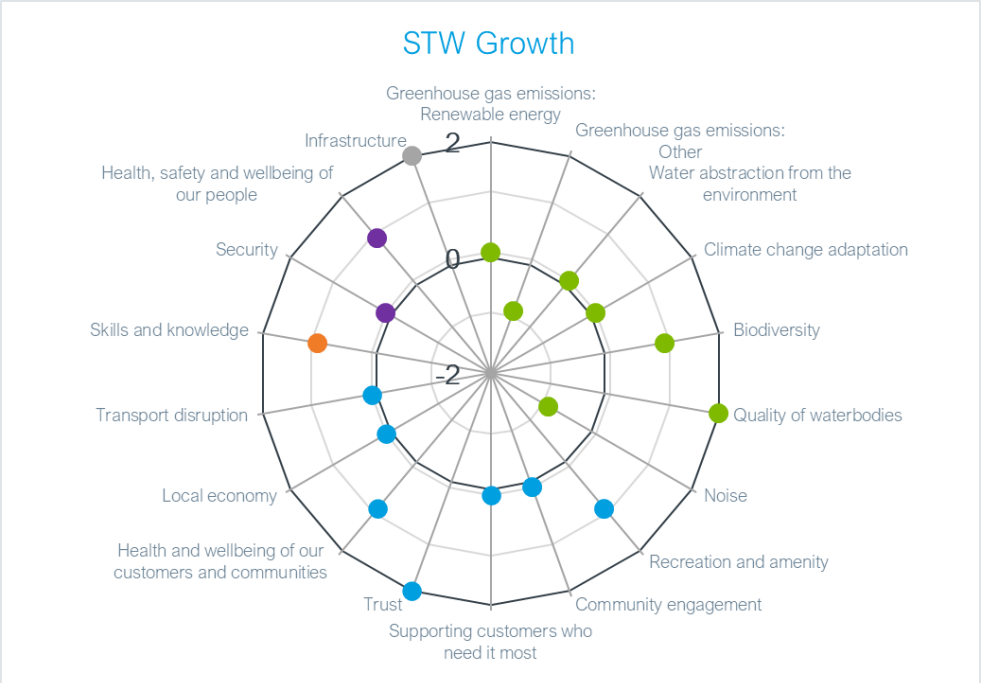


Figure 50: How we balanced the AMP8 growth plan using a Public Value Framework

How we developed the best value plan | How we tested against different scenarios | Howg we determined the core pathway | How we determined the alternative pathways

We followed Ofwat's LTDS guidance by considering 'common reference scenarios' to test against our best value plan. We focussed on demand and technology as they are likely to have the most significant impact on our solutions for sewage treatment growth. Abstraction reductions will not impact sewage treatment growth solutions in any significant way. Climate change was assessed as not having a material impact on this investment programme. This position will be reviewed in the future as more information becomes available, in particular, national research on how temperature changes could affect sewage treatment work processes.

The table below summarises how we defined the forecast for the different scenarios.

Common reference scenario		How we tested our plan against common reference scenarios
Demand	High and Low	Forecasts used: Plan-based: the use of forecasts based on Local Planning Authority data relating to house building trajectories. Office for National Statistics: the 2018-based population projection was used which is based on mid-year population estimates and assumptions of future fertility, mortality and migration

		When considering the best value plan at a company-wide level, Local Plan forecasts provide a high (adverse) scenario, but when considering at a catchment level, the opposite may be true. Therefore, we separately assessed every catchment against Local Plan and Office for National Statistics forecasts, to create a new adverse (high) or benign (low) forecast, depending on which forecast was used in our Best Value plan
Technology	Faster and slower	The main impact of the benign and adverse scenarios is the impact on wastewater volumes received at STWs which will vary depending on the speed of penetration of smart metering. We examined those sites earmarked for investment in our best value plan which appeared to have a high risk of becoming non-compliant by 2050 and calculated the impact of the scenario on headroom under Dry Weather Flow permits. Where a scheme was needed, we derived a factor to adjust costs of achieving compliance.

Table 49: Detail of different scenarios used in testing

Results from our testing of the best value plan are summarised in Figure 51. The benign demand scenario (low growth) has a significant impact on our solutions to address sewage treatment growth. A greater level of investment is needed in all adverse scenarios compared to benign scenarios.

The technology scenarios have a limited impact when compared to our best value plan. We have assessed emerging wastewater technologies (e.g., intensification processes such as Nereda® and the impact they could have on our long-term plan). The benefits of these technologies have the potential to be significant at our very largest STWs,[21] due to a lack of available land. However, the benefit is likely to be more borderline at our smaller more rural or suburban STWs where land availability is less restrictive. Therefore, we have found that at a programme level the largest technology impact on our sewage treatment growth investment is likely to come from smart water meter penetration as this reduced per capita consumption and therefore the volume of wastewater required to be treated, this has a direct impact on dry weather flow and flow to full treatment permit condition compliance.

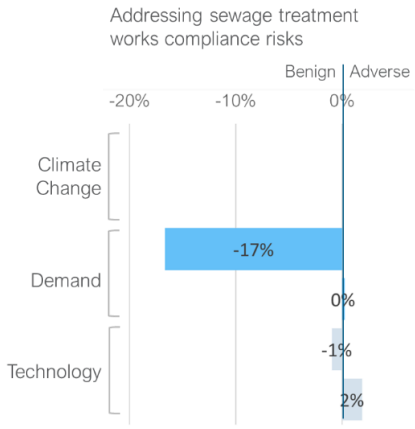


Figure 51 : Comparing our best value plan to the scenarios we tested

[21] For more details on a site based view of the impact of innovative wastewater technologies see DWMP Technical Appendix G : An adaptive planning pathways for Mogden and Beckton

The table below shows the impact of individual scenarios on the package of solutions within our best value plan and the overall cost. Demand (growth) and technology (mostly smart meter penetration) impact on the investment programme after 2030.

The impact of the technology scenarios is relatively small. This is because of the relatively small effect of differing rates of smart metering penetration on demand compared to underlying population and economic growth.

Investment	Planning horizon	Best Value Plan (£m)	Demand Low (£m)	Demand High (£m)	Tech Faster (£m)	Tech Slower (£m)
Sewage treatment growth	2025-2030	355	355	355	355	355
	2030-2035	717	507	721	712	735
	2035-2040	351	297	351	344	361
	2040-2045	52	57	52	50	53
	2045-2050	77	72	77	75	79
	Totex impact	1,552	-17%	<1%	-1%	2%
		The scope (and cost) of solutions is the same or more than the best value plan				
		The scope (and cost) of solutions is less than the best value plan				

Table 50: Impact of scenarios on Best Value Plan – Sewage treatment growth (2020/21 price base)

How we developed the best value plan | How we tested against different scenarios | How we determined the core pathway | How we determined the alternative pathways

The core pathway drives a programme of no and low regret investments, as per Ofwat's LTDS guidance. For STW growth we defined the core pathway as mostly tracking the most benign demand forecast.

The table below shows the programme of investment selected in the best value plan compared against the core pathway. The table shows that our best value plan is aligned to a no and low regret (core) pathway in the near term. The table shows there is a significant difference in sewage treatment works investment between the core and best value plan from 2030 onwards. In the longer term our best value plan tracks more catchment specific forecasts than the core pathway as our experience is these forecasts are more appropriate for long term wastewater growth planning.

Investment	Planning horizon	Best Value Plan (£m)	Needed in all scenarios	Needed in most scenarios	Needed to keep future options open	Needed in the short-term	Core Pathway (£m)
Sewage treatment growth	2025-2030	355	Yes	No	No	Yes	355
	2030-2035	717	No	Yes	No	No	507
	2035-2040	351	No	Yes	No	No	297
	2040-2045	52	No	Yes	No	No	57
	2045-2050	77	No	Yes	No	No	72
Total cost	£m	1,552					1,288
		The scope (and cost) of solutions is the same or more than the best value plan					

	The scope (and cost) of solutions is less than the best value plan

Table 51: Comparing the best value plan to the core pathway (2020/21 price base)

We have set one alternative pathway from the core pathway which tracks more catchment specific forecasts in the longer term. What triggers the switch to an alternative pathway is a change in demand forecasts. We set the assessment point in 2030 when we expect the next round of revisions.

Most of our solutions have short lead times and therefore there is a degree of scalability to the plan. Our sewage treatment growth upgrades are designed to be delivered 'just in time' i.e., constructed ahead of growth but only when firm commitment of development delivery has been established. This ensures that capacity is not delivered which is un-necessary or includes stranded assets. We also ensure that modular upgrades are used for long-term growth areas or those which span multiple AMPs. This allows additional capacity to be added in phases as and when new houses are constructed.

Figure 52 below shows the alternative pathway for addressing sewage treatment works growth.

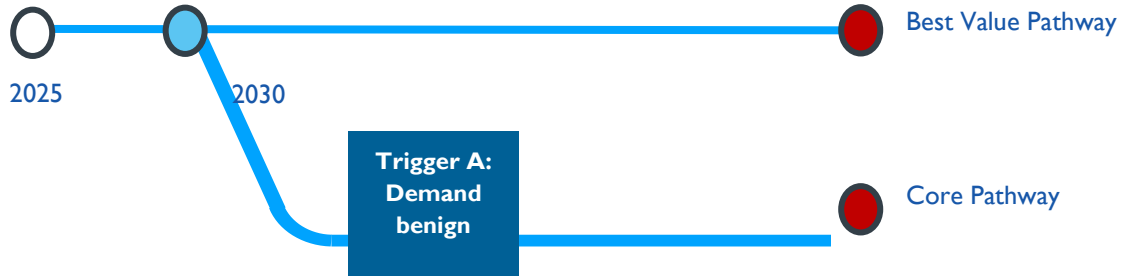


Figure 52: Alternative pathway diagram (addressing sewage treatment works growth)

Pathway Name	Decision/Trigger Dates	Description
Core Pathway / Best Value plan	N/a	As described above.
Demand benign	2030	In all other scenarios, a greater level of investment is required. However, in a benign demand scenario, the expenditure requirement would be over £200 million lower than the best value plan.

Conclusion

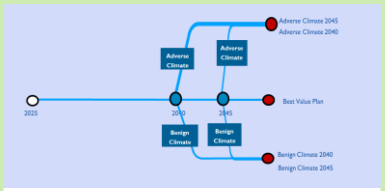
In order to meet our vision outcome of our leadership and collaborating improving the health of rivers, we are going to need a multi-AMP investment programme – as per our drainage and wastewater management plan.

Strategy

Our strategy involves extensive deployment of nature-based surface water management solutions, enhancements to network capacity and a programme of sewer lining to prevent infiltration. We have determined the best value pathway through the DWMP process.

Scenarios

We have tested the best value pathway against different scenarios. Our core scenario reflects the lower level of investment from 2040 associated with a plausibly low climate change scenario.



Adaptation

We are able to deploy our solutions adaptably and flexibly in response to emerging future conditions. We have identified alternative pathways from 2040 or 2045 which would be followed if adverse climate change scenarios emerge.

4 Aggregate plans

4.1 Core pathway

As described above, our core pathway has been developed by testing our best value plans against the common reference scenarios and company-specific scenarios to identify the low / least regrets investments, and to keep future options open.

The aggregate expenditure profile of our core pathway for those enhancement areas subject to adaptive planning (discussed in Section 3 above) is set out in Figure 53 below. Areas subject to adaptive planning represent £66bn of a total of £70bn of expenditure under our core pathway.

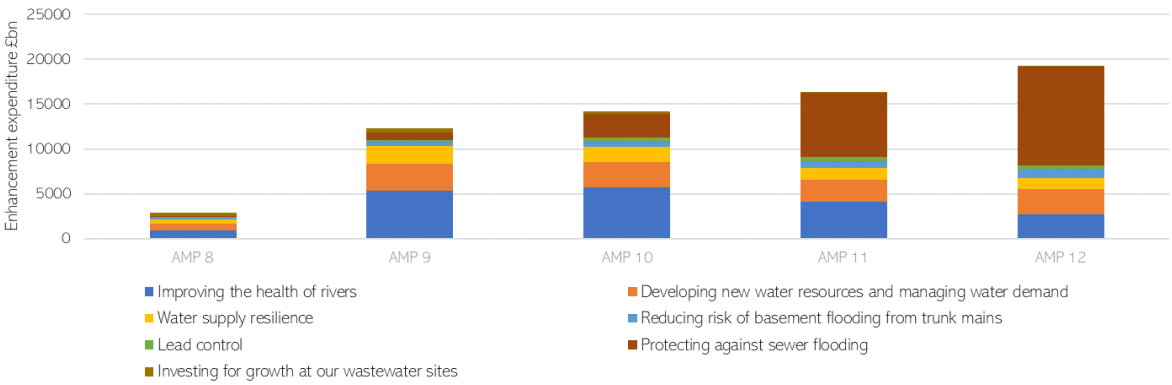


Figure 53: Adaptive planning enhancement expenditure – core pathway, 2022/23 prices

In addition to the enhancement areas subject to adaptive planning, those described in section 3, there are several other enhancements we are proposing for AMP8. An explanation of why we have not subjected these enhancement cases to scenario testing and adaptive planning is provided in section 6.3. The aggregate expenditure profile of our core pathway for all enhancement areas including those areas not subject to adaptive planning is set out in Figure 54 below.

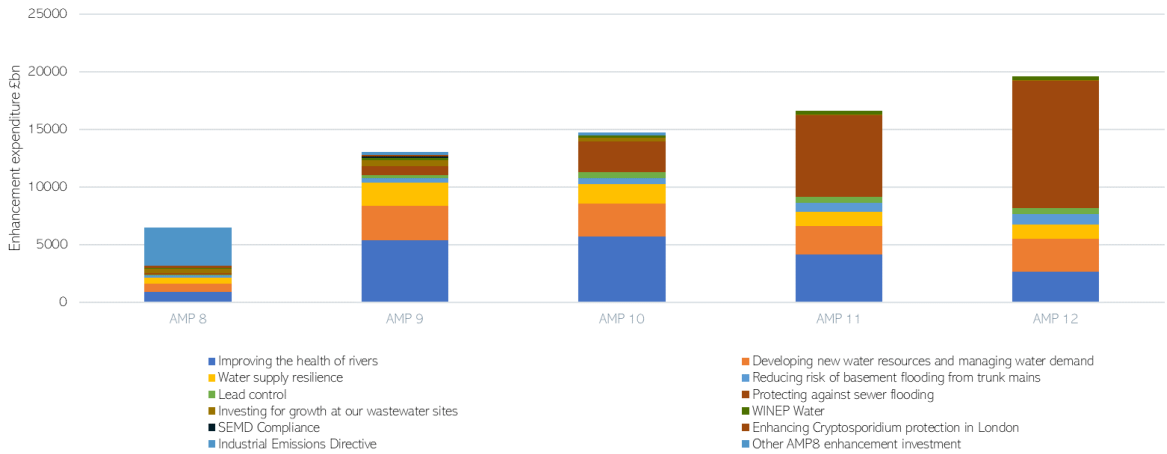


Figure 54: All enhancement expenditure – core pathway, 2022/23 prices

As illustrated in Figure 53 and Figure 54 our major investment requirements increase further after 2025-30 with continuing substantial investment in delivering river health, balancing supply and demand and providing protection against sewer flooding, in particular. We will need to continue to

work with our supply chain to ensure there is sufficient capacity to deliver such a large programme of works. We will also need to continue focusing on providing support to vulnerable customers so that bills remain affordable.

The average bill forecast of our core pathway is shown below – this relates to all enhancement expenditure, including those that are not subject to adaptive planning.

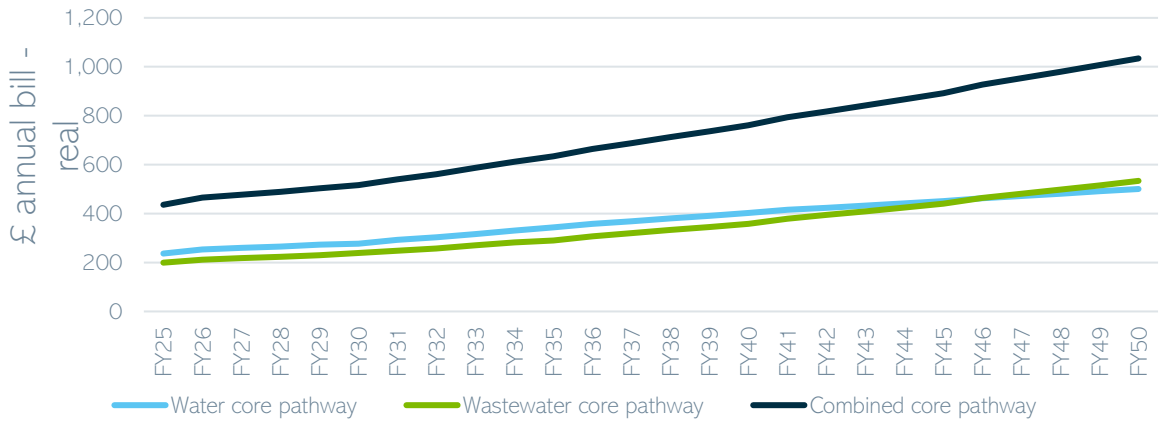


Figure 55: Average bills (combined, real), with long term enhancement impact - core pathway

4.2 Alternative pathways

As described throughout Chapter 3, each enhancement area has a number of potential alternative pathways including our best value pathway. The aggregate expenditure profile of best value pathway for all enhancement areas including those areas not subject to adaptive planning is set out in Figure 56 below. Areas subject to adaptive planning represent £71bn of a total of £75bn of expenditure under our best value pathway.

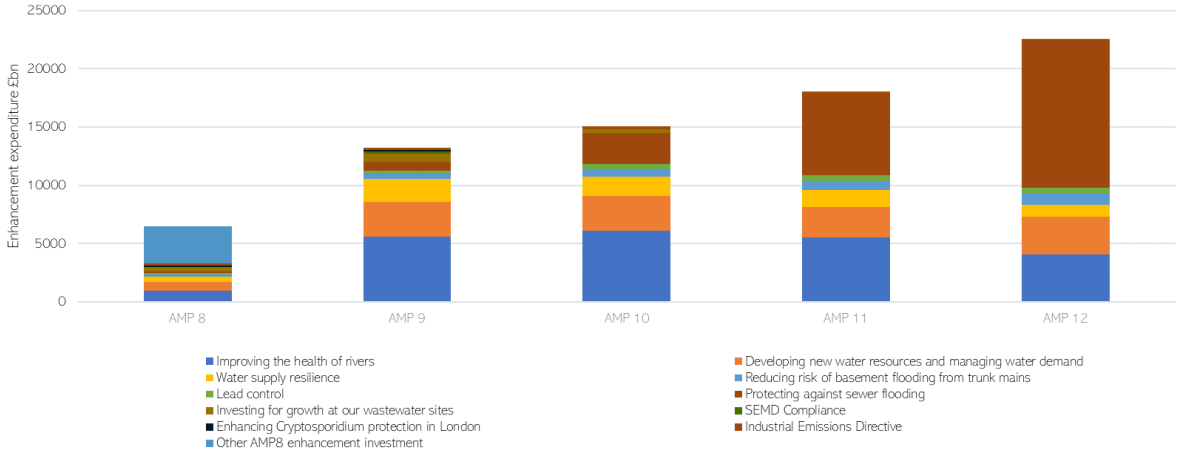


Figure 56: All enhancement expenditure – best value pathway, 2022/23 prices

There are also many more alternative pathways which have been developed as part of our planning. Alternative pathways have emerged by considering how our strategies will adapt against Ofwat's common reference scenarios and our broader company specific scenarios and sensitivities (detailed in section 2.3.4).

We will continue to engage with our customers and stakeholders as well as monitor growth, climate change, technological developments and environmental ambition. This will be necessary to inform our decision making over time and allow our plans to respond and adapt to any changing needs and circumstances. Much of our plan is inherently modular and hence readily adaptable in terms of pace and scale of investment.

The average bill forecast of our core and alternative pathways for water and wastewater are shown in the figures below. There is very little difference in the bill impacts until the final decade of the planning horizon.

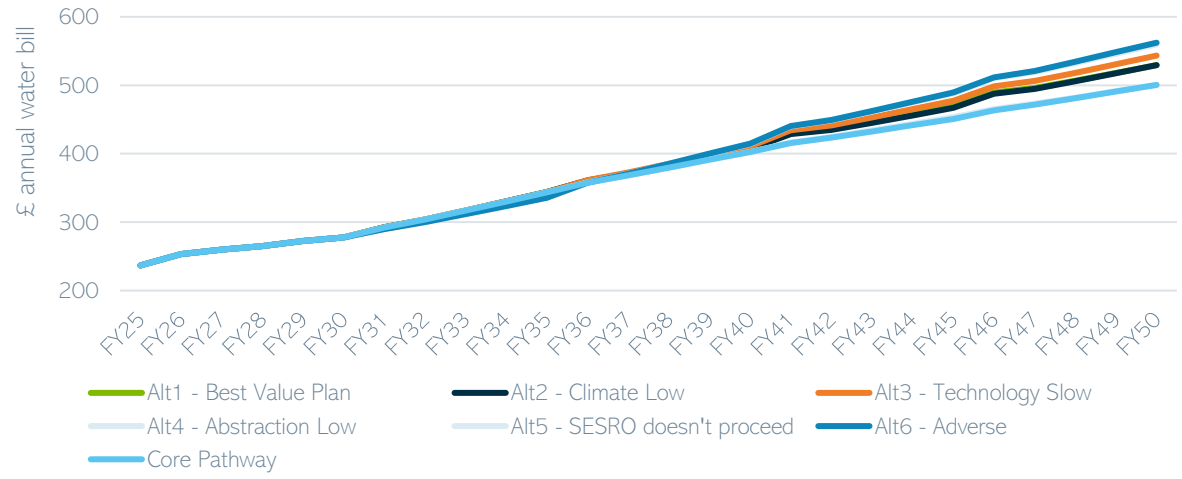


Figure 57: Water average bills (core and alternative pathways)

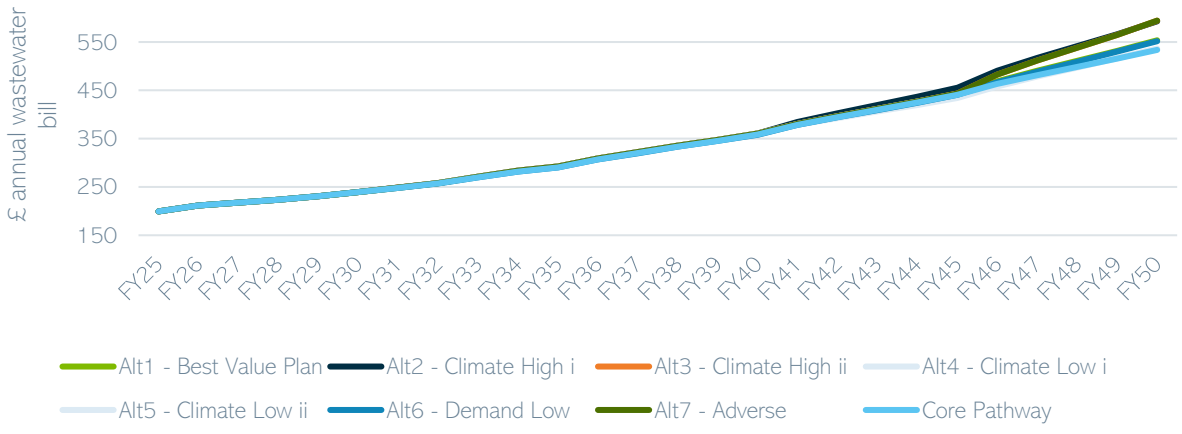


Figure 58: Wastewater average bills (core and alternative pathways)

As we set out in relation to each of the enhancement areas detailed in Section 3, at specific points in the future we will be required to make decisions that which move us onto alternative pathways. These decisions will be made by considering latest available data which we discuss further in our monitoring plan in Section 6.1 below.

In the following sections, we present the aggregate cumulative totex associated with selected pathways in the following sections for the water and wastewater services, consistent with LTDS data tables, specifically:

- LS3 – which sets out aggregate water totex for the core pathway and selected alternative pathways
- LS4 – which sets out aggregate wastewater totex for the core plan and selected alternative pathways

For both services, the aggregate core pathway is thus the lowest cost pathway in aggregate over 2025 to 2050 period, reflecting benign outcomes from our scenarios. We also include the Best Value Plan, together with pathways for other materially different scenarios and a most adverse pathway, the highest cost pathway emerging from the scenarios.

4.2.1 Water

The following diagram shows the cumulative totex associated with each of the water individual pathways included in our LTDS data tables.

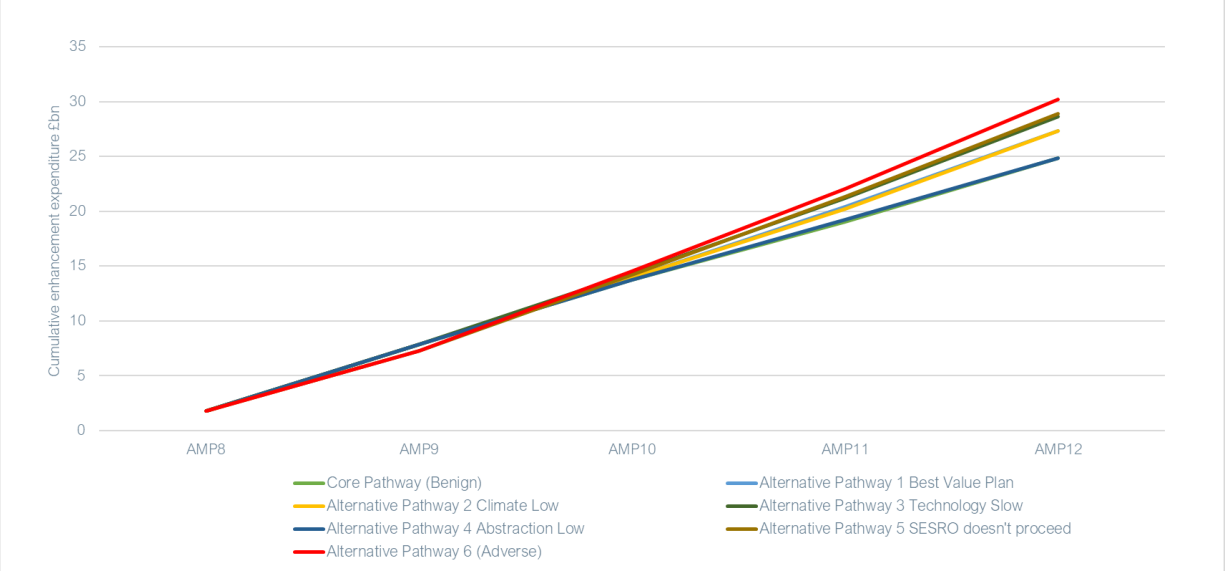


Figure 59: Totex associated with aggregate water pathways

The following table summarises these aggregate pathways, the relevant material scenarios and trigger points affecting key enhancement investment areas within each scenario. It also shows the variance in totex over 2025 to 2050 between the pathway and the core pathway. Note that the trigger points are described in more detail in a subsequent table.

Pathway Name / Data Table Ref	Summary - key Investments, relevant material scenarios and trigger points	Delta vs core (£m)
Core Pathway (LS3)	The Core Pathway includes low/least regrets investment as described above. It is associated with benign outcomes across the material scenarios we have considered and is the lowest overall cost pathway.	-
Alternative Pathway 1 Best Value Plan (LS3a)	This is the pathway consistent with our aggregate Best Value Plan derived for each enhancement area as described in Section 3. The key enhancement investments affected by relevant material scenarios and the associated trigger points are: • **WRMP Supply** and **WINEP** investment is higher than the core pathway due to a **low abstraction** scenario from **2035** • **Water resilience** investment is higher than the core pathway due to a **low climate change** scenario from **2040** Investment in **trunk mains** and **lead** is not materially affected and so is the same the core pathway.	2,485
Alternative Pathway 2 Climate Low (LS3b)	This is a pathway in which climate change is benign from 2040. The key enhancement investments affected by relevant material scenarios and the associated trigger points are: • **Water resilience** investment is higher than core pathway due to a **low climate change** scenario from **2040** • **WRMP supply, WINEP, lead** and **trunk mains** investment is not materially affected and so investment is the same as the core pathway.	2,468
Alternative Pathway 3 Technology Slow (LS3c)	This is a pathway in which technological progress is slower than expected under the core pathway from 2035. The key enhancement investments affected by relevant material scenarios and the associated trigger points are: • **Investment** in **lead** and **trunk mains is higher** than core pathway due to a scenario with a slow rate of technological progress from **2035** • **WRMP supply, WINEP,** and **water resilience** investment is not materially affected and so investment is the same as the core pathway.	3,801
Alternative Pathway 4 Abstraction Low (LS3d)	This is a pathway in which more abstraction for water supply is available from 2035. The key enhancement investments affected by relevant material scenarios and the associated trigger points are: • **WRMP supply** and **WINEP** investment is lower than core pathway due to a **low abstraction** scenario from **2035** • Investment in **water resilience, lead** and **trunk mains** is not materially affected and so investment is the same as the core pathway.	17
Alternative Pathway 5 SESRO not allowed (LS3e)	This is a pathway in which SESRO is not permitted. The key enhancement investments affected by relevant material scenarios and the associated trigger points are: • **Investment in WRMP supply** is higher than core pathway due to a decision **not to permit SESRO** in **2027** • Investment in **water resilience, WINEP, lead** and **trunk mains** is not materially affected and so investment is the same as the core pathway.	4,084
Alternative Pathway 6 Adverse (LS3f)	This pathway is associated with adverse outcomes across the material scenarios we have considered and results in the highest level of totex in aggregate over 2025 to 2040. • **Investment in WRMP supply** is higher than core pathway due to a decision **not to permit SESRO** in **2027** • **Investment** in **lead** and **trunk mains is higher** than core pathway due to a scenario with a slow rate of technological progress from **2035** • **Water resilience** investment is higher than core pathway due to a **high climate change** scenario from **2040** • Investment in **WINEP** is not materially affected and so investment is the same as the core pathway.	5,400

Table 52: Aggregate water pathway descriptions

In aggregate our Best Value Plan begins to diverge from the Core pathway only from 2040 with that divergence becoming more material after 2045 driven largely by the need for more expensive water supply schemes if the need for abstraction reduction remains high. Under an adverse aggregate pathway, which would include the scenario in which SESRO does not proceed then expenditure on water supply schemes would be far greater than under our core scenario but would be incurred later in the period as alternative supply schemes with shorter build times are utilised. Slower than expected technological progress leading to higher costs of addressing trunk mains and lead also drive the adverse scenario materially.

We have identified four key trigger points at three dates between 2025 and 2050 at which emerging scenarios vary materially and therefore require us to adapt our plan to follow alternative pathways. These three trigger points are described in the following table together with the relevant decision points, which areas of enhancement investment are affected and by what emerging scenario.

Decision Point	Trigger Point	Enhancement Area	Notes
2027	2027	WRMP supply	A decision not to permit SESRO to proceed, in 2027, will require alternative and more costly investment in new water supply resources to balance supply and demand. We would need to decide to adapt our plan to follow this pathway during AMP8 and it would require a revised Water Resources Management Plan to be implemented from AMP9 Business Plan submission. During AMP8 we will be engaging with key stakeholders to understand likely responses by regulators and outcomes from public consultation and planning processes to understand as soon as practical whether this scenario is likely to crystallise.
2033	2035	WRMP Supply WINEP	A more benign than expected scenario in relation to required abstraction reduction would enable us to take more water from the environment, and/or from different sources. This could allow for a material reduction in our investment in water supply and water resilience schemes from 2035. We would need to decide to adapt our plan to follow this pathway by 2033 to reflect it in our Business Plan submission ahead of AMP10. To inform our decision we would engage closely with the Environment Agency and other stakeholders as well as undertaking work to better understand the potential impact of abstractions.
2033	2035	Lead Trunk Mains	An adverse technology scenario in which expected cost reductions do not materialise as quickly as expected may lead to us needing to materially increase the level of investment to deal with risk associated with lead and trunk mains from 2035. We would need to decide on this pathway by 2033 to reflect it in our Business Plan submission ahead of AMP10. To inform our decision we would monitor the emerging costs of delivery of these programmes and also resulting service performance, especially in relation to trunk mains bursts.
2038	2040	Water Resilience	Climate change outcomes which are more adverse or benign may emerge through the plan period but the earliest that these could have a material impact on our investment plans would be 2040. At this point we may need to adapt our plans to reflect the need for lower levels of investment in water resilience. We would need to decide to adapt our plan to follow this pathway by 2038 to reflect it in our AMP11 Business Plan submission. To inform our decision we would

			monitor leading and lagging indicators of climate change throughout the period including outputs from recognised climate models, data from monitoring our own networks and service performance and modelled forecasts based on these data.

Table 53: Trigger point summary – water

More details on how we will monitor factors to inform whether a trigger point has been reached are set out in section 7.1. Although we have identified specific trigger points in our adaptive plan, in reality our plan is in large part inherently modular and flexible and so may be adapted relatively easily at any point in the period.

4.2.2 Wastewater

The following diagram shows the cumulative totex by AMP associated with selected aggregate wastewater pathways included in our LTDS data tables. For clarity we show three of the seven pathways: core, best value plan and a pathway driven by adverse climate change. Each of the pathways not shown has a similar profile of investment as one of these three.

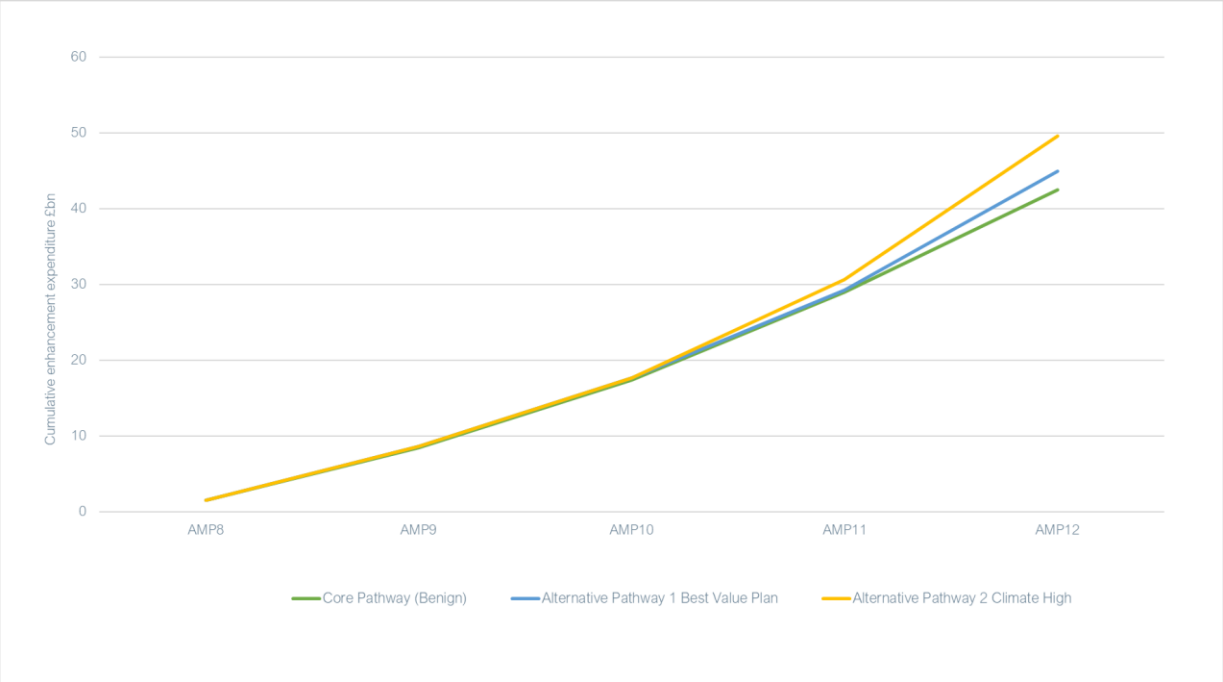


Figure 60: Cumulative totex associated with selected aggregate wastewater pathways

The following table summarises all seven of the aggregate pathways we include in our data tables, the relevant material scenarios and trigger points affecting key enhancement investment areas within each scenario. It also shows the variance in totex over 2025 to 2050 between the pathways and our Core pathway. Note that the trigger points are described in more detail in a subsequent table.

Pathway Name / Data Table Ref	Summary - key Investments, relevant material scenarios and trigger points	Delta vs core (£m)
Core Pathway (LS4)	The Core Pathway includes low/least regrets investment as described above. It is associated with benign outcomes across the material scenarios we have considered and is the lowest overall cost pathway.	-
Alternative Pathway 1 Best Value Plan (LS4a)	This is the pathway consistent with our aggregate Best Value Plan derived for each enhancement area as described in Section 3.	2,438

	The key enhancement investments affected by relevant material scenarios and the associated trigger points are: • **STW Growth** investment is higher than core pathway due to a **low demand** scenario from **2030** • **Sewer Flooding** and **WINEP** investment is higher than core pathway due to a **low climate change** scenario from **2040**	
Alternative Pathway 2 Climate High 2040 (LS4b)	This is a pathway in which climate change is adverse from 2040. The key enhancement investments affected by relevant material scenarios and the associated trigger points are: • **Sewer Flooding** and **WINEP** investment is higher than core pathway due to a **high climate change** scenario from **2040** • **STW Growth** is not materially affected and so investment is the same as the core pathway.	7,127
Alternative Pathway 3 Climate High 2045 (LS4c)	This is a pathway in which climate change is adverse from 2045 (i.e five years later than for Alternative Pathway 2). The key enhancement investments affected by relevant material scenarios and the associated trigger points are: • **Sewer Flooding** and **WINEP** investment is higher than core pathway due to a **high climate change** scenario from **2045** • **STW Growth** investment is not materially affected and so is the same as the core pathway. This pathway results in the highest level of totex in aggregate over 2025 to 2050 and is therefore the most adverse aggregate WW pathway.	7,160
Alternative Pathway 4 Climate Low 2040 (LS4d)	This is a pathway in which climate change is benign from 2040. The key enhancement investments affected by relevant material scenarios and the associated trigger points are: • **Sewer Flooding** and **WINEP** investment is only marginally greater than the core pathway due to a **low climate change** scenario from **2040** • **STW Growth** investment is not materially affected and so is the same as the core pathway.	287
Alternative Pathway 5 Climate Low 2045 (LS4e)	This is a pathway in which climate change is benign from 2045 (i.e five years later than for Alternative Pathway 5. The key enhancement investments affected by relevant material scenarios and the associated trigger points are: • **Sewer Flooding** and **WINEP** investment is only marginally greater than the core pathway due to a **low climate change** scenario from **2045** • **STW Growth** investment is not materially affected and so is the same as the core pathway.	263
Alternative Pathway 6 Demand Low (LS4f)	This is a pathway in which demand is low from 2030. The key enhancement investments affected by relevant material scenarios and the associated trigger points are: • **STW Growth** investment is lower than core pathway due to a **low demand** scenario from **2030** • **Sewer Flooding** and **WINEP** investment is not materially affected and so is the same as the core pathway.	2,175
Alternative Pathway 7 Adverse	The most adverse pathway which results in the highest level of totex in aggregate is the scenario in which adverse climate change impacts investment from 2045 (Alternative Pathway 3, above).	7,160

Table 54: Aggregate wastewater pathway descriptions

The diagram shows how the most and least cost pathways diverge materially from our best value plan only very late in the period and shows that the most important factor driving the need to vary our investment is climate change. The main areas of investment affected by climate change is that needed to protect against sewer flooding and to address storm overflows. Although there is a large range of outcomes that might emerge as a result of climate change, we have sought to ensure that our Best Value Plan is a low regret plan as far as possible. It is also inherently adaptable because the investment can be relatively easily changed as new information emerges.

We have identified three key points between 2025 and 2050 at which emerging scenarios vary materially and therefore require us to adapt our plan to follow alternative pathways. These three trigger points are described in the following table together with the relevant decision points, which areas of enhancement investment are affected and by what emerging scenario.

Decision Point	Trigger Point	Enhancement Area	Notes
2028	2030	STW Growth	Materially lower growth and hence demand for wastewater services may emerge early in the period and could result in lower required investment in STW growth from 2030. We would need to decide to adapt our plan to follow this pathway by 2028 to reflect it in our AMP9 Business Plan submission. We would monitor leading and lagging indicators of demand such as reported and forecast population growth to inform our decision.
2038	2040	Sewer Flooding WINEP	Climate change outcomes which are more adverse or benign may emerge through the plan period but the earliest that these could have a material impact on our investment plans would be 2040. At this point we may need to adapt our plans to reflect the need for lower or higher investment in sewer flooding and WINEP. We would need to decide to adapt our plan to follow this pathway by 2038 to reflect it in our AMP11 Business Plan submission. To inform our decision we would monitor leading and lagging indicators of climate change throughout the period including outputs from recognised climate models, data from monitoring our own networks and service performance and modelled forecasts based on these data.
2043	2045	Sewer Flooding WINEP	Adverse or benign climate change may lead to material effects later in the period in 2045, with impact on investment in sewer flooding or WINEP from that date. We would need to decide on this pathway by 2043 to reflect it in our AMP12 Business Plan submission. Monitoring would be as for the 2040 trigger above.

Table 55: Trigger point summary – wastewater

More details on how we will monitor factors to inform whether a trigger point has been reached are set out in section 7.1. Although we have identified specific trigger points in our adaptive plan, in reality our plan is in large part inherently modular and flexible and so may be adapted relatively easily at any point in the period.

5 How the LTDS differs from our previous long term plans

We have produced many different long term plans in the past. Typically, these are updated every five years to reflect changes in the external environment (e.g., climate change and population growth), new legal / regulatory requirements, and other new sources of information. Our long term delivery strategy will be no different – it will be a 'live' set of plans that will need to be amended and updated over time.

Where new plans are produced, it is important that key differences to previous plans are identified and explained, so customers and other stakeholders can see why things have moved on.

Our LTDS aligns to our most recent WRMP. Our WRMP24 will have a section that will clearly set out changes since WRMP19.

The key differences between previous strategic direction statement are summarised below.

5.1.1 Strategic Direction Statement

We set out a 25-year plan covering the period 2010 to 3035 in 2007.

Our strategic direction statement was based on customer and stakeholder research, and included a number of longer term goals in a number of thematic areas. Progress against the goals is summarised by theme below.

Overall, we have made good progress relative to our 2007 strategic direction statement. The main area where our ambitions were not met was regarding leakage. We set out the ambition to move towards industry average levels of leakage. Over the last 15 years, we have reduced leakage, however the rest of the sector has also driven significant improvements. We remain a comparative outlier. Going forward, our plans include a reduction of leakage by 50% by 2050 (relative to 2018 levels).

Thematic area	Our previous plans	Progress made
Drinking water quality	• Continue lead pipe replacement as opportunities arise • Monitor the effectiveness of current drinking water treatment processes and technology, adapting them as necessary • Respond to changes in raw water quality caused by climate change and other environmental factors • Seek to develop low-energy, low-chemical use water treatment processes and to implement real-time monitoring of water quality • Progressively reduce customer complaints about discolouration through a sustainable approach to asset maintenance and replacement	• Over the last 15 years we removed circa. 95,000 lead pipes and are now proposing to accelerate our programme further to meet our 2050 ambition by replacing 1.2 million lead comms pipes. • We continue to monitor processes and technology. • We have installed real time upstream monitoring of raw water quality at abstraction points and at our treatment works. • We continue to reduce customer complaints for discolouration to be industry leading.
Leakage	• Continue an accelerated rate of leakage reduction, moving from industry outlier to industry average levels by 2020 • Continuously improve leakage detection and repair technology and techniques to sustain water network performance • Deliver energy savings associated with leakage reduction • Seek to develop non-intrusive street work technology and techniques to further improve the accuracy of leak detection	• Our ambition is to exit AMP7 having achieved a 20% reduction in leakage – the largest reduction achieved by the industry in a 5-year period. Nevertheless, we still remain a comparative outlier. By 2050, we plan to reduce leakage by 50% (from 2018 levels) • We have adopted a range of new technologies to improve leakage detection e.g., installing over 20,000 acoustic loggers across our water distribution network. We have continued the use of pressure management and our calm networks programme to reduce leakage and save energy. • Industry wide initiatives and trials are ongoing to develop non-intrusive street work approaches. We plan to adopt innovations in these techniques when they are proven effective.

Thematic area	Our previous plans	Progress made
Water efficiency	• Work to ensure the value of water is fully appreciated and that current best practice water efficiency becomes the norm • Encourage a cultural shift in the way our customers are supplied with, and use, water through our promotion of progressive metering and investigation • of new ways of charging for water use • Plan for separation of drinking water and non-drinking water supplies in • best-practice developments	• We have developed the sector's largest and most innovative water efficiency programme, delivering more than 320,000 in-home water efficiency visits on smart metered households and over 13,000 business water efficiency visits. We have developed the sector's leading online Water Calculator tool, free for all customers to quantify their water usage and potential savings. Our water efficiency initiatives have since won multiple national awards, including the Water Industry's water efficiency initiative of the year award, on several occasions. • We have installed over 1 million smart meters so far and our we are on-track to meet our AMP7 meter installation targets through our Progressive Metering Programme (PMP). Our smart meter installations and parallel water efficiency visits / engagement efforts are delivering significant demand reductions and informing PR24 smart metering and wider demand reduction objectives. We have implemented a non-financial incentive and reward scheme with 'Green-redeem' and are developing plans to pilot innovative tariffs in AMP8. • We have worked with Defra to inform the proposed change roadmap for Building Regulations (Future Homes), which includes the use of water reuse technology as a potential requirement for future development. We have launched the industry's first Environmental Incentive for developers that offers financial incentives to include rainwater harvesting and/or greywater recycling into new homes in our supply area – as a key part of achieving water neutral development. We have also been a key steering group member on the Waterwise development of the 'Independent review of costs and benefits of rainwater harvesting and greywater recycling options in the UK' report.

Thematic area	Our previous plans	Progress made
Metering	• Aim to individually meter all domestic properties, where it is cost-beneficial to do so • Aim for the remainder of domestic properties to move from a rateable basis of charging to one based on assessed consumption • Keep under review the case for metering flats and seek technological advances to enable greater coverage of individual domestic meters • Seek to implement remote meter-reading technologies	• We have installed more than 1 million smart meters, and are on-track to meet AMP7 installation and demand reduction targets from metering and water efficiency schemes. • All household and non-household connections to the network will be smart metered by 2035, including all individual household properties able to have a meter installed. • We continue to work with our meter technology providers to improve the smart meter devices. • We have completed the rollout of the Fixed Area Network coverage for our London WRZs, achieving a c.98% coverage of our London customer base. We are currently installing smart meter communications infrastructure in certain Thames Valley areas. • We are developing plans to pilot innovative tariffs in AMP8, that will increase protection of financially vulnerable customers and seek to enhance demand reduction opportunities.
New sources of water	• Keep our WRMP and programme of future resource options under continual review, incorporating technological improvements as appropriate • Develop new sources of water where required • Work with stakeholders to monitor and understand trends in population growth, ensuring an appropriate range of water resource schemes for future years	• Every five years we update our wate resource management plan. This takes into account new technologies and solutions. • Since the last price review we have working on developing Strategic Resource Options through the RAPID process. Our current WRMP will mobilise selected options through Direct Procurement for Customers.

Thematic area	Our previous plans	Progress made
Wastewater and sludge	• Continue to explore new technologies • Improve the tidal Thames by almost eliminating storm discharges from London's sewerage network through completion of the Tideway Tunnel • Continue a programme of cost-effective solutions working towards achieving 'good status' in accordance with the Water Framework Directive (WFD) • Continue to adapt treatment processes and implement sustainable sludge strategies, incorporating innovative solutions where appropriate.	• We are exploring nature-based solutions as an alternative to traditional processes but early indications show that this will be challenging due to the high effluent quality standards required. • The Tideway tunnelling phase was completed in 2022 with the tunnel forecast to start commissioning in 2025. • Most of our rivers are not in 'good' ecological status under the WFD. We have developed our river health action plan with the aim to improve on this. We are in continuing discussions with DEFRA and the EA on the timing of delivering this programme between AMP8 and AMP9. • We have kept our processes under review and are planning a number of projects to upgrade our works. • We maintain a sustainable sludge strategy, which is kept under constant review. • We have real time monitoring of the sewer networks. New permits continue to drive energy intensive treatment processes.
Sewer flooding	• Seek to eliminate high-risk property flooding related to sewer incapacity through a proactive programme that identifies areas at risk of flooding and prevents this before it occurs • Adapt the sewerage system to cope with climate change seeking innovative solutions where appropriate. • Work with stakeholders to develop catchment-wide solutions	• Over the last 15 years, we have reduced the number of sewer flooding incidents by around 20%, but remain vulnerable to flooding following heavy rainfall • As part of the DWMP development process we have generated an extensive database of partnership opportunities which was published as part of the DWMP June submission.

Thematic area	Our previous plans	Progress made
Odour	• Adopt a more proactive approach to odour management • Mitigate odour where cost beneficial for customers • Monitor trends in customer acceptability • Seek to reduce customer complaints to a minimum level	• We continue to follow odour management plans at our sites, following good housekeeping to keep odour emissions to a minimum
Customer experience	• Continue to improve levels of service • Provide timely and accurate information through appropriate technologies • Work with local people to develop a sense of shared ownership and pride in our sites where these are, or can become, a useful resource to communities • Continue to provide opportunities for conservation, leisure and education • Manage our investment plans to ensure that all proposals represent good value for customers and that resulting bill increases remain within customers' ability to pay	• We have implemented a new billing system, and through our initiative Spring, have given call agents easy access to more information (including operational data) to respond more substantively to customer queries • We have taken steps to improve accessibility at our sites to increase the availability of recreational space for our customers. For example, we are working in partnership to provide access to the Walthamstow Wetlands. Our Public Value Framework will continue to assess other opportunities to integrate our operations into communities. • We continue to develop our education centres to reach school aged children and encourage engagement on subjects such as the wider water cycle. We have opened up a number of our sites e.g., Walthamstow Wetlands for recreational activities including bird watching or angling.
Sustainability	• Continue to review our sustainability strategy • Continue to publish our performance in our own reports and through appropriate industry-wide reports • Monitor advances in sustainability practice	• We have regularly refreshed our sustainability strategy.[22] • We produce and publish an annual sustainability report and ESG statement. • We have adopted new practices – for example we have raised over £3 billion of debt through our sustainable financing framework.

Table 56: Comparison between LTDS and previous long-term plans

5.1.2 Long term forecasts from 2019

Alongside our 2020-25 business plan, we produced some longer-term performance commitment forecasts up to 2045.

The table below compares our previous 2045 forecasts with our current 2050 ambition, and provides an overview of any key changes. For some of the measures, the units are slightly different to those presented in Chapter 3 to enable a like-for-like comparison with previous targets, which in some cases were defined on a different basis.

Performance measure	Units	Previous 2045 forecast	Current 2050 ambition	Description
Water				
Leakage	Ml/d	391	322	We are committed to reducing leakage by 50% from 2018 levels
Per capita consumption	Litres per head per day	121	110	Since our 2019 plan, the government has set out a clear ambition of per capita consumption of 110
Interruptions to supply	Minutes per property per year	8.5	5	An ambitious but deliverable target reflecting our specific circumstances
Mains repairs	Number per 1,000 km of mains	206	116	Addressing our Asset Deficit and leakage reductions in our WRMP will require a large mains replacement programme
Unplanned outages	%	17.0	1.1	Latest forecast reflects an improved methodology and focus on HazRev at large sites.
Wastewater				
Internal sewer flooding	Number per 10,000 sewer connections	498	641	Our Drainage and Wastewater Management Plan has given us a better understanding of the impact of climate change on these forecasts
Total pollution incidents	Number per 10,000 km of wastewater network	6.0	11.00	
Sewer collapses	Number per 1,000 km of sewer network	1.7	3.88	We intend to focus on service consequences of collapses, rather than collapses themselves.
Discharge permit compliance		100%	100%	There is no change in our ambition to become fully compliant.

Table 57: Comparison to previous long term forecasts

[22] https://www.thameswater.co.uk/media-library/home/about-us/governance/our-policies/sustainability/sustainability-policy.pdf .

6 Foundation: what is underpinning the strategy?

6.1 Key assumptions

Our strategy has been stress tested against a number of different scenarios. However, there are a number of key assumptions that underpin our strategy. Should these assumptions no longer hold, we may need to revisit our strategy and make material revisions.

- Asset health – We have an ageing asset base that will require a step up in maintenance and renewals activity over the next 25 years. We have begun conversations with Ofwat regarding the nature of the asset challenge. Closing any 'asset deficit' will need to be a key component of business plans spanning multiple control periods – supporting the delivery of our long term ambitions. Further details on our asset deficit position is set out below.
- Household incomes – our strategy assumes there will not be a substantial worsening in disposable household incomes to the extent that water bills would become unaffordable for significantly more people than our current research suggests. If this were to happen to an extent that it could not be suitably mitigated through future customer support and use of social tariffs, we would need to consider tempering aspects of our ambition to reduce costs and therefore bills.
- Government and regulatory policy – our strategy is based on the current and known government and regulatory policy positions. It is crucial to recognise that there are external risks beyond our immediate scope of consideration, and that unanticipated policies could require a swift and adapt approach to remain on course with our objectives. We have tested our plan against different scenarios for future abstraction reduction levels, however, other policies (or policies outside of the range of what has been considered) could materially change what we need to deliver, and potentially, how we are able to deliver.
- Water efficiency standards – delivery of the per capita consumption is contingent on new and appropriate standards being set by government.
- Consumer attitudes – our strategy has been shaped based on our current customers' views. It is possible over a 25-year period, customer priorities may change resulting in new areas of focus. If this were to happen, we would need to revisit our strategy.
- Costs of inputs (including skills availability and supply chain capacity) – our strategy has been developed using various cost forecasts. If costs for certain inputs were to materially change, or parts of our investment programme were not able to be delivered due to skill / supply chain shortages, we may need to revise our strategy to reflect this.
- Deliverability – We consider there to be resource and supply chain constraints into AMP8 which impacts our deliverability of the PR24 business plan. We have assessed this risk and have increased our Capital Delivery capacity to meet this challenge – for further information see our chapter TMS40 Accounting for Past Delivery and Deliverability. We have assumed that beyond AMP8 deliverability constrains are relieved and that we have the capacity to deliver our full LTDS as planned.
- Base cost allowances – our strategy assumes that the PR24 Final Determination allows for suitable base cost allowances to adequately fund our business.

6.2 Working Smarter

Our Long Term Delivery Strategy (LTDS) take us forward to towards our Vision for 2050 and delivering for customers, communities and the environment. There are a few areas where we do not have a plan today to achieve our vision, but we are challenging ourselves to unlock the pathway to Vision 2050. We've started taking bold steps towards a brighter future. To make bigger strides, we're changing how we work across our entire business. At the heart of this is our pledge to continue developing our skills, creating new and exciting roles across our business and using cutting-edge technologies to address the challenges we face.

- Building a culture of innovation, enhancing our skills and thinking digital first – We're encouraging our people to put the customer first and make change happen in their area of expertise. This means innovating creative solutions to address our most urgent problems and thinking digital first to help us deliver better outcomes. For example, we're increasing the use of sensors, drones, data and analytics to help us find and fix leaks faster. We're also building new customer portals and using smart data to predict demand for water and plan maintenance work. In addition, we're exploring cost-effective, less intrusive ways to replace ageing pipes, adopting green infrastructure at scale, and using sustainable drainage systems to protect the planet.
- Helping shape the future of the UK water industry – We're engaging with as many people as possible across our industry to create the conditions we need for success. Alongside the government and our regulators, we're encouraging smarter long-term investments so we can move beyond short-term regulatory cycles and put sustainable water and waste management first. This will enable us all to look further ahead and work together to protect water supplies for future generations. A great example of this is the Thames Tideway Tunnel – a critical national project designed and delivered in partnership to future-proof London's network and clean up the River Thames.
- Transforming how we work with local partners – We're working smarter with our community partners to co-create and co-deliver exciting new projects. From devolved government to local businesses, environmental groups to customer collectives, everyone has a chance to shape plans that will benefit them in the future.
- Securing funds and investing our customers' money wisely in our assets and communities – We're building a strong financial foundation that will support our transformation for the decades ahead. By working with other organisations to plan, fund and deliver projects in partnership, we can achieve more with pooled resources than any of us could on our won, stretching budgets further and targeting our efforts in the right places.

6.3 Enhancement not subject to adaptive planning

In addition to the longer-term enhancement areas described in Chapter 3, there are several enhancement areas where expenditure has only been forecast until either the end of AMP8 or AMP9 and these have not been subject to adaptive planning. We provide reasons for this in this section.

Cryptosporidium Risk Reduction (Additional line LS3.40)

Description of enhancement case

Our 4 Large London Process Plants use slow sand filtration as the principal treatment process. Although slow sand filtration is an efficient process, it cannot be relied upon in all conditions to consistently remove/inactivate *Cryptosporidium* oocysts – a parasite that can cause a diarrhoeal disease if consumed in drinking water. Despite delivering on operational improvement plans and maintaining our Works appropriately, this parasite is still sometimes detected in final water samples. We will be installing UV treatment at all 4 sites to mitigate this risk.

Why we have not subjected this enhancement to adaptive planning

Our Board has been very clear that this risk must be mitigated as soon as possible. Our deliverability assessment concluded that we will be able to complete the work by 2035. This precedes the key triggers that we have identified for water services. Furthermore, we do not consider that this solution will change when climate, demand, abstraction and technological scenarios are applied.

Why is this required to achieve our vision?

This investment is required to achieve our vision and safe water for customers.

Asset Deficit (Additional lines LS3.41 and LS4.61)

Description of enhancement case

Investing appropriately to maintain asset health is critical if we are to deliver our long-term Vision for 2050, particularly given the challenges of climate change, pollution growth and changing customer expectations.

The future will be different to the past and a step-change in capital maintenance / renewals is required in AMP8 and beyond if we are to maintain asset health and address deficits that have built up where assets have been sweated to the point they now need replacing urgently.

In AMP8, we want to make a fundamental shift in approach to address the “deep rooted” issues that exist with our asset base, which will take a number of AMPs to resolve fully. We have a clear vision to 2050 to address these issues and improve performance, resilience and the environment.

Why we have not subjected this enhancement to adaptive planning

Our work to date has only identified investment in AMP8, to begin to close our asset deficit. Further work will be needed to determine longer-term investment requirements and benefits for customers, communities and the environment. We have not subjected this investment to scenario testing and adaptive pathway modelling. As our assessment matures, in time we expect to produce a full 25 year view of how the gap will be closed. There will also be reductions in reactive operational expenditure, once the asset base becomes more resilient to weather events.

Why is this required to achieve our vision?

Our Asset Deficit is having an impact on common performance commitments and reactive costs (mostly operational expenditure) due to a lack of resilience.

Digital Cyber (Additional lines LS3.43 and LS4.62)

This enhancement enables Thames Water to meet the necessary "appropriate and proportionate" cyber security and resilience requirements. These cyber security and resilience requirements are appropriate for an operator of essential services in the UK water supply sector to meet our statutory obligations, such as the Network and Information Systems regulations (NISR) 2018 and the Data Protection Act (DPA), 2018. Recent assessments have identified areas where improvements in cyber security are required. Moreover, the growth in the use of internet connected devices and threats from cyber-criminals and hostile nation states will further increase the risks to OES (Operator of Essential Services) and their customers – and the requirement for improvement in Thames Water's cyber security.

Why we have not subjected this enhancement to adaptive planning

All investment is forecast to be completed in AMP8, which precedes any adaptive planning triggers.

Why is this required to achieve our vision?

The investment is required to deliver safe and reliable water and wastewater services.

Industrial Emissions Directive (Additional lines LS4.59)

Description of enhancement case

The Industrial Emissions Directive (IED) committed EU Member States to control and reduce the impact of industrial emissions on the environment. Defra transposed the IED into legislation applicable in England and Wales, in the form of amendments to the Environmental Permitting Regulations. Our investment is to achieve compliance with the Industrial Emissions Directive and subsequent notification from the Environment Agency is planned for completion with the control period. Details of this can be found in our enhancement case.

Why we have not subjected this enhancement to adaptive planning

Given that this obligation will be substantially met by 2035 (before any adaptive planning triggers that we have identified), there is no requirement for a long-term strategy for IED investment.

Why is this required to achieve our vision?

This is required so we are compliant with our legal obligations and regulations.

Completion of AMP7 WINEP (Additional lines LS3.44 and LS4.60)

Description of enhancement case

We are committed to delivering our AMP7 WINEP statutory obligations in AMP8. Costs are significantly higher than those that were forecast for PR19 due to general inflationary pressures in the supply chain. There are also specific challenges with delivering enhancements across our live operational sites, which has led to schemes taking longer to construct. This enhancement case recovers the additional costs that have been incurred and sets a revised timeline for delivery.

Why we have not subjected this enhancement to adaptive planning

We will complete our statutory obligations in AMP8, which precedes any adaptive planning triggers.

Why is this required to achieve our vision?

This is required so we are compliant with our legal obligations and regulations.

Security and Emergency Measures Direction (SEMD)

Description of enhancement case

This enhancement case is driven by a step change in expenditure required by changes to the following legislation:

- Protective Security Guidance (PSG) – Relating predominantly to physical security
- Security and Emergency Measures Direction 2022.
- Section 3.1 of PSG, Alternative Water requirements. Emergency Planning Outcome 3.1 Alternative Water.

The Direction sets out a requirement for an alternative water supply capability of 1.5% of our population by 2030 as well as physical, electronic and SEMD cyber protection of 44 Critical National Infrastructure assets (sites and systems). We are currently in discussion with DEFRA about the viability of providing alternative water supplies in London and our proposal to defer Critical National Infrastructure investment to AMP9.

Why we have not subjected this enhancement to adaptive planning

The work precedes any triggers that we have identified. Discussions with DEFRA are ongoing.

Why is this required to achieve our vision?

This is required so we are compliant with our legal obligations and regulations.

7 Assurance

7.1 Monitoring plan

What we will monitor

Our long term delivery strategy is a 'live' and adaptive plan. We will continue to update, refresh, and adapt our strategy as we gain new information, both from the external environment, and from our own delivery. Data that has been used within the LTDS has been subject to internal and external independent assurance. All information contained within the LTDS is accurate at time of submission but is subject to review as things develop in the future.

As set out in Chapters 3 and 4, we have identified a number of alternative pathways relative to the core pathway. For each of these pathways, we have identified potential 'trigger points'. These are points in time where we would expect the alternative pathways to diverge from the core pathway. Each trigger point is associated with a material change in the key assumptions defining the core pathway.

To understand whether a trigger point has 'been reached', and that the plan should diverge from the core pathway, we will monitor a number of key metrics.

In practice, our decision to adopt an alternative pathway will not be a simple mechanistic response to a metric reaching a certain threshold. For example, while demand is a key driver of our water supply and demand investment, if demand were to significantly increase relative to forecasts, we would re-run the extensive modelling that we undertake as part of our water resource management planning process, updating for all new and relevant information before determining the new best value course of action.

Therefore, the metrics set out below should be seen in this context. These are important indicators to help us understand whether a change in strategy is likely to be required. They are not sole determinants of future strategy. Other factors, such as changes in our foundational assumptions could also lead to required changes in our strategy. These will be tracked through a combination of our corporate risk approach and for more granular assumptions, at a working level, feeding into planning updates where appropriate.

The table below summarises the trigger points and the associated monitoring metrics for each of the enhancement areas. Notwithstanding the comments in the previous paragraphs, in the table we generally show trigger points at the beginning of five-year regulatory periods because this is frequently the mechanism by which changes in investment obtain regulatory funding approval. In consequence the decision points are generally timed at the point of submission of the relevant business plan, two years ahead of that date.

Our monitoring metrics are a combination of both leading indicators, which forecast the future state and lagging indicators such as asset performance or outturn costs.

Enhancement area	Decision point	Trigger point	Key driver	Monitoring metrics
Lead pipe replacement	2033	2035	Technology (slow)	• Unit cost rates of replacement (both achieved by TW and market rates)
Water supply resilience	2038	2040	Climate change (benign and adverse)	• Leading - Official updates to the RCPs • Lagging - Temperature differentials • Lagging - Rainfall intensity • Lagging – Supply interruptions >48 hours
Reducing risk of basements flooding from trunk mains	2033	2035	Technology (slow)	• Unit cost rates of replacement (both achieved by TW and market rates) • Lagging – basements flooded because of trunk main bursts
Develop new water resources	2025	2027	SESRO not allowed	• Lagging - PCC consumption rates • Lagging – Current leakage and forecasted figures
Resilience to sewer flooding	2040 - 2045	2040 - 2045	Climate change (benign and adverse)	• Leading - Official updates to the RCPs • Lagging - Network capacity (from smart monitors) • Lagging - Recorded rainfall (e.g., from radar observations or rain gauges) • Leading - Number of property sewer flooding incidents (forecast from modelled assessments) • Lagging - Number of property sewer flooding incidents (recorded)
Reducing sewage spills to rivers and improving river health	2040 - 2045	2040 - 2045	Climate change (benign and adverse)	• Leading - Official updates to the RCPs • Lagging - Network capacity (from smart monitors) • Lagging - Recorded rainfall (e.g., from radar observations or rain gauges) Lagging - Recorded spills (e.g., Sewer Depth Monitors)
Sewage treatment works growth	2028	2030	Demand (benign)	• Leading – population growth forecasts derived from local planning authorities • Lagging – population growth

How we will monitor

We currently operate a risk management framework, to identify, assess, respond to, and monitor key strategic and operational risks. Our framework is aligned to the enterprise risk international standard ISO31000:2018, which supports compliance with the UK Corporate Governance code.

A risk review by business functions is carried out at least annually. This review considers movement in the exposure of existing risks and identifies any new or emerging risks. All risks are captured within the enterprise risk register (ERR).

All risks have clear owners, and executive risk sponsors who have overall accountability and are responsible for presenting on how the risk is being managed to the relevant oversight groups.

The ERM team produce relevant risk reports and dashboards for stakeholders, including the Risk Committee, the Audit, Risk and Reporting Committee ("ARRC") and, where relevant, the Board for them to obtain oversight of the most material risks to the organisation and to show how these risks are being managed for these forums to discharge their duties.

Our approach enables risks from across all parts of the business to be brought together to enable senior leadership to oversee their management, make risk-informed investment decisions, and prioritise mitigation strategies.

In the context of the LTDS, a 'risk' would be that we may need to make material changes to our plans – i.e., we need to shift to an alternative pathway. As such, all trigger points are risks, and the monitoring metrics are measures that need to be tracked in order to provide a regular assessment of the risk.

We propose to embed the monitoring of the LTDS monitoring metrics into our existing framework. This will mean that there will be:

- clear owners and executive sponsors for each trigger point;
- an assessment of the monitoring metrics at least annually; and
- an established tracking and governance framework, with escalations to the Board where necessary.

How we will respond to changes

The term 'trigger point' suggests that should a threshold be met, there would be an instant change of strategy. However, this is unlikely to be the case. For example, if demand were to be higher than forecast, we would consider this as part of our water resource management planning process – along with all other changes in variables – and then develop an informed set of plans based on the latest available information.

The trigger points and monitoring metrics are important, as they indicate when a change of strategy would be likely, and serve to inform when the company needs to revisit its strategy. However, they are not mechanistic determinants of our strategy.

All significant changes to our strategy will be taken by the Board, based on an assessment of all relevant information available at the time.

How we will report

We will report each year within our Annual Performance Report as to whether there have been any material changes in the LTDS monitoring metrics. This will give a high degree of transparency to customers and stakeholders.

Additionally, we will report the LTDS monitoring metrics to the board via our annual risk dashboard. We will take a proportionate approach to board reporting to provide the board with more frequent updates leading up to trigger points.

7.2 Board assurance

7.2.1 Board input to date

The table below provides a summary of the Board engagement related to our LTDS. For further details on our approach to engagement see TMS48 Our Assurance Framework

The Board has satisfied itself that the strategy…	Board engagement
Reflects a long-term vision and ambition that is shared by the company management	The Board was closely involved in the development of Vision 2050, which acts as a key input into the LTDS. Examples include: • The Board reviewed a draft of the 2050 Vision in June 2021. • The Board held a strategy day in September 2021, this included reviewing the ambition included within the Vision. • The Regulatory Steering Committee (Board sub-group) reviewed a draft of the vision and strategy in November 2021. Challenge provided around increasing the ambition on lead pipe replacement. • The Board met in January 2022 to discuss operationalising the Vision, including the credibility of performance improvements. • Board sessions in June and September 2022, reviewed the key enablers to the Vision. The Board has reviewed and approved the vision and ambition as set out in the LTDS.
Is high quality, and represents the best possible strategy to efficiently deliver its stated long-term objectives, given future uncertainties	Key inputs into our LTDS are our DWMP and WRMP – both have been reviewed in depth by a Sub-Committee of the Board. Further engagement with the Board on the LTDS has taken place. Examples include: • In January 2023, the Regulatory Steering Committee (RSC) discussed the approach to developing the LTDS. • In June 2023, the RSC discussed how TW's approach aligned to Ofwat's guidance, specifics on forming the core and alternative pathways, along with key assumptions. The Board has also relied on a robust assurance process. This has included both a 2nd line assurance review by internal functions, and a 3rd line review by Flint.
Is based on adaptive planning principles	The best value pathways have been tested against different scenarios, and alternative pathways have been identified. The approach to forming the core and alternative pathways was discussed with the RSC.

Has been informed by customer research	The development of our ambition (Vision 2050) took account of the views of insight gained from customer engagement. We commissioned targeted research to test Vision 2050 with our customers. We have also undertaken targeted customer engagement to help inform the enhancement cases we are proposing. Our customer challenge group has had extensive input into our plans. The Board has been engaged on customer insight via the Customer Service Committee. For example: • The RSC discussed how to incorporate customer priority research findings into the Vision and the LTDS in September 2022. • The RSC discussed the assurance process over 'line of sight' and embedding customer findings in the LTDS in November 2022. See section 2.3.2 for further details on our approach to customer and stakeholder research.
Has taken steps to secure long-term affordability and fairness between current and future customers	In September 2023 we tested with customers an indicative example bill profile for our proposals to 2050. In this testing we increased the sample size of future customers to 50% to gain views on intergenerational factors. Most customers reluctantly agreed that bills will need to increase, and that they would be able to manage their water bill in future. The full findings of this customer research were made available to the Board as part of their assurance suite.
The strategy will enable the company to meet its statutory and licence obligations, now and in the future	The long term delivery strategy includes the enhancement expenditure required to meet the statutory and licence obligations that the company is currently subject to (providing the company also receives a sufficient base cost allowance). We have also tested the strategy against likely changes in statutory requirements. Should further statutory requirements / obligations arise, we will need to revise our long term delivery strategy to reflect. Specific discussions on future obligation compliance regulatory occur with the Board, for example: In September 2022, the Board discussed the challenges of SEMD and WINEP requirements for deliverability and balancing customer priorities with licence and legal obligations.

Table 58: Board assurance summary

7.2.2 Assurance statement

Our Board accepts ownership of, and accountability for, the development of our long term delivery strategy.

This statement has been approved and signed by Sir Adrian Montague, Alastair Cochran, Cathryn Ross, Catherine Lynn, Nick Land, Ian Pearson, Hannah Nixon, Jill Sheddon, John Holland-Kaye, Michael McNicholas and Guy Lambert and is part of our full Board assurance statement.

The PR24 business plan has been our most challenging plan to date with significant upward pressures on investment that need to be balanced with customer affordability, deliverability, financeability and a financially resilient plan. We have also needed to balance delivery of improvements on performance, resilience and compliance risk with the imperative of achieving a sustained and sustainable turnaround of the company. We (Thames Water's full Board) have taken steps throughout the development of the plan to challenge that it is ambitious while also being deliverable and based on appropriate assumptions that fully reflect Thames Water's current circumstances.

Following our in-depth involvement in the planning process, finalisation of the business plan and successful delivery of the assurance programme, the full Board confirm that, insofar as we are aware, having made reasonable inquiries we have challenged and satisfied ourselves to confirm the statements below:

Long term delivery strategy

- The long term delivery strategy reflects a long-term vision and ambition that is shared by the board and company management.
- It is high quality, and represents the best possible strategy to efficiently deliver its stated long-term objectives, given future uncertainties.
- Thames Water has prioritised the business plan to include the maximum scope that is both deliverable and financeable within an efficient totex proposal. The company is seeking derogations for proposed requirements that are not deliverable in 2025-2030, alongside our turnaround plan, and will continue making improvements to meet statutory and licence obligations in subsequent regulatory period(s). We submit that we can meet our AMP8 statutory and licence obligations if we secure the appropriate derogations.
- As Thames Water's long term delivery strategy can only give an adaptive planning picture based on current obligations, and we do not know what future policy changes for the sector will require of the company, it is not possible for us to submit that the company can meet its statutory and licence obligations beyond 2030. We can submit that we will continue to invest in our business on a 'no regrets' basis to enable compliance with current licence and legal obligations over the long term and maintain flexibility to accommodate future changes.
- The long term delivery strategy is based on adaptive planning principles.
- It has been informed by customer engagement.
- Thames Water has taken steps to secure long-term affordability and fairness between current and future customers.
- The 2025-30 business plan implements the first five years of the long term delivery strategy.

7.3 Meeting Ofwat's requirements

Long term delivery strategy guidance

At each step of devising our LTDS, we have followed the requirements that Ofwat sets out in its final guidance on long-term delivery strategies. Below, we outline the requirements set out in the guidance and how we have met them.

Area	Requirement	Response
Ambition	The LTDS should start with the company's vision statement. This should articulate what the company would like to achieve over the next 25 years, how it wants to position itself and how it wants to be seen. It should provide focus for the company while being clear and concise. [p14 in Ofwat's final guidance]	Our vision statement is articulated through our Vision for 2050, which is presented in section 2.2. Specific performance commitments to meet that vision are then covered in greater depth throughout section 3.
	The ambition set out in the vision statement should give regard to Ofwat's public value principles. [p15]	As expressed in section 2.2, our 2050 vision includes a specific ambition to create social and public value. Our best value plans consider a wide range of options based on factors beyond expenditure, identified by our public value framework in line with Ofwat's public value principles and other planning requirements.
	Set out what the vision would mean for customers and the environment. [p15]	Our vision statement covers five themes: (i) water; (ii) wastewater and rivers; (iii) energy; (iv) customer; and (v) community. What our vision means for customers and the environment is set out within each theme in section 2.2.
	The ambition for the level of performance outcomes and metrics should be informed by government and regulatory policy. [p15]	As set out in section 6.1, our ambition is based on the current and known government and regulatory policy positions. We have also considered the possibility that policy changes could materially affect what we need to deliver and how we are able to deliver.
	The ambition for the level of performance outcomes and metrics should be informed by statutory environmental programmes such as WINEP. [p15]	As set out in our plans in section 3, our ambition for the level of performance outcomes is informed by such programmes. For example, ambitions for the *always enough water* and *cleaner rivers* outcomes are informed by WINEP.
	Ambition should reflect the issues and challenges facing the company and the sector. [p15]	As set out in section 2.2, we created the vision and ambition through a robust process. At the foundations, we acquired an understanding of the context and the key facts and insights that would underpin our strategic choices. The issues and challenges that form the basis of this foundation are set out in section 2.1.
	The ambition for the level of performance outcomes and metrics should be informed by customer and stakeholder preferences. [p15]	As set out in section 2.2, we created the vision and ambition through a robust process. At the foundations are the issues and challenges facing the sector in addition to an understanding of what customers and stakeholders want. The customer and stakeholder preferences in the foundations then informed the level of ambition.
	Set out what the company will deliver in terms of key performance outcomes over the next 25 years. [p15]	The key performance outcomes we will deliver over the next 25 years are provided under each theme in section 3. A concise summary of these performance outcomes is provided in section 2.2.
	Key performance outcomes should include PR24 common performance commitments, except those based on compliance or relative performance. [p15]	What our vision and ambition mean for Ofwat's common performance measures is set out in section 2.2. We also set these out for each outcome under the key themes of our plans in section 3.

Area	Requirement	Response
	The ambition for the level of performance outcomes and metrics should be informed by strategic planning frameworks including regional plans, DWMPs, WRMPs and FRMPs. [p15]	Our LTDS has been heavily informed by our WRMP and DWMP.
	Highlight the company's areas of strength and weakness. [p15]	Our Vision 2050 serves as a key input into our LTDS. It was formed using extensive stakeholder feedback and provides challenging performance targets for the future. Thames Water's specific strengths and weaknesses were considered and challenged by our Board when forming the Vision to ensure it is credible. See section 2 for more details.
Strategy	Set out a clear narrative on how the company expects to achieve the ambition and vision. The full strategy, and not just key enhancement investments, should be covered in the accompanying narrative. [p16]	We set out a comprehensive strategy for how we will achieve our ambition and vision in the plans we set out in section 3 and in our assurance plans in section 7.
	The core pathway should clearly set out the improvements in performance that are expected from base expenditure. [p22]	For each outcome in the five themes in section 3, we separate the improvements in performance that are expected from base expenditure and from enhancement expenditure.
	The core pathway should clearly set out the additional enhancement expenditure that would likely be required to meet the ambition. [p22]	After setting out the improvements in performance that are expected from base expenditure for each outcome in the five themes in section 3, we set out the additional enhancement expenditure that is needed to meet our ambition.
	The core pathway should clearly set out the key strategic investments that are likely to be needed, and their estimated cost and timing, including lead and delivery times. [p22]	For each theme of our strategy in section 3, we provide an enhancement expenditure profile for each area of enhancement in five-year intervals (until the date of expected completion of investments in line with expected lead times). We provide details on the key strategic investments that underpin this expenditure.
	The impact of the investment on performance targets should be set out.	For each outcome in the five themes in section 3, we separate the improvements in performance that are expected from base expenditure and from enhancement expenditure.
	Adaptive planning should be at the heart of the strategy approach. [p17]	Our strategy considers alternative pathways (see sections 3 and 4.2).
	The strategy should demonstrate it avoids stranded assets and irreversible decisions. [p17]	The core pathway contains low / least regrets investment, as such it is designed to avoid stranded assets.
	The strategy should demonstrate why it is 'low regret' or 'benefit lock in'. [box 3]	As set out in our approach to devising the LTDS (see 2.3, we have selected investments and activities for inclusion in the core pathway that are 'no and/or low regrets' and that are required: in both benign and adverse scenarios; across a wide range of plausible scenarios; or need to be undertaken to meet short-term requirements. We provide further details for the core pathway for each specific outcome area in section 3.
	The strategy should consider modular enhancement and wider solutions such as behaviour change. [p18]	As set out in section 2.3.3, in most cases, our plans are modular and relatively small-scale individual investments. This means our plans can be easily scaled up as the external environment evolves, as opposed to fundamentally changing our investment pathways. As we set out in section 2.2, our approach to delivering our vision focuses on priority applications. One of these priority applications is 'Rethinking Customer Relationships', which focuses on the potential for changing customer behaviour to future-proof water

Area	Requirement	Response
		supplies and reduce flooding and sewage spills. This is part of our broader consideration of wider solutions.
	The strategy should deliver outcomes under at least all the common reference scenarios. [p21]	As set out in section 2.3.4, our strategy delivers outcomes across the common reference scenarios defined by Ofwat in its guidance.
	The strategy should set out the 'higher regret' enhancements (how the enhancement investment programme may need to change in future, in response to changes in circumstances) – the alternative pathways. [p22]	We set out how the enhancement investment programme may need to change in future in response to changes in circumstances, or triggers, through the identification of alternative pathways, the investments required under those pathways, and their triggers, in section 3 and Chapter 3.
	Set out the how the strategy delivers long-term outcomes given the uncertainty in common reference scenarios. [p35]	For each area of enhancement, we set out whether each common reference scenario is relevant in Table 6 in section 2.3.4. We then set out how we will deliver on those enhancement areas within our strategy under each relevant common reference scenario in section 3.
	The strategy should set out an estimate of the likelihood of following each alternative pathway. [p23]	While a definitive likelihood is difficult to provide for each alternative pathway, we provide contextual notes on the trigger for each alternative pathway in section 4.2.
	Alternative pathway decision types should be clear and identify trigger points and associated dates. [box 3]	For each alternative pathway, we clearly indicate trigger points and their associated dates in section 4.2 and also in detail for each theme of our plans in section 3.
	The trigger points should set out the conditions that would cause one pathway to be adopted over another, using clear and observable metrics supported by a monitoring plan. [box 3]	We set out the conditions for one pathway to be adopted over another in section 4.2 and also in detail for each theme of our plans in section 3.
	Set out a monitoring approach (the metrics, frequency of reporting, thresholds and actions). [p25]	Our monitoring plan and metrics to be monitored and reported are set out in section 7.1.
	The strategy should be aligned with WRMP/DWMP and the 'most likely' approach should be shown as an alternative pathway (if not the core pathway). [p24]	Our long term delivery strategy builds on our most recent water resource management plan (WRMP24) to create the best value plan. WRMP24 contains a number of new positions relative to the previous plan (WRMP19). The most likely approach is shown as an alternative pathway (if not the core pathway) (see section 4.2).
	The WRMP process should reflect specific requirements, such as regarding utilisation rates. [p25]	Please see our WRMP for further details on specific technical assumptions.
	The impact on bills should be set out for the core and alternative pathways. [p26]	We set out the bill impact of the core pathway in section 4.1.
	Total enhancement expenditure for all pathways should be presented in data tables. [p26]	Enhancement expenditure for each pathway is presented for each theme of our plans in section 4.2. Information for each theme is also provided in section 3.
	Set out how the method and strategy align with previous strategies. [p28]	We set this out in section 5.
Rationale	The strategy should show how activities and pathways have been chosen. [p26]	We set out how the LTDS was developed in section 2.3.
	The strategy should show how options have been identified and selected. [p26]	We set out how the LTDS was developed in section 2.3.
	The strategy should show why the chosen options are best value. [p26]	We set out how the best value options are identified and selected in section 2.3.3
	Show how customer and stakeholder views have been taken into account in the core pathway. [p27]	We set out how customer and stakeholders have been engaged in developing the LTDS in section 2.3.
	Set out how sequencing of investment has been considered and optimised. [p26]	Our enhancement investments within each of the five themes of our vision, and their phasing, have been guided by what customers have told us. We summarise how customers informed our enhancement investments in Table 5 in section 2.3.2.

Area	Requirement	Response
	Set out which options were considered in identifying activities in the core pathway. [p27]	As set out in section 2.3.4 , we have used Ofwat's common reference scenarios to test and define the core pathway for each of the investment areas we describe below.
	Consider the sensitivity of the core pathway to the common scenarios. [p27]	See section 4 and the supporting data tables.
	Set out differences between LTDS and previous strategies, including the SDS (where comparable), PR19 long-term PC forecasts and the WRMP. It should also set out any lessons learnt. [p28]	We set out the differences between the LTDS and previous strategies in section 5.
	Set out the impact on bills separately for core and alternative pathways. [p29]	We set out the bill impact of the core pathway in section 4.1.
	Set out the impact on affordability and fairness between current and future customers. [p28]	In section 2.3.2, we set out the findings from engagement with current and future customers on theoretical options for phasing investment and bill impacts over the longer-term and whether an indicative example bill profile for our proposals to 2050 was considered to be fair and affordable for current and future customers.
	Provide evidence that customers consider the forecast bill impacts of the strategy to be acceptable. [p28]	In section 2.3.2, we set out how we have engaged with customers on an indicative example bill profile for our proposals to 2050.
	Provide evidence of any need for preparatory work to keep future options open such as pre-planning application activities and investigations or part-delivery. [p29]	For each enhancement area within each theme of our plans in section 3, we identify whether the "investment" is required to keep future options open. This includes preparatory work such as obtaining consent (e.g., for SESRO).
	Provide evidence that scenarios outside common scenarios are relevant and plausible. [p32]	We set out the basis for selecting our scenarios in section 2.3.4. In addition to the common reference scenario, we use one company specific scenario. We provide details on the relevance of each scenario to the different enhancements in Table 6 of this section. We also explain why that scenario is plausible and set out the process we used for selecting it.
Foundation	Clearly set out the assumptions underpinning the strategy. [p30-31]	We set out our key assumptions in section 6.1.
	Ensure the assumptions in the company strategy are clear to stakeholders. [p30]	The assumptions we set out in section 6.1 are presented clearly and concisely in bullet form in a manner intended to be clear to stakeholders.
	Set out the areas with the greatest uncertainty. [p32]	Our strategy has been stress tested against a number of difference scenarios that represent uncertainties. However, there are a number of key assumptions that underpin our strategy. Should these assumptions no longer hold, we may need to revisit our strategy and make material revisions. We set out those key assumptions and possible uncertainties underlying them in section 6.1.
	Ensure the assumptions in the common scenarios are aligned with Ofwat guidelines. [p30]	We adopt four sets of benign and adverse common reference scenarios defined by Ofwat in its guidance (see section 2.3.4). Our assumptions are aligned with them.
	Clearly set out the assumptions for the company specific factors. [p30]	We include one company specific scenario related to SESRO in the water theme of our plans (see sections and 4.2 for the underlying assumptions).
	Clearly set out the company's operational assumptions. [p30-32]	See section 6 which details our foundational assumptions which underpin the LTDS
	Ensure consistency between the assumptions and uncertainties across the different methodologies across the entire strategy. [p31]	We set out our key assumptions that remain fixed across all scenarios in this strategy in section 6.1. For each area of uncertainty, we define an alternative

Area	Requirement	Response
		pathways and clearly set out the assumptions in our plans in section 3.
	Where there is significant uncertainty around assumptions, assumptions should be tested to ensure they are plausible. [p30]	The best value pathways have been tested against different scenarios where there is significant uncertainty, and alternative pathways have been identified.
	Clearly set out the expected improvements in performance towards each of the outcomes and metrics in the ambition. [p31]	We clearly set out the expected improvement in performance for each metric when we set out the ambition under each theme of our vision in section 3.
	Take account of Ofwat's approach to 'what base buys' in setting long-term performance forecasts. [p31]	We address this in section 2.3.6.
Customer engagement	Provide evidence that the ambition and strategy are informed by customer engagement. [p14]	Our vision (articulated through our Vision for 2050) and our strategy (articulated in our plans in this LTDS) were informed by customer engagement. We set out how we engaged with customers in developing our vision in section 2.2 - research from April 2022 confirmed that most customers feel we have captured what matters to them in creating this vision. We set out how we engaged with customers in developing our strategy in section 2.3.2.
	Ensure that customers and their representatives have been able to challenge the strategies. Challenge should be focused on the full range of areas where customers and communities can have meaningful views: • water and wastewater services (where applicable) • customer services • significant investment (large one-off schemes) • performance levels • bill impacts [p13]	We have engaged with customers on a full range of areas across the key pillars of our vision and strategy. We set out customer views on each area in section 2.3.2.
	The strategy should incorporate important and material or urgent issues that customers have challenged. [p13]	To ensure our strategy continues to deliver what customers, communities and stakeholders want, including consideration of important material or urgent issues, we periodically undertake further engagement and gather additional insights and iteratively update our evidence base (see section 2.3.2).
	Engagement should support customers to inform the company's long-term ambition. [p13]	We set out how we engaged with customers in developing our long-term ambition (our Vision for 2050) in section 2.2.
	Engagement should support customers to inform the company's phasing of key investments. [p13]	Our enhancement investments within each of the five themes of our vision, and their phasing, have been guided by what customers have told us. We summarise how customers informed our enhancement investments in section 2.3.2.
	Engagement should consider future and vulnerable customers. [p14]	As set out in section 2.3.2 an objective of our customer engagement has been to gain insight into customer preferences and priorities both now and in the future to ensure there is no disproportionate allocation of costs between current and future customers. Another objective has been to understand the specific needs of vulnerable customers.
	Research on long-term issues should be 'fit for purpose', for example by ensuring the sample and methodology is	For customer engagement on long-term issues, we use a triangulated approach based on best-practice guidance, a wide range of sources, and robustness

Area	Requirement	Response
	appropriate for the research objectives. [p14]	assessment to create customer and stakeholder insights (explained in section 2.3.2).
	In setting the ambition, any long-term objectives, over and above any statutory requirements, should be informed by customer views. [p14]	From the very start of our work on Vision 2050, we have been guided by what our customers and other stakeholders expect us to deliver in areas over and above statutory requirements (see a timeline of customer engagement in section 2.2).
	In setting the ambition, there should be consideration of the coherency between proposed performance commitment levels for PR24, their forecast performance commitment levels up to 2050, and the customer evidence used to inform the ambition. Where appropriate, the LTDS should explain how and why these differ. [p14]	Where new plans are produced, it is important that key differences to previous plans are identified and explained, so customers and other stakeholders can see why things have moved on. We set out how and why the LTDS differs from our previous long-term plans in section 5.
	In setting the strategy, provide evidence that customer priorities and preferences have been used to inform the selection and sequencing of key enhancement investments for the core pathway up to 2050. [p14]	Our enhancement investments within each of the five themes of our vision, and their phasing, have been guided by what customers have told us. We summarise how customers informed our enhancement investments in Table 5 in section 2.3.2 .
	In assessing affordability, the bill impacts for their core and alternative pathways should be identified separately. [p26]	See section 4 where we set our the bill impacts for the core and alternative pathways.
	In assessing affordability, engagement with customers should reflect the potential range of affordability impacts in different futures. [p29]	In section 2.3.2, we set out the findings from engagement with current and future customers on theoretical options for phasing investment and bill impacts over the longer-term.
	Companies conduct willingness to pay research to support enhancement proposals. [p55]	Willingness to pay has been considered in development of each of our enhancement cases and given an appropriate customer weightings. See section 3 for how we have developed our Best Value Plans.
Board assurance	The method should set out how the Board has challenged management that the LTDS [p32-33]: • reflects a long-term vision and ambition that is shared by the Board and company management • is high quality, and represents the best possible strategy to efficiently deliver its stated long-term objectives, given future uncertainties • is based on adaptive planning principles • has been informed by customer engagement • has taken steps to secure long-term affordability and fairness between current and future customers • will enable the company to meet its statutory and licence obligations, now and in the future	A full explanation of how the board has challenged management on each aspect of the LTDS listed in the guidance is provided in section 7.2.1. Further information on the board's involvement in the development of our vision is set out in section 2.2. A statement of board assurance on each of these aspects is given in section 7.2.2.

Area	Requirement	Response
	Provide evidence of board challenge of company management. [p33]	Specific examples of how the board has challenged our company management in developing our vision, ambition and strategy are provided in section 7.2.1. Further details can be found in the separate appendix on Assurance for the whole business plan.
	Provide an explanation of the process that has been used for board assurance to ensure the strategy is the best it can be. [p33]	An explanation of the process adopted for board assurance is provided in section 7.2.1. An explanation of the process for their involvement going forward is provided in section 7.3.

Ofwat feedback letter

On the 3rd of April 2023, Ofwat wrote to us, providing feedback on an presentation we provided on our emerging LTDS. This was a useful set of feedback on our work in progress plans. We summarise how we have addressed each of the points raised below.

Feedback point	How has this been addressed
Your presentation demonstrated a good understanding of how to set your ambition in line with our guidance	See Chapter 2 for further details.
We did not see sufficient and convincing evidence that you are developing a core pathway in line with our definition	Our presentation did not focus on this component of the LTDS. Further detail of how we have developed the core pathway is included in Chapter 2.
The approach set out in your presentation risks constraining the options available for selection in the core pathway to only those that are selected under 'most likely' y scenarios	To develop our best value plans, we considered a wide range of options. We then tested those plans to ensure they meet the 'core pathway' definition of low / least regrets.
In your PR24 submission, you should clearly explain how you have identified and prioritised low-regret investment	See chapters 2 and 3 for further details.
Your presentation demonstrated a good understanding of how you are formulating alternative pathways in line with our guidance	See Chapter 2 for further details.
You should test each of the common reference scenarios to inform your strategy	We have tested our enhancement strategies against each of the common reference scenarios to inform our strategy – see Chapters 2 and 3 for further details.
We expect you to use scenario testing to inform the development of your strategy	
It is essential that only plausible scenarios are used to develop the core and alternative pathways	As per the Ofwat guidance, we have tested each common reference scenario separately to develop the core and alternative pathways – i.e., scenarios have not been combined. In addition, we have only considered one company-specific scenario, which is plausible.
We saw only limited evidence that you are testing the common reference scenarios for technology in line with our guidance	As per the Ofwat guidance, we have tested our best value plans against all four of the Ofwat reference scenarios, including technology. See section 3 for further details.
We saw only limited evidence that you are considering long-term performance improvements from base expenditure	We have carefully considered what can be delivered from base. In most cases, the long term performance commitments are being met entirely from base. We have identified a limited number of areas where enhancement funding is required. See Chapter 3 for further details.
We are encouraged to see that customer engagement is informing your ambition and the selection and sequencing of key investment	See Chapter 2 for further details.
We saw only limited evidence that you are engaging your Board and senior management in the development of your strategy	See Chapter 7 for further details.

Table 59: Response to Ofwat feedback letter

8 Conclusions

We have listened to our customer and stakeholders and developed an ambitious vision for 2050. To close the gap to our customers' and stakeholders' expectations will require fundamental transformation of our business. Much of the required service improvement can be delivered through our base cost allowances. However, there are instances where incremental enhancement expenditure will be required.

We have identified areas where enhancement investment is required in order to meet our long-term ambition, of which our Vision 2050 is a key input. For each of these areas, we have developed a Best Value Plan. In doing so, we have considered a range of different options, and factors beyond just expenditure, in line with Ofwat's public value principles and other planning requirements. We have put adaptive planning at the heart of the approach – i.e., we have considered low / least regret options, modular solutions, and enabling investment / actions.

In developing our best value plans, we have tested our approach with customers and stakeholders. There is wide-spread support for our approach. We have tested our best value plan against the common reference scenarios and company-specific scenario to define the core pathway.

Our plan is modular and flexible, meaning that for many areas we can quickly ramp up or slow down investment to suit the changing operating environment. The core pathway is a low / least regrets course of action, as per the Ofwat guidance. As time passes, it may be appropriate to switch to alternative pathways. We have identified trigger points where we would likely need to change strategy, and a series of monitoring metrics to help inform whether a change in approach would be required.

Our Best Value Plan and core pathway are closely aligned, and both show a major step up in investment is required both in AMP8 and beyond in order to meet statutory requirements, and the key priorities of our customers. Our plan is built on a several assumptions including the reduction of our asset health deficit, which is a key enabler to achieve our long term ambition.

Our Board has been engaged and involved throughout, in terms of setting the ambition, scrutinising our approach, and fully supports our long term delivery strategy.

Appendix A: Glossary

Acronym	Description
AI	Artificial intelligence
ALARP	As low as reasonably practicable
AMP	An 'Asset Management Plan' period is the five-year period covered by a water company's business plan. These are numbered; with AMP1 referring to the first such planning period after the water industry was privatised – i.e. the period from 1990 to 1995. The current period (2020 – 2025) is known as AMP7.
BRAVA	Baseline Risk and Vulnerability Assessment objective is to assess the baseline position of system performance and to understand wider resilience issues within each catchment that could impact on maintaining compliance with planning objectives.
BP	Business plan
BVP	Best value plan
CSO	Combined sewer overflow
CCW	Consumer Council for Water is an independent organisation which aims to protect consumers' interests and investigate customer complaints free of charge.
CCG	The Customer Challenge Group is an independent body that provides insight, thorough reporting, and commentary, to our customers, the public and Ofwat.
DRA	Direct river abstraction
DWMP	Drainage and Wastewater Management Plan
DWF	Dry Weather Flow
EA	Environment Agency
EC	Enhancement Case
EU	European Union
FMECA	Failure Modes Effects and Criticality Analysis
GIS	Geographic Information System
GPRS	General Packet Radio Services
GISMP	Groundwater Infiltration System Management Plan
IED	Industrial Emissions Directive
LWICA	London Water Infrastructure Conditional Allowance
LTDS	Long Term Delivery Strategy
NBS	Nature Based Solution
PC	Performance Commitment - Outcome performance commitments agreed with Ofwat that reflect customers' views and priorities of service.
RTS	Return to Sewer
SDS	Strategic Direction Statement
SEMD	Security and Emergency Measures Direction
SODRP	Storm Overflow Discharge Reduction Plan
STT	River Severn to River Thames Transfer
STW	Sewage Treatment Works
SUDS	Sustainable Urban Drainage Systems
TWUL	Thames Water Utilities Limited
UK	United Kingdom
WINEP	Water Industry National Environment Programme
WRMP	Water Resource Management Plan

Acronym	Description
WS-SRP	Water Supply – System Resilience Programme (WS-SRP)
WCCSW	What Customers, Communities and Stakeholders Want
WRPG	Water Resources Planning Guideline
WRSE	Water Resources South East
WRZ	Water Resource Zone