WRMP24 Technical Document

Demand management preferred plan

September 2024

Demand Management Preferred Plan

1 WRMP24 Introduction

1.1 About our company

Anglian Water is the largest water and wastewater company in England and Wales geographically, covering 20% of the land area.

We operate in the East of England, the driest region in the UK, receiving two-thirds of the national average rainfall each year; that's approximately 600mm.

Our region has over 3,300km of rivers and is home to the UK's only wetland national park, the Norfolk Broads.

Between 2011 and 2021, our region experienced the highest population increase in England. Despite this, we are still putting less water into our network than in 1989.

1.2 Planning for the long term

Our company Purpose is "to bring environmental and social prosperity to the region we serve through our commitment to Love Every Drop". This purpose is at the heart of our business, having been enshrined in our Articles of Association in 2019.

Central to delivering this purpose is planning for the long term; one of the strategic planning frameworks we use to achieve this is the Water Resources Management Plan (WRMP), which details how we will ensure resilient water supplies to our customers over the next 25 years.

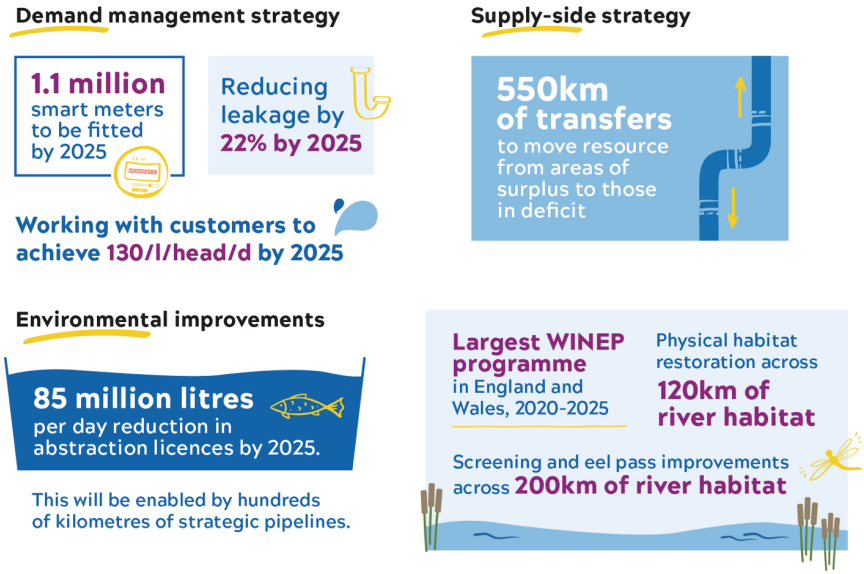
A WRMP looks for low regret investments[1] for our region, giving flexibility to adapt to future challenges and opportunities such as technological advances, climate change, demand variations, and abstraction reductions.

1.3 What is a Water Resources Management Plan?

We produce a WRMP every five years. It is a statutory document that sets out how a sustainable and secure supply of clean drinking water will be maintained for our customers. Crucially it takes a long-term view over 25 years, allowing us to plan an affordable, sustainable pathway that provides benefit to our customers, society and the environment.

Our previous WRMP, WRMP19, had an ambitious twin track strategy, combining an industry leading smart meter roll out and leakage ambition with a strategic pipeline across our region, bringing water from areas of surplus to areas of deficit. An overview of the WRMP19 strategy can be seen in Figure 1.

Figure 1 Our WRMP19 twin track approach



This WRMP focusses on the period 2025 to 2050, and is known as WRMP24. We have developed it by following the Water Resources Planning Guideline (WRPG)[2], as well as other relevant guidance, in order to meet our statutory requirements. This has ensured our WRMP24:

- Provides a sustainable and secure supply of clean drinking water for our customers.
- Demonstrates a long-term vision for reducing the amount of water taken from the environment, and shows how we will protect and improve it.
- Is affordable.

1 Investments that are likely to deliver outcomes efficiently under a wide range of plausible scenarios
2 https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline

- Maintains flexibility by being able to respond to new challenges.
- Complies with its legal duties.
- Incorporates national and regional planning; and
- Provides best value for the region and its customers.

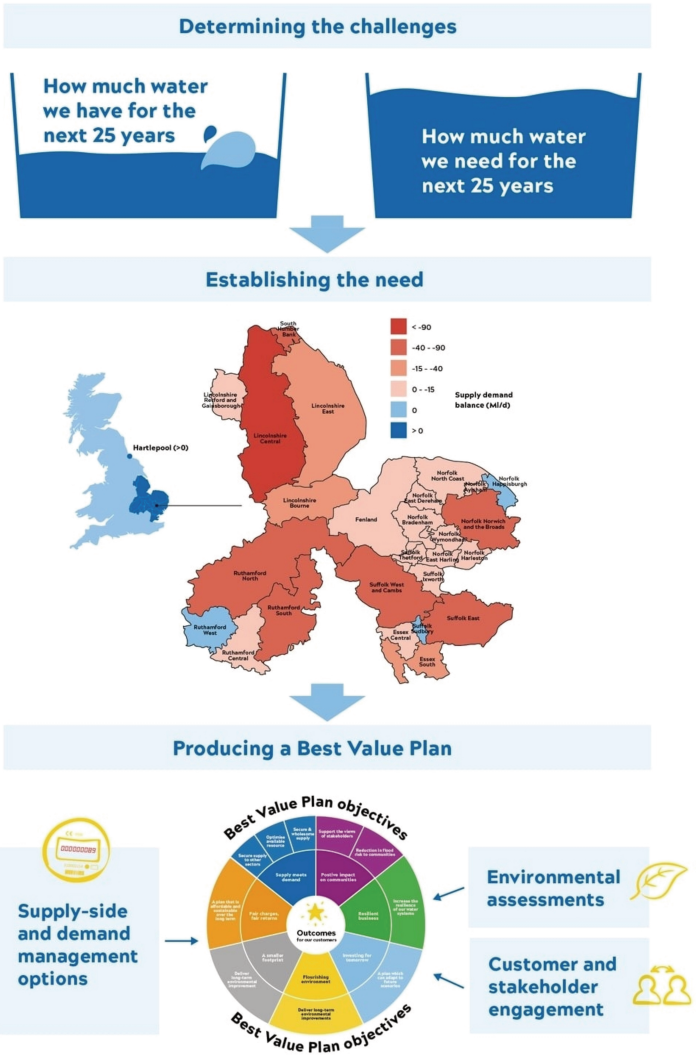
1.4 Developing our WRMP

Our WRMP24 has been progressed following the processes detailed in the WRPG, as shown in (Figure 2).

We start by determining the extent of the challenges we face between 2025 and 2050. We achieve this by developing forecasts to establish the amount of water available to use (supply forecast) and the amount of water needed (demand forecast) in our region. When these forecasts are combined, a baseline supply-demand balance is created. This tells us whether we have a surplus of water or a deficit, establishing our water needs for the planning period.

An appraisal for both demand management options and supply-side options is undertaken, starting with an unconstrained list of possible options which progresses through various assessments until a final constrained list is determined.

Figure 2 A high level overview of our WRMP24 planning process



Demand management options aim to reduce the amount of water being used by our customers and lost in our water network. Examples of these options include smart metering and the promotion of water efficiency measures, such as reducing shower times. Supply-side options are also developed; these provide additional water to supply to customers. Examples of these options include new raw water storage reservoirs or water reuse treatment works.

We environmentally assess both demand management and supply-side options so we can understand their potential environmental impacts and what could be put in place to mitigate these impacts; in some cases we exclude options from further consideration.

The next step is for the water savings associated with the chosen demand management option to be added into our baseline supply-demand balance to determine if our region's water needs are met. If the demand management options savings do not solve the need, supply-side options are added into the modelling process. This is undertaken in our Economics of Balancing Supply and Demand (EBSD) model which conducts numerous modelling runs, creating a range of plans that meet our objectives. These plans are also environmentally assessed.

We develop a best value plan from these different model runs and environmental assessments, encompassing the views of our customers and stakeholders who have been consulted throughout the plan's development.

1.5 Best value planning

To ensure we develop the right solution for our region's water needs, we have focused on 'best value'. To us, best value is looking beyond cost and seeking to deliver a benefit to customers and society, as well as the environment, whilst listening and acting on the views of our customers and stakeholders.

These views, from our customers and stakeholders, have helped build our best value framework, shown in (Figure 3) which has been used as the basis for our decision making.

Figure 3 Best Value Plan wheel

1.6 Our WRMP24

Our best value plan, has been produced following a public consultation on our draft and revised draft WRMP24. This consultation ran from December 2022 to March 2023. Taking into account consultation feedback and our revised forecasts, we:

- Increased our leakage ambition from 24% to 38%.
- Included projected non-household demand for the South Humber Bank, in north Lincolnshire.
- Developed non-household demand management options.
- Recognised further opportunities to utilise the existing resource we have; and
- Removed abstractions from the supply forecast that are likely to be closed due to Habitats Regulations.

1.7 Strategic context of the WRMP24

Our WRMP24 aligns with our Purpose, as well as internal and external strategic plans and initiatives. We have worked collaboratively with internal and external stakeholders, regulators and other water abstractors to achieve this.

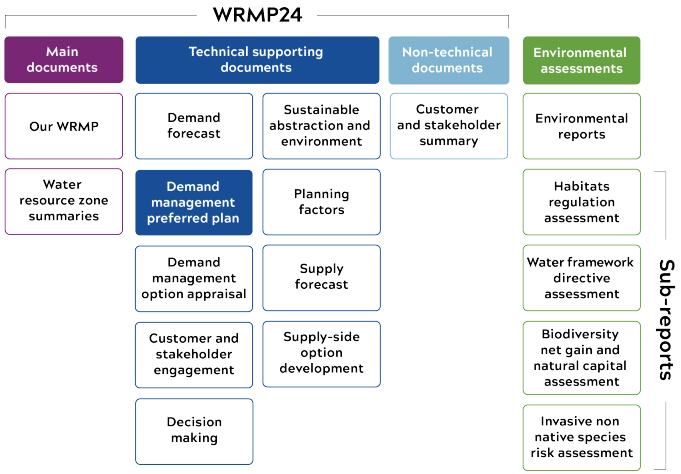
These interactions are highlighted throughout our WRMP24, showing the importance of collaborative planning. For instance, Regional Plans led by Water Resources East (WRE) and Water Resources North (WReN) have been significant in shaping our investment priorities and requirements, with WRE demonstrating the valve of the strategic regional options (SROs) at the regional, multi-sectoral level.

This WRMP24 has helped shape our company investment strategy for the Price Review (PR24), as well as our Long Term Delivery Strategy. We have also maintained close links with the Drainage Wastewater Management Plan and our Drought Plan.

1.8 Guide to our WRMP24 submission

Our submission comprises a non-technical customer and stakeholder summary, our main report and nine technical supporting documents, shown in Figure 4) Below. These technical documents are supported by a suite of independent environmental assessments.

Figure 4 Our WRMP24 reports



This report is concerned with the development of the Demand management preferred plan.

This is the WRMP24 Demand management preferred plan technical supporting document.

2 Executive Summary

2.1 The challenge

It is anticipated that unconstrained demand will increase by over 133Ml/d over the WRMP24 plan period (2024/25 to 2049/50), due to the effects of growth and an additional population of 911K.

As stated in the Waterwise 'UK Water Efficiency Strategy to 2030';

> *'Without action to reduce water demand there is an increasing risk that future housing and business growth will be increasingly constrained by water availability. We are already starting to see this.'* [3]

2.2 Our track record and commitment

Historically, we have an enviable track record in mitigating demand and now put less water into the supply system than in 1989, despite an increase of more than 40% in the households we serve.

Our leakage performance is industry leading, currently representing 15% of our total demand (with 22% of that leakage being on the customer-side (cspl)).

In the current year 2022/23, we have over 90% of household properties with installed meters and 84% of customers paying measured charges.

2.3 Developing our strategy

Given the scale of the challenges we will face in future (growth, climate change and environmental sustainability), we have collaborated extensively in the development of our WRMP24, utilizing our extensive customer engagement program to ensure that our customers fully understand demand related issues.

Generally, customers prefer options that are perceived to make best use of existing resource and infrastructure. Leakage continues to be a priority and an emblematic issue.

We understand that our strategy must underpin regional planned economic and housing growth in a sustainable manner. We have also been committed to our association with Water Resources East (WRE). WRE is a leading example of collaborative, multi-sector planning, working with partners to develop a long-term strategy for water stewardship in the East of England, stressing significant demand management interventions in our near and long term strategy.

Our preferred plan and our vision and future ambition

We plan to build upon our proven track record of delivering demand management savings and our ambitious AMP7 program, through leakage reduction, our ambitious strategy for smart metering and innovative water efficiency options.

Our program of demand management in AMP7, including the roll-out of over 1M smart meters, will act as the foundation for our WRMP24 plan; one that provides economic benefits, delivers substantial water savings, and is also considered to be achievable.

Our previous success, however, does mean that there is limited potential to achieve further savings through 'tried and tested' demand management activities (as demonstrated by our current meter penetration). Our ambition is to drive the next 'step-change' in demand management through technological innovation, enhanced communications and the implementation of 'industry leading' behavioural change initiatives.

Savings from our smart meter program, leakage reduction, water efficiency options and non-household options, in combination with government led interventions are expected to more than compensate for regional increases in demand due to population growth throughout the WRMP24 plan period.

We expect that with our ambitious program for smart meters and water efficiency and the inclusion of impacts from government led interventions ('white good' and water utility labelling and mandatory design standards) our customers should achieve a per capita consumption of less than 110 l/h/d, in line with the National Framework 2050 target. Additionally, we expect to achieve a leakage level that exceeds the National Framework leakage target when considered at a National Level (without this implying an absolute

3 *Waterwise (2023), 'UK Water Efficiency Strategy to 2030', p.11*

50% reduction in leakage at a company level; noting the massive cost that this would imply for Anglian Water). This is explained more thoroughly in the "leakage Section' of the report.

Using new technology, behavioural understanding and innovation, our strategy will unlock estimated demand savings of up to 48Ml/d by the end of AMP8 (2029/30), and 218Ml/d by the end of the planning period (2049/50) including impacts from Government led interventions. Note that additional significant savings from our AMP7 smart meter roll-out (1.1M) are included in our base-line forecast. The cost of our demand management strategy is expected to be approximately £171 million (totex) in AMP8 (2025-2030).

We also intend to implement our water efficiency strategy for the business sector with our Retail partners, saving approximately 10Ml/d by 2029/30 and 50Ml/d by 2049/50.

As part of devising our WRMP24 plan, we have undertaken an assessment of costs and benefits, including carbon impacts with regard to our Net Zero ambition.

We have sought to develop our demand management plan using an holistic approach, utilizing innovative technologies, and extending our AMP7 'smart meter' rollout. Smart meters allow us to use real-time consumption data, assisting our customers to reduce their consumption and save money.

We are keen to complete the roll-out in AMP8 (by 2029/30) and develop sophisticated communications systems for the benefit of our customers, in order to realize the demand reductions which will be key managing growth and abstraction reduction.

As part of our preferred plan we have included an innovation and discovery fund in order to further our understanding of customer behaviour and the potential for future water efficiency initiatives. We have termed this our 'Water Demand Reduction Discovery Fund'. The inclusion of this fund reflects our unique circumstances, in that we will shortly be fully smart metered and currently record industry leading leakage levels. We, consequently need to investigate and develop new and innovative solutions to enable further significant reductions in demand. This fund will be used to identify and fill evidence gaps regarding consumption, customer behaviours and water efficiency programs. It will help inform future forecasting for our WRMP/WRE and Price Review (PR) submissions along with our Long-Term Delivery Strategy (LTDS). This 'Discovery Fund' will complement the 'Demand management monitoring framework', which is also being developed to analyse consumption and validate the demand management options in our plan.

With the implementation of our smart metering program (and other associated water efficiency measures) we expect per capita consumption (PCC) to decrease to a value of 109.74 l/h/d by 2049/50, for our Dry Year Annual Average (DYAA) forecast. The Normal Year Annual Average (NYAA) per capita consumption (PCC) value will be 107.59 l/h/d, in line with the National Framework target of 110 l/h/d (DYAA). This additional decrease in PCC, will be driven by our full smart meter rollout by 2029/30, enhanced water efficiency options (linked with the opportunities arising from smart meters with respect to our water efficiency communications strategy) and additional savings from government led interventions ('White good' labelling and mandatory standards).

Note that the impact of government led interventions ('white good' / water utility labelling and mandatory standards) is only included in the preferred plan forecast. No allowance for 'Government led interventions' is included in the base-line forecast (as stated in the WRPG: '*Your baseline should not include any relevant government interventions (i.e., mandatory water labelling) which should instead be reflected through options and through your final plan*').[4]

Government led interventions will have a significant impact on PCC (approximately 14 l/h/d by 2050).

Per capita consumption can be shown for the WRMP24, with the base-line (no demand management) forecast shown in light purple and the preferred plan forecast shown in dark purple (Figure 5):

4 Environment Agency (March 2023), '*Water Resources Planning Guideline WRMP24*', p. 42

Figure 5 Per capita consumption, base-line and preferred plan

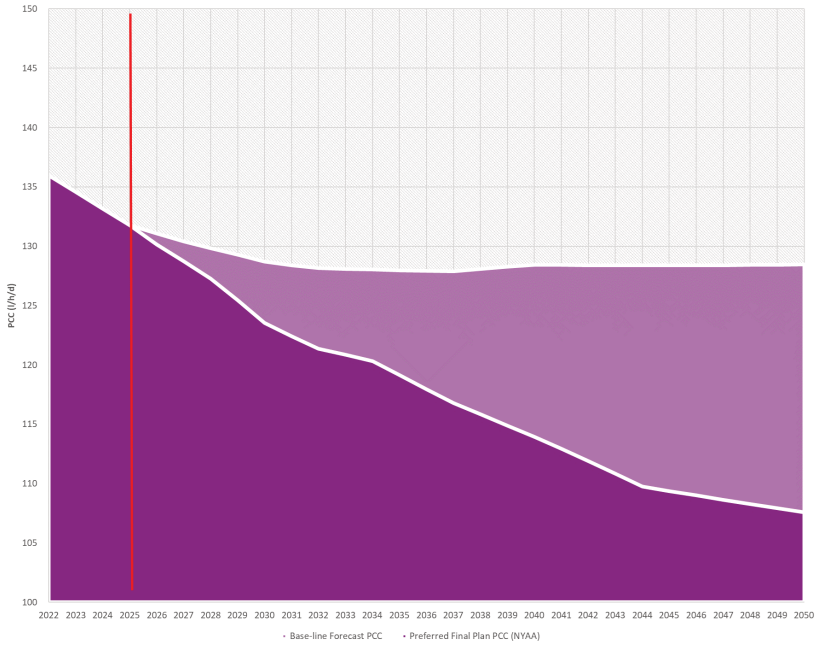
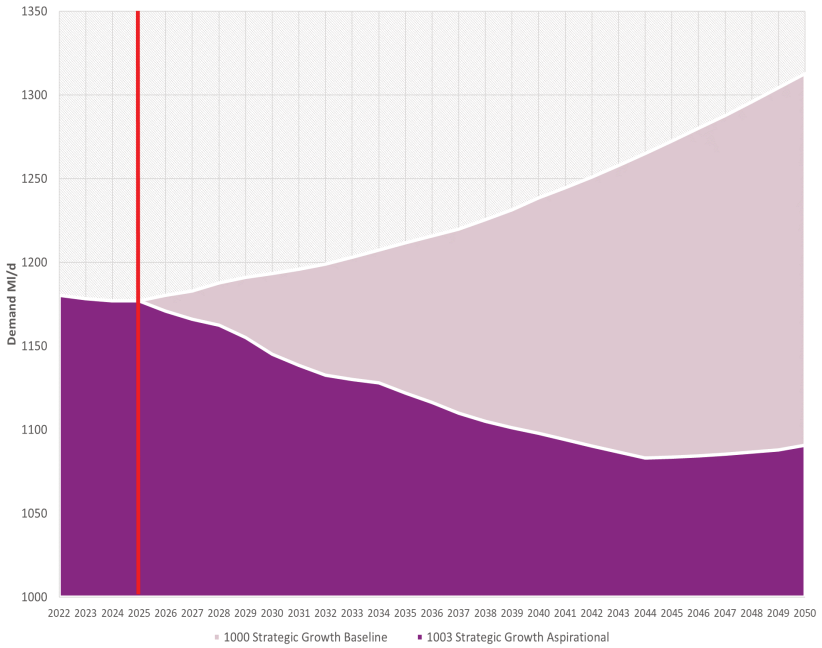


Figure 6 DYAA Demand for the base-line and preferred plan



Dry year annual average demand can be shown for the WRMP24, with the base-line (no demand management) forecast shown in light purple and the preferred plan forecast shown in dark purple (Figure 6):

3 Strategic need

Strategic challenges

Whilst considering the future for water demand in the Anglian Water region, we have also been mindful of our role in achieving the wider ambitions for water efficiency and demand reduction, as detailed in the 'Environmental Improvement Plan (EIP) 2023 (April 2023): Goal 3 Clean and plentiful water' (Defra, 2023). This technical report will detail our preferred plan and how it will contribute to reaching Defra's strategic out-comes.

Water resources in our region are expected to suffer very significant pressures from both demand and supply issues, including; increasing demand due to population growth, climate change, sustainability reductions (in order to achieve our environmental ambitions) and the need to increase our resilience to severe drought. Additionally, our region has been classified by the Environment Agency as an area of serious water stress.

In particular our population is forecast to increase by 911K over the WRMP24 period (2024/25 to 2049/50), implying a potential increase in water demand of 135Ml/d (DYAA forecast). This overall growth in base-line demand, is driven by the growth in population, but also includes reductions in per capita consumption due to the introduction of smart meters in the Anglian Water region in AMP7 (1.1M by 2024/25).

The assessment of growth in the region has been driven by our understanding of Local Authority Planning information. We have been keen to ensure that our strategy supports local growth and is carried forward in consultation with local stakeholders.

Challenges are acute and drive the need for investment in both demand management and supply-side options, particularly in the short and medium-term.

To ensure that we provide our customers with clean, safe water, we have considered the widest range of options to secure our water supplies, using a 'twin track' approach, exploring options to increase our capacity to supply water, as well as options to reduce demand. By exploring both supply and demand options we can ensure a cost effective, secure supply-demand balance, whilst ensuring the environment is protected.

In particular, in developing our WRMP24, we have noted the stress placed upon demand management by Defra, as a preferred strategy to address anticipated growth and mitigate environmental impact.

We have taken special account of the Water Resources Guiding Principles;

'Government and regulators expect that all parts of demand are managed and, where possible reduced, while acknowledging that your demand is also influenced by your customers' behaviour[5]*.*

Additionally, the National Framework states:

'In advance of the government's response to the consultation, the national framework senior steering group has agreed the case for making ambitious demand savings. Based on the best available evidence the group agreed to work to an initial planning assumption of reducing average per capita consumption (PCC) to 110 litres per person per day by 2050 nationally. This is the lowest PCC that can realistically be achieved without government action in addition to water company action. However, it can be achieved more cost effectively and at lower risk with action from government and the water industry[6]*.*

This guidance has, consequently, been key to informing and developing our demand management strategy.

5 Environment Agency (March 2023), '*Water Resources Planning Guidelines*', p. 63
6 Environment Agency (March 2020),*'Meeting our future water needs: a national framework for water resources*', p. 9

3.1 Government policy and regulatory guidance

3.1.1 Water Resources Planning Guidance

The Environment Agency has updated the Water Resource Planning Guidance (WRPG) for WRMP24. In this, they confirm that the WRMP24 must be closely aligned with the National Framework, Local Authority and Regional Plans (WRE) along with the Business Plan, Drought Plan, Drainage and Wastewater Management Plan and River basin management plans.

- *'National Framework (For companies wholly or mainly in England) - The National Framework sets out the challenge for water resources over the next generation. You are expected to work within and in regional groups to meet this challenge and work together to develop a cohesive set of plans that identify the best strategic options to meet the challenges we, as a country, face.*
- *Regional plans - For the first time, if you are wholly or mainly in England, your WRMP will be aligned to a new regional plan. Your WRMP should reflect the regional plan unless there is clear justification for not doing so. Given the close link between the regional plan and the WRMP we expect that this guidance will be also highly relevant for regional groups.*
- *Local Authority plans - Local authority plans set out future development, such as housing. Your WRMP should meet planned housing demand.'*[7]

It is stated that the Water Resources Plan (and consequently aligned WRE regional plan) should emphasize demand management, and the reduction of consumption, as a key strategy. Future forecasts should reflect demand management strategies and align with the regional plan forecasts.

> *'Government and regulators expect that all parts of demand are managed and, where possible reduced, while acknowledging that your demand is also influenced by your customers' behaviour.*
>
> *For companies, wholly or mainly in England, your forecasts should be aligned with the regional plans. You should demonstrate how you have collaborated at a regional level with neighbouring water companies and non-public water supply abstractors to generate your forecasts and have made use of best available data and information.'*[8]

WRMP planning should also reflect the planning targets defined in the National Framework, as stated;

> *'account for future demand reduction planning assumptions and targets set out in the National Framework (England only) or set through government policy."*

With respect to growth, it is indicated that the WRMP should reflect Local Authority projections and include strategic growth (such as the potential OxCam Arc development).

> *'Where your area includes major strategic housing and growth developments such as the Oxcam Arc or Garden Communities, you should include the planned growth in your plan.*

- *check whether the adopted or draft local plan contains and uses information on local housing need*
- *use whichever forecast has the greater number of properties and population in your WRMP*

> *You should demonstrate you have incorporated local council information (particularly in relation to their published adopted local plans) in England.'*[9]

It is also expected that both the WRMP and WRE scenarios should include the outputs of the Defra PCC consultation process (as detailed in the Artesia Report 2020) and should reflect the potential impacts from both water company demand management options and potential government interventions including mandatory standards and white good labelling.

> *'Your plan should also consider the results of water industry project on 'Water Demand Insights from 2018 (Artesia 2020).'*[10]

The Environment Agency also stresses that non-household demand management should be promoted more effectively in WRMP24 and included in forecast projections.

> *'You should continue to work with the retailers to ensure the promotion of water efficiency and demand management with all customers.'*[11]

It is also stressed that forecasts for the WRMP and regional plans should be aligned.

> *'Your forecasts should be aligned with the outputs of regional plans. You should demonstrate how you have collaborated at a regional level with neighbouring water companies and non-public water supply abstractors*

7 Environment Agency (March 2023), *'Water Resources Planning Guideline for WRMP24'*, p. 12
8 Environment Agency (March 2023), *'Water Resources Planning Guideline for WRMP24'*, p. 63
9 Environment Agency (March 2023), *'Water Resources Planning Guideline Working version for WRMP24'*, pp. 71-72
10 Environment Agency (March 2023), *'Water Resources Planning Guideline Working version for WRMP24'*, p. 74
11 Environment Agency (March 2023), *'Water Resources Planning Guideline Working version for WRMP24'*, p. 78

*to generate your forecasts and how you have made use of best available data and information. 'Water Resources Planning Guideline Working version for WRMP24' (*Defra and Environment Agency, March 2023), pp. 63-64

This could include:

- *sharing consumption and segmentation data to increase sample sizes for modelling*
- *sharing sub annual data for seasonal peak analysis (including weather, economy and tourism driven factors)*
- *pooling data, expertise and modelling resources to assess a wider range of viable models i.e. allowing you to explore different modelling techniques.'*

Defra have also recently published their 'Environmental Improvement Plan (EIP) 2023 (April 2023) Goal 3 "Clean and plentiful water', stressing how demand management strategies must be integral to future plans for water resources. As they state:

- *To drive progress to close the gap, we have set a new legally binding target under the Environment Act 2021 to reduce the use of public water supply in England per head of population by 20% by 2038. To achieve this we will reduce household water use to 122 litres per person per day, reduce leakage by 37%, and reduce non-household (for example, businesses) water use by 9% by 31 March 2038. This is part of the trajectory to achieving 110 litres per person per day household water use, a 50% reduction in leakage and a 15% reduction in non-household water use by 2050.*[12]

During the development of our WRMP24, we have been mindful of these targets, whilst also building a robust scientific basis for our future forecasts.

Waterwise have also recently published their 'UK Water Efficiency Strategy to 2030'. This provides a clear description of the collaborative program that will be needed to ensure that demand management and water efficiency play their part in meeting our future water resource challenges.

We fully support the 10 strategic directives described in the document, and as will be seen our WRMP24 has been designed to play our part in achieving these goals in the near and long term.

In detail:

- *Strategic objective 1: All UK Governments and regulators show clear, visible leadership for water efficiency and reflect this in their policy and regulatory frameworks.* [13]

We fully support clear government policy direction from the government and have included the impacts from government led interventions in our plan.

- *Strategic objective 2: People and organisations have access to useful and timely information on their water consumption and potential for savings.*[14]

We fully recognise the key requirement, that we can provide useful 'real time' consumption data to our customers and consequently plan to fully implement our smart meter program by 2030.(6)

- *Strategic objective 3: People and organisations are aware of why we need to use water wisely and how to do it and are taking action. Water-saving campaigns are effective; consistently evaluated - and the learnings are shared and used.* [15]

Beyond the implementation of our smart meter roll-out, we fully recognise that behaviour change will only be delivered if we communicate with our customers in a meaningful way, regarding the need for water efficiency.(7)

- *Strategic objective 4: People value water through life-long learning about water and how to use it wisely.* [16]

We understand that changing behaviours and attitudes to water use will be a long term challenge and we are continuing to develop our communications strategies and enhance our offerings, leveraging the opportunities that smart metering and our 'MyApp' system will facilitate. (10)

- *Strategic objective 5: Water efficiency advice and support is inclusive and is helping people in vulnerable circumstances, including in financial hardship.* [17]

We have consulted with vulnerable customer groups whilst developing our plan and will continue to ensure that we offer assistance where needed as we implement our program.

- *Strategic objective 6: All new developments are much more water-efficient and are water neutral in areas with current or future water availability challenges.*[18]

12 Defra (April 2023), '*Environmental Improvement Plan (EIP) 2023: Goal 3 Clean and plentiful water*', p. 67
13 *'Waterwise (2023), 'UK Water Efficiency Strategy to 2030', p.18*
14 *'Waterwise (2023), 'UK Water Efficiency Strategy to 2030', p.22*
15 *'Waterwise (2023), 'UK Water Efficiency Strategy to 2030', p.26*
16 *'Waterwise (2023), 'UK Water Efficiency Strategy to 2030', p.30*
17 *'Waterwise (2023), 'UK Water Efficiency Strategy to 2030', p.34*
18 *'Waterwise (2023), 'UK Water Efficiency Strategy to 2030', p.38*

We are keen to pursue 'water neutrality' with our partners in order to facilitate future growth and meet our commitments to demand reduction. We are now experiencing an increase in NAV developments in the Anglian Water region and will work with our NAV partners to assist in implementing water efficiency measures for their customers.

- *Strategic objective 7: Water efficiency measures are included in building retrofit programmes, including to achieve net zero.*[19]

Where feasible we will work all key stakeholders to push retrofit installations in parallel with the energy requirements for net zero.

- *Strategic objective 8: People and organisations are fitting water-efficient products and making use of a mandatory water efficiency label. The take up of innovative water-saving products is increasing.*[20]

We have included a factor to account for water labelling and mandatory standards (based upon the WUK/Artesia findings) as part of our final plan and support this policy going forward.

- *Strategic objective 9: Leaking toilets and confusing dual-flush buttons are a thing of the past.'Waterwise (2023),* [21]

Smart metering and the immediate data regarding continuous flow that this provides is already proving key to finding and fixing leakage in the home (including 'leaky loos'). We intend to assist vulnerable customers with these repairs, but are keen for further work to be carried out to make dual flush cisterns more effective and less prone to leaks. (6)

- *Strategic objective 10: Organisations are more motivated to save water and the delivery of water-saving advice and support to them is working well.*[22]

As part of our plan we are working with our Retail partners to develop and implement water efficiency options that are tailored to the different consumption patterns demonstrated by each business sector. (9)

Whilst considering the future for water demand in the Anglian Water region, we have been mindful of our role in achieving the wider ambitions for water efficiency and demand reduction. We have recognised the specific targets for reductions in leakage and customer consumption PCC) and have tailored our ambitious plan to contribute to these reductions (noting that this must be viewed in the context of each water companies current position and that modelling must be robust and defensible).

19 *'Waterwise (2023), 'UK Water Efficiency Strategy to 2030', p.42*
20 *'Waterwise (2023), 'UK Water Efficiency Strategy to 2030', p.46*
21 *'UK Water Efficiency Strategy to 2030', p.50*
22 *'Waterwise (2023), 'UK Water Efficiency Strategy to 2030', p.54*

All these expectations are reflected in both the WRMP and WRE planning processes, and out-comes, as set out in this document.

3.2 Guidance

The EA and UKWIR provide detailed guidance with respect to the demand forecasting element of the Water Resources Management Plan:

- 'Final Water Resources Planning Guideline': EA, NRW, Defra and Ofwat (March 2023)
- 'Guiding principles for water resources planning': Defra (2021)
- 'Water Resources Long Term Planning Framework': Water UK (2016)
- 'Preparing for a drier future, England's Water Infrastructure Needs': National Infrastructure Commission (2018)
- 'Meeting our future water needs: a national framework for water resources': (March 2020)
- 'Collaborating to secure England's future water needs: Our initial water resource position statement': (March 2020)
- 'A leakage routemap to 2050': Water UK (2022)
- 'Agriculture, England; Environmental Protection England Water England; The Environmental Targets (Water) (England) Regulations': (2023)
- 'Our integrated plan for delivering clean and plentiful water': Defra (April 2023)
- 'Water 2050: A white paper': Water UK (2022)
- 'Population, household property and occupancy forecasting' - Guidance manual, supplementary report and worked example: UKWIR (2016)
- 'WRMP19 methods - Household consumption forecasting' - Guidance manual and supplementary report: UKWIR (2016)
- 'Peak water demand forecasting methodology': UKWIR (2006)
- 'WRMP19 methods - Risk based planning': UKWIR (2016)
- 'WRMP19 methods - Decision making process': UKWIR (2016)
- 'Integration of behavioural change into demand forecasting and water efficiency practices': UKWIR (2016)
- 'Customer behaviour and water use - A good practice manual and roadmap for household consumption forecasting': UKWIR (2012)
- 'Impact of climate change on water demand': UKWIR (2013)
- 'An improved methodology for assessing headroom': UKWIR (2002)

In developing the demand forecast for WRMP24, the EA recommends that the methodology balances simplicity and accuracy, and that more detailed analysis should be undertaken where there is vulnerability to growth within a given Water Resource Zone (WRZ).

Given the significant growth and supply-side challenges expected across our region, we have reviewed our WRMP19 modelling processes, and enhanced our forecast modelling methods, applying the same sophisticated approach to all our WRZs. Furthermore, we have maintained alignments between our WRMP24, WRE and DWMP recycled water demand forecast modelling, in order to develop a coherent set of demand forecasts, for all growth-related investment. We have also been keen to liaise with Local and Regional Planning Authorities to ensure that forecasts properly reflect Local Plans. This report will concentrate on the requirements of the WRMP24, as opposed to WRE, or the DWMP24 (Drainage and Wastewater Management Plan).

Due to the complexity of, and pressures on water resources in the East of England, a scenario led approach has provided much greater clarity in understanding future uncertainties and planning options. These scenarios have been integral to the Water Resources East (WRE) planning process, as well as the WRMP24.

3.3 Population and demand growth

The Anglian water region is forecast to experience significant growth over the planning period (2024/25-2049/50) in terms of both properties and more importantly for population (which drives demand).

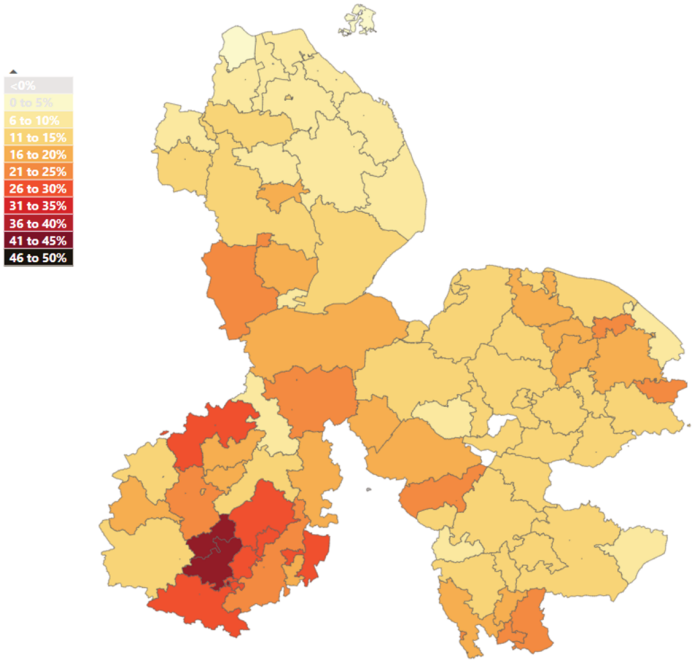
Edge Analytics have been commissioned to developed key growth scenarios for Anglian Water (and have also provided similar aligned scenarios for WRSE). These have included strategic growth scenarios (OxCam), based upon a theoretical uplift in local housing for relevant local authorities (whilst also accounting for Local Authority plans). For our WRMP24, we have taken a pragmatic approach to the inclusion of strategic growth (higher than Local Authority Plan in the longer term), in order to minimize future risk from population growth. Consequently, we have included the OxCam1b_r_P scenario, as our key growth projection.

Our preferred growth scenario has been chosen to reflect Local Authority planning projections with an additional long term uplift to account for potential regional strategic growth.

- **Base-line Household Population 4.987M (2024/25)**
- **Base-line Properties 2.162M (2024/25 - excluding voids)**
- **Population is forecast to increase by 0.911M from 4.987M (2024/25) to 5.898M (2049/50), during the WRMP24 planning period.** Note that population is forecast to increase by 18% over the WRMP24 planning period, reflecting official ONS forecasts and including a variant of strategic growth (OxCam1b).
- **Households are forecast to increase by 0.527M from 2.162M (2024/25) to 2.689M (2049/50), during the WRMP24 planning period.** Households are forecast to increase by 24% from over the WRMP24 planning period, reflecting LAUA planning projections and a variant of strategic growth (Oxcam1b).
- **Note that there is an additional allowance for non-household population.** The consumption for this is accounted for in the Non-Household forecast.

Percentage growth can be shown across the region as shown below (Figure 7):

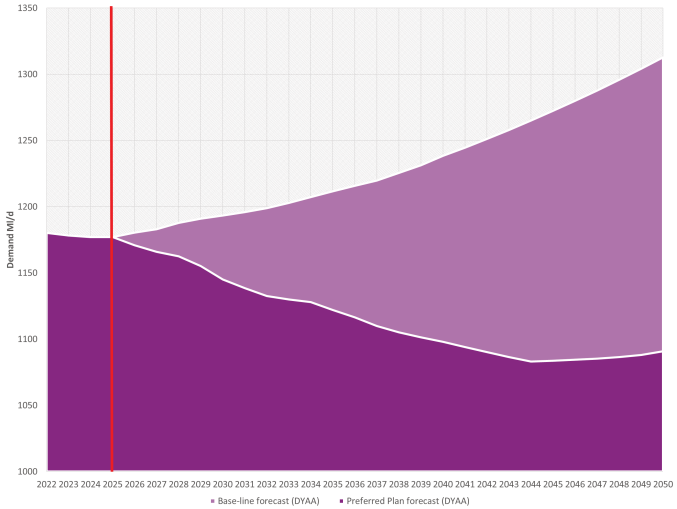
Figure 7 Population Growth - % change from 2025-2050 (PZ detail)



- **Dry year Annual Average (DYAA) Base-line (BL) Demand -** Is expected to increase from 1177.09Ml/d in 2024/25 to 1312.74Ml/d in 2049/50 in the base-line (BL) scenario (an increase of 135.65Ml/d). This includes our current smart meter strategy (1.1M meters), and strategic growth. Note that for the revised draft WRMP24 government led interventions are only included in the final plan projection, causing a large deviation for the base-line and preferred plan forecasts (in line with Water Resource planning Guidance).
- The expected growth will have a direct impact on the amount of water required for distribution input, in order to supply this growing population.
- **Dry year Annual Average (DYAA) Final Plan (FP) Demand -** For the preferred plan (FP) scenario, we expect demand to be 1090.86Ml/d in 2049/50.
- This significant reduction reflects the impacts of:
    - the completion of the smart meter rollout,
    - our aspirational portfolio of water efficiency options,
    - 38% leakage reduction by 2049/50 (from the National Framework 2017/18 base-line),
    - the inclusion of non-household options,
    - significant impacts from Government led interventions.

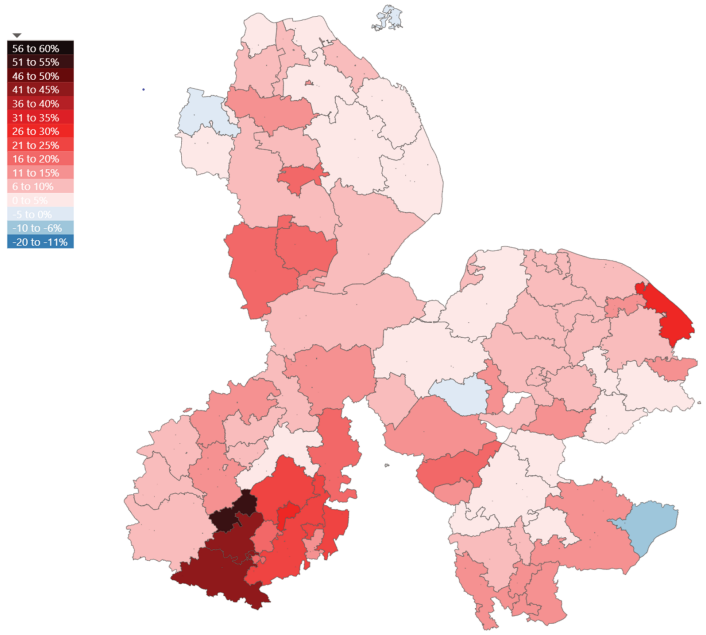
DYAA Base-line (light purple) and preferred plan (dark purple) demand can be shown (Figure 8):

Figure 8 DYAA demand for the base-line and final plan forecast (Ml/d)



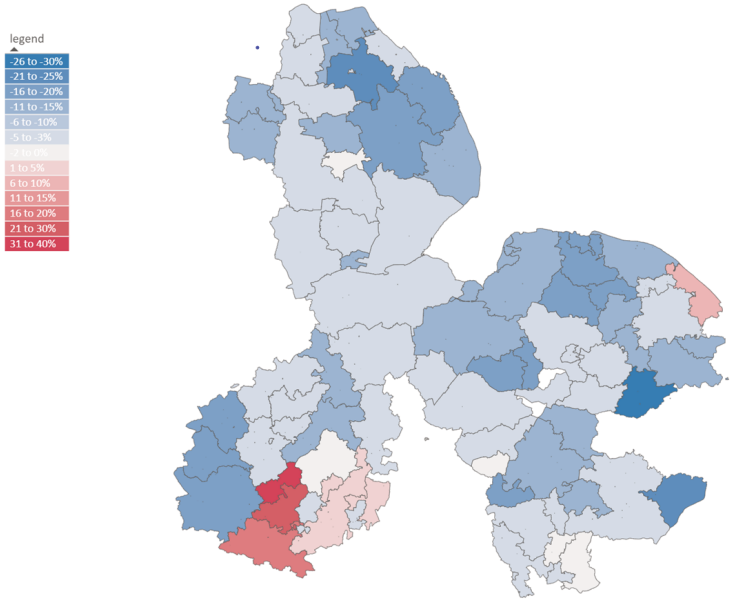
- The relative (% increase) changes in demand can be shown geographically for the period 2024/25 to 2049/50, for both the base-line scenario (as below) and the preferred plan (Figure 9):

Figure 9 Base-line - DYAA - Percent change in demand 2025-2050 (Planning Zone detail)



- The preferred plan scenario can be seen to significantly mitigate demand growth due to increasing population. This can be shown at Planning Zone (sub water resource zone) level as below (note growth in red, decline in blue) (Figure 10):

Figure 10 Preferred Plan with DMOs - DYAA - Percent change in demand 2025-2050 (Planning Zone detail)



- Significant growth is expected in the south of our region over the planning period, especially around the Milton Keynes, Newport Pagnell, Bedford region (as anticipated in the Oxcam arc region).

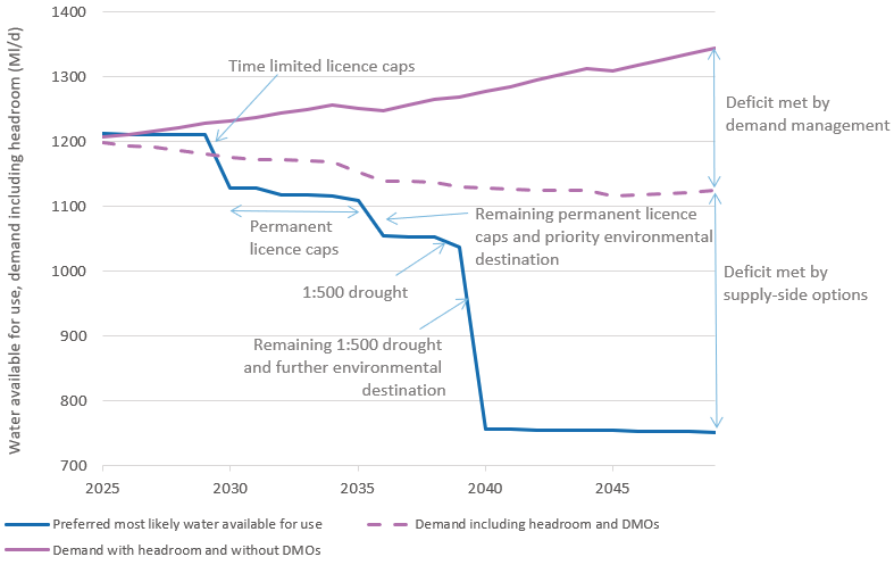
3.4 Sustainability, climate change, drought resilience and our environmental destination

In addition to the impact on demand from population growth, significant changes and reductions are anticipated with regard to water availability (in order to maintain sustainable supplies for the foreseeable future). Our preferred environmental destination will enhance our environment, biodiversity and resilience to future climactic changes.

These changes will have a very significant impact in the way we maintain the supply of water to match forecast demand requirements, even with demand reduction: This is termed the **supply-demand balance**. Demand management will play a key role in our strategy to meet these challenges.

As can be seen, the potential environmental destination (described in more detail in our WRMP24 'Sustainable abstraction and environment technical supporting document') being envisaged will create significant challenges, which we aim to address in our WRMP24 (Figure 11).

Figure 11 Supply-demand balance showing environmental destination



Our demand management strategy has, consequently, been designed to maximise potential savings that might be achievable, as we build upon our current smart meter installation program. The current plan should more than mitigate the increase in demand due to growth across our region, over the WRMP24 plan period (assisting with supply-demand issues in the near-term).

However, sustainability reductions and our environmental destination, call for significant longer term supply-side option development, whilst maintaining a keen focus on how we might extend and innovate our water efficiency and demand reduction programs in future.

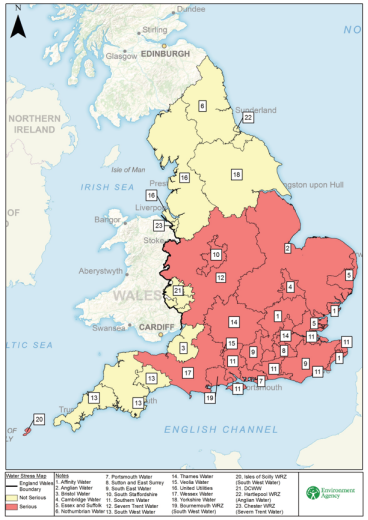
The EA have also recently revised their assessment of water stress in the UK, based upon WRMP19 data. As they note:

> *Water stress applies both to the natural environment and to public water supplies. Both will be affected by climate change. Public water supplies are under pressure from reductions in abstraction to make them more environmentally sustainable. There is also a need to make public water supplies more resilient to droughts and meet additional demands associated with development and population growth.*
>
> *The determination shows where we believe there are or, are likely to be, environmental impacts caused by public water supplies or the need for major water resources developments. It indicates where these could be reduced by improving water efficiency through metering.*[E23]

As can be seen in the figure below, the entirety of the South east of England including the Anglian Water Region are deemed to be water stressed (Figure 12).

23 Environment Agency (2021), *'Water stressed areas - final classification 2021'*, p. 4

Figure 12 Water stressed classification



It is noted that companies within areas, which are deemed to be water stressed, should evaluate the potential for compulsory metering (which we will address later in the report). Additionally local authorities should utilize the classification in order to drive the adoption of a standard of 110l/h/d for new-build developments.

4 Customer consultation and planning framework

Our engagement

Given the scale of the challenges that we anticipate, we have actively collaborated and engaged extensively during the development of our WRMP24. Additionally, we have actively participated with Water Resources East (WRE) to derive the regional plan in collaboration with major regional stakeholders.

Customer engagement is central to both the daily running of our business and our long-term decision making processes. We continue to refresh our customer engagement strategy and embed it as a 'business as usual' activity. Our enhanced strategy places greater emphasis on ensuring our engagement is meaningful to customers and explores differences of opinion, experience and behaviours between different groups of customers. We have also undertaken extensive work to understand the value that customers place on certain standards of service and different outcomes. We have used the outputs of these studies in our cost benefit analysis.

As part of the development of our WRMP24 plan, we have also been keen to engage with our retail partners and their business customers, as we have sought to produce a strategy for non-household water efficiency.

Key conclusions include:

- Customers are fully supportive of our 'core' responsibility in ensuring that supply meets demand in the Anglian Water region. Customers support investment to increase resilience and believe we should be planning for the long-term and taking preventative action to deal with foreseeable future challenges.
- Generally, customers prefer options that are perceived to make best use of existing resources, however, many customers also recognize our expertise and trust us to make complex investment decisions.
- Leakage continues to be a priority and an emblematic issue, with customers supporting our continued drive to reduce wastage.
- Although customers are prepared to accept bill increases for service improvements that they value, many customers are feeling under financial pressure and are concerned about future bill increases.
- Our retail partners and business customers support the need for water efficiency measures in the non-household sector.

4.1 A collaborative plan

We believe customer engagement must be at the heart of all that we do as a company, not just for set piece consultations. We have, therefore, embedded it as a core 'business as usual' activity. Our on-going program of customer engagement is extensive, robust and innovative (see our WRMP24 'Customer and stakeholder engagement' technical supporting document).

We have built upon the extensive engagement undertaken for the PR19 business plan, and for WRMP24/PR24 have refreshed our customer engagement strategy. From the outset we have involved customers in the co-creation of our strategy, to ensure that the engagement would be meaningful.

This has helped us to develop our understanding of the world from a 'customer's point of view', and has ensured that we have developed our initiatives, language and materials in a way that would best engage customers in the risks and issues we are facing. The development of these materials is also key to our communication strategies as we progress our smart meter rollout.

As part of our WRMP24, we have looked to combine our historical consultations with new engagement to form a rolling synthesis report. This has been compiled by an independent consultant This has also helped to identify whether newer sources confirm or potentially conflict with existing analysis, as well as including new insight to areas not previously covered.

The majority of insights suggest that there is a strong view to *'get your house in order'* first, focusing on demand management options. For a significant majority of customers this means fixing leaks. Leakage features, as the second most important thing we need to do, behind providing good quality water, consistently across research.

This view is driven by the perception that leakage is just wasteful and unnecessary. However, we have noted for the synthesis, that there is some contradiction regarding the level of leakage repair that should be aimed for, as some customers think that leakage should be done at any cost, while others suggest there should be a cost-benefit ratio (in line with our WRMP24 approach).[24]

Reducing customer-side leakage, although less familiar to our customers, is also supported. Reducing customer consumption generally, is seen as the next priority, with education being a key element of its delivery. There is, however, recognition that behavioural change and household demand reductions, may be difficult to achieve.[25]

Views on leakage are closely followed by metering considerations, with most customers seeing compulsory metering as a fair way to charge for water. The views on universal and compulsory metering seem to have shifted since PR19 with 79% of our customers agreeing that people should pay on the basis of the amount of water they use. [26]

Note that this figure closely aligns with our current metered/measured customer base, which stands at 84%. Customers have also shown real interest in smart meters, the information that these can provide and the benefits they can deliver, supporting our current and future roll-out.

Customer views on paying according to the amount of water used, can be summarized as follows (Table 1):

Table 1 Customers telling us their thoughts on paying according to the amount of water they use

Yes they should pay based upon usage	No, they should not pay based on usage	I am not sure
Fairness - pay for what you use	Difficult, as some find it challenging to pay their bills	People experience different circumstances
Other utilities use this method	Water should be free to all	Low income households/big households need support
Reduces water wastage	Don't believe meters are the way forward	Those with medical conditions use more water [27]

We have been mindful, with regard to these responses, in considering how we might further encourage customers to be billed on measured charges, whilst supporting our more vulnerable population. We, currently, offer a number of social tariffs which have been developed in order to support our vulnerable customers, which we intend to develop as part of this process.

We have also noted that there is significant frustration when bills increase and real concern for those who are financially vulnerable, indicating that we must protect those on lower incomes.[28]

We have also been extensively consulting with Non-household Retailers and their customers, whilst considering their attitudes to leakage reduction and water efficiency. These findings have been used to develop demand management options for the Non-household sector in liaison with our Retail colleagues and WRE partners.

While demand management programs tend to be prioritized by customers and have direct environmental benefit, these can prove costlier than alternative supply-side solutions and the potential savings can be less certain, particularly for initiatives where there is little or no UK experience. As a result, our customer engagement activities have included a focus on the development of water resources and demand management options, in a holistic fashion.

Overall we have found that customers support the principle of a 'best value plan' (not the cheapest, but the best for society and the environment). However, our customers want us to prioritise core business activities (such as protection of the environment, managing flood risk and drought resilience) over the 'added value' elements (boosting the local economy, consulting customers, and creating public amenities) [29]

24 Fladrax Consulting (May 2022), '*Anglian Water Customer Engagement Synthesis Report v4*', p. 25
25 ' *Faldrax Consulting (May 2022), Anglian Water Customer Engagement Synthesis Report v4*', p. 25.
26 Faldrax Consulting (May 2022),*'Anglian Water Customer Engagement Synthesis Report v4', p.*25
27 Emotional Logic, June 2022, Anglian Water: Customer Engagement Quantitative Research final report, page 51
28 Faldrax Consulting (May 2022), '*Anglian Water Customer Engagement Synthesis Report v4*', p 50
29 Faldrax Consulting (May 2022), '*Anglian Water Customer Engagement Synthesis Report v4*', p 30.

Views have shifted slightly from PR19, with customers spontaneously mentioning post-COVID-19 effects and the 'cost of living crisis', both of which are likely to be influencing their views. There is a core desire from customers for bills to be fair and affordable and a frustration when bills go up. There is real concern for those who are financially vulnerable. This 'citizen-focused' mentality shows customers feel it is important to protect those on lower incomes. [30]

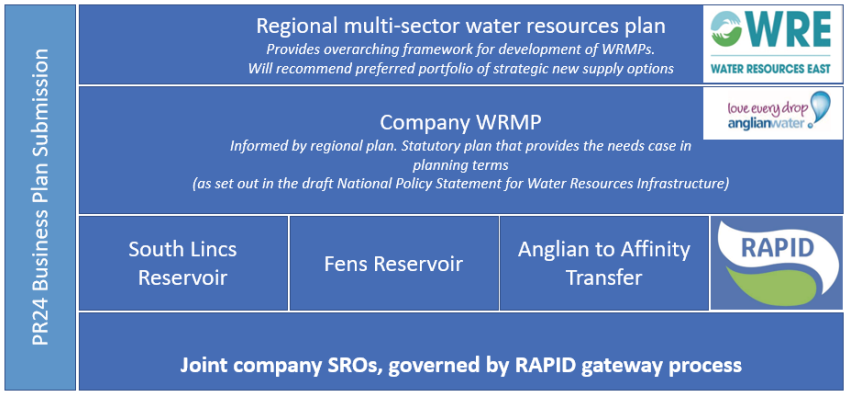
These findings are described in detail in our 'WRMP24 Customer and stakeholder engagement technical supporting document'.

4.2 Water Resources East and regional planning

The scale of the challenges we face from drought, climate change, population growth and meeting the needs of the environment are common to the East of England, impacting neighbouring water companies, regional stakeholders, as well as other abstractors and users of water across the East of England and adjoining regions. To ensure that we all have access to reliable, sustainable and affordable water supplies in the future, we are taking a leading role in a number of collaborative water resource planning efforts.

This planning framework includes Water Resources East, which informs our WRMP24 and PR24 plans, along with the RAPID process for assessment of strategic supply-side projects (Figure 13).

Figure 13 Planning framework



We helped establish and continue to drive the Water Resources East (WRE) initiative. WRE has been instrumental in developing a multi-company, multi-sector approach to analysing water resources. WRE brings together partners from a wide range of sectors, including water, energy, retail, the environment, land management and agriculture, to work collaboratively to manage water challenges and pioneer new approaches to planning and managing water resources.

Partners in our different collaborations also include representatives from, drainage, local government, business and finance sectors, other water companies, Defra, Ofwat, the Environment Agency and Natural England.

Analysis from WRE suggests that demand management is an essential component of any long- term, sustainable water resource strategy.

The WRE option appraisal process shows that a reliable, sustainable and affordable strategy depends upon a combination of demand management and supply-side solutions, as it has been previously concluded that uncontrolled growth in demand would drive a significant failure of water resource and supply systems. If demand were to be left to grow unchecked, it would result in widespread deficits and service failures (including rota-cuts and standpipes) in the future.

We have also been actively involved with:

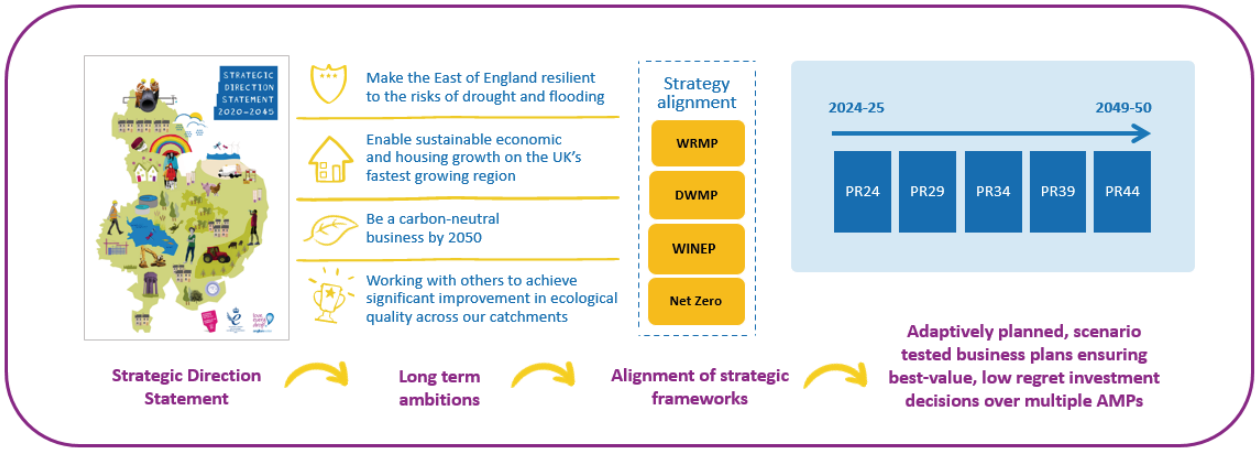
- the water efficiency strategy steering group and the customer leadership group working with Waterwise
- the Regulators' Alliance for Progressing Infrastructure Development (RAPID) (this has been formed to help accelerate the development of new water infrastructure and design future regulatory frameworks)
- national Framework for Water Resources and,
- Trent and Ouse Working Groups.
- The Oxford to Cambridge Water Leadership Group

We have also actively liaised with Water Resources South East (WRSE) and have had regard to their projected outputs, in the development of our WRE and WRMP24 plans. The continuing purpose of these collaborations is to develop a common understanding of water resource planning issues and to identify cost-effective options for sharing available resources, including transfers and trading.

Additionally, we are aligning our WRMP24 planning outcomes with the PR24 Long Term Delivery Strategy (LTDS) and our other strategic outcomes (wastewater DWMP, nutrient neutrality etc.), with each 5 year business plan being developed, as stepping stones to longer term outcomes (Figure 14).

30 Faldrax Consulting (May 2022), *'Anglian Water Customer Engagement Synthesis Report v4'*, p. 50.

Figure 14 Our business plans and long term strategy



As part of the development of our preferred WRMP24 plan and long term strategy, we have used multi-variant scenario testing to produce reactive outcomes, over the WRMP24 planning period.

For our W

RMP19 plan our adaptive strategy was to:

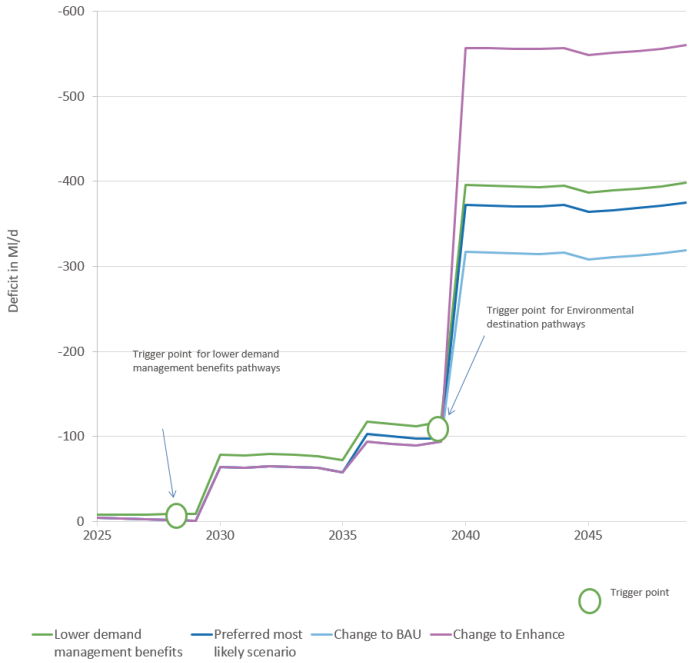
- better utilize existing resource through transfers
- implement demand management via leakage reduction and smart metering
- start planning for strategic options including reservoirs

For our WRMP24 adaptive plan we will balance:

- further demand management activities
- the continued development of selected strategic options
- the need for short-term supply options

As part of the WRMP24 planning process we intend to show how the WRMP24 plan should adapt to changing conditions over time. Such adaptive plans might be visualised with trigger points (Figure 15)

Figure 15 Adaptive planning processes



5 Our preferred plan

Our vision and future ambition

We plan to build upon our proven track record of delivering demand management savings, through our leakage reduction strategy, ambitious smart metering program and innovative water efficiency initiatives. We will extend our ambitious program of demand management options, in order to support our new WRMP24 plan; one that provides economic benefits, delivers substantial water savings, but is also achievable.

Our previous success, however, does mean that there is limited potential to achieve further savings through 'tried and tested' demand management activities.

Our ambition is to drive the next 'step-change' in demand management through:

- technological innovation,
- enhanced communication strategies,
- improved understanding of our customers behaviour, and
- the implementation of 'industry leading' water efficiency initiatives.

Note, also, that current significant savings from our AMP7 smart meter roll-out (1.1M) are now included in our base-line forecast.

Savings from our smart meter program, leakage reduction and water efficiency options, in combination with government led interventions are expected to more than compensate for regional increases in demand due to population growth during the WRMP24 planning period.

With our ambitious program for full smart meter installation and associated water efficiency measures, our customers should achieve a per capita consumption of less than 110 l/h/d, in line with the 2050 National Framework Target. Note that this includes a significant impact from government led interventions ('white good' and water utility labelling and mandatory design standards).

Additionally, we expect to achieve record low levels of leakage that exceed the National Framework Target, as applied at a National Level (without this implying a 50% reduction in leakage at a company level (noting the significant cost that this would imply for Anglian Water)). This is explained more thoroughly in the "Leakage Section' of the report.

Our preferred portfolio

Our ambitious strategy will comprise four strongly interlinked programs:

Water metering program

- We intend to complete our current smart meter rollout which will replace our entire meter stock (>2M meters) over 10 years (2 AMPs), noting that 1.1M smart meters will be installed by 2025.
- The 'information revolution' resulting from smart metering will help our customers understand their water usage and assist us with our future water efficiency programs.
- It will also help with our ability to detect leakage, significantly reducing plumbing losses and customer supply pipe leaks, and understand our network.
- This roll-out will include smart meters for the 100K business customers in our region.

Leakage reduction

- Our aim is to reduce leakage by more than 45Ml/d from 2025 to 2050 to a leakage level of 118Ml/d by 2049/50, building upon our

ambitious program of leakage reduction in AMP7 (a 14% reduction of more than 27Ml/d by 2024/25).

- Note that despite our current frontier leakage position and cost/benefit analysis, we have responded to our consultation process and chosen our most ambitious program of reduction, maintaining our commitment to the National Framework 50% target.
- We are aiming to reduce leakage by targeting both losses in our distribution system and losses due to customer supply pipe leakage using smart meter data (noting that we also intend to reduce internal plumbing losses, which impact the per capita consumption metric).

Water efficiency measures

- New technologies and our interventions will help promote the careful use of water by our household customers, stressing our commitment to leaving more water for the environment.
- Additional water efficiency programs will include: the promotion of 'Smart' devices; further development of our Multi-utility web-portal; garden advice; support for vulnerable customers with plumbing loss and cspl; Community reward schemes.
- Enhancing our understanding of human behaviour, with regard to water usage, and the impact of our water efficiency strategies, will be key to improving our WRMP demand forecasting in future. We are actively developing our 'smart meter monitoring framework' to test the effectiveness of our demand management program.

Non-Household water efficiency

- We have worked with Retailers to develop demand management strategies and have made significant progress in identifying actionable options, which have now been included in the WRMP24. We have now developed measures centred around pro-active water efficiency visits and smart meter enabled leakage reduction.

5.1 Our preferred plan and the deployment of demand management options

The importance of managing demand has been emphasized in the 'National Framework for Water Resources', as stated: *'Regional groups should plan to meet ambitious reductions in demand and leakage.'* [31]

Demand management forms an essential strategy in mitigating short-term environmental risks, as increasing our current abstractions to meet growth related requirements would represent a risk of deterioration. Additionally, there is envisaged to be a significant reduction in licensable water available to meet future demand, as we strive for environmental improvement over the WRMP24 planning period.

We, therefore, plan to use demand management strategies to off-set any growth in demand, mitigating these risks.

Demand management also has wider environmental benefits. It directly benefits our local environment, as we are saving water that would otherwise have to be abstracted and increasing the well-being and resilience of natural aquatic habitats. Avoiding the need for additional abstraction is particularly important in our region, which is home to many internationally important wetland eco-systems and is classified as an area of 'serious water stress' by the Environment Agency.

In addition, water saved does not need to be treated and distributed which reduces our operational energy consumption, making us more efficient and saving carbon, as we build towards our Net zero strategy.

Analysis from WRE also suggests that demand management should be an essential component of any long-term, sustainable water resource strategy for the region.

5.1.1 Reliability:

- We will ensure that our system is resilient to the combined effects of severe drought (defined as an event with an approximate 1 in 200 year return period) and climate change, so that none of our household and non-household customers are exposed to an unacceptable risk of standpipes and rota-cuts.

5.1.2 Water Resource Sustainability:

- We will ensure that there is enough water to meet forecast local authority growth projections.

31 Environment Agency (March 2020), *'Meeting our future water needs: a national framework for water resources'*, p. 13

- We intend to meet all of our statutory environmental obligations, including restoring abstraction to sustainable levels and preventing deterioration in water body status.
- We shall make the best use of available water resources, before developing new ones. This includes prioritizing cost-beneficial demand management and trading to share any available surpluses.

5.1.3 Affordability:

- We will ensure our preferred plan represents ‘best value’ over the long-term, through rigorous analysis and sensitivity testing. We will minimize the risk of delivering assets that become stranded or under-utilized in the longer term.
- We will ensure that investment not driven by statutory requirements, is kept within a range of a affordability for all customers.

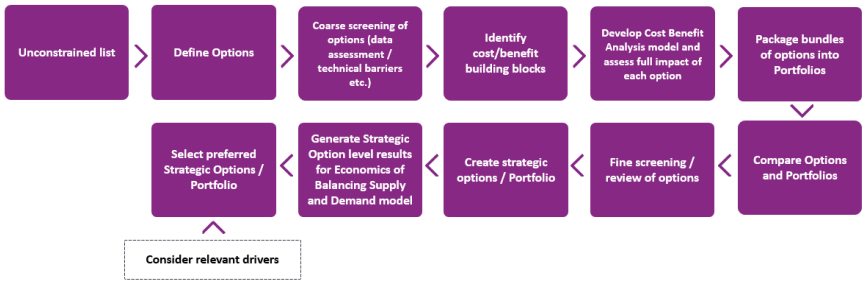
5.2 Cost benefit analysis approach

Our approach to the assessment of demand management options has been structured according to the process steps shown; see figure below (Figure 16):

- Option definition.
- Identification of cost and benefit elements, referred to as 'building blocks', to be included in the cost-benefit analysis. This step includes itemising the information needed for that calculation; and, where appropriate, includes a set of values and assumptions that could be used in the calculation in the absence of company-specific data.
- Assessment of the full impact (i.e. costs and benefits) of each option. This step was carried out using bespoke Excel-based models.
- Option comparison and incremental impact calculation.
- Creation of strategic option portfolios.
- Generation of sub-option level results for the Economics of Balancing Supply and Demand (EBSD) model.
- Selection of the preferred strategic option representing the preferred demand management strategy.

The approach is illustrated in the following diagram and described fully in our 'WRMP24 Demand management option appraisal technical supporting document' (Figure 16):

Figure 16 Cost benefit analysis process



5.3 Options considered

Reflecting on the Water Resource Planning Guidance and noting that our demand management measures need to be considered holistically, we have produced a number of variations of our strategic portfolios of options, including complementary elements of leakage, smart metering and water efficiency interventions. These have been based upon an initial assessment of our unconstrained list of potential options (see the 'WRMP24 Demand management option appraisal technical supporting document').

For sensitivity testing we have produced a large number of scenarios (as detailed in our 'WRMP24 Demand management option appraisal technical supporting document'). However, from these we have developed a number of core scenarios in order to evaluate and select our preferred demand management option portfolio.

These key portfolios are characterised as follows;

5.3.1 Base-line (Code 1000)

- No additional leakage interventions beyond 2024/25. The base-line leakage level would initially be 164Ml/d remaining very close to this level by 2049/50, including housing growth associated cspl.
- Smart meter rollout to 2024/25 (approximately 1.1M meters) only. These smart meters would continue to operate through the WRMP24 plan.
- BAU water efficiency measures only.
- Note that the projection includes water efficiency and leakage savings totalling 20Ml/d (reflecting impacts from our WRMP19 plan, from 2021/22 to 2024/25)

5.3.2 Low Demand Management (Extended Low Portfolio - Code 1001)

- Reduction of leakage by 5Ml/d to 157Ml/d by 2029/30 (AMP8) and 20.5Ml/d to 144Ml/d by 2049/50 (AMP12), by a combination of leakage and smart metering strategies.
- Implementation of smart metering over a 3AMP (15 year) program to maximum feasible penetration (95%); 7.1Ml/d saving by 2029/30, 33.3Ml/d by 2049/50 (note includes SM leakage cspl savings)
- Low - program of water efficiency strategies, saving 6.4Ml/d by 2030 and 11.1Ml/d by 2050
- Non-household water efficiency options saving 10Ml/d by 2029/30 and 50Ml/d by 2049/50.
- Total Option savings from base-line:
  - End of AMP8 (2030): 27.98Ml/d
  - End of AMP12 (2050): 106.6Ml/d
- Note that the projection includes water efficiency and leakage savings totalling 20Ml/d (reflecting impacts from our WRMP19 plan, from 2021/22 to 2024/25)

5.3.3 Medium Demand Management (Extended Plus - Code 1002M)

- Reduction of leakage by 10.7Ml/d to 151Ml/d by 2029/30 (AMP8) and 32.9Ml/d to 131Ml/d by 2049/50 (AMP12), by a combination of leakage and smart metering strategies.
- Implementation of smart metering over a 2AMP (10 year) program to maximum feasible penetration (95%); 18.1Ml/d saving by 2029/30, 31.9Ml/d by 2049/50.
- High program of water efficiency strategies, saving 9.4Ml/d by 2029/30 and 14.6Ml/d by 2049/50.
- Non-household water efficiency options saving 10Ml/d by 2029/30 and 50Ml/d by 2049/50.
- Total Option savings from base-line:
  - End of AMP8 (2030): 44.0Ml/d
  - End of AMP12 (2050): 121.5Ml/d
- Note that the projection includes water efficiency and leakage savings totalling 20Ml/d (reflecting impacts from our WRMP19 plan, from 2021/22 to 2024/25)

5.3.4 High Demand Management (Aspirational Portfolio - Code 1003)

- Reduction of leakage by 10.7Ml/d to 151Ml/d by 2029/30 (AMP8) and 45.5Ml/d to 118.5Ml/d by 2049/50 (AMP12), by a combination of leakage and smart metering strategies.
- Implementation of smart metering over a 2AMP (10 year) program to maximum feasible penetration (96%); 18.1Ml/d saving by 2029/30, 31.9Ml/d by 2049/50.
- High 'Aspirational' program of water efficiency strategies, saving 9.4Ml/d by 2029/30 and 14.6Ml/d by 2049/50.
- Non-household water efficiency options saving 10Ml/d by 2029/30 and 50Ml/d by 2049/50.
- Total Option savings from base-line:
  - End of AMP8 (2030): 44Ml/d.
  - End of AMP12 (2050): 134Ml/d.
- Note that the preferred plan also incudes government led interventions savings of 84.35Ml/d by 2049/50.
- Note that the projection includes water efficiency and leakage savings totalling 20Ml/d (reflecting impacts from our WRMP19 plan, from 2021/22 to 2024/25)

After full consideration, we have concluded that the Aspirational Portfolio, best represents our ambitions and aspirations for demand management in the next 25 years, giving the best opportunity to meet our customers needs and external framework requirements.

Our 'Aspirational' option allows us to:

- **innovate and deliver on our further ambitions for our demand management activities,**
- **show our commitment to meeting EA/Defra/National Framework targets for leakage reduction per capita consumption and non-household water efficiency**
- **deliver a strong economic case.**

The other strategic options do not strike the same balance, compared with our preferred 'Aspirational' option. We do not believe that the less ambitious, 'Extended' or 'Extended Plus' options go far enough in delivering the demand management that our customers and stakeholders expect.

Preferred Portfolio (Aspirational Portfolio - Code 1003)

- Reduction of leakage by 10.7Ml/d to 151Ml/d by 2029/30 (AMP8) and 45.5Ml/d to 118.5Ml/d by 2049/50 (AMP12), by a combination of leakage and smart metering strategies.
- Implementation of smart metering over a 2AMP (10 year) program to maximum feasible penetration (96%); 18.1Ml/d saving by 2029/30, 31.9Ml/d by 2049/50.
- High 'Aspirational' program of water efficiency strategies, saving 9.4Ml/d by 2029/30 and 14.6Ml/d by 2049/50.
- Non-household water efficiency options saving 10Ml/d by 2029/30 and 50Ml/d by 2049/50.
- Total Option savings from base-line:
  - End of AMP8 (2030): 44Ml/d.
  - End of AMP12 (2050): 134Ml/d.
- Note that the preferred plan also incudes government led interventions savings of 84.35Ml/d by 2049/50.
- Note that the projection includes water efficiency and leakage savings totalling 20Ml/d (reflecting impacts from our WRMP19 plan, from 2021/22 to 2024/25)

Despite the cost associated with the 'Aspirational' option, especially with regard to leakage, we believe that this option continues the progress we are making with regard to demand management, and also shows our commitment to contributing to the National Framework targets for leakage and PCC (a 50% leakage reduction and 110 l/h/d PCC by 2049/50).

Thus, our preferred option ('Aspirational') has been assessed to 'best meet' our multi-criteria approach to selection, meeting customer need, mitigating growth and meeting all our obligations (Noting our RAG assessment).(Table 2).

Table 2 Comparison of options against selection criteria

Best Value Planning Objective	Critera	Extended Options	Extended Plus	Aspirational
Optimise our available resource	Mitigates near term growth			
	Mitigates long term growth			
	Fulfils regulatory obligations			
Affordable and sustainable over the long term	Reasonable cost			
Delivers long-term environmental improvement	Assists near term environmental destination			
	Assists long term environmental destination			
	Meets SEA requirements			
	Aligns with Net Zero ambition			
Increase the resilience of our water systems	Is deliverable/achievable			
A plan that supports the views of stakeholders and customers	Meets customer expectation			
	Aligns with WRE			

	Unlikely to meet criteria
	May meet criteria
	Will meet criteria

The 'Aspirational' option will form part of our ambitious and deliverable twin track approach, of using demand and supply solutions, to secure future water supplies.

5.4 Best value planning and our preferred portfolio

We believe there is great potential for increasing future demand savings, driven by innovation and investment, building upon the ambitious demand management program currently being implemented in AMP7. Consequently, demand management strategies will play a vital role in ensuring that we meet our planning objectives, both for Anglian Water and for the regional Water Resources East plan.

Both the government and our customers expect us to continue to reduce demand for water resources. Our customers have told us that they prefer options that make best use of available resources and that leakage reduction should be prioritized.

Bearing this in mind, we believe, there is further potential for increasing future demand savings, facilitated by the ongoing roll-out of our smart meter program, assisting customers to engage with their water usage and making them part of the 'water saving' journey.

We have also used the results of our 'Problem Characterization' analysis, following Water Resource Planning Guidance (see our 'WRMP24 Decision making method technical supporting document') , together with the out-comes of customer and stakeholder engagement to assist in developing our specific planning objectives, embodied in our Best Value Planning criteria.

What is a Best Value Plan?

This concept has been introduced for the latest WRMP24, with the aim that the WRE regional plan and WRMP24 should present a best value plan, both in the short term and the long term.

The WRMP24 should ensure a secure supply of wholesome drinking water for customers and protect and enhance the environment.

The best value plan considers and includes other factors alongside economic cost and seeks to achieve an outcome that increases the overall benefit to customers, the wider environment and society overall (See Figure 17).

Figure 17 Best Value planning criteria

Our current achievements in demand management, mean that we must go beyond 'tried and tested' demand management activities. In particular, it should be noted that our standard 'dumb' meter penetration currently stands at a very high level, with 84% of our customers receiving a measured bill, (and 90% having a meter 2022/23) with associated behavioural savings (as customers switch from being unmeasured to measured status) already having been achieved.

We also now have >500K smart meters installed across the Anglian Water region (2022/23), as part of our rollout of 1.1M meters, expected to be installed by 2024/25.

Additionally, our leakage levels are already significantly below our previously assessed Economic Leakage level (of 219.6Ml/d), at 182.61Ml/d (2022/23).

However, our ambition is to build significantly upon our current position.

Further advances in demand management will be achieved through additional technological innovation and sophisticated data analytics, maximizing the impact of our smart meter rollout, and the implementation of 'frontier' initiatives, that are relatively un-tested in a UK context.

5.5 Our preferred portfolio

Our ambitious program will comprise three strongly interlinked strategies, as described (This has been termed our 'Aspirational' Option) (Figure 18):

Figure 18 Our holistic plan

This plan will include smart metering, leakage reduction and behavioural change options as detailed:

5.6 Metering

Our key metering plan will consist of a continuation of our smart metering rollout program, and will complete the replacement of our entire meter stock over 10 years, by 2029/30 (2 AMPs from 2020). We are currently progressing the rollout of our AMP7 program of smart meter installation of 1.1M meters by 2024/25 (We currently have >500K smart meters installed 2022/23). We have also readjusted our installation profiles to account for the AID program (Accelerated Infrastructure Delivery); installing an additional 60K smart meters in AMP7.

The data resulting from 'smart metering' is helping our customers to better understand their water usage and is allowing us to more efficiently communicate messaging regarding water efficiency. It is also helping with our ability to detect household leakage, speed up repairs and understand our network.

We intend to build upon our initial findings, refining our interactions with our customers and enhancing savings over time.

By the end of AMP7 (from our 2021/22 base-line), we now estimate that smart meters, combined with the behavioural change and the improvements in leakage performance that they enable, will result in up to 3.5Ml/d demand savings from behavioural change, 2Ml/d savings from quicker plumbing loss repairs (which impact PCC) and up to 1Ml/d reduction in cspl repairs.

The enhanced additional smart meter program is forecast to enable savings of 18.1Ml/d by 2029/30. By the end of our WRMP24 planning period (2049/50), we estimate smart meters will result in savings of 31.9Ml/d, constituted of:

- 7.7Ml/d of savings from behavioural change,
- 16.6Ml/d savings from quicker plumbing loss repairs, and up to
- 7.7Ml/d reduction from customer supply pipe leaks (cspl) repairs.

From 2024/25 to 2049/50, we estimate that the entire smart meter rollout will save 45.4Ml/d of water due to behaviour change and reduction in plumbing losses and customer supply pipe leakage (cspl).

We also intend to encourage our customers who have a meter, but are not billed upon their usage, to switch to being measured customers. This should result in cost savings for the customer.

As part of our roll-out program, we also intend to install smart meters for the entire non-household customer base, by 2030.

5.7 Water efficiency measures

We forecast that our additional water efficiency activities will result in savings of 9.4Ml/d by 2029/30 (the end of AMP8), and 14.6Ml/d by 2049/50.

New technologies and our interventions will help promote the careful use of water by both our household and non-household (business) customers.

Additional water efficiency programs will include:

- the provision of smart water devices/sensors (shower). Potentially linking sensors (shower sensors) to MyAccount. Linking Smart devices to hubs, developments and communities.

- continuing development of the MyAccount App (and website) to provide easy access to customer data. Personalized engagement on discretionary/seasonal water use - virtual assistants.
- development of gamification and rewards schemes.
- additional community based campaigns -hyper local and seasonal.
- provision of garden advice / garden kits for outdoor usage, with higher levels of engagement on discretionary/seasonal water use.
- a scheme to assist vulnerable customers with internal leaks.
- a leaky loo campaign for traditionally metered customers.
- further development of customer leakage journey to achieve maximum target run-time of 100 days (or below).
- research into 'Smart communities' - link smart systems to other utilities.

Potential demand reduction savings for each of these programs have been quantified, using detailed assumptions and modelling, based upon both internal Anglian Water data and external research.

We also anticipate that government led interventions ('white good' labelling and mandatory standards), will also enable savings of 3.5Ml/d by 2029/30 84Ml/d by 2049/50. This significant impact will be driven by the adoption of water efficient utilities by the whole of the Anglian Water population through natural replacement. The impact of government led interventions is only included in the preferred plan (in line with the Water Resource Planning Guidance).

Now that we are gaining significant insight into customer consumption through smart meters (hourly data), we are conducting significant research into customer behaviour patterns, and segmentation, in order to inform our water efficiency measures and customer communications strategies. As we progress this understanding, it will inform our WRMP24 plan (through AMP8) and WRMP29. We aim to enhance this understanding with our 'Water Demand Reduction Discovery Fund' and Smart Meter Monitoring Framework.

5.8 Leakage

Our target for AMP7 is to reduce leakage by 30Ml/d, from a value of 191Ml/d in 2019/20 (using the AMP7 revised regulatory calculation methodology). We anticipate our AMP7 out-turn to be to 164.2Ml/d by the end of AMP7 in 2024/25. Taking 2017/18, as a base-year, we are now targeting a reduction of 14.0% by 2024/25.

Whilst considering our consultation responses and the National Framework target, we have revised and increased our ambition for leakage reduction for our WRMP24 plan. We originally proposed a conservative 24% reduction in leakage (from the 2017/18 National Framework base-line) based upon an assessment of cost and benefit, but have now revised this to a much more ambitious target of a 38% reduction by 2049/50.

This 38% reduction indicates our commitment to assisting the industry in achieving the National Framework target of a 50% reduction by 2049/50, and represents the maximum reduction in leakage that we consider feasible with current technologies (achieving our minimum leakage level). Note that if the National Framework target is translated into equivalent metrics for leakage per km main and leakage per property our plan absolutely achieves the required values by 2050.

We will, however, argue that although we fully support the National Framework target of a 50% reduction in leakage, this must be seen as a national target and should only be considered at PWC level, once each company's current position has been reviewed.

This reduction in leakage relies upon a significant amount of mains replacement by 2049/50 (>8000km of mains replaced) at a very significant cost (>£4 billion), but we believe that these costs will be mitigated over time as technology advances. However, whilst sequencing this leakage reduction program, we have ensured that the bulk of these costs, impact after AMP8 (2029/30). This will allow us to review costs and benefits as part of the WRMP29 planning program.

Our aim, therefore, is to reduce leakage by an additional 45.5Ml/d by 2049/50 to a final figure of 118Ml/d (base-line leakage will remain relatively static with cspl, associated with additional new build properties, remaining at approximately 164Ml/d).

Leakage currently (2022/23) represents 15.4% of distribution input (DI) (182.6Ml/d leakage / 1178.1Ml/d DI) and will represent 11.0% of DI in 2049/50 (118.5Ml/d leakage / 1072.5Ml/d DI). Note that, we anticipate Distribution Loss leakage to be 89.9Ml/d by 2049/50, representing 8.2% of DI.

We are aiming to reduce leakage by targeting losses in our distribution system (through mains replacement), losses due to customer supply pipe leakage (identified using smart meters), leakage from shared supply properties (identified using smart meters) and internal plumbing losses (which is leakage, but impacts PCC).

5.9 A plan that best meets customer expectations

There is clear support from customers for us to continue with our ambitious demand management activities, with leakage reduction remaining a priority for our customers. However, customers will not support demand management at any cost, especially where there are cheaper supply-side alternatives. Customers also value options that are reliable.

Our preferred plan best meets customer expectations of continued improvements in reliable water efficiency, shows our level of commitment to achieving our targets, whilst being mindful of the costs associated with these significant levels of demand management.

5.10 Striking the right balance between affordability and the environment

Anglian Water has a key role to play in protecting the natural environment. It is a priority for us to act as stewards of our local eco-systems and to be leaders in environmental protection. As discussed, through our Best Value Planning Framework, in collaboration with our customers and in partnership with our WRE colleagues, we have sought to develop a WRMP24 plan that successfully achieves these aims of maintaining high quality water supplies, with environmental enhancement and biodiversity net-gain.

Demand management will be essential in mitigating short-term environmental risks and longer term population growth. Increasing our current abstractions to meet growth related requirements would represent a deterioration risk.

By choosing our preferred 'Aspirational' plan, we are using demand management to more than offset any growth in demand, mitigating deterioration risks and assisting with near term supply/demand issues. We believe that despite the significant long term costs associated with the 'Aspirational' option, it strikes the right balance between protecting the environment, maintaining a sustainable and resilient future, and ensuring affordability for our customers.

5.11 An ambitious, but achievable plan

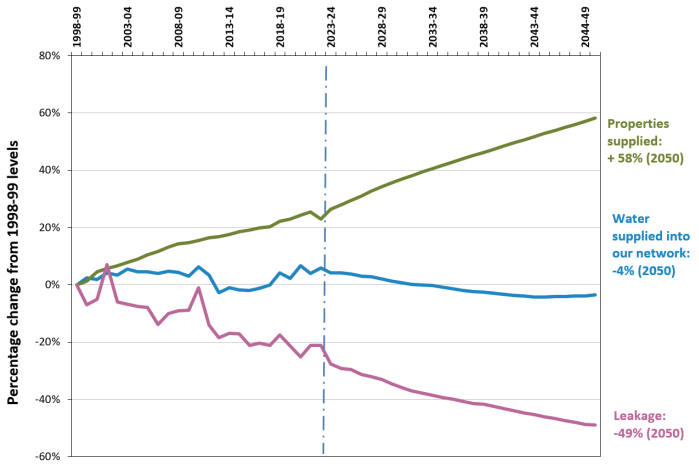
The results of our analysis, show that we should be aiming to complete our smart meter program, significantly reduce leakage and further enhance our demand management activities to secure future water supplies.

Our 'Aspirational' portfolio represents a very ambitious extension to our existing demand management activities, completing our smart meter roll-out and incorporating innovative initiatives to deliver further water savings. It will facilitate further, very significant, leakage reductions, maintaining our frontier leakage position in the UK, and will build upon our smart meter program to unlock a host of other activities to deliver water savings that can offset projected demand growth.

Our historic achievements can be seen as demand has remained relatively consistent since 1998 (despite a >20% increase on properties and population to date). The scale of our ambition is illustrated below, as we intend to reduce demand from current levels, despite an increase in population of 911K (from 2024/25 to 2049/50).

This graph shows the percentage change in the number of properties supplied, the water we put into our network and leakage since 1998, based upon our WRMP24 projections (Figure 19).

Figure 19 Demand management: past achievements and future ambition

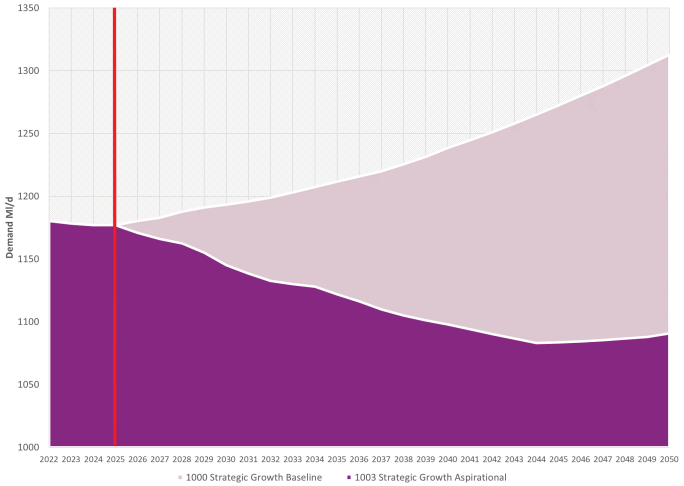


In terms of actual demand, without demand management, consumption (Dry Year Annual Average - DYAA) is forecast to rise by 135.6Ml/d, from 1177.1Ml/d (2024/25) to 1312.7Ml/d (2049/50), noting that the base-line includes the savings from our current smart meter roll-out.

With our preferred 'Aspirational' portfolio, this potential growth in demand is significantly mitigated, with consumption in 2049/50 set to be 1090.9Ml/d a decrease of 86.2Ml/d from the initial 2024/25 value (1177.1Ml/d). Note that this preferred plan includes the impacts from Government led interventions (84.3Ml/d reduction) in the preferred final plan.

The base-line and final (preferred) plan (DYAA) demand forecast is shown below (Figure 20):

Figure 20 Demand - base-line and preferred plan 2020-2050



Bearing in mind, the National Framework Target for per capita consumption (PCC) of 110 l/h/d by 2049/50, the impact of smart metering and our demand management strategy on per capita consumption (PCC) is shown in the figure below (Figure 21). The 2021/22 base-year PCC is recorded as 135.99 l/h/d, having reached a peak of 146.7 l/h/d for 2020/21 due to the impact of the Covid19 pandemic and lockdown. However, we expect the implementation of our smart meter program and water efficiency measures to significantly influence PCC over AMP7, leading to a value of 131.8 l/h/d by 2024/25.

By the end of the WRMP24 planning period (2049/50), we expect that our average PCC (Normal Year Annual Average - NYAA) will be 107.6 l/h/d, a reduction of 18% (24.2 l/h/d) compared with 2024/25 value of 131.8 l/h/d. For the Dry Year Annual Average (DYAA) values, we expect that our average PCC will be 109.74 l/h/d, a reduction of 18% (24 l/h/d) compared with 2024/25 value of 134.4 l/h/d. This DYAA value achieves the National Framework target for PCC, driven by our smart meter and water efficiency programs, in association with impacts form government led interventions.

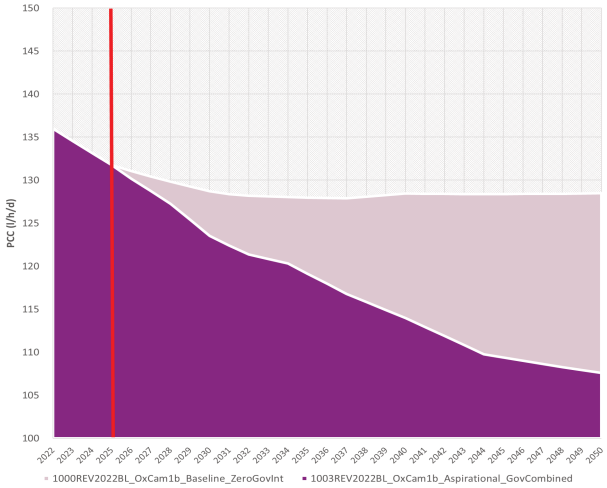
The final plan includes an allowance for PCC reduction due to Government led interventions ('White good' labelling and mandatory standards), which are expected to make a very significant contribution to decreasing demand. For the purposes of the WRMP24 we have chosen to adopt a scenario based upon the Artesia/WUK/Defra research report. This will accounts for a 14 /h/d reduction in PCC by 2049/50 (a 84Ml/d reduction in household consumption).

This outcome:

- aligns our WRMP24 plan with national expectations,
- confirms our ambition with regard to water efficiency, and
- is in accordance with our WRE partners.

Base-line and final (preferred) plan per capita consumption (PCC) can be shown (Figure 21):

Figure 21 Per capita consumption (NYAA) base-line and preferred plan



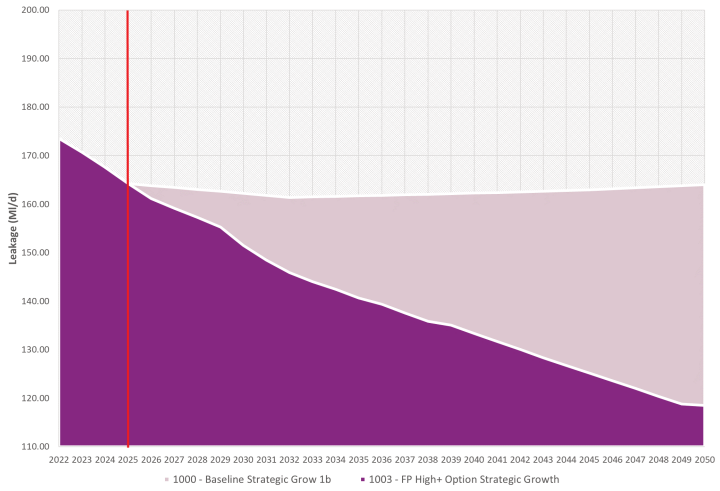
We will also build upon our current ambitious target for leakage in AMP7 (a 14% reduction from 2017/18). Leakage is expected to reduce from our 2017/18 value of 191Ml/d to 164.3Ml/d by 2024/25.

Whilst considering our consultation responses and the National Framework target, we have revised and increased our ambition for leakage reduction for our WRMP24 plan. We originally proposed a conservative 24% reduction in leakage (from the 2017/18 National Framework) based upon an assessment of cost and benefit, but after review, have now revised this to a much more ambitious target of a 38% reduction by 2049/50 This 38% reduction indicates our commitment to assisting the industry in achieving the National Framework target of a 50% reduction by 2049/50, and represents the maximum reduction in leakage that we consider feasible with current technologies (achieving our minimum leakage level).

We will, however, argue that although we fully support the National Framework Target of a 50% reduction in leakage, this must be seen as a national target and should only be considered at PWC level, once each company's current position has been reviewed. Leakage currently (2022/23) represents 15.4% of distribution input (DI) (182.6Ml/d leakage / 1178.1Ml/d DI) and will represent 11.0% of DI in 2049/50 (118.5Ml/d leakage / 1072.5Ml/d DI) with a reduction of 45.5Ml/d by 2049/50.

Base-line and final plan leakage trajectories can be shown (Figure 22):

Figure 22 Leakage for the WRMP24 baseline and preferred plan



32 Water UK (Project reference: 2346, Report number: AR12862019-08-15), '*Pathways to long-term PCC reduction*',

Our ambitious demand management strategy is made up of many activities within our control. However, we believe that the support of the government and other stakeholders will be required for the UK water sector to deliver further significant demand management savings.

Through our engagement with the government and the National Infrastructure Commission we hope to support the development of the following measures:

- For new homes, incentives for water efficient buildings could be supported by clear messaging from the government as well as local authorities, requiring increased water efficiency standards. These standards should facilitate significant reductions in PCC, below the current 125 l/h/d and 110 l/h/d current design standards and regulations, with the potential to introduce requirements for grey/green water re-use systems.
- The introduction of a standardised water efficiency labelling system covering bathroom, kitchen and garden products should be on a par with labelling of product energy efficiency ratings. As mentioned, we have used the findings of the WUK/Artesia project [32] to include a reduction in consumption due to the introduction of white good/water utility labelling from 2024/25. It is expected that, as products are replaced over the 25 year planning period, these savings will accrue (currently we have included Artesia's low estimate of 14 l/h/d by 2049/50).
- New regulations have a part to play; in particular Water Fittings Regulations could further prevent waste, and higher bills for individuals that arise, from leaking toilets.

5.12 Overall costs and benefits

The cost of our enhancement for our demand management strategy will be £171million (totex) in AMP8 (2024/25-2029/30) (Excluding financing and including opex savings) with overall savings of 44Ml/d (excluding 3.5Ml/d for government led interventions).

Costs and benefits have been reassessed for smart metering for the WRMP24, as we have now re-assessed smart meter savings for household continuous flow reduction (cspl and plumbing loss). We have also readjusted our installation profiles to account for the AID program (Accelerated Infrastructure Delivery); installing an additional 60K smart meters in AMP7. All smart meter savings associated with the AMP7 smart meter program are now included in our base-line forecast.

Costs and benefits can be shown for the 25 year period, as below (Table 3). Note that this table shows near term costs and benefits for AMP8 (2024/25 to 2029/30) and the full cumulative WRMP24 costs and benefits for 2024/25 to 2049/50.

Table 3 Our preferred plan - Costs and benefits

		AMP8 - 2030				AMP12 -2050		
	Water Savings Final Year AMP8	Total Cost (Ex. Finance - Inc. Opex Savings)	Total Cost (Ex. Finance - Ex. Opex Savings)	Cost per Mld (AMP8)	Water Savings Final Year AMP12	Total Cost (Ex. Finance - Inc. Opex Savings)	Total Cost (Ex. Finance - Ex. Opex Savings)	Cost per Mld (AMP12)
Smart Metering (2AMP rollout)	18.08 Ml/d	£115.68m	£117.29m	£6.40m per Ml/d	31.91 Ml/d	£223.29m	£243.23	£7.00m per Ml/d
Water Efficiency	9.37 Ml/d without gov. interventions 12.89Ml/d with gov. interventions	£15.81m	£16.82m	£1.67m per Ml/d	14.61 Ml/d without gov. interventions 98.96 Ml/d with gov. interventions	£63.75m	£73.58m	£4.36m per Ml/d
Leakage	6.53 Ml/d without smart meter benefits (10.57 Ml/d with 2AMP rollout)	£35.73m	£36.42m	£5.58m per Ml/d	37.23 Ml/d without smart meter benefits (44.92 Ml/d with smart meter benefits)	£4364.82m	£4370.70m	£117.39m per Ml/d
Non-HH Water Efficiency	10.08 Ml/d	£3.87m	£4.83m	£0.38m per Ml/d	50.39Ml/d	£2.61m	£24.14m	£0.05m per Ml/d
Total savings for the preferred portfolio (ex. Gov. intervention)	**44.06Ml/d**	**£171.09m**	-	**£3.88m per Ml/d**	**134.14 Ml/d**	**£4654.47m**	-	**£34.69m per Ml/d**
PCC Out-turn	123.54 l/h/d AMP8 (NYAA)				107.59 l/h/d AMP12 (NYAA)			

Significant costs for our smart meter program are now considered as part of our base-line operation. Base-line costs for maintaining leakage levels at a given level are also rising as we reach lower and lower values.

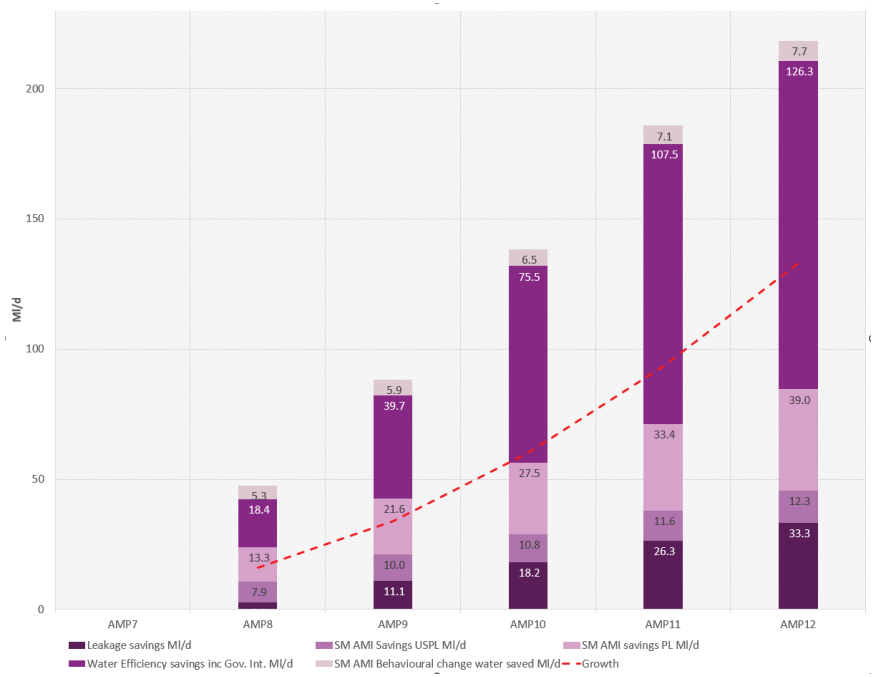
As discussed, we have reviewed the level of leakage reduction to be included in the WRMP24, and our position with respect to the achievement of the National Framework target of 50% by 2049/50 (from the 2017/18 base-line year). We have, consequently increased our ambition for leakage so that we achieve a reduction of 38% (rather than the 24% originally contemplated).

We understand that our ambition to reduce our leakage level by the maximum assessed feasible volume in the Anglian Water region (a 38% reduction) implies a very significant cost (associated with large scale mains replacement). This reduction in leakage relies upon a significant amount of mains replacement by 2049/50 (>8000km of mains replaced) at a very significant cost (>£4 billion), but we believe that these costs will be mitigated over time as technology advances. However, whilst sequencing this leakage reduction program, we have ensured that the bulk of these costs, impact after AMP8 (2029/30). This will allow us to review costs and benefits as part of the WRMP29 planning program.

We believe that, as part of our WRMP24 program, we should indicate the level of our ambition to contribute to the national position and that these costs will be mitigated by technological advances which will be reflected in WRMP29 and beyond.

As can be seen, in totality, for our preferred option package, the demand management program should maximise the potential savings that might be achievable, as we build upon our smart meter program and effectively mitigate the growth impact from demand. The water efficiency values shown also include savings associated with government led interventions which will be a significant factor by 2049/50 (84Ml/d) (Figure 23).

Figure 23 Aspirational DMO option savings (Not including Gov. led interventions)



Water efficiency option savings can be shown, as described below:

- 'Leakage savings' - associated with cspl reduction, mains replacement, shared supply cspl reduction.
- 'SM AMI savings PL' - plumbing loss reduction associated with smart meters.
- 'Metering water saved' - Smart meter behavioural change savings.
- 'SM AMI Savings USPL' - customer/underground supply pipe leakage reduction associated with smart meters.
- 'Water Efficiency savings inc. Gov Int' - water efficiency savings for both households and non-households, including government led intervention savings.
- 'Growth' - demand growth associated with additional population and non-HH growth in the preferred plan

Our preferred plan will focus on the following activities.

- **Smart meter roll-out (by 2030)**
- **Leakage reduction (38% by 2050)**
- **Our Water Efficiency program**
- **Non-household options (in partnership with Retailers) to encourage water efficiency and reduce leakage**

6 Smart metering

Smart metering, enhancing customer communication and the drive for behavioural change

The smart meter technological revolution is now progressing across the Anglian Water region, as we install 1.1M smart meters by 2024/25 (over AMP7). We currently have installed over 500K household smart meters and 16K non-household smart meters (2022/23).

Under our preferred smart metering option for the WRMP24, we intend to complete our installation of smart meters across our region by 2029/30 (a 10 year roll-out), reaching the limit of feasible meter penetration (94.8%) by 2049/50. We have also readjusted our installation profiles to account for the AID program (Accelerated Infrastructure Delivery); installing an additional 60K smart meters in AMP7. All smart meter savings associated with the AMP7 smart meter program are now included in our base-line forecast.

Smart metering is fundamental in supporting our water efficiency and behavioural change activities, through the provision of real time consumption data for both our customers and ourselves. We intend to build on our current progress in developing our water efficiency communications strategy, as part of WRMP24. Data is being provided on a daily basis to customers through a dedicated website and 'customer portal' and we intend to develop these communication channels further over the WRMP24 planning period.

The central imperative, which drives our 'smart meter' roll-out, is the provision of information for our customers, so that they can understand their consumption and so that we can help encourage behavioural change. Changing attitudes and behaviours will reinforce current water savings, as customers become metered and measured and unlock the potential for additional water efficiency measures, in a mutually reinforcing way.

Smart metering is also enabling significant benefits for leakage reduction through the more efficient and timely identification of both 'plumbing loss' and customer supply side leaks. The identification of leakage will inform our home visits, adding significant value to our water efficiency activities. Consequently, the systems that we are investing in are robust and, critically, must be able to supply accurate and reliable data collection over the long term. This requirement has been foremost in our thinking regarding our original smart meter trials and in the selection of the current system being installed across the region.

By 2029/30 (the end of AMP8), we estimate that smart meters, combined with behavioural change and the improvements in leakage performance that they enable, will result in 5.3Ml/d from behavioural change demand savings, 8.8Ml/d savings from plumbing loss reductions and up to a 4.0Ml/d from reductions in cspl (a total of 18.1Ml/d). This excludes AMP7 savings from smart meters, which are now considered as part of the base-line forecast.

By 2049/50, we estimate smart meters will result in 7.7Ml/d from behavioural change demand savings, 16.6Ml/d savings from plumbing loss reductions and up to 7.7Ml/d from reductions in cspl (a total of 31.9Ml/d). This excludes AMP7 savings from smart meters, which are now considered as part of the base-line forecast.

Overall it is expected that smart meters will reduce cspl by 70% as we achieve full roll-out.

This preferred option will give the greatest level of benefit to our customers, allowing us to develop individually tailored customer services, fully realising the potential for water efficiency in our region.

6.1 Current position and overview

Anglian Water currently has one of the highest rates of meter penetration in the UK. In the current year 2022/23, we have over 90% of household properties with installed meters (visual read and smart AMI) and 84% of customers paying measured charges. This differential is related to our current policy of enhanced metering (installing meters where feasible whilst encouraging customers to switch to being measured) and to our current policy of not switching customers to measured charges on a compulsory basis, even when we have installed a meter. As such, if customers do not want to switch to measured charges we wait until there is a change in occupancy, or request to opt in, before changing the premises to measured charging.

We do, however, believe that metering is the fairest way to charge for water, because in that instance customers only pay for what they use. Customers who are metered and billed on their measured usage typically use less water than customers who pay an unmeasured estimated charge (this saving has been determined to be approximately 15%). We have consistently sought to increase the number of customers who are metered and billed on their measured usage, without a compulsory metering program. Generally our customers agree that it is most fair to pay for what is used, but there are still concerns around making metering compulsory.

We currently still have 75% of our installed meters which are 'visual read' (that is they do not 'speak' or provide data remotely), so they have to be read manually (25% of meters are now smart, 2022/23). Manual reading requires significant operational input and staff, only allowing measurements to be collected over long periods (6 monthly). Consequently, only infrequent customer usage data is available. These delays in the gathering of data have led to low levels of engagement and have severely limited the potential for relaying price signals to customers. (i.e. indicating increased water usage and, therefore, increased cost). Additionally, the detection of customer supply pipe leakage and internal plumbing losses has only been possible on an infrequent basis (leading to long leak run-times). Hourly data also gives us an opportunity to identify very low level leakage, which would otherwise be undetectable, as it would be indistinguishable from consumption.

However, our key metering policy for AMP7 is the implementation of our smart metering program. We intend to install 1.1M smart meters across the Anglian Water region by 2024/25 and have already installed over 500K smart meters (2022/23) out of our total property base (25% of our meters are now AMI smart).

We have also readjusted our installation profiles to account for the AID program (Accelerated Infrastructure Delivery); installing an additional 60K smart meters in AMP7. Note that for the WRMP24 assessment, all smart meter savings associated with the AMP7 smart meter program are now included in our base-line forecast. We estimate that this accelerated installation will save an additional 0.9Ml/d a day (for these 60K properties; equivalent to 0.3Ml/d for behaviour change, 0.4Mld for plumbing loss reduction and 0.2Ml/d for cspl). These savings have been included in our base-line forecast and are aligned with our revised assessments for smart meter savings implying an overall difference of >0.1l/p/d in PCC by 2024/25.

We also expect that by 2024/25 approximately 50% of non-household properties will be smart metered or have loggers installed and by 2029/30 this will be increased to 138K (noting that 99.5% of non-household properties are currently metered or logged).

The key strategy for our preferred WRMP24 plan is to complete the rollout of smart meters to all our customers by 2029/30 (a 10 year program). Analysis of our wider smart meter program and smart meter long term (Newmarket and Norwich) trial data suggests that smart meters will save approximately 2% with respect to behavioural change, 4% plumbing loss reduction along with reductions in cspl (equivalent to 2.5% of PCC) by the end of the plan period. Additionally, in parallel we will install smart meters for all non-household properties in the Anglian Water region.

Whilst developing our smart meter strategy, we have embedded data security into our systems and understand our obligations under the GDPR regulations. We understand the sensitivity of this data and adhere to internal protocols which govern exactly who is allowed to access the data and for what purpose.

Understanding that we have already achieved significant demand savings through our extensive 'visual read' metering program, further reductions in water usage and behavioural change require us to consider new and innovative approaches, based upon our smart meter program and communications technologies. It must also be noted that, although we have historically seen savings of the order of 15%, as customers switch from being unmeasured to measured, these savings might diminish, as we move forward with this diminishing cohort.

6.2 Data, smart technologies and the future

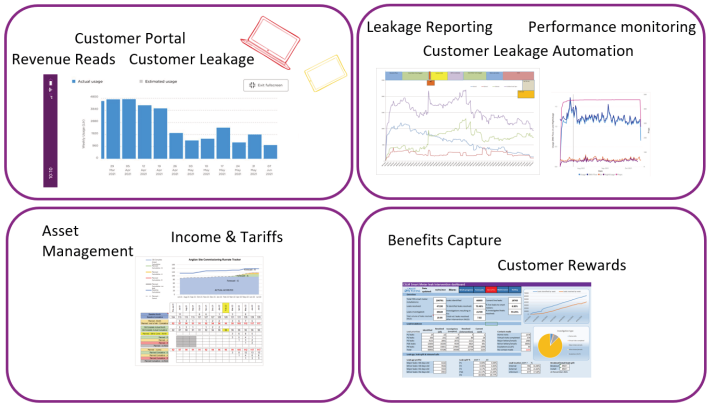
'Smart' interconnected technologies and the remote collection and transmission of information are a rapidly developing area.

We, at Anglian Water, are fully committed to upgrading our assets with smart technologies to capture data, improve our understanding of our customer consumption, our business and improve the productivity of our infrastructure.

The central imperative, which has driven our 'smart meter' option, is the acquisition of data. We understand how crucial data is as an 'enabler', building towards a new relationship with the customer, in which we can assist them to make informed choices regarding their behaviour and their water consumption. The collection of real time granular daily and hourly household consumption data is enabling us to build a much more dynamic relationship with our customers and radically changing how we might influence behaviour.

We are currently developing our analytics and communications systems in order to efficiently communicate with our customers and intend to develop these processes in AMP8 and beyond, as we gain further understanding (Figure 24).

Figure 24 Data systems associated with smart metering



Additionally, the systems that we invest in must be robust and, critically, must be able to supply very accurate and reliable granular data over the long term. This requirement has been foremost in our current thinking regarding the selection of systems which are able to collect and transmit this data, given the conditions that pertain to where and how data can be collected.

Thus, our preferred smart metering option will continue to be AMI meters ('Automatic Metering Infrastructure', monitored through a fixed network), which provide detailed usage data to our customers and for ourselves.

This abundance of data is the most important aspect of the the new smart metering world.

6.3 The preferred technological solution

The current development of smart meters has been primarily driven by their rollout in the energy (gas and electricity) sector. While the energy smart meter rollout has been informative, for the water industry, differences in the characteristics between water and energy metering mean that careful consideration is needed to determine the optimal solution.

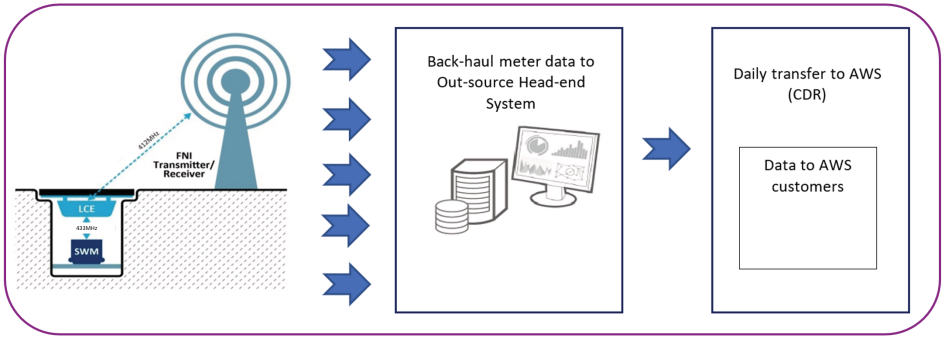
- Particular challenges for water smart metering include the potential location of the meter, in that water meters are in general placed outside of the home without a power source. Thus external meters require a power source, and the location may impede the transmission of data.

Our current (AMP7) solution involves smart meters and smart point transmitters. In this system, data is passed from the 'smart meter' to a 'smart point' on the under-surface of the meter box, which then transmits this via a radio mast network (Figure 25). This is necessary as many external meters can be located at depth, where signals would be lost.

Figure 25 Smart meter technologies - trialling

This technology (as tested in our trials and now under deployment) allows hourly readings from the customer meter. Under the current system, the data is being transmitted every 4 hours, (transmitting the last 12 reads each time). This means that we have several opportunities to capture each hourly read. These multiple reads (and data redundancy) are key to ensuring data accuracy and consistency, as the data is processed and analysed. Data is then sent to our systems twice a day. Currently we receive the previous day's data, (e.g. Today's data will be visible to us from midday tomorrow) however, planned system improvement should facilitate as near 'real time' data as is feasible (Figure 26).

Figure 26 AMP7 Data transmission from the customer to Anglian Water



With regard to this data acquisition process, we are currently using a managed service from a proven supplier, as procured for the AMP7 rollout, for the WRMP/PR24 plan. Note that the key outcome of this is the data that we receive, not necessarily the final technical solution we use.

The network system is currently operated as a managed network (as in the Newmarket trial), in order to, minimize risks in terms of the quality of data and also, minimize the potential scale and disruption of the installation of the network systems required. This means that the network operator is responsible for all issues with the network (planning, installation, maintenance) and data transmission (quality and timing). These procurement arrangements are under constant review on the basis of costs and benefits.

Meter readings are collected by the fixed network and transmitted daily to the cloud. Customers are currently provided with information on their consumption through a web portal. We are working on integrating the portal with customer billing information.

6.4 Our Smart Meter trials

To inform our decision making processes, we have conducted a number of trials using smart meters. This has allowed us to investigate types of technologies, installation issues, methods of data collection, data integrity and also new methods of communicating with our customers. These trials have been designed to inform our future business plans and help us identify an innovative, ambitious and achievable metering strategy.

The trials now give a long term view of smart meter impacts, as they have been running for 5 years, giving us a wealth of data for analysis.

These trial areas are now being complemented by the full roll out of smart meters to their respective Planning Zone (PZ) and Water Resource Zone (WRZ) areas.

- Colchester - Historically we trialled roughly 21,000 radio meters which have been installed and targeted by a ‘mobile’ network of passive readers fitted to council refuse lorries, with data collected weekly. This Automatic Meter Read (AMR) technology has been discounted for future installation as the weekly drive by data does not provide the near 'real-time' information required.
- Newmarket - In this area around 6,000 ‘Advanced Meter Infrastructure’ (AMI) meters have been installed in 4 DMA (District Metering Areas).
- Norwich - This is a larger scale version of the Newmarket trial with a rollout of 12,000 AMI smart meters. This commenced in October 2017 and started to yield data from February 2018.

The Newmarket trial formed part of our wider ‘Innovation Shop Window’ trials taking place in Newmarket. Data has been collected from January 2017, which has allowed us to analyse customer data from the calendar years of 2016 to 2021 and make informed initial comparisons.

As the full roll-out has progressed we have now enhanced this analysis, superseding some of these initial findings, with findings from the wider cohort. These findings will be continuously reviewed as part of the "smart meter monitoring framework', currently in development.

These trials have been vital in informing a metering strategy that is ambitious, engages customers and is cost effective.

6.5 Smart meter installation rollout

Under our preferred smart metering option, we intend to continue our smart meter installation across our region (monitored through a fixed network), reaching the limit of feasible meter penetration by 2029/30 (the end of AMP8), in order to provide detailed granular daily usage data to our customers (and for ourselves). This data is then provided daily to customers through a dedicated website or ‘customer portal’.

This preferred option will give the greatest level of benefit to our customers and will involve a major installation and meter replacement program, for all our current ‘visual read’ meter stock (approx. 2 million meters) with new ‘smart meters’ over a 10 year period. This program will build upon the 1.1 million smart meters that we are currently installing as part of WRMP19 by 2024/25. Currently in 2022/23, we have installed over 500K smart meters across the region. We have also re-adjusted our installation profiles to account for the AID program (Accelerated Infrastructure

Delivery); installing an additional 60K smart meters in AMP7. All smart meter savings associated with the AMP7 smart meter program are now included in our base-line forecast.

We also intend to install smart meters for the >100K non-household properties in the Anglian Water region. In partnership with the Retail sector we will utilize smart meter data to assist non-household customers to identify leakage and to facilitate water efficiency.

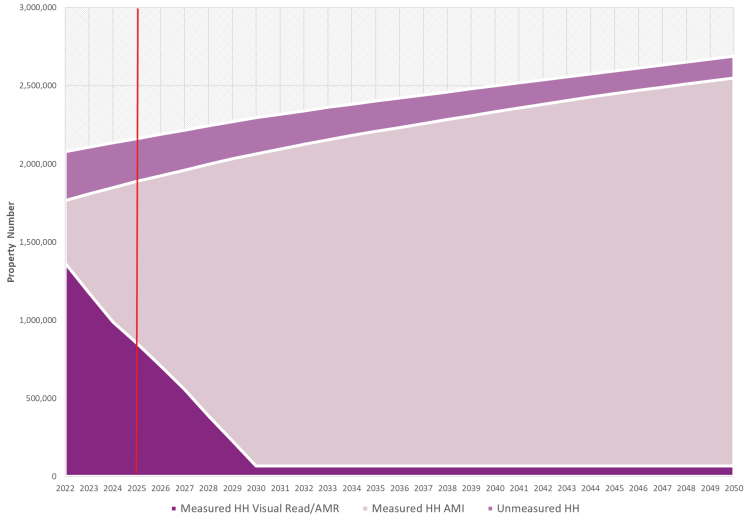
Additionally, for WRMP24, we have included the installation of meters in new developments (currently projected to be approximately 132K new properties from 2024/25-2029/30). By 2029/30, we are currently projected to have 2.295M properties in the Anglian Water region.

We have noted that the incidence of 'New appointments and variations' (NAVs) where alternate companies are appointed to provide a water and/or sewerage service to new development customers are increasing. A new appointment is made when a limited company is appointed by Ofwat to provide water and/or sewerage services for a specific geographic area. A new appointee has the same duties and responsibilities as the previous statutory water company. These companies install their own metering systems for their customers independent of our smart meter installation program, and as such might not achieve the savings we would expect. Despite the fact that these customers would not fall directly into our domain, we would still need to supply water as the regional wholesaler, which would impact our overall supply demand balance.

We are closely monitoring the incidence of these NAV applications and are in discussion regarding how smart metering benefits might be provided to these customers. (Note that for business customers we are installing smart meters despite these not being our customers, being served by Water Retailers).

Our preferred smart meter roll-out plan can be visualized (Figure 27):

Figure 27 Smart meter rollout trajectory for the preferred plan

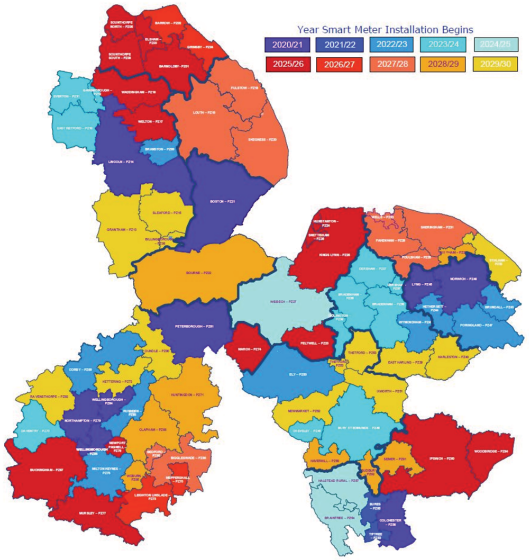


The rollout has been devised (at the planning zone level) to reflect a number of operational and risk based factors including;

- operational considerations (staffing),
- current meter penetration and population,
- expected growth and
- Supply Demand Balance Index issues (SDBI).

Additionally, the roll-out has been devised so that the network and meter installations will be completed area by area (Planning Zone (PZ) and Resource Zone (WRZ)) in order to prevent the potential for stranded assets as the installation program proceeds (Figure 28).

Figure 28 10 year - 2AMP - smart meter rollout



This will mean that:

- Benefits achieved in the near term by 2029/30 will greatly help our supply-demand balance (18Ml/d in addition to the AMP7 savings) and align with our leakage aims.
- All properties will be metered where feasible, and we will encourage customers to switch to measured charging.
- Meters will be rapidly 'switched on' as they are installed (with meter installation and network mast installation being carried out in unison), meaning that benefits can rapidly be realized.
- Areas will be completed with similar technologies, such that, as technologies improve they will not be randomly distributed across the region, so as not to leave stranded assets.
- WRZs will be completed in sequence, targeting higher risk areas as a priority.
- The installation roll-out will be distributed evenly across the region, whilst maximizing the speed at which benefits can be passed to our customers.
- It will allow targeted customer engagement, area by area.

Obsolescence and technological change have been considered, in that the geographical roll-out of contiguous areas will allow us to efficiently incorporate future technology improvements. Future changes in communication technology or in the smart meter itself will be able to be incorporated into the planned roll-out area by area, as it is progressed.

Each area network will be commissioned prior to the installation of the smart meters in order to enable our customers to instantly access their consumption data post installation.

The geographically based roll-out will allow us to actively promote the smart meter program locally, tying in local community water saving initiatives and benefits.

6.6 Determining realistic values for smart meter savings

We have been keen to ensure that potential demand savings, that might be realized by the introduction of smart meters, are achievable and realistically reflected in the WRMP24 plan. We have, therefore, been keen to review our original assumptions from WRMP19, and in the draft WRMP24, on the basis of longer term analysis.

For our WRMP24, we have, therefore, conducted detailed, independently verified, analysis of household data from our full AMP7 smart meter roll-out and from the original Newmarket and Norwich trial data. This has included:

- data from the full rollout of smart meters across the Anglian Water region (a cohort of approximately 150K smart metered properties with more than a full year of continuous data has been analysed, from the current installed base of >500K smart meters (2022/23)).
- along with the Newmarket and Norwich trial data (with a duration of more than 4 years) originally used for the draft WRMP24 plan.

These datasets have allowed us to observe what might be termed a 'new normal' for household consumption and leakage. This analysis has allowed the determination of values for cumulative and year on year changes in ADCs (Average Daily Consumption per property) and continuous flow data; comparing values from 2017 to 2022. Whilst pursuing our analysis we have been mindful of the current volatility in household consumption due to the impacts of the Covid19 pandemic and the more recent rises in energy costs and their impacts on water usage (the 'cost of living crisis').

6.7 Plumbing losses and customer supply pipe leakage

Plumbing loss and customer supply pipe leakage

Key to the detection of plumbing losses and customer supply pipe leakage, is continuous flow data from the hourly reads provided by smart meters. Thus, the availability of continuous flow' information allows the identification of flow when customer usage should be at a minimum or zero (night-flows),which typically indicates leaks in the system. Identification of these flows will enable any associated leaks to be speedily repaired, as these typically go unnoticed. Repair of the leaks also results in lower energy and treatment costs.

Initial analysis has been conducted to review leaks detected and repaired after smart meters have been installed.

Long term data has been required for our analysis, in order to:

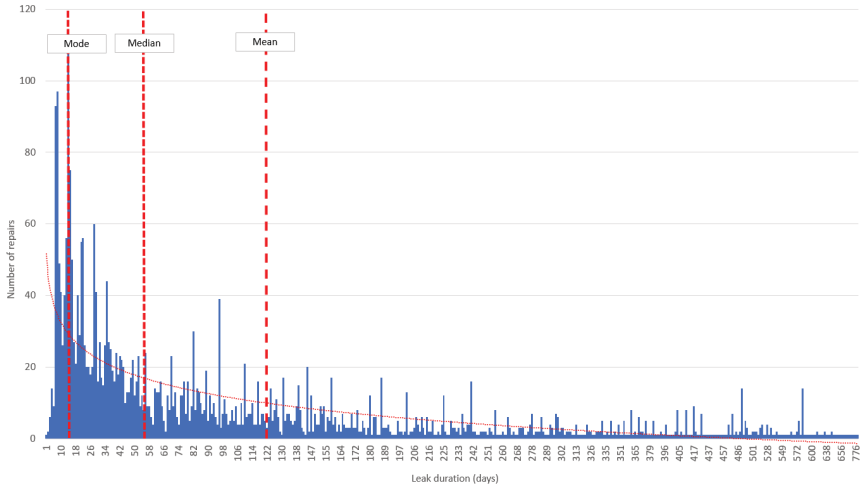
- understand initial leakage levels (associated with 'visual read meters') as smart meters 'discover' pre-existing leaks in properties (the pre-smart 'normal').
- break-out rates, as smart meters identify new leaks (and the new smart meter 'normal').

Research, based upon the long term Newmarket and Norwich data, has indicated that currently, even with smart meters, average leakage run-time duration is greater than 100 days. This number is driven by our customers who are responsible for fixing their own leaks, however, our policy is to work with customers to accelerate this process dramatically.

Although this appears to be a relatively high number, considering that smart meter customers should be contacted within three days, it must be noted that this average is skewed by a number of very long running leaks (with the vast bulk of leaks being fixed within 28 days). This figure has been calculated using the total days of leakage run-time divided by the numbers of leaks (so that leaks with run-times of 600 or 700 days disproportionately affect the overall number). Note that the maximum number of leak repairs occur between the 7 and 14 day period, such that the median run-time is 56 days, with the mode value of 14 days.

However, it is well below the estimated 210 days run-time for conventional 'visual read' meters. The distribution of leaks and run-times can be seen below (Figure 29).

Figure 29 Newmarket and Norwich smart meter leak duration



This data has been used in order to determine the current and future 'normal' for cspl (leakage), 'plumbing loss' (PCC) and behavioural change savings.

Leaks are assessed by their relative size, P1 to P4, as below (Table 4) and this determines the nature of our intervention and communication with our customers. As part of our smart meter program, we are developing new and innovative ways to contact and communicate with our customers to assist them with finding and fixing their leaks and save money.

Smart meter data is now giving much greater insights into household continuous flow, indicating that 11% of customer properties have a continuous flow (leak) discovered upon the installation of a smart meter, and we experience a 4% leakage break-out rate.

Table 4 Leak Sizes and interventions

Leak split (priority)	Volumes (litres/hr)	AWS action
P1	>1500	Sent to CLST -CLST is the customer leakage support team who work with the customer to ensure they are going to repair the leak - immediate action
P2	500-1500	Customer virtual visit leak investigation
P3	40-500	Customer virtual visit leak investigation
P3A	8-40	Major leak letter informing customer of leak details and required actions (customers can request a visit)
P4	<8	Minor leak letter informing customer of leak

As well as modelling the current situation with regard to smart meter leakage savings, options have been considered which should lower the average leak duration below the current >100 day period, and, therefore, increase savings.

Our original draft WRMP24 understanding of smart metering (based upon our trial data) suggested that potential future targets would yield savings as below (Table 5):

Table 5 2025 Potential run-times and savings for alternate scenarios

Scenario	HH SM Properties @ 2025 - AMP7	Target max runtime (Days)	Average runtime (Days)	CSPL saving - AMP7 (Ml/d)	PL saving - AMP7 (Ml/d)	Total saving from base-line - AMP7 (Ml/d)
Baseline (Visual Read)	1,100,000		210**	N/A	N/A	N/A
Current smart metering	1,100,000	(795*)	112	7.4	13.3	20.7
Runtime=100 days	1,100,000	100	59	8.8	17.9	26.7
Runtime=80 days	1,100,000	80	51	9.0	18.5	27.5
Runtime=60 days	1,100,000	60	42	9.2	19.2	28.4
Runtime=40 days	1,100,000	40	31	9.5	20.1	29.5

- *"If the active leakage control policy is to carry out leak detection surveys across the whole system on an annual basis, then some leaks will be up to one year old, having just occurred after the last survey, whilst some will be no more than a few days old. The average duration of an unreported burst will be half of the interval of the survey". We therefore assumed here that for meters read once per year the average leak detection time is six months i.e. 180 days.*
- **Note that analysis from Newmarket/Norwich indicates that the average leak run time is >100 days and that the maximum run-time in the dataset was 795 days.This figure has been calculated using the total days of leakage run-time*

divided by the numbers of leaks (so that leaks with run-times of 600 or 700 days disproportionately affect the overall number). Note that the maximum number of leak repairs occur between the 7 and 14 day period, such that the median run-time is 56 days, with the mode value of 14 days.

- *** Note that the estimate of average run-time for conventional 'visual read' meters has been assumed to be based upon a yearly read, giving an average half yearly runtime of 180 days plus the grace period for repair of 30 days, giving a total of 210 days. The actual value may be higher.*

In this analysis, future savings have been calculated, based upon:

- the average number of leaks that should occur for a given number of properties (the break out rate)
- an assessment of run-times and leak volumes (with smart meter interventions in place)
- an estimate of where varying sizes of leaks might occur. We have currently assumed that smaller leaks will on the whole be attributable to internal plumbing losses and larger leaks will tend to be customer supply pipe leaks.

This led to the following original analysis for each leakage category (Table 6), based upon their attribution to internal plumbing loss or external customer supply pipe leakage (cspl), which was original included in the draft WRMP24:

Table 6 Analysis of plumbing loss and cspl savings for differing run-time scenarios

Leaks	Household	All			Leak run-times			
				Average leak duration:	59 days	51 days	42 days	31 days
				Target duration:	100 days	80 days	60 days	40days
	% of Px leaks	Base-line (Dumb meters)	Current smart meters	Saving on switch from dumb to smart meter	Future smart meters	Future smart meters	Future smart meters	Future smart meters
		l/prop/d	l/prop/d	l/prop/d	l/prop/d	l/prop/d	l/prop/d	l/prop/d
CSPL								
P1	90%	2.7	0.62	2.09	0.61	0.61	0.62	0.60
P2	27%	2.4	0.42	1.94	0.23	0.19	0.15	0.11
P3	31%	3.8	1.38	2.45	0.69	0.60	0.49	0.37
P3A	16%	0.8	0.53	0.27	0.24	0.21	0.17	0.12
P4	100%	0.1	0.16	0.01	0.08	0.07	0.06	0.04
Total		9.8	3.1	6.7	1.9	1.7	1.5	1.2
PLUMBING LOSSES (PL)								
P1	10%	0.3	0.07	0.23	0.07	0.07	0.07	0.07
P2	73%	6.3	1.11	5.18	0.63	0.51	0.40	0.28
P3	69%	8.5	3.05	5.41	1.53	1.33	1.09	0.82
P3A	84%	4.1	2.74	1.38	1.24	1.07	0.87	0.64
P4	90%	1.2	1.34	0.11	0.68	0.59	0.48	0.35
Total		20.4	8.3	12.1	4.1	3.56	2.91	2.16

After further consideration of the data from the wider smart meter rollout cohort (>150K smart meters), we have, however, concluded that current continuous flow savings attributable to smart metering should be limited to 40% of those originally estimated for the draft WRMP24 (for 2021/22) and that this should then increase, as systems become embedded (and as an indication of our ambition) on a glidepath to a value of 90% of the original estimation by 2031/32 (and beyond).

This revised analysis indicates that we may potentially expect continuous flow savings for cspl and plumbing loss as below (Table 7):

Table 7 Smart meter continuous flow reduction glide-path

10 year profile - 90% outcome	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
cspl saving profile (l/prop/d)	2.68	3.01	3.35	3.69	4.02	4.34	4.69	5.03	5.36	5.70	6.03
plumbing loss profile (l/prop/d)	4.84	5.45	6.05	6.66	7.26	7.87	8.47	9.08	9.68	10.23	10.89
total saving (ex. Behaviour) (l/prop/d)	**7.52**	**8.46**	**9.40**	**10.34**	**11.28**	**12.22**	**13.16**	**14.10**	**15.04**	**15.98**	**16.92**

Note that we still expect significant reductions in continuous flow (both for plumbing losses which impact PCC and customer supply pipe leakage (cspl) which impacts our leakage total) from the 7.5 l/prop/day, which we are currently seeing, to 16.9 l/prop/d by 2031/32.

We will continue to analyse data to ascertain the potential final 'new normal' for household leakage/continuous flow and to realise the full smart meter benefit.

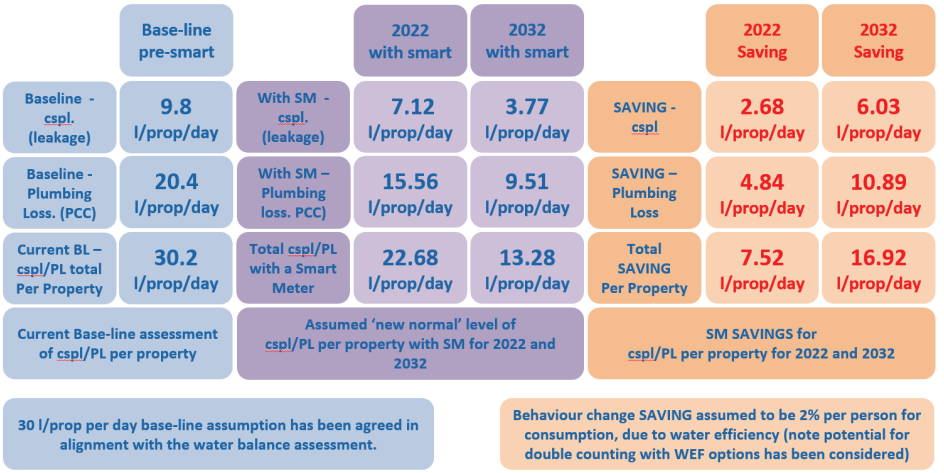
For our WRMP24 we have continued to assume a 2% impact on customer behaviour (per capita consumption). We, therefore expect to realise:

- a 2% impact on customer behaviour (per capita consumption).
- an average reduction of 10.89 l/prop/day, due to the timely identification of plumbing loss leaks and their repair by the customer, by 2031/32. This is an approximate 3% reduction in per capita consumption.
- an average reduction of 6.03 l/prop/day, due to the timely identification of customer supply pipe leaks and their repair by the customer, by 2031/32. This equates to a 2% reduction in per capita consumption (note this is leakage).

This can be visualised as shown (Figure 30):

Note that these savings from our smart meter program are key to achieving our target of 110 l/h/d by 2050.

Figure 30 Revised SM continuous flow saving assessment for WRMP24



At this point in time we have assumed there are no customer supply pipe leakage savings from unmeasured properties, attributable to smart metering program, because there is no financial incentive for the customer to undertake a repair. However in practice, due to our enhanced program, some customers will be metered, but paying unmeasured charges and in this case we will be able to identify these leaks.

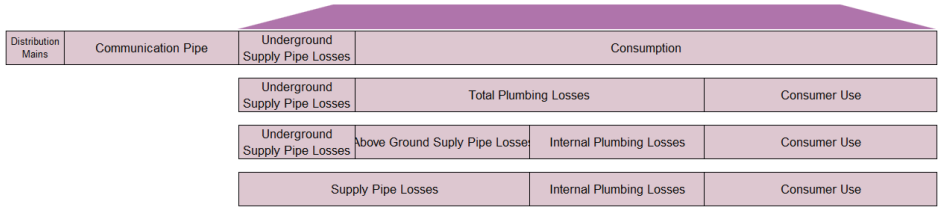
Note that the savings (over the WRMP24 planning period), from the 1.1M smart meters being installed between 2020 and 2025 (AMP7) are included in the WMP24 base-line forecast, with only the savings from the additional smart meters installed in AMP8 included in the WRMP24 enhancement program.

As part of WRMP24, we will continue the development of options that should assist in reducing leakage run-times further. These are termed our 'leakage 100' options based upon a maximum run-time of 100 days (Note that is would imply and average leak run-time of <60 days with the majority fixed in less than 30 days).

6.8 The definition of leakage and customer consumption

The relationship between the expected leakage savings from the smart metering program and their impact on our leakage and consumption (PCC) targets is defined according to UKWIR Guidance (Components of demand described in 'Demand Forecasting Methodology Main Report Joint R&D WR-01/A' Pages 15-19). Reference (Figure 31);

Figure 31 Consumption, customer supply pipe leakage, and plumbing losses; included in leakage or customer consumption



Both the leakage program and smart metering programs, will have an effect in reducing;

- leakage distribution losses,
- customer supply pipe leakage and,
- internal 'plumbing losses'

Consequently, the impact of this, will by definition, be attributed to:

- Customer consumption savings will include reductions in internal plumbing losses and above ground customer supply pipe leakage (cspl). **This will affect our Per capita Consumption target.**
- Leakage savings will include reductions in distribution losses, communication pipe losses and underground supply pipe leakage losses. **This will affect our Leakage target.**

6.9 Smart meters and behavioural change

Smart meter installation is enabling a fundamental change in our understanding of customer consumption and in our ability to communicate with our customers. We are currently developing strategies to provide our customers with key information to help drive water efficiency, enabling more effective behavioural change programs and consequent reductions in demand. We believe there is great potential for smart metering to encourage customer engagement, making them part of the 'water saving' journey, and allowing us to produce an individually tailored customer service. It should also allow us to contextualize why saving water is so important for protecting the environment, as part of our revised WRMP24 plan.

The smart meter system, by its nature, will generate significant volumes of data, necessitating a revolution in the way we engage with our customers. (At the rate of one read per household per hour, this will generate over 20 billion reads per year, once we have completed the smart meter roll-out, excluding the duplication of reads for data validation, which will multiply this further.)

In order to maximize the benefit our customers will gain from the detailed water usage data that will be available, we have been trialling a variety of methods of providing this information.

We originally considered and trialled display units for our customers (similar to energy smart meters), however, technologically this is difficult to facilitate with our external meter stock. Potentially, such display units could more easily be used with internal meters, but this could only be utilized by a proportion of our customer base. We will continue to investigate the potential integration of our customer data with other utility information, so that it can be presented in the home, as technology develops.

Currently, we have developed a standalone customer Web Portal and Mobile Application to deliver information to customers (This is termed 'MyAccount'). We have fully integrated the portal into our 'MyAccount' website, such that consumption and billing information are now combined.

We now have 160,000 registered active smart meter households who are engaged with their usage (2022/23). We send monthly reminders for customers to view their consumption and compare usage from the previous month with 'social norms'. It is revealed that their usage is either efficient, average or above average to similar homes, based upon provided occupancy rates. For customers who have signed up for the service, consumption information is shared on a daily basis through the online portal or Mobile Application. This allows customers to see their water use in more detail than ever before, noting there is a requirement for immediacy of read data to engage customers. Customers having frequent engagement with their consumption helps them to take direct control of their usage by changing their behaviour. Customer side leakage (plumbing loss or cspl) accounts for the majority of reduction in overall PCC/Household consumption and has been quantified separately in the smart metering benefits.

Smart metered customer engagement

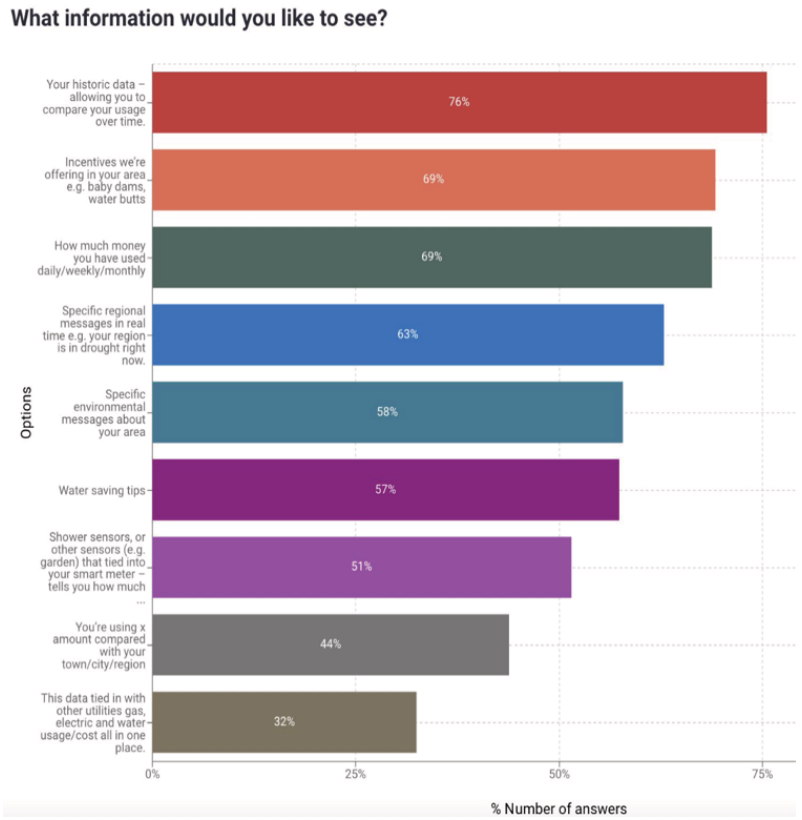
To date, customers have reacted very positively to receiving consumption data and we haven't seen any negative comments about intrusion. Customers generally trust us to collect only the data that we need and see the benefit of what we're trying to do. However, we do understand that we will potentially see some customers who do not want us to collect this data as we roll out region wide.

"I am quite comfortable sharing personal data when there are clear benefits or rewards and I have given permission. I would stop sharing personal data if I found it was being resold or used without my permission."

We have also questioned our customers regarding their priorities for information which we might provide as part of our digital offering (Figure 32).

These consultation responses have guided the development of our smart meter communications strategy and methods of engaging with our customers.

Figure 32 Customer preferences regarding available data



We are, therefore, concentrating on:

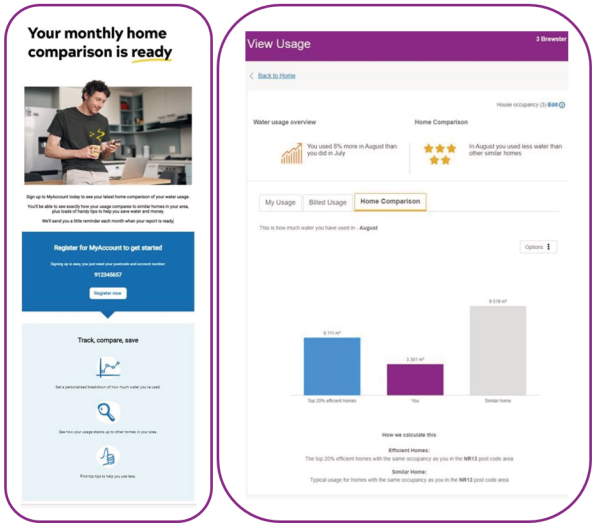
- identifying any 'usage' discrepancies, and increased night-flows (these may be leakage)
- benchmarking to help customers understand where they need to make changes at home; comparing usage with similar homes
- setting targets to make it easy to track progress
- developing personalized incentives to help further savings
- making 'my usage' tangible to the amount customers are spending/saving in ££s

Customers have been asked to complete questionnaires, as part of their sign up to the MyAccount portal, in order to categorize them demographically, and give an initial indication of whether the customer is a high/low/average user, in comparison to a similar cohort. We are working to ensure that these questionnaires are very focused on the key information that will help both our customers and our future engagement (helping to determine occupancy, no. of toilets, etc.).

Our current strategy stresses the following activities, as part of the customer smart meter journey :

- **Track: c**ustomer's are able to track their water usage over time,
- **Save:** we offer water saving tips and advice, so that customers can modify their behaviour, including advice on garden usage.
- **Compare:** customers are able to compare their usage with similar households and groups, so that they can see how they are performing (see Figure 33).

Figure 33 Customer consumption data

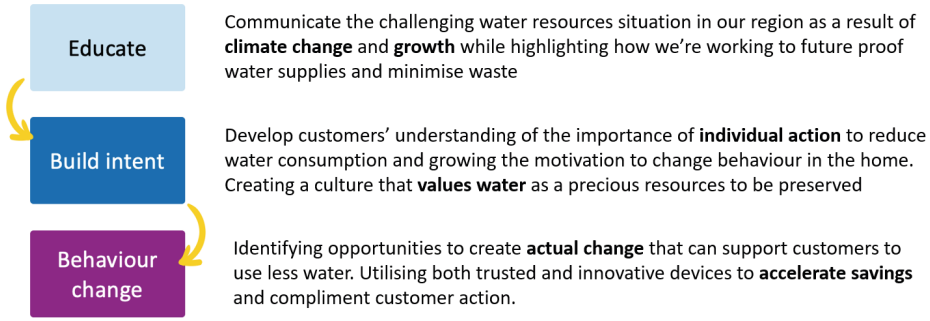


As we continue to develop our digital offering we will look to imaginatively include the information most helpful to our customers, whilst increasing and maintaining engagement and informing them as to why water efficiency is so important for our communities and the natural environment.

Alongside the information on their water usage, our customers will also be able to access tips on how to save water, pledge to change their water usage behaviours and track the effect of the changes on their water use.

Our developing communications strategy can, therefore, be described:

Figure 34



6.10 Smart meter behavioural change savings

In addition to our re-evaluation of plumbing loss and cspl reductions for the WRMP24, which should be facilitated by smart meters, we have reviewed our long term trial data (from Newmarket and Norwich) and our newly acquired data from the full-roll-out to determine the additional benefit that we might expect due, purely to household behaviour changes.

Our long term trial data suggests the following:

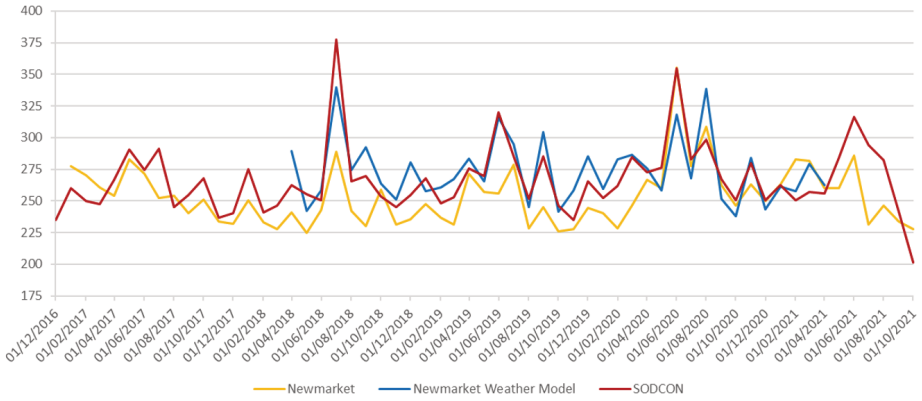
- Pre-smart meter introduction, Newmarket consumption was +6% above the base-line derived from our SODCON (Survey of Domestic Consumers) control group: Norwich consumption was +0.5%, above the base-line derived from our SODCON control group (measured tariff properties)
- Post-smart meter introduction, Newmarket consumption was -7% below the base-line derived from our SODCON control group: Norwich consumption was -7.5%, below the base-line derived from our SODCON control group (measured tariff properties)

Once plumbing loss and cspl reductions have been subtracted from the overall changes in consumption, the remaining difference indicates a reduction in demand due to behavioural change of 2%.

This aligns with the original assumption used in WRMP19 (3%), however, given that we are also accounting for savings from plumbing loss reductions and that we are also including a significant portfolio of water efficiency measures aimed at behavioural change, we have felt it prudent to reduce the behavioural savings attributed purely to smart meter introduction, to 2% for the WRMP24 (when changing from 'visual read' metering to smart metering). We would consider this to be pragmatic, as the assumption is based upon limited data from a limited geographic area, within the Anglian Water region.

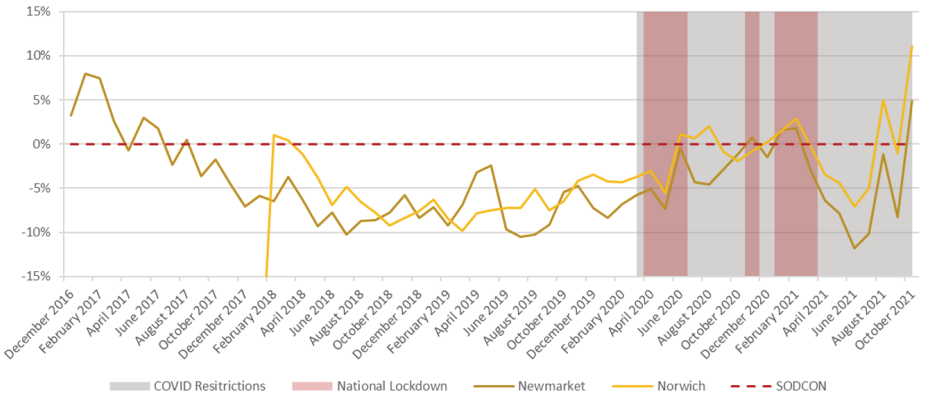
The graph below shows the comparison between the Newmarket smart meter data, the weather model and the SODCON (Survey of domestic consumption) (Figure 35).

Figure 35 Newmarket, measured domestic consumption



Additionally we can show the percentage difference between the Newmarket smart meter consumption and the SODCON reference (Figure 36).

Figure 36 Measured domestic consumption average % above/below SODCON



6.11 Compulsory metering

As we are in an area of serious water stress, we have an obligation to consider the costs and benefits of compulsory metering.

The results from multiple sources show that, generally, customers are much more supportive of universal and compulsory metering than has been the case previously. However, customers who pay measured charges tend to support compulsory metering, whereas those who pay unmeasured charges do not. We believe the higher levels of support for compulsory metering reflect the larger proportion of customers paying measured charges.

Defra's Guiding Principles state that the government does not believe a blanket approach to water metering is the right way forward.

The majority of our customers, 84% (in 2022/23) are metered and pay measured charges. Additionally, another 6% of our customers have a meter fitted (through our enhanced program), but are not billed upon their measured volume. In total we have 90% of our customers with a meter.

By the end of WRMP24 (2049/50) we expect 94.8% of our customers to be metered and measured, which we would consider to be close to our theoretical maximum meter penetration (our current absolute maximum meter penetration by 2049/50

has been estimated to be 95.4%). However, our modelling indicates that we would still have a number of metered/unmeasured customers at the end of the WRMP24 planning period, without further intervention.

Analysis shows that unmeasured customers tend to use more water than our measured customer base. Currently (2022/23) measured customers have a PCC of 123.1 l/h/d and unmeasured customers have a PCC of 174.77 l/h/d.

Customers are currently switched to being metered and measured upon request, or upon moving house (in that, any house which has a meter, automatically becomes a measured property upon the arrival of new occupiers) and as part of our WRMP24 innovation program we will investigate how we might engage with our unmeasured/metered and unmeasured/unmetered customers further, in order to persuade them of the benefits of measured status, and help us to achieve the maximum measured/metered penetration possible.

To test a potential universal and compulsory metering program, we have analysed an alternative scenario. This achieves a marginally higher metered/measured penetration of 95.4% by 2049/50 as opposed to the 94.8% level achieved in our preferred WRMP24 plan.

- This higher scenario only saves an additional 1.18Ml/d by 2049/50 (33.09Ml/d as opposed to 31.91Ml/d)
- However this scenario costs £253.02M as opposed to £223.29M for our preferred plan (Enhancement costs only, excluding finance and opex savings); a significant cost for a marginal benefit.

As part of the development of our WRMP24 we have continued to investigate how we might pursue a universal (or compulsory) metering strategy, whilst being mindful that:

- the costs of achieving 100% metering penetration will be very high, supposing this is feasible.
- compulsory metering could cause affordability problems for some customers and
- compulsory metering could result in a loss of customers' goodwill.

As part of our compulsory metering program we would also also move our remaining unmeasured (unmetered) customers to an assessed charge. This would mean that these customers would be charged based on an assessment of likely water use determined from a survey of the property.

Our current view is that the additional cost to reach the 95.4% theoretical maximum meter penetration, would not be cost beneficial, however we do intend to implement a compulsory metering program in AMP8, such that we encourage all customers who have a meter to switch to pay a measured charge.

Whilst considering this program we have consulted with a group of our vulnerable customers, in order to understand and try to alleviate their concerns. We understand that there are particular groups of customers (who might have high usage due to ill health), who might be impacted, and we are keen to help them as much as possible through any transition period. We do currently have a number of tariffs designed to help our most vulnerable customers and we will work to ensure that these will be developed further in parallel with any compulsory program.

6.12 Smart Meter costs and benefits

For our preferred enhancement program for smart meter installation from 2024/25 onward we anticipate the following reductions in demand for the WRMP24 (Table 8).

Table 8 Savings attributable to SM behaviour change, plumbing loss and cspl - Enhanced smart meter roll-out post 2025

	2030 (AMP8)	2035 (AMP9)	2040 (AMP10)	2045 (AMP11)	2050 (AMP12)
Smart Metering behaviour change saving (Ml/d)	5.3	5.9	6.5	7.1	7.1
Smart Metering CSPL saving (Ml/d)	4.0	5.8	6.5	7.1	7.7
Smart Metering Plumbing Loss saving (Ml/d)	8.8	12.6	14.1	15.4	16.6
Total (Ml/d)	18.1	24.3	27.0	29.7	31.9

However, it must be noted that we also expect savings from our AMP7 (2019/20 to 2024/25) smart meter rollout, as below (Table 9). These savings will be included in our base-line demand forecast. Note that AMP7 savings have now been revised to reflect current savings attributed to smart meters, as described above.

Table 9 Savings attributable to SM behaviour change, plumbing loss and cspl - base-line Smart Meter roll-out - Pre 2025 roll-out

	2030 (AMP8)	2035 (AMP9)	2040 (AMP10)	2045 (AMP11)	2050 (AMP12)
Smart Metering behaviour change saving (Ml/d)	3.3	3.3	3.2	3.2	3.2
Smart Metering CSPL saving (Ml/d)	5.5	6.9	6.9	6.9	6.9
Smart Metering Plumbing Loss saving (Ml/d)	2.9	3.2	3.2	3.2	3.2
Total (Ml/d)	12.4	13.3	13.3	13.3	13.3

External (distribution loss and smart meter identified cspl) and internal leakage (plumbing losses) reductions will form a significant part of our anticipated demand reductions over the WRMP24 plan period.

We have calculated the costs associated with the metering program for the WMRP24, as shown (showing AMP8 out-turn costs (2024/25-2029/30) and AM12 out-turn costs (2024/25-2049/50)).

Note that we have also separately calculated the base-line costs for our metering program (visual read and smart), which now includes the cost of the rollout for the 1.1M smart meters by 2024/25, the network installation costs and costs for maintaining data processing systems. (We have assumed that we would continue to provide the services associated with the initial 5 year, 1.1M smart meter rollout as part of this base-line).

Overall the smart meter enhancement program for the WRMP24 will cost £124m between 2024/25 and 2029/30, and £280m (excluding finance costs and opex savings), over the 25 year WRMP24 plan period (to 2049/50). This cost has now been revised to align with Business Plan (PR24) costing and the AID (accelerated infrastructure deployment) program for installing additional smart meters in AMP7 (Table 10).

Table 10 Preferred smart meter program (costs and benefits)

	Total Cost (AMP8) - 2030	Out-turn Saving (AMP8) 2030	Cost per Ml/d (AMP8) 2030	Total Cost (AMP12) 2050	Out-turn Saving (AMP12) 2050	Cost per Ml/d (AMP12) 2050
Costs and savings represent enhancement (AMP8 and AMP12)						
Fixed Capex/Opex inc - Finance	£124.92m	18.08 Ml/d	£6.40m	£280.04m	31.91 Ml/d	£7.00m
Fixed Capex/Opex pre - Finance	£117.29m			£243.23m		
Opex saving	£1.61m			£19.94m		

The preferred plan leads to the following installation trajectories and a metered/measured penetration of 94.8% by 2049/50 (Table 11).

Table 11 Measured/unmeasured customers - end of AMP status

	2030	2035	2040	2045	2050
Measured (000s)	2064.8	2,270.7	2,333.1	2,450.9	2,550.4
Unmeasured (000s)	230.4	194.6	166.5	144.1	138.9
Meter penetration (000s)	90.0%	91.9%	93.3%	94.4%	94.8%

Smart meter installations will be as follows (Table 12):

Table 12 Meter installation types - end of AMP status

	2030	2035	2040	2045	2050
Visual Read (000s)	67.9	67.9	67.9	67.9	67.9
AMI Smart Meter (000s)	1996.9	2139.9	2,265.2	2,383.1	2482.6
Unmeasured (000s)	230.4	194.6	166.5	144.1	138.9

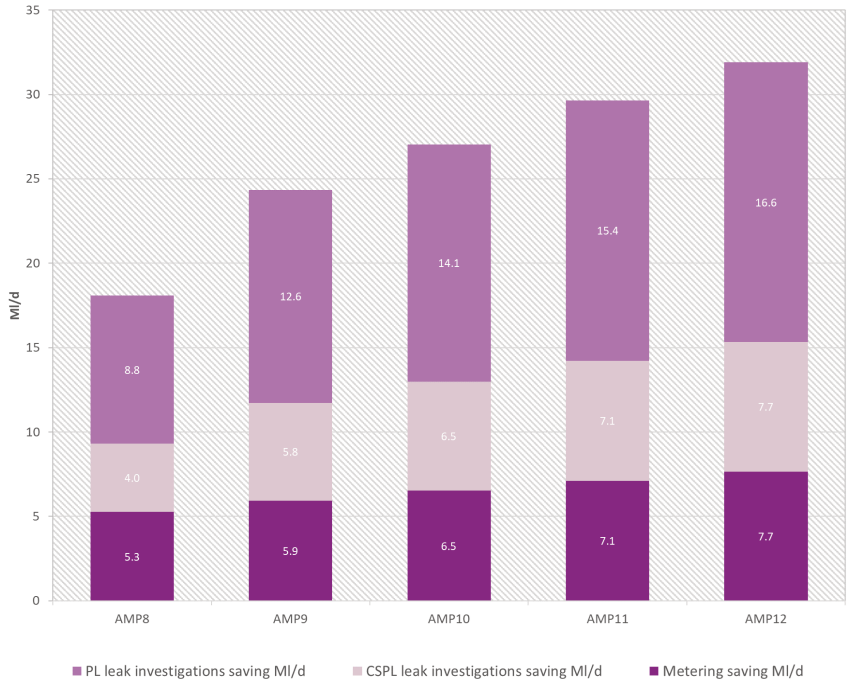
New build additional installations will be as follows for the WRMP24 planning period (Table 13).

Table 13 Meter installation types - per AMP

	2030	2035	2040	2045	2050
New Builds (000s)	132.79	107.09	97.25	95.46	94.34
Cumulative total	132.79	239.88	337.13	432.59	526.93

Water efficiency savings attributable to the smart meter roll-out can be shown (Figure 37):

Figure 37 WRMP24 smart meter savings 2025-250 (additional Smart meters only)



7 Household Water efficiency

Encouraging changes in behaviour

An important aspect of demand management is the empowerment of our customers to understand and reduce their water usage. This involves changing attitudes and encouraging customers to use less of our retail product - a concept that some may find surprising.

We, therefore, have a dedicated water efficiency team which leads our work in this area and designs our communication strategies.

Key to our water efficiency strategy is the introduction of the smart metering program. This is instrumental in enhancing our ability to communicate more effectively the reasons why demand and water efficiency are so important in achieving our goals for the environment and for the provision of sustainable clean water supplies.

Our current WRMP19 (AMP7) strategy (2020-25) includes the following options:

- a rewards scheme for signing up to the smart meter customer portal.
- 'Drop by 20' audits and home visits. These visits deliver water savings through retrofitting free water saving devices and, through the provision of advice, to encourage positive behaviour change.
- the continuation of our ‘Drop by 20’ campaign. ‘Drop by 20’ is a water efficiency campaign which we developed in response to the 2011-12 drought and we continue to offer it to customers when they request a meter.
- our campaign to assist customers with leaky loos via rebates (noting that a leaking loo can lose on average 478l/prop/d)
- trialling of smart water devices (including smart shower sensors) for a full rollout in AMP8.
- we have also been developing our engagement with business water Retailers regarding demand management. This currently has included a dedicated section on our Wholesale website providing targeted information for Retailers and also content which can be directed towards their non-household customers.

These programs have been accelerated in order to achieve our per capita consumption (PCC) target for 2024/25.

Looking to the future

We are keen to build on our current momentum and the rapid deployment of smart meters across our region, while expanding our digital offerings to take full advantage of our smart future.

Our proposed portfolio represents our most extensive program of water efficiency and behaviour change activity to date.

Our ability to change customer behaviour and drive efficiency will be noticeably enhanced, as it is supported by our smart meter 10 year installation program. Smart meters are now facilitating innovative water efficiency interventions and allowing us to provide a platform for tailored customer engagement. Some of the options that are enabled by smart metering include customer campaigns and reward schemes through the smart meter usage portal (MyApp Account) and smart home device retro-fitting. These options are included in our preferred portfolio.

The success of smart metering will also be directly related to our water efficiency activities. We understand that smart metering is a technological revolution and it needs to be accompanied by a behavioural revolution to unlock its full potential to help manage demand. We are excited by the opportunities that the provision of timely consumption data from smart metering is having on our ability to change consumer behaviour and to promote the conservation of water.

7.1 Current and future engagement

We assess our success in encouraging water efficient behaviour by measuring average per capita consumption. This is one of our ODIs (Outcome Deliver Incentives).

Our performance target is to reduce average per capita consumption by 7l/h/d from 2019/20 to 2024/25 (from 133 l/h/d in 2019/20 to 126 l/h/d by 2024/25, for our three year rolling average values). However, in recent years we have seen significant volatility with respect to assessed PCC.

We have suffered a severe recent challenge due to the Covid19 pandemic, which impacted behaviour. For 2020/21, when we experienced lockdown periods, we saw average PCC increase from 133.3l/h/d to 146.9 l/h/d (a 7.5% increase).

More recently we have experienced a significant decrease in per capita consumption, as we have seen the effects of;

- our smart meter rollout (with more than 500K smart meters now installed (2022/23))
- are return to work from the Covid19 'working from home' patterns and
- the 'cost of living crisis'.

This has led to a recorded PCC of 131.3 l/h/d for the year 2022/23. We are keen to utilize our new access to 'real time' data to understand these new patterns of behaviour and assess the developing 'new normal'.

We are also mindful of the National Framework target for a per capita consumption of 110 l/h/d to be achieved by 2049/50.

This has made it even more imperative to understand and enhance our water saving activities, post pandemic. Water saving activities have, therefore, been maximized using our digital engagement program, as well as working with key community partners to utilize their online channels. The biggest benefits for delivering water efficiency have been gained by making the changes within 'MyAccount', our online tool, for customers to engage with their smart metering data to help them to understand their consumption.

We have also been keen to ensure that customers understand the information being collected and are comfortable with sharing this information with Anglian Water. Key to our engagement is helping our customers understand the reasons why water efficiency is so important for our plan and desired environmental destination. Customers maintaining frequent engagement with their consumption, helps them to take direct control of their usage by helping them to understand and change their behaviours.

Customer side leakage (plumbing loss or cspl) accounts for the majority of estimated reductions in overall PCC/Household consumption and has been quantified separately in the smart metering benefits.

There is a strong link between our work to address water affordability in our region and our water efficiency and metering activities. The provision of water efficiency advice to metered customers helps them reduce consumption and, consequently, their bills. Because of this, we co-ordinate our metering and water efficiency work to support customers and encourage them to reduce their water consumption. Our combined metering and water efficiency program divides the region into areas that are visited in turn, combining the offerings from all elements of the program, delivered in the same place at the same time.

As part of our WRMP24/PR24 consultation process we have contacted a selection of our most vulnerable customers to ascertain their views on their unmeasured status, and potential volumetric billing, in order to understand and alleviate their concerns.

We also believe that there are significant opportunities to work with land developers to promote sustainable developments and water efficiency. Additionally we have been liaising with Local Authorities to encourage developers to meet much more stringent water efficiency standards for new developments. With regard to this, Local Authorities have been pushing housing developers to adopt a standard of 110 litres per person per day. for new-build homes.

As part of our vision for a sustainable future, we are also focused on promoting our ‘green’ water initiatives and the wider concept of 'Water Neutrality' (Green water being designated as non-potable rainwater, storm-water, or recycled water). This involves, both the promotion of simple solutions (such as water butts to collect rainwater) and liaising with developers to install more complex ‘green’ water systems into new homes and businesses.

7.2 Our preferred portfolio

Our preferred water efficiency strategy includes a range of household water efficiency and behavioural change activities. Some of these are based upon the continuation of current activities as well as those we are developing alongside our smart meter rollout in AMP7.

Our preferred option also includes a significant number of new activities, such as incentives for customers to replace leaky toilets with more efficient versions and the installation of smart devices. Further initiatives will draw upon insights from 'Behavioural Economics' and will be enabled by smart metering and our online platform, such as a rewards scheme that incentivizes water saving.

Assumptions regarding costs and benefits have been developed using our internal analysis and external experience, whilst understanding the interconnected nature of the options (especially with respect to smart metering) and the potential for double counting.

The selected option portfolio will include the following sub-options:

- Provision of smart water devices/sensors (shower sensors); investigating the potential to link smart sensors to 'MyAccount'; further investigation to link Smart devices to utility hubs, developments and communities.
- Continued development of the 'MyAccount' App to provide easy access to data.
- Additional community based campaigns including hyper local and seasonal messaging.
- Development of gamification and rewards schemes, digitally accessed.
- Provision of garden advice / garden kits for outdoor usage with higher levels of engagement on discretionary/seasonal water use.
- Personalized engagement on discretionary/seasonal water use through virtual assistants.
- Enhanced scheme to assist vulnerable customers with internal leaks.
- Leaky loo campaigns for traditionally metered customers.
- Development of the customer leakage journey, to achieve maximum target run-time of 100 days.
- Potential for smart communities; link smart systems to other utilities.

Some of these options are based upon the continuation of our current activities, similar to our 'Drop by 20' campaign (where we carry out free water saving home visits and install water saving devices), our retrofitting program and 'The Potting Shed' (where we provide water efficiency advice and free products to gardeners).

Note that whilst developing our water efficiency strategy we have reviewed our current option implementation and produced revised future options. This has meant that some of what we currently call 'Drop 20' high consumption visits have been re-allocated to our leakage reduction options and visits (our 'Plumbing Loss Uplift' options for vulnerable and non-vulnerable customers), and some of these activities will continue as business as usual visits. For WRMP24 we did not specifically include this option as a stand-alone enhancement, but a key element of the plan is smart meter identified interventions, with water efficiency at the core. Note that for AMP8 we intend to spend over £4M for cspl/plumbing loss incentivisation/find fix assistance and over £38M by 2050 . We are constantly reviewing these activities and plan to assess their effectiveness as part of our 'Demand management monitoring framework'.

We are also actively developing options that will impact the non-household sector (which are now included in our preferred plan), as well as investigating the potential for water re-use for both domestic and industrial customers.

The potential for differential tariffs to impact summer demand and alleviate drought pressures are also being actively investigated as part of our preparation for AMP8 and beyond.

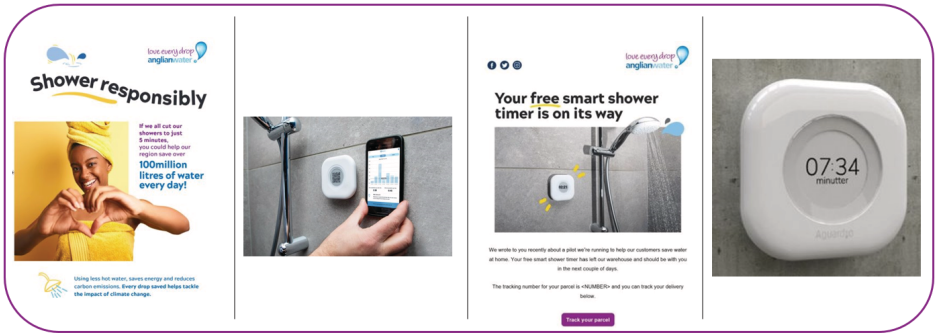
7.2.1 Smart Homes

We intend to exploit the full capabilities of the smart connected world by introducing additional smart devices into our connected network, currently under development. These devices will allow us to target the most water intensive aspects of consumption, such as showering and bathing, by giving customers even more information about these specific activities.

We intend to provide a number of smart devices (particularly shower sensors, which record the duration of showers) in order to provide more information about shower volume and duration. Showering is a major component of household consumption (An eight minute shower, with an average flow rate, uses 62 litres of water), so that, if we can impact shower durations, this should have a significant overall impact on PCC. We will also trial sensors which are capable of being linked to our own smart meter system, providing information through our 'My App' system.

Communications will be tailored to inform customers of the impact of these activities and how making small lifestyle changes (reducing showering times by even a small amount) can reduce water usage significantly. We have also supported the use of other water saving devices, such as 'babydams' which reduce the water needed for infant washing (with our incentivization of these devices). (Figure 38).

Figure 38 Smart devices



(Figure 39)

Figure 39 Baby bathing water saving

The options that have been developed for the revised draft WRMP24 may be described as below (Table 14):

Table 14 Smart homes

SECTION 1: SMART HOMES - layer smart sensors in the home to provide data on specific components such as white goods, taps, garden use or showers. Provide and fit the sensors then link into 'My Account' or their proprietary smart hub. Provide the ability to set targets within the home then set rewards linked to water saving. Nudge customers within their comparative cohorts using ongoing engagement.	
Option - 1a	Provision of smart sensors (such as Smart Shower Sensors). · Provision of other smart sensors and devices - trials to be completed in AMP7 where possible. In AMP8 we would look to ensure these devices/sensors feed into 'My Account' for customers who are registered and can also link their usage patterns to the rewards scheme. · AMP8 options will include monies to trial any new devices to market. Use sensors as a reward in the rewards scheme.
Option - 1c	Link up with other providers of energy data to provide a smart hub for the home showing all your energy and water consumption in one place. · Currently we are holding discovery sessions with 'HIVE' as part of the AMP7 trial. Data from this trial will go into the PR24 submission.

7.2.2 Encouraging behaviour change

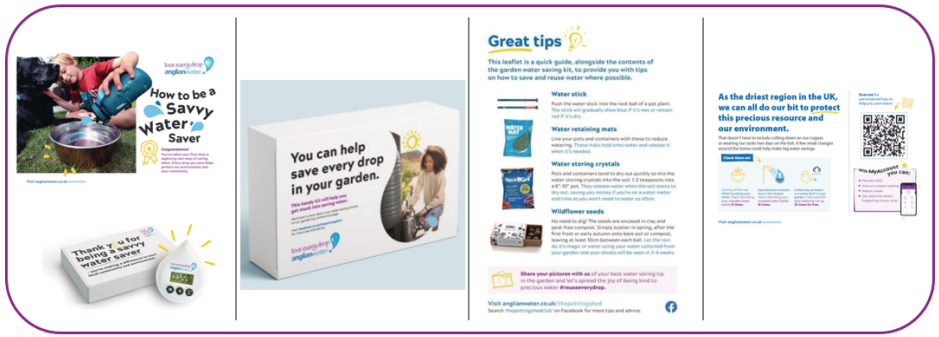
Continuous engagement with our customers will be essential in embedding and maintaining behavioural change over time.

We intend to build upon our current engagement, using all the available channels for communication (radio, publications, news-media, email, text and social platforms) in addition to our smart meter program and digital offering.

We also target our communications, during times of drought and peak summer demand, so that our customers can more effectively use water during periods of hot weather.

(Figure 40).

Figure 40 Garden advice for our customers



Additionally, we use a mix of channels, as well as being present in communities to help customers understand the benefits of metering and how this can assist with bills and affordability for our vulnerable customers (Figure 41).

Figure 41 Examples of drought communications and vulnerable customer communications

We intend to update our offering, with the ability to offer rewards to customers and/or their local communities. These rewards would be available when certain milestones are achieved. Additionally, we envisage that the customers would be involved with setting the level (and degree of difficulty involved) of the milestones and the potential level of reward.

We are currently reviewing the form that these rewards might take (they may range from a small 'thank you' up to some water saving technology; community rewards may involve contributions to a local playground, for example).

We are conscious that developing and maintaining customer engagement, will be key to customer satisfaction and achieving the demand reduction goals we have set.

We will, therefore, be keen to ensure that the design and presentation of information to our customers (via the web-portal and mobile applications), should be clear and keep customers engaged. (facilitating the demand savings in the plan). This process will require continuous monitoring, validation and update, as the smart meter roll-out proceeds.

The options that have been included in the WRMP24 plan can be described in more detail as below (Table 15):

Table 15 Encouraging behavioural change

SECTION 2: ENCOURAGING BEHAVIOURAL CHANGE - putting data at our employee's and customer's fingertips to help them save water and save money on their water and energy bills. Making the savings tangible to customers' bills.	
Option 2a/b/d/f	Continued development of the 'My Account' app to provide quick easy access to data and services: Usage data comparisons, spotting customer side leaks, high consumption identification, personalized tips, proactive warnings. Improving graphics and display as new technology comes to market. Further development of gamification within 'My Account'. Continued support & development of rewards schemes to encourage water saving behaviours. Setting of targets and challenges, which could include environmental/social/carbon rewards and therefore include additional benefit lines here. Improved analysis of smart meter consumption data, to fine-tune information sent to customers and maximize behavioural consumption reductions.
Option -2c	Continued provision of garden advice, promotions on social media and garden kits to support reduction in discretionary use in the garden. The option includes seasonal tips within 'My Account' for gardening, linked to usage, and personalized options linked to smart hubs/virtual assistants.
Option - 2d	Campaigns to support our key messages and brand (Hyper local and seasonal). Linked to smart data, including drought messages and peak demand messaging. Providing water saving tools to nudge customers to use less during peak summer demand.
Option - 2e	Development of tariffs using smart meter data to promote water saving. We are, however, currently starting to trial 'Summer Use' tariffs, prior to AMP8.
Option - 2g	Drop by 20 option - fitting of water saving devices by a plumber and giving water saving advice. This option is provided for non-smart customers still on a visual read meter.

7.2.3 Community action

We are keen to develop communication strategies, which are tailored to our customers and relate to the regional issues facing water usage, by referencing local conditions relevant to customers in that area.

In future we intend to use our smart meter communications strategies to encourage water efficiency locally, with community reward schemes. We are also keen to develop the idea of smart cities, linking water, energy and carbon efficiency programs in an holistic scheme (Figure 42).

Examples of our current localized communications strategy can be shown as the following (Figure 42):

Figure 42 Community presence and engagement to drive awareness and intent

Table 16 Community action

SECTION 3: COMMUNITY - promoting water saving as a community activity, aligning to our hyper-local brand messaging.	
Option - 3a	We will work at a community level to encourage water savings with the results triggering a community reward. · This could also help with non-contact CMEX, with the correct publicity, and should be linked into our overall community strategy. · Link into Education and school challenges with rewards linked to them: Pupils take home the challenge which has a very wide impact overall. Also potentially sponsor annual awards ceremonies (albeit virtual) to promote great ideas and gain additional publicity.
Option - 3c	Net Zero Project · Development of a smart city. Provide information into big data systems. Partner with a city in our region to promote and take this forward.

7.2.4 Leakage interventions

A key pillar of our smart meter program is the potential impact it will have on leakage reduction.

As described, smart meters mean that household leaks will be identified after 3 days of continuous night flow.

We are keen to develop our communications to help customers find and repair these leaks (either plumbing losses or customer supply pipe leaks) as fast as possible. We are also keen to help our most vulnerable customers with visits and incentives to fix these leaks as fast as possible (Table 17 andFigure 43).

Figure 43 Leakage communications

Table 17 Interventions (leakage)

SECTION 4: INTERVENTIONS - direct interventions to reduce the amount of water being consumed in the home.	
Option - 4a	Scheme for customers in vulnerable circumstances and customers with affordability issues to fix leaky loos and leaky taps up to a capped value. If toilets cannot be fixed then provision of a small amount of toilet rebate vouchers again linked to vulnerability and affordability. Part of Drive to 100 day maximum target for leak run-time - For Plumbing Loss element
Option - 4b	Fix all customer side supply pipe leaks for all customers up to a value of £500 for P3 and above. Part of Drive to 100 day maximum target for leak run-time - For cspl reduction element
Option - 4c	Delivery of the the customer side leakage journeys relating to P1-P4 break out leaks: Includes virtual and customer side leakage visits, providing expert advice to customers through online and video assessments for potential internal leaks identified by smart metering. Offer of physical visit to help identify location of the leak particularly those in vulnerable circumstances.. Part of Drive to 100 day maximum target for leak run-time.
Option - 4d	Leaky loos campaign (base option). This is a continuation of a service we offer in PR19 for non-smart, visual read customers
Option - 4f	Network leakage detection: sensor development to add pressure and noise sensors into smart meters to provide online network leakage monitoring and early warning.

Note that the ‘leaky loo’ campaign described is the residual campaign targeting visual read customers and this consequently reduces to zero, as we achieve full smart meter penetration.

Our main 'leaky loo' targeting program is described as part of our smart meter leakage program for 'plumbing losses' as well as our 'plumbing loss option for vulnerable customers'. We are currently saving approximately 4.5l/prop/d, due to smart meter continuous flow detection and our 'customer leakage journey'. As we improve our 'customer leakage journey' (including 'virtual visits') we expect that these savings will increase to 10.89 l/prop/d by 2032. We are also expecting to assist and incentivise vulnerable customers to fix leaks with our 'Target 100' option at a cost of £3.8m in AMP8 (many of these leaks will be leaky loos).

7.3 A behavioural revolution

It is important to note the key role that smart metering will play in any future plan to change customer behaviour. Our water efficiency activities will seek to begin, and sustain, an attitudinal and behavioural revolution, based upon the technological revolution that the smart meters represent.

Our ability to show customers their water use, in near real-time, will allow a significant improvement in customer understanding of their consumption, allowing us to tailor water efficiency initiatives directly to their needs. The research is clear that some of the most effective behavioural interventions are supported by consumption information. We believe that smart metering linked to our water efficiency sub-options represents an opportunity to drive a further advance in demand management and water conservation.

Many of our water efficiency sub-options will be facilitated by the smart metering campaign, particularly those that involve the use of the customer portal.

7.4 Water efficiency, PCC and the Defra/EA targets

Our WRMP24 water efficiency strategy, includes;

- the full roll-out of smart metering across the Anglian Water region
- our most ambitious program of water efficiency options and tailored customer communications, designed to influence customer behaviours and attitudes
- the impact of government led interventions (these will also be integral to achieving our PCC target).

Using our Dry Year Annual Average (DYAA) forecast for per capita consumption we achieve the interim 2037/28 and 2049/50 targets (Table 18):

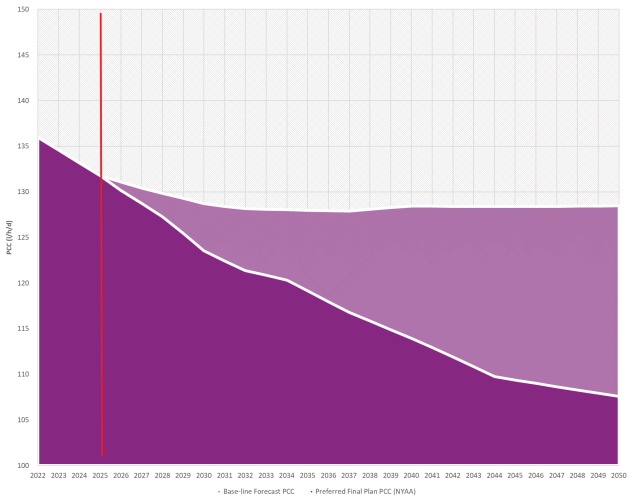
- In 2038 we expect to reach a value of 118.15 l/h/d, below the target of 122 l/h/d, as stated in the EIP and WRPG.
- In 2050 we expect to reach a value of 109.74 l/h/d, below the target of 110 l/h/d, as stated in the NF, EIP and WRPG

Our base-line (light purple) and preferred plan (dark purple) PCC projections can be shown (Figure 44).

Table 18 PCC targets and the preferred plan

PCC Scenario DYAA	2025	2030	2035	2038	2040	2045	2050
Base-line forecast	134.41 l/h/d	131.28 l/h/d	130.52 l/h/d	130.63 l/h/d	131.00 l/h/d	130.95 l/h/d	131.04 l/h/d
Preferred (Aspirational) Plan	134.41 l/h/d	126.00 l/h/d	121.51 l/h/d	118.15 l/h/d	116.23 l/h/d	111.97 l/h/d	109.74 l/h/d
Target Value	-	-	-	122 l/h/d	-	-	110 l/h/d

Figure 44 Base-line and preferred plan per capita consumption forecasts



7.5 Water efficiency costs and benefits

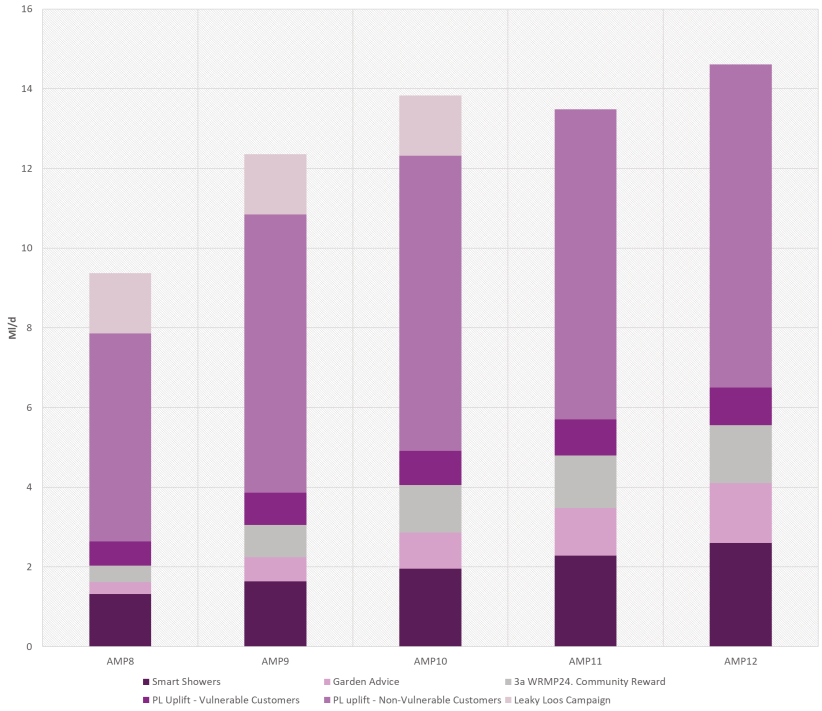
For our preferred portfolio of water efficiency measures we expect the following costs and benefits (noting that this table also includes the savings from government led interventions, which are independent of our program) (Table 19):

Table 19 Costs and benefits for our preferred water efficiency portfolio

	AMP 8 -2030 out-turn water saving per year Ml/d	Opex (£) AMP8 - 2030	Opex saving (inc. value of water saved) (£) AMP8 - 2030	AMP 12 -2050 out-turn water saving per year Ml/d	Opex (£) AMP12 - 2050	Opex saving (inc. value of water saved) (£) AMP12 - 2050
Smart Showers	1.32	£3,296,000	£133,295	2.60	£16,480,000	£1,474,321
Smart Hub	-	£	£	-	£	£
My Account	-	£2,593,649	£	-	£15,580,917	£
Garden Advice	0.30	£1,593,000	£30,294	1.50	£7,965,000	£656,376
3a WRMP24. Community Reward	0.41	£75,000	£42,075	1.46	£375,000	£776,453
PL Uplift - Vulnerable Customers	0.60	£442,691	£63,874	0.94	£2,945,317	£639,552
PL uplift - Non-Vulnerable Customers	5.22	£3,788,647	£551,493	8.11	£25,206,690	£5,521,929
Leaky Loos Campaign	1.51	£33,033	£194,740	-	£33,033	£763,278
Mandatory water labelling	3.52	-	£177,217	84.35	-	£31,401,523
Innovation Fund		£5,000,000	-		£5,000,000	
Totals	**12.89 Ml/d**	**£16,822,020**	**£1,192,989**	**98.96 Ml/d**	**£73,585,958**	**£41,233,432**

Savings have been calculated for each of the water efficiency measures and can be shown (Figure 45):

Figure 45 Water efficiency measure savings for the plan period



8 Leakage

Our ambition for leakage

Leakage is a particular concern for our customers, who see it as wasteful and a sign that we are not doing enough to conserve water and invest in infrastructure. This can be a strong disincentive for customers to adopt more water efficient behaviours. Customers also, often associate leaks with service interruptions. However, our leakage performance is currently industry leading. We have cut leakage by more than a third since privatization in 1989 and it is now at very low levels; around half the national average based on the amount of water lost per kilometre of main.

Leakage has continued to fall from 191Ml/d at the end of AMP6 (2019/20 (using the revised methodology: note previous WRMP19 reporting methodology stated 182.4Ml/d). In 2021/22 we achieved a record low (for AWS) leakage level of 173.44Ml/d, with leakage for 2022/23 increasing to 182.6Ml/d, reflecting the challenges we faced due to the extreme summer heat (>40◦C) and multiple winter freeze/thaw events.

Thus, although we are taking significant steps towards our AMP7 target of 161Ml/d in 2024/25, this is still a challenging target.

Nonetheless, we do not believe it is good enough to stop at the targets set by our regulator, especially when reducing leakage is such an important issue for our customers and so vital for us in this dry part of the country. Additionally, we have considered the wider national context and consultation responses, for our WRMP24.

Whilst developing our WRMP24 plan we have reviewed the PIC (Public interest commitment) and NIC (National Infrastructure Commission) targets, our current position as a company (in relation to other water companies) and future potential outcomes. Costs and benefits have been generated for a number of scenarios achieving alternate leakage reductions.

In order to meet the government aspirations, of reducing leakage by 15% by the end of AMP 7 (to 161Ml/d) and potentially by 50% by 2049/50, we have reviewed all feasible demand management options for the WRMP24 planning period. We have also assessed leakage reduction in the context of our current 'frontier' leakage position in the industry, potential cost and bill impacts.

Considering the wider context, national leakage target, and consultation responses, we now intend to reduce overall leakage to 118.49Ml/d (significantly below our initial draft WRMP24 plan of 145.7Ml/d) by the end of the WRMP24 planning period (2049/50). This would be a reduction of 45.71Ml/d from our 2024/25 value of 164.2Ml/d. This would represent a reduction of 72.51Ml/d or a 38% reduction from our 2017/18 base-line of 191.3Ml/d, (as opposed to the 24% included in the draft WRMP24). This is a much more ambitious target for the WRMP24.

This revised leakage reduction program represents a very significant expansion from our Draft WRMP24 (originally a 23.4% reduction), having taken into account the strength of response regarding our original position, and achieves the maximum leakage reduction that we believe is feasible with current technology.

However, this augmented plan does come at a very significant cost in the longer term (>£4 billion). We have, therefore, sequenced the plan such that the vast majority of the cost should impact AMP9 and beyond (post 2030). As we review the plan for WRMP29 we will investigate how technological improvement can mitigate these costs.

We consider this revised position indicates our level of ambition in making a fair and equitable contribution to the overall national leakage target of a 50% reduction in leakage from the 2017/18 base-line for England and Wales.

We have assessed a 50% reduction in leakage (achieving a leakage level of 90Ml/d) as being unfeasible requiring significant mains replacement, at a cost in excess £20 billion. We currently consider this to be an unrealistic burden upon our customers and have, consequently settled upon a leakage reduction of approximately 38%, which allows us to more than meet our NIC and PIC targets.

To achieve our ambition we will need to use innovative techniques, as well as tried and tested methods. Smart metering is currently offering an opportunity for a step change in detecting customer supply pipe (external) and plumbing loss (internal) leaks by improving our understanding of continuous flows in customer properties (usually indicating a leak), as well as increasing our overall understanding of our network. Customer supply pipe leakage currently accounts for 23% of total leakage. As smart meters are introduced we expect cspl to be reduced by 70%.

We will continue to actively explore how the use of state-of-the-art technology can help us to achieve further leakage reductions. This is why the concept of 'zero leakage and bursts' is one of the seven goals of our Shop Window initiative. We also continue to actively trial technologies such as thermal imaging drones to detect leaking pipes and the use of satellite imagery to identify leakage. We continue to explore, for example through our research on smart networks as part of Ofwat's Innovation Fund and through our engagement with fellow water companies and smart water network pioneers such as Vitens in the Netherlands and Global Omnium in Valencia.

8.1 Current position and overview

Leakage is treated water lost from our distribution network system. It includes water lost from our mains and pipe networks (known as distribution losses) and losses from customers' supply pipes (known as customer supply pipe leakage, cspl).

Our record in reducing leakage has caused our leakage rate to improve dramatically in the last 20 years and we are currently a 'frontier' company, within the industry. We now lose approximately 25% less water through leaks than we did in 1998, despite the expansion of our pipe networks to connect to over 500,000 more properties.

Reflecting our customers' concerns about leakage, we are continuing to pursue our ambitious leakage reduction initiative for AMP7. As a company we committed to reduce leakage by 15% from the base-line of 191.3Ml/d value (revised methodology: note previous WRMP19 reporting methodology stated 182.4Ml/d), to 161.3Ml/d by 2025 (3 year average).

Leakage is now assessed using the methodology set out by Ofwat in the reporting guidelines published during the PR19 process.

Leakage for 2022/23 is assessed at 182.6Ml/d in year against an in-year target of 174.2Ml/d. This represents an 9.2Ml/d increase from our 2021/22 value and reflects the challenges we have faced due to the extreme summer heat and multiple winter freeze/thaw events. Note that the previous years leakage (2021/22), was assessed to be 173.44Ml/d which was our lowest recorded annual leakage on record.

The three-year rolling average leakage continues to reduce this year despite adverse weather impacting our network both during the hottest summer on record and during 2 significant freeze thaw events during the winter.

We now anticipate our AMP7 out-turn to be to 164.2Ml/d by the end of AMP7 in 2024/25. Taking 2017/18, as a base-year, we are now targeting a reduction of 14.0% by 2024/25.

Our AMP7 leakage strategy continues some of the themes that we started in AMP6, such as network optimisation and intensive leakage investigation. It is supplemented with new Smart strategies, such as permanent noise logging, smart metering and widespread pressure monitoring.

Our current and forecast leakage remains below our previously assessed level suggested by the Sustainable Economic Level of Leakage (SELL) methodology (211Ml/d). A key reason for setting a target beyond the level suggested by the SELL is that leakage is one of the most important issues for our customers. Through our customer engagement activities, customers have indicated that:

- Fixing leaks should be a top priority for additional investment
- Tackling leaks should be a core service, and,
- Fixing leaks should be an important element in delivering a value for money service.

8.1.1 The main parts of our strategy can be summarized (2022/23):

8.1.2 Proactive Leakage Resource:

- In 2022/23 we had 227.8 FTE dedicated proactive leakage operational roles. (170.8 FTE are field based detection roles).
- The average leakage technician productivity for 2022/23 was 1.02 leak fixes per technician per day (an increase of 76% when compared to the 2019/20 base-line)
- In 2022/23, 14,134 leaks were located through proactive detection activities.
- In addition to proactive detection activities, Leakage Operations supported c3,500 customer reported visible leaks during the summer drought period and supported incident response through network operations and bottled water deployment centres during the summer demand (drought) and winter freeze-thaw events.

8.1.3 Leakage capital delivery programmes:

8.1.4 Leakage SENSORS

- Our fixed network hydrophone monitoring system now incorporates 307 DMA's (an increase from 285 DMAs in 2021/22)
- The total number of leaks found from SENSOR detection in 2022/23 was 4,556. This brings the total number of leaks detected using this technology to 16,469 since 2020.
- In 2022/23 the SENSOR programme delivered 1.07Ml/d of leakage benefit.

8.1.5 Intensive Investigation

- Our intensive investigation process continues to develop well and now incorporates a comprehensive programme of virtual step testing using flexible metering assets, camera insertion detection and mains condition assessment, and the use of drones with thermographic imagery. In 2022/23 we established a contract with a company to image and analyse 5,000km of targeted large rural distribution and trunk mains each year. This technology uses Synthetic Aperture Radar with patented analysis to detect underground leaks. To compliment the satellite detection, we now use leakage detection dogs as part of our investigation process.
- In 2022/23 the Intensive Investigation Process delivered 3.54Ml/d of leakage benefit.

8.1.6 Leak repair numbers

- Repaired 29,972 leaks in 2022/23 (an increase from 28,459 in 2021/22)
- Repaired 6,361 burst mains in 2022/23 (an increase from 4,328 in 2021/22)

8.1.7 Network/pump optimisation schemes

- There have been 162 optimisation schemes implemented this year, delivering 4.56 Ml/d leakage reduction. This was split between:
- 43 schemes to optimise existing pressure management assets, delivering 0.4 Ml/d leakage reduction.
- 112 schemes introducing first time pressure management, delivering 2.64 Ml/d leakage reduction.
- pump optimisation schemes delivering 0.44 Ml/d leakage reduction
- system optimisation schemes delivering 1.08 Ml/d leakage reduction

8.1.8 A reduction in customer supply pipe leakage (cspl) that will be facilitated by smart meters.

We continued to work closely with our customers to ensure they are supported through the process of repairing private leaks in a timely manner. Excluding the SMART metering programme, the customer leakage policy support team resolved 10,270 cases in 2022/23 with only 1,036 Waste of Water notices requiring to be issued.

- We have installed 233,365 smart meters in the year 2022/23 (including 208,558 AMI meters for existing visual read meter household customers, 7,574 AMI meters for existing AMR meter household customers, 9,833 for visual read business customers, 70 for AMR meter business customers and 2,144 new connections).
- These smart meters are in addition to the 164,400 & 145,099 smart meters installed in the previous years (2020/21 & 2021/22 respectively), giving a current total of 542,864 smart meters installed overall this AMP. As discussed previously, we have reviewed the rollout of smart meters for AMP7 and have re-targeted the installation program, in order to address near term supply/demand (SDBI) issues.
- For 2022/23 smart meters have helped to identify 107,847 home leaks, combined with the previous year to identify 182,266 in total this AMP.
- 12,976 of these leaks have been rectified by customers with no additional intervention. The peak flow volume of these rectified leaks is 5.98 Ml/d.

- The total number of interventions for 2022/23 is 101,685, with the total number of fixes from these interventions being 83,926. The peak flow volume of these rectified leaks is 30.2Ml/d.
- We continue our process of working with customers to ensure that they repair leaks on their supply pipe or internally to the property in a timely manner.

We remain committed to our downward glide path towards meeting our ambitious goals for leakage reduction and our specific targets (for the end of this AMP) of reducing leakage by 15% (by 2024/25).

8.2 Looking to the future

We continue to believe that minimizing the amount of water we lose from our system through leakage is the right thing to do for our customers and the environment. The National Framework sets an overall goal of a 50% reduction for leakage for the whole of England and Wales by 2050 [33], building upon Ofwat's methodology for the PR19 price review, which includes the stretching target for companies to reduce leakage by 15% by 2024/25.

As stated in the 'Leakage Routemap to 2049/50'

> *In 2019 the English water companies made a Public Interest Commitment (PIC) to "Triple the rate of sector-wide leakage reduction" by 2030. The water sector has also taken up the National Infrastructure Commission's (NIC) challenge by committing to halving leakage from 2018 levels by 2050.*[34]

In accordance with these ambitions, we have committed to achieving a 14% reduction in demand for AMP7, and a further ambitious program of reductions for WRMP24, achieving a 38% reduction from the National Framework 2017/18 base-line.

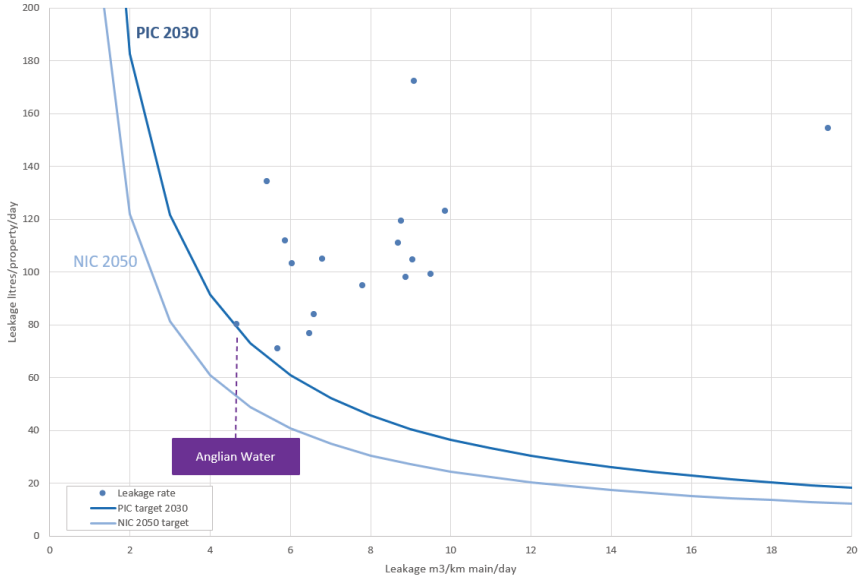
As part of this evaluation we have reviewed the current position of Anglian Water (and the other Water Companies) with respect to the Public Interest Targets and the National Infrastructure Commission Target of a 50% reduction.

Note these targets have been converted into attainment curves, based upon a 50% reduction from the 2017/18 national base-line (total leakage) position.

This graph below (Figure 46) updated to current values (2023 values used to update the original graph shown in the 'Leakage Routemap to 2050' report[35]) shows the wide range of current leakage positions for different water companies, and indicates that for the national 50% reduction to be achieved some companies need to reduce their leakage values by a much larger amount than other forefront companies such as Anglian Water. Additionally it must be noted that as companies, such as Anglian Water, reach lower and lower leakage levels, the costs for finding and repairing greater numbers of smaller and smaller leaks will lead to diminishing returns for significantly higher costs.

Note that the attainment curves for PIC and NIC targets have been created in the National Leakage Routemap by aggregating the water company leakage values to a national value, halving this, and then creating a set of equivalent figures for the combined metrics of leakage per km main and leakage per property (Figure 46).

Figure 46 Relative positions of PWCs with respect to National Targets 2023



As can be seen Anglian Water is a frontier company with respect to leakage, as of 2023. In light of this and as part of our leakage option analysis we have determined how different levels of leakage reduction for Anglian Water (and our customers) will be reflected, against these attainment curves.

33 Environment Agency (March 2020), *'Meeting our future water needs: a national framework for water resources - Main Report'*, p. 65
34 Water UK (2022), *'A Leakage Routemap to 2050'*, p. 7
35 Water UK (2022), *'A Leakage Routemap to 2050'*, p. 56

The graph below (Figure 47) shows the leakage position for each AMP out-turn year (2030, 2035, 2040 etc.) up to the year 2050. As can be seen even with our current base-line and the impact of smart meters (on cspl), we expect leakage to be below the PIC target by 2025 and below the NIC target by 2040.

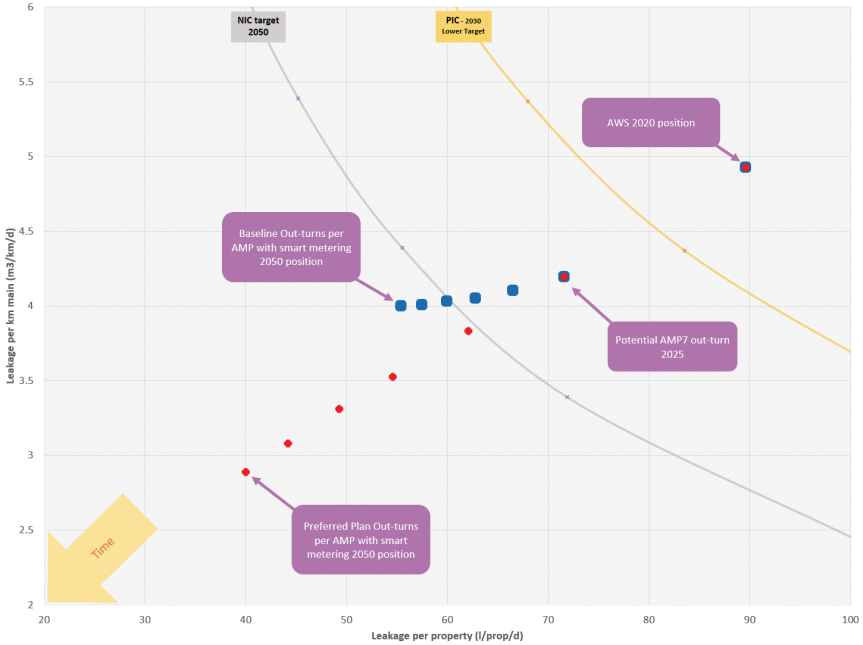
As part of our post consultation review, we noted that key consultees stressed that we should be more ambitious with regard to our leakage reduction program. Our revised leakage reduction program represents a very significant expansion from our Draft WRMP24 (originally a 23.4% reduction from 2017/18, updated to a 38% reduction from 2017/18), having taken into account the strength of response regarding our original position, and achieves the maximum leakage reduction that we believe is feasible with current technology. This augmented plan does, however, come at a very significant cost in the longer term.

It must be noted that the additional 25Ml/d saved, is currently estimated to cost >£4 billion, due to the inclusion of a major mains replacement program of over 8000km (>20% of our network). We have, therefore, sequenced the plan such that the vast majority of the cost should impact AMP9 and beyond (post 2030). As we review the plan for WRMP29 we will investigate how technological improvement can mitigate these costs.

We consider this revised position indicates our level of ambition in making a fair and equitable contribution to the overall national leakage target of a 50% reduction in leakage from the 2017/18 base-line for England and Wales.

With our preferred plan for our WRMP24 we expect to be below the NIC target by 2030, reaching the exceptionally low levels of 2.9m³ per km of main/day or 40l/prop/day respectively, by 2050, compared to 4.2m³ per km of main/day or 71.6l/prop/day in 2025. These levels will be unprecedented across the industry (Figure 47).

Figure 47 Base-line and preferred plan leakage forecasts and NIC/PIC attainment curves



Preferred plan values for leakage per property and leakage per km of main are shown below (Table 20), indicating;

- a 41% reduction in leakage per property and
- a 55% reduction in leakage per km of main.

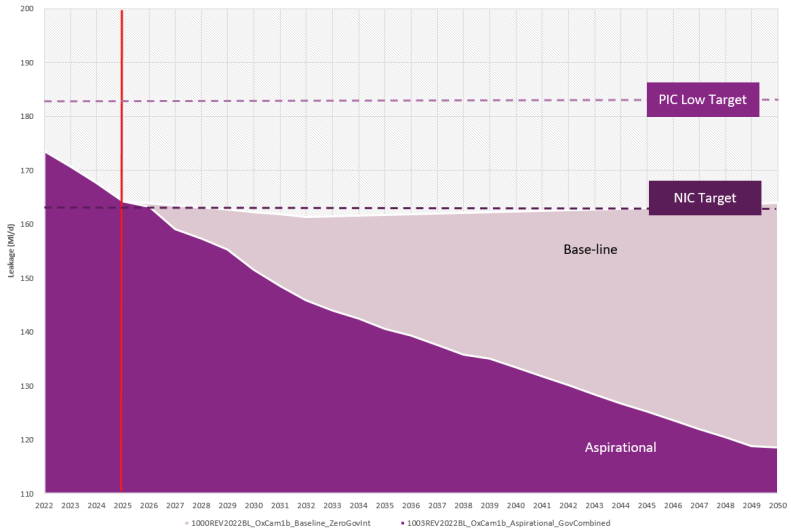
Table 20 Preferred plan AMP out-turn values

Preferred Plan	2025	2030	2035	2040	2045	2050	NIC Target
litres / property / day	71.57 l/p/d	62.11 l/p/d	54.61 l/p/d	49.29 l/p/d	44.17 l/p/d	40.02 l/p/d	55.51 l/p/d
litres per km main	4.2 m³/km/d	3.8 m³/km/d	3.5 m³/km/d	3.3 m³/km/d	3.1 m³/km/d	2.9 m³/km/d	4.39 m³/km/d

Note the base-line values for 2020 are 4.9 litres per km of main and 89.6 litres per property.

Alternatively the key scenarios can be visualised, as below (Figure 48). This shows that the preferred scenario achieves both the PIC and NIC ambition, whilst also indicating the level of our ambition in adopting the 'Aspirational' program for leakage reduction.

Figure 48 Leakage scenarios and NIC/PIC targets

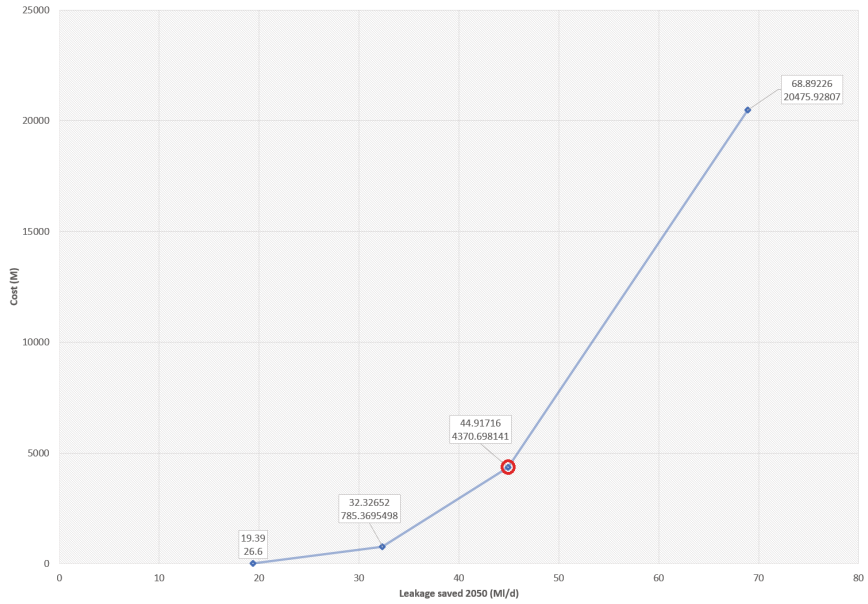


Leakage reductions have been modelled at a granular level using DMA geographies (District metering areas) to determine current leakage levels, zonal pressures and minimum leakage levels that might be achievable. Options have been modelled which would impact leakage including pressure management and network optimization, active leakage control, mains replacement and cspl 'find and fix' (due to the introduction of smart meters). We have then generated a number of scenarios, achieving different levels of leakage reduction for alternate costs.

Through our analysis, we have found that achieving a reduction of 50% of leakage from our 2017/18 position (equivalent to a leakage level of 90Ml/d), is not a reasonable option, due to the uncertainty associated with the possibility of realizing this reduction (potentially being below our background minimum leakage level) and the fact that we currently estimate that it would inflict huge costs on our customers (potentially a current estimation of £20 billion). It must also be noted that pressure management and network optimisation schemes may well be fully exhausted using current technology (in terms of further leakage reduction) by 2024/25, meaning that the vast majority of additional leakage would need to be associated with mains replacement. The disruption and detrimental environmental impact associated with extensive mains replacement, along with the material and carbon requirements would also be significant negative considerations, ruling out the viability of this option.

As can be seen (Figure 49), costs exponentially increase as we reach lower levels of leakage, as more cost effective options are exhausted and an increased number of mains replacement options are selected.

Figure 49 Leakage enhancement costs and benefits beyond our preferred plan



Whilst balancing our desire to continue to reduce leakage, we have considered the following:

- how we might achieve the NIC and PIC targets.
- the current leakage position of Anglian Water and other water companies.
- feasible options for leakage reduction.
- exponentially increasing costs to our customers as a result of achieving lower and lower levels of leakage.
- potential rising costs to maintain these lower levels of leakage.
- whether it is equitable to expect certain customers to pay very high costs for relatively low additional leakage reductions, while other customers face much lower costs.
- potential minimum leakage levels with current and future technologies.
- achieving our current ambitious target of leakage reduction in AMP7.
- our current smart meter rollout and embedding the new process for cspl reduction in our systems.
- consultation responses
- our ambition for leakage reduction in the context of other water company draft plan submissions
- longer term technological advancement

In order to achieve our preferred plan, we will need to use innovative techniques, as well as tried and tested methods. We will continue to explore new solutions and operational practices to reduce leakage. The sub-options we have identified not only address the symptoms of leakage, but activities such as pressure management also allow us to take action to prevent leakage occurring in the first place.

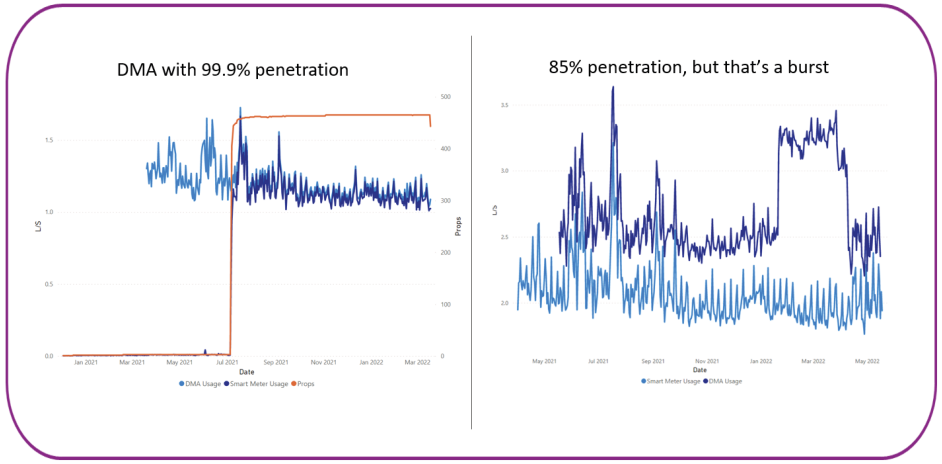
As part of our demand management strategy we have considered detailed activities that enable, support and sustain further leakage reduction. These include a mix of well understood interventions and others that are more innovative.

We are actively exploring how the use of state-of-the-art technology can help us to achieve further reductions, and that is why we have made 'zero leakage and bursts' one of the seven goals of our Shop Window initiative. We are actively trialling technologies such as thermal imagining drones to detect leaking pipes and the use of satellite imagery to identify leakage.

Additionally, our smart metering program is facilitating an opportunity for a significant advance in detecting leaks by improving our understanding of continuous flows into customer properties (usually indicating a leak). The benefits of leak detection associated with smart metering are included within the metering business case. In addition, live data for actual consumption is making the identification of network leakage more accurate by measuring the actual difference between bulk (district) meters and customer use. This benefit is captured in the metering cost benefit analysis.

Customer supply pipe leakage currently accounts for approximately 23% of total leakage. As smart meters are introduced we expect that cspl will be reduced by 70% from the current level (Figure 50).

Figure 50 Smart Meter DMA data showing leakage



With our preferred plan our intention is to show the scale of our ambition as a leader in leakage reduction and make a fair and equitable contribution to the overall national leakage target, such that the preferred plan provides us with an ambitious, but achievable goal, notwithstanding that this will burden our customers with significant additional costs in the long term.

However, we will continue to actively explore how the use of state-of-the-art technology can help us to achieve further leakage reductions, and mitigate the future costs that might be associated with this level of leakage reduction.

8.3 Preferred plan leakage options

As part of our leakage appraisal the following options have been considered and modelled in detail.

8.3.1 Pressure management

- Pressure management options typically considered are:
  - Leakage reduction via pressure management with new pressure reducing valves (PRVs).
  - Leakage reduction through PRV upgrades where fixed outlet PRVs are changed to 2 stage or fully modulated valves.

8.3.2 Increased 'find and fix' budgets - Fixed acoustic logging

- Fixed (permanent) acoustic logging is a leakage localisation and pinpointing method, which involves the installation of permanent sensors along the distribution network. These sensors 'listen' for leak noises and allow a more accurate pinpointing of leaks, saving ALC (Active leakage control) effort and, therefore, time. This reduces detected leak run-times which leads to overall leakage reduction.
- Permanent acoustic logging, therefore, reduces leak awareness times and its detection time, but may make it harder to locate leaks on the ground, it has, however, been proven to be overall net beneficial in the UK environment.
- Although many of these type of technologies deliver their best results when used on metallic pipes, there are some that can be used on plastic mains, for example using hydrophone sensors. This technology is used by Anglian Water and can be used on plastic and large diameter pipes.

8.3.3 Water main replacement

- Water main replacement is one of the key methods for reducing physical water losses from the network. The main benefit of this method is that, if done correctly, it will reduce so called 'background' losses. Background losses are a component of total physical losses that cannot be detected and, therefore, reduced using active leakage control (ALC). This is because background leakage is made up of many small leaks which are undetectable due to their low flow rates.
- These types of options require an estimate of the relationship between the fraction or length of network renewal (typically at DMA level) and the leakage

saving. The fraction/length of mains targeted for renewal can be identified using similar approaches and range from 100% of network within a DMA to selected lengths informed by hotspot analysis.

- UKWIR research has provided a relationship between the level of network renewal and the level of leakage achieved. A small number of companies have also carried out extensive network renewal while monitoring the effect on leakage levels and burst frequencies. The result of the UKWIR study is a relationship gained from regression analysis of DMA level data, linking nightline (NL) after network renewal to the NL before network renewal and the fraction of the network renewed. This has been used in our modelling processes.
- As part of our preferred plan we have now included a significant program of mains replacement in order to achieve our maximum feasible level of leakage reduction. We have currently estimated that 8,654km of mains replacement will be required to achieve our ambition for a 38% leakage reduction, at a significant cost of over £4 billion. We understand that this is a considerable commitment, but have weighted the program beyond AMP8, such that further investment might be mitigated by new technologies as we develop the WRMP29 plan.

8.3.4 Smart metering and shared supply cspl reduction

- We have a number of properties that share a customer supply pipe. Identifying leaks on these systems is particularly difficult, but the process will be enhanced by the introduction of smart meters which will help identify continuous flows on these systems. We intend to follow this up with additional leakage investigation in order to rectify this leakage.

8.3.5 Smart metering and cspl leakage.

- As discussed, smart meters are a key element in the identification of customer supply pipe leakage (detecting continuous flow).We are keen to develop our analytical systems and communications to help customers find and repair these leaks (either plumbing losses or customer supply pipe leaks) as fast as possible. We are also keen to help our most vulnerable customers with visits and incentives to fix these leaks as fast as possible.
- As we identify customer-side leakage (both plumbing losses which impact per capita consumption (PCC), and customer supply pipe leakage (cspl)) we intend to initiate schemes to assist customers in vulnerable circumstances and customers with affordability issues, to fix these leaks. These will potentially take the form of:
  - A scheme for vulnerable customers to fix leaky loos and leaky taps up to a capped value with potentially the provision of a small toilet rebate voucher (linked to vulnerability and affordability). (Note this will impact the PCC metric, not leakage).
  - A scheme to find/fix customer side supply pipe leaks up to a given value, for larger leaks P3 and above (P3, P3a, P2s, P1s) for vulnerable customers. (this would impact the leakage metric directly.
  - Improved delivery of our customer-side leakage journeys relating to P1-P4 break out leaks. This will include virtual and CSR customer-side leakage visits for reported leaks; providing expert advice to customers utilizing online and video assessments for potential internal leaks, identified by smart metering. We will also offer a physical visit for customers, who need this service.

8.3.6 Conclusion

- For our preferred plan we have selected a number of these options. It is noted that we expect reductions from pressure management options to be exhausted by the end of AMP7 (as we achieve our anticipated 14% reduction in leakage).
- As, discussed, part of our preferred plan we have now included a significant program of mains replacement in order to achieve our maximum feasible level of leakage reduction. We have included significant mains replacement to achieve our ambition for a 38% leakage reduction. We understand that this is a considerable commitment, but have weighted the program beyond AMP8, such that further investment might be mitigated by new technologies as we develop the WRMP29 plan.
- We are therefore, including:
  - Fixed acoustic logging.
  - Shared supply cspl reductions.
  - Smart metering and cspl leakage reductions.
  - A major program of mains replacement.

8.4 Targeting leakage reduction

Leakage option development and targeting has been analysed at the District Metering Area level (DMA), with leakage levels being characterized, in order to understand average zonal pressures and minimum leakage levels. This process has been used to show how further leakage investigation and analysis might be applied and which solutions might be best implemented in each zone.

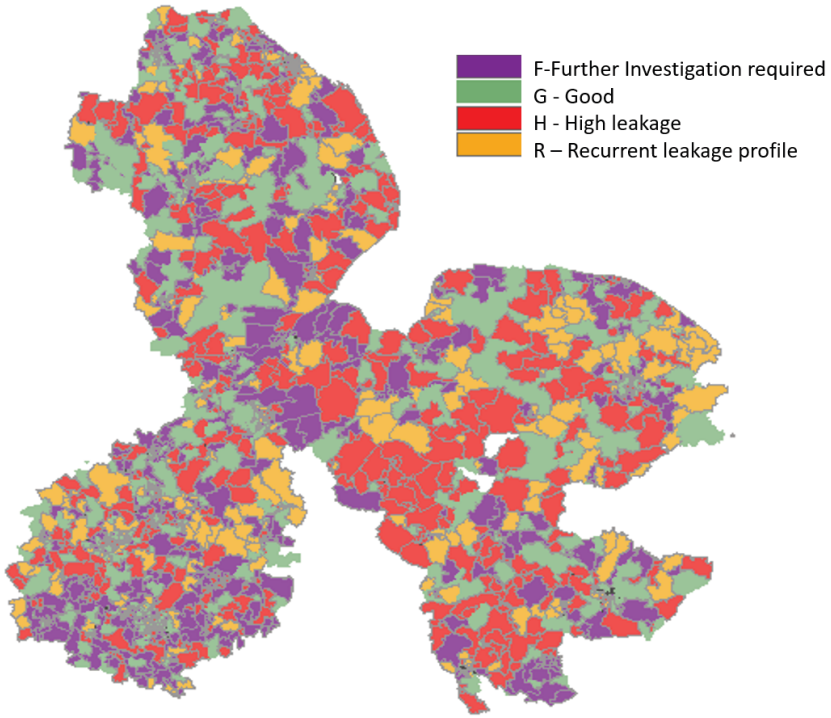
The DMAs have been characterized;

- F - requiring further investigation
- G - Good, low leakage areas
- H - High leakage areas
- R - Recurrent leakage areas

Leakage reduction options have been developed at DMA level and have then been selected for each portfolio from the list, choosing the least costly to the most expensive, dependent upon the level of leakage reduction selected.

Further work has then been carried out to align the targeted leakage options with the overall WRZ risk assessment (Supply-demand balance, growth). For our preferred plan, however, we have ultimately solved all DMA leakage to reach our minimum feasible leakage level (Figure 51).

Figure 51 Indicative DMA characterization



8.5 Leakage costs and benefits

For our preferred leakage portfolio of options for leakage enhancement, we expect the following costs and savings (excluding those associated with smart metering).

Note that costs have been based upon a provisional 2022/23 cost base (Table 21).

Table 21 Costs and benefits for leakage enhancement (AMP8 and AMP12)

	Cost 2030 (AMP 8)	Saving 2030(AMP8)	Cost per Ml/d 2030	Cost 2050 (AMP 12)	Saving 2050 (AMP12)	Cost per Ml/d 2050
Total financial (pre financing)	£36.42m	10.57 Ml/d	£5.58m	£4370.70m	44.92 Ml/d	£117.39m
Total financial (with financing)	£37.87m			£5164.54m		

In detail the options can be described (Table 22):

Table 22 Detailed option costs and benefits (AMP8 and AMP12)

	Cost (AMP 8)	Saving (AMP8)	Cost per Ml/d saved (AMP8)	Cost (AMP 12)	Saving (AMP 12)	Cost per Ml/d saved (AMP12)
Main Replacement	£22.36m	1.65 Ml/d	£13.52m/Ml	£4,333.14m	25.43 Ml/d	£170.39m/Ml/d
Find And Fix	£0.38m	0.76 Ml/d	£0.50m/Ml	£22.62m	5.86 Ml/d	£3.86m/Ml
CSPL leak investigations		4.04 Ml/d			7.68 Ml/d	
CSPL - Shared Supplies	£8.69m	3.72 Ml/d	£2.34m/Ml	£9.94m	3.92 Ml/d	£2.53m/Ml
Innovation Fund	£5.00m			£5.00m		-
Financing Cost Mains Replacement	£0.71m			£792.11m		
Financing Cost Pressure Management	£0.00m			£0.00m		
Financing Cost Shared Supplies	£0.74m			£1.73m		
Financing Cost WRE Leakage Target	£0.00m			£0.00m		

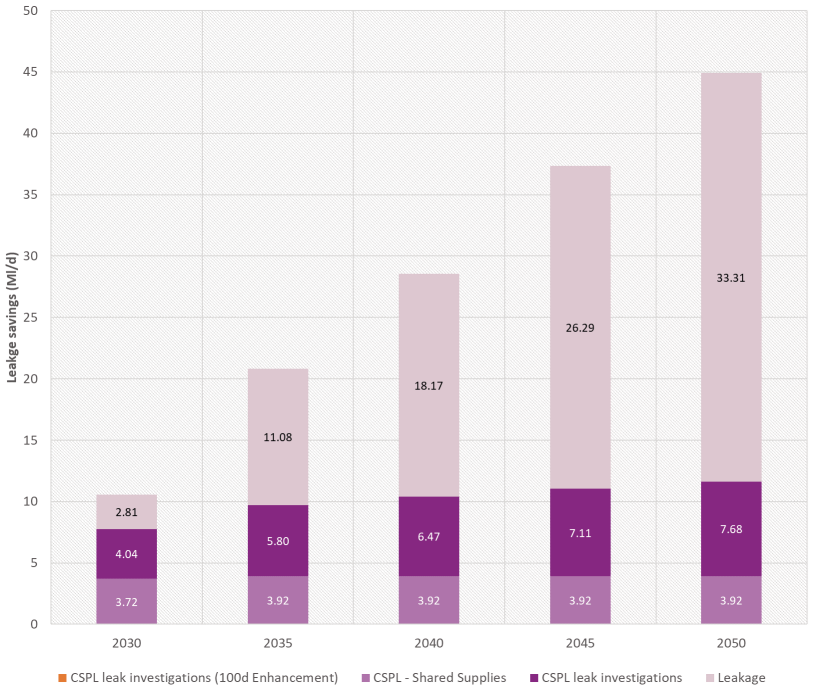
Detailed costs and benefits per AMP can be shown (Table 23):

Table 23 Leakage enhancement costs per AMP

	AMP8	AMP9	AMP10	AMP11	AMP12
Leakage Saving per AMP (Final year value) - Ml/d	10.57	10.24	7.76	8.76	7.59
Cumulative % Saving from 2025	6.43%	12.67%	17.40%	22.73%	27.35%
Fixed capex (£)	£31.05m	£215.11m	£470.05m	£1070.87m	£2556.01m
Financing cost	£1.45m	£22.06m	£79.94m	£201.53m	£488.87m
opex savings (Repair and detection)(£/AMP)	-	-	-	-	-
opex savings (value of water saved)(£/AMP)	£0.69m	£1.96m	£3.24m	£4.54m	£5.88m
Opex(maintenance cost)(£/AMP)	£5.38m	£1.39m	£3.16m	£6.13m	£11.56m
Total all					
TOTEX - Total financial (pre financing)	£35.74	£214.54	£469.96	£1072.46	£2561.69
Total financial (with financing)	£37.19	£236.59	£549.90	£1273.99	£3050.56

The leakage enhancement savings can be shown through the WRMP24 plan period (see Figure 52).

Figure 52 Leakage savings per AMP 2030 to 2050

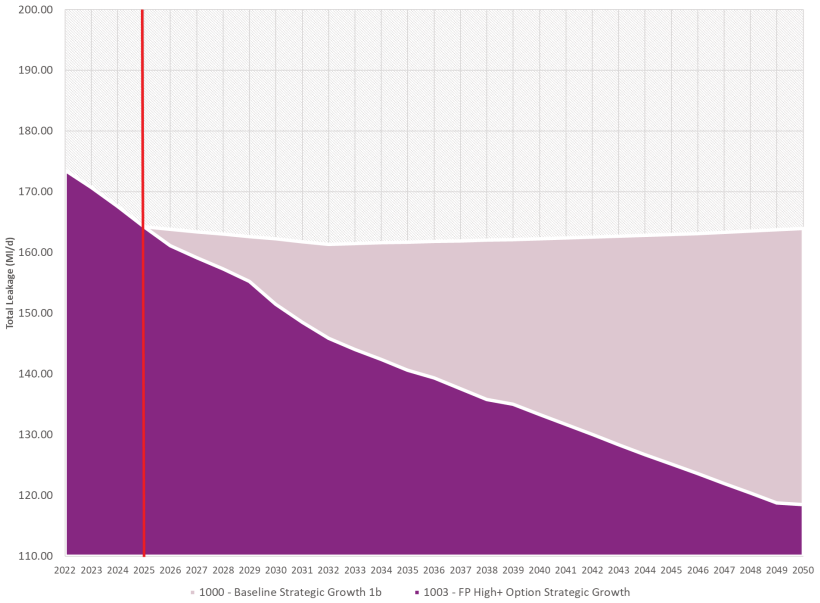


Note savings are shown, for:

- Leakage (mains replacement) - mains replacement savings
- CSLP leak investigations - program to assist vulnerable customers with cspl leaks
- CSPL shared supplies - enhanced program to find leaks on shared supplies
- CSPL leak investigation (100d enhancement) - enhanced customer leakage journey to reduce run-times.

The base-line and preferred plan leakage forecast can be shown, as below (Figure 53):

Figure 53 Leakage forecast, baseline and preferred plan (including AMP7).



- Total leakage for the forecast base-year (2021/22) was 173.49Ml/d
- Total leakage predicted for the AMP7 out-turn (start year for the WRMP24 plan period (2024/25) is 164.2Ml/d.
- For the WRMP24 planning period 2024/25-2049/50 the base-line leakage level has been derived to reflect changing levels of customer supply pipe leakage due to the increase in properties caused by growth. Base-line leakage, consequently, remain relatively stable despite metering changes ('visual read' to AMI smart) at 164.0Ml/d (due to an increase of 528K properties).
- Our preferred plan leakage projection for the WRMP24 planning period (2025-2050) forecasts leakage to be 118.49Ml/d by 2049/50. This represents a 38% reduction from the National Framework base-year value of 191.3Ml/d for 2017/18 (and includes the 14% reduction projected for AMP7).
- Approximately 11.5% (2021/22) of the water we put into supply is lost through leakage from our distribution system (133.6Ml/d - 2021/22 of DI 1156.97Ml/d).
- A further 3.4% of the water we put into supply is attributed to customers supply pipe leakage (40.17Ml/d - 2021/22).

- AWS have made significant efforts to reduce leakage and are now significantly below the previously derived sustainable economic level of leakage (SELL) - 211Ml/d.
- Smart meters are now also contributing to leakage reduction and we expect this to be enhanced over the WRMP24 planning period, as continuous flows will be identified much more rapidly and, consequently, repaired. The smart meter program for 2024/25 to 2049/50 is expected to save 7.7Ml/d of cspl (over and above that attributed to the AMP7 smart meter roll-out, which would give a 13.2Ml/d saving by 2049/50 from 2019/20).

8.6 Leakage option summary

In summary:

We have recognised the importance of our our role as an industry leader in leakage reduction, in helping to meet the National Framework 50% leakage reduction target. We have also taken into account consultation responses to our initial draft WRMP24 suggested leakage reduction program.

We must also note that we currently record very low levels of leakage compared to the rest of the industry. This makes the realization of addition leakage reduction more difficult and costly.

For the WRMP24 program we intend to reduce leakage by 38% (from the 2017/18 base-line position), reaching a leakage level of 118Ml/d (11% of demand - 1072.5Ml/d). This will comprise 89.9Ml/d of distribution losses (8.3% of DI) and 28.6Ml/d of cspl (2.4% of DI).

This represents the current feasible maximum level of leakage reduction and consequently, achieves what we would assess as our minimum background leakage level (with current technology).

However, this augmented plan does come at a very significant cost in the longer term (>£4 billion). We have, therefore, sequenced the plan such that the vast majority of the cost should impact AMP9 and beyond (post 2030). As we review the plan for WRMP29 we will investigate how technological improvement can mitigate these costs.

If the National Framework target is translated into nationally representative metrics (leakage per property / leakage per km of main), we easily reach the required attainment levels, whilst not necessarily meeting an absolute company level 50% reduction in leakage.

We do not consider achieving a 50% reduction at a company level to be feasible or desirable,

- as we have now exhausted more cost effective leakage reduction options and this
- would require a very significant mains replacement program, (beyond that currently included) with
- a theoretically estimated cost of >£20 billion.

We would not consider it fair or equitable to expect certain customers to pay very high costs for relatively low additional water savings and leakage reductions, while other customers face much lower costs. Additionally, achieving these levels of leakage is associated with great uncertainty.

9 Non-household water efficiency

Non-Household water efficiency option development

Non-household consumption accounts for a substantial proportion of overall demand in Anglian Water, representing 27% of our overall demand (2022/23). Understanding and forecasting this segment of demand is crucial to the demand forecasting process. Additionally, developing water efficiency strategies for non-household sectors will form a key additional element for any demand reduction strategy, for water companies, retailers and other major sectors that are heavily dependent on water.

As, the Water Resources Planning Guidance states:

> *'You should clearly demonstrate how you will deliver non-household water efficiency. Your final plan should see an overall reduction in non-household consumption In England, you should set out how it contributes to Defra's water demand target and associated Environmental Improvement Plan, which seeks a 9% reduction of non-household water consumption by 2037/38, from a 2019/20 base-line, as part of the delivery of the distribution input per person reduction.'*[36]

As part of the WRMP24 demand management option development process, and in conjunction with our WRE partners, we have engaged with our regional retailers and business customers, in order to gauge opinion on further water efficiency measures for the business sector.

This recent engagement (in association with WRE and 'Blue Marble') has been conducted:

- to understand the retailer perspective regarding the promotion of water efficiency.
- to develop and refine propositions and understand and overcome barriers.
- to explore these propositions and how they might be implemented with retailers and non-household customers

We are, in accordance with the EA Water resource planning guidelines, actively engaged in developing water efficiency options and have included our initial portfolio of non-household options in our WRMP24. These include;

- measures to reduce customer supply pipe leaks, based around the provision of smart meter data and further potential incentives
- measures to reduce leakage from internal plumbing losses, based around the provision of smart meter data and further potential incentives (leaky loo find and fix)
- assistance and incentivization with regard to water visits and the retrofit of water efficient devices (these potentially funded by wholesalers)

We are also looking into evaluating additional measures with our partners, including:

- water recycling / reuse (grey/green/blackwater reuse); provision of information/scheme design/consultancy support
- incentives and rebates for water consumption reduction; potentially linked to other utilities (energy)

We are currently installing smart meters for all non-household businesses, as part of our full smart meter roll-out. These smart meters will be essential in providing Retailers with the data necessary to facilitate water efficiency and leakage reduction.

For the WRMP24 we have now assessed and quantified options for further development and trials, whilst also considering how we might address barriers to their implementation (funding issues, access

36 Environment Agency (March 2023), '*Water Resources Planning Guidance for WRMP24*', p. 77

issues etc.). We have consequently designed a portfolio of non-household options which are expected to save 10Ml/d of water by 2029/30 and 50Ml/d by 2049/50.

9.1 Non-household water efficiency options overview

For WRMP24, we have now developed a number of non-household water efficiency options, which we will trial prior to full implementation in AMP8 (2025/26 onwards).

As part of the development of these options we are actively working with our retail partners to overcome barriers to the development of these options, including;

- working within the retail/wholesale framework
- the provision of meaningful data for retailers and non-household customers
- characterizing the multiple sectors and business concerns involved (large, small, simple, complex)
- Understanding the different behaviours and water usage of the multiple sectors involved (household equivalent, industrial process, irrigation etc.)
- ensuring that business customers understand the overarching need for reductions in demand as part of our environmental destination, sustainability and resilience ambitions.

Additionally, given the diversity of different types of organisation and their water consumption, we are working to develop methods of best characterising businesses, so that water saving measures might be more efficiently targeted to their needs.

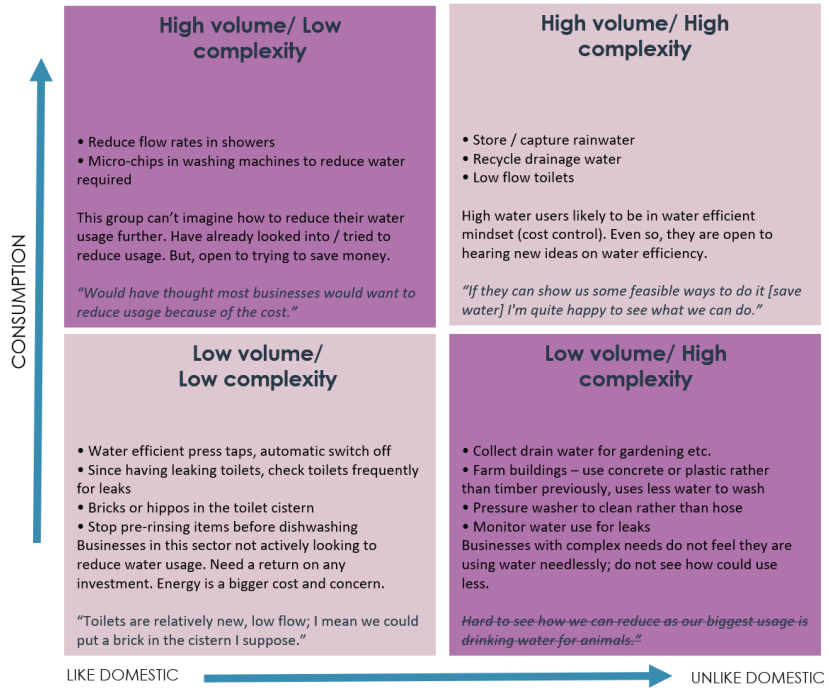
Our consultation has indicated that customers are currently unsure about the need to reduce water consumption and how they might become more water efficient. However, we found there is an appetite to engage with additional water efficiency measures, which will help business customers with their bills, if we as water wholesalers can assist with this process.

As noted, we as an industry, need to:

- Ensure that businesses understand why water efficiency is important in the context of the regional water resource strategy.
- Convince businesses that there may be water to be saved and that this will be beneficial, both for the regional environment and for their own business resilience.
- Develop actionable options that we can trial and then implement with our Retail and business partners.

As part of this work we characterised businesses, in terms of the volume, type and complexity of their consumption. This can be visualised, as in the Blue Marble project (Figure 54):

Figure 54 Customer ideas and comments regarding water efficiency



Our consultation suggested that there are two main option types that should be initially developed, and we have now quantified these for inclusion in the WRMP24.

We are currently beginning to investigate implementing these options in trial form with input from ourselves, as water companies, as well as our Retail partners and their business customers.

These two main option types concentrate on the following (leakage reduction and water efficiency visits):

9.1.1 Reducing leakage (both internal plumbing loss and supply pipe leakage) for business customers

- For this option we will leverage our smart meter introduction and the data that would be available. Continuous night flows (or irregularities in consumption) would be analysed and notifications sent to business customers, indicating a potential leak.
- Business customers would have the option to 'self audit', utilising on-line processes or 'virtual visits', in order to assist with the identification and repair of the leak. The audit would also help in identifying whether the leak was internal (plumbing loss, 'leaky loo') or external (customer supply pipe leakage)
- If the leak is internal and a plumber were to be required, water efficiency visits would be incentivised.
- If the leak were found to be external, we would investigate the provision of a 'find and fix' service.
- This type of option will be targeted at all sizes of business customer, of all types of complexity.

We have received positive feedback on this potential option and will look to trial this in collaboration with our WRE partners. Businesses are concerned about leakage (and its impact on their bills) and suggested that assistance with reducing leakage, including notification alerts and incentivisation, would be appreciated. Businesses understood the significant role that smart metering could play with respect to this.

9.1.2 Enable businesses to reduce water usage with our Retail partners

- In order to assist customers to become more water efficient, we would look to develop on-line self auditing systems, that could guide businesses to understand their consumption and then produce recommendations regarding potential usage reductions (this might also be linked to energy usage). This auditing tool should be able to provide usage comparison data, benchmarking, potential reductions that might be seen and, also generate cost and benefit data.
- This type of option would appear to be most suitable for targeting low complexity, high consumption businesses.
- Additional 'virtual visits', where customers could be talked through this information will also be part of the service.
- Part of this option will also involve the possibility of in-person, 'audit and install' visits. In this case, an expert auditor visits the customer, identifying areas for improvement and offering advice. Additionally, the operatives may be able to assist with simple plumbing fixes and retrofitting water efficient devices (for example, toilet cistern replacement), as part of the visit.
- Further incentives may be considered to encourage businesses to action any areas of improvement identified.

Again, we have received positive feedback on this option, which should give clear guidance on water efficiency and offer assistance in remedying any areas of concern.

It should be possible to develop these options for most of the business customer base, but more complex interventions may well be necessary for the largest non-household consumers. We will look to investigate these options as part of our "Water Demand Reduction Discovery' program.

Options that might be targeted towards larger users will potentially include:

9.1.3 Encouraging businesses to adopt water recycling systems

- For larger businesses, we see definite potential in the development of grey, green, rainwater and blackwater water re-use systems. These systems range in cost and complexity and would potentially require bespoke design for each different business need. However, we believe there is significant scope in working with businesses, especially where new developments are being constructed to install these systems from the outset (Retrofitting might prove more costly).
- For this option we are considering how information on these options might be provided by the Retailer, including;
  - summaries of existing technologies,
  - case-studies of existing installations and
  - how they might be applied for the business in question
- Water companies could also be in a position to offer audits and advice to developers and businesses, as large scale sites are constructed.
- We are also considering how we could incentivize this type of water re-use option (potentially with reward tariffs), providing feasibility studies for water capture and on-site storage developments.

- We will also need to liaise with local authorities as well as developers to facilitate the installation of water re-use systems, as new-build projects are designed and constructed.
- Such options could be tied to 'green 'accreditation systems, recognising the contribution to the local environment.
- We note that these systems might be more appropriate for larger non-household customers, which might have a requirement for non-potable water usage (e.g. irrigation).

We intend to develop these options for trial and full implementation in our WRMP24. However, we still need further research before we will be in a position to quantify some of the options for full cost/benefit analysis.

9.2 Preferred non-household options

For the WRMP24 we have now assessed and quantified options for further development and trials, whilst also considering how we might address barriers to their implementation (funding issues, access issues etc.).

It must be noted that the options that have been developed will all need Retailer participation for their delivery and success.

Our initial assessments for costs and benefits have been based on smart meter data, internal cost estimates for similar household options and external consultant information.

These options have been included in our preferred portfolio for implementation from 2024/25 to 2049/50 and are described below:

1. Water Efficiency Visits - Low size customer (Retailer driven)

This option is the **Smart meter targeted Non-Household Water Efficiency Audit for smaller** customers with lower estimated Per property consumption values (similar to the household 'drop20' option, with similar targeted interventions; leaky loos, taps etc.).

This option will deliver water saving efficiency packages, on a scaled basis, dependent upon the size of water consumption per property:

- companies with a per property consumption similar to 300l/prop/d to be provided 1 equivalent 'drop20' interventions.
- companies with a PHC similar to 1500l/prop/day to be provided 3 equivalent 'drop20' interventions.
- companies with a PHC similar to 5000l/prop/day to be provided 5 equivalent 'drop20' interventions.

The average saving per property is 86 l/prop/day, (based upon a 9% saving).This option is expected to target approximately 3000 properties per year. This would equate to approximately 75% of all properties over the WRMP24 period. (15,000 visits over AMP8). Note that this option is driven by smart meter data, indicating properties with high usage / continuous flow.

2. Water Efficiency Visits - Medium sized customers (Retailer/consultant driven)

This option is the **Smart meter targeted Non-Household Water Efficiency Audit for medium** sized customers with medium estimated per property consumption values.

This option will deliver smart meter targeted specialist water efficiency 'Water Audit Visits' with 'find and fix' services for larger consumers (with per property consumptions of approximately. 25,000 l/prop/day).

Costs are currently estimated at £2,600 per visit, based upon specialist consultant information.

Average savings have been initially assessed at 2,127 l/prop/day (based upon an average 9% reduction). This option is expected to target approximately 108 properties per year.

3. Water Efficiency Visits - High sized customers (Retailer/consultant driven)

This option is the **Smart meter targeted Non-Household Water Efficiency Audit for large** sized customers with large estimated per property consumption values.

This option will deliver smart meter targeted specialist water efficiency 'Water Audit Visits' with 'find and fix' services for very large consumers (with per property consumptions of approximately. 500,000 l/prop/day).

Costs are currently estimated at £10,400 per visit, based upon specialist consultant information.

Average savings have been initially assessed at 43,775 l/prop/day (based upon an average 9% reduction). This option is expected to target approximately 10 properties per year.

4. Water Efficiency Visits - Retailer Incentive - plumbing loss reduction (Retailer driven)

We will look to incentivize 'plumbing loss' repairs with a £100 incentive to the Retailers in order to impact longer running leaks.

This option is expected to potentially save another 59 l/prop/day, with 3000 properties per year targeted. This is similar to the the target 100 program that has been developed for the household sector.

5. Smart Meter identified Plumbing Loss Fix

This option targets non-Household Plumbing loss repairs for properties identified to have continuous flow (through smart metering).

The number of properties targeted will align with the water efficiency visits (i.e. 3000 per year - with approximately 75% of non-household stock impacted by 2050).

Costs have based upon similar customer journeys for household leakage.

Savings are currently estimated to be 240l/prop/day, based upon most recent smart meter data.

6. Smart Meter identified cspl Fix

This option targets non-Household customer supply pipe leakage (cspl) repairs for properties identified to have continuous flow (through smart metering).

The number of properties targeted will align with the water efficiency visits (i.e. 3000 per year - with approximately 75% of non-household stock impacted by 2050).

Costs have been based upon similar customer journeys for household leakage.

Savings are currently estimated to be 9l/prop/day, based upon most recent smart meter data (this based upon the bulk of the properties with a low per property consumption).

Options 1, 4 and 5, will act together to drive (Retailer) Water Efficiency Visits, informed by smart meter continuous flow, enabling plumbing loss find and fix. Overall, these non-household options are expected to save 10Ml/d of water by 2029/30 and 50Ml/d by 2049/50.

Note that whilst considering appropriate savings for each of the options we have been mindful of the Defra/EA target of a 9% reduction by 2037/38, tailoring savings, where appropriate, to adhere to this figure, where feasible.

Savings and target cohorts have been considered in the light of Thames Water recent findings of approximately 3000l/prop/day average savings for 3000 visits per year, with an average cost of £250K per Ml/d saving. Note we have modelled a more conservative 650l/prop/d at a cost of £475K per Ml/d.

9.3 Non-Household option costs and benefits

The non-household water efficiency options may be summarised as follows (Table 24):

Table 24 Non-household water efficiency options

Type of visit	Size of customer (consumption)	Expected no. Properties impacted per year (based upon our customer base)	Expected saving (per property per day)
Delivery of smart meter targeted water efficiency packages, similar to household drop20 campaigns. This will be undertaken on a scaled basis (dependent upon the size of consumption).	Low Consumption	3000	86 litres per water efficiency package
Specialist water efficiency audits, with find and fix for consumers using approximately 25,000 litres per property per day.	Medium Consumption	79	2,127 litres per property
Specialist water efficiency audits with find and fix for larger consumers (approx. 500,000 litres per property per day).	High Consumption	10	43,775 litres per property
Retailer incentives for plumbing loss reduction: A £100 incentive to retailers to reduce plumbing losses.	All users	3000	59 litres per property
Smart meter identified plumbing loss fix: Non-household PL repairs for properties identified to have continuous flow. Visits will be aligned with water efficiency visits.	All users	3000	240 litres per property
Smart meter identified customer supply pipe leakage (cspl) fix. Non-household cspl repairs for properties identified to have continuous flow. Visits will be aligned with water efficiency visits.	All users	3000	9 litres per property

These options will result in the following costs and savings (Table 25):

Table 25 Non-Household water efficiency option savings

	2030 water saving per year Ml/d	AMP8 Opex (£)	2030 Opex saving (inc. value of water saved) (£)	2050 water saving per year Ml/d	2050 Opex (£)	2050 Opex saving (inc. value of water saved) (£)
	AMP8	AMP8	AMP8	AMP12	AMP12	AMP12
PL repairs	3.60Ml/d	£0.291m	£0.36m	18.0Ml/d	£1.45m	£7.87m
PL100 repairs	0.89Ml/d	£1.50m	£0.089m	4.42Ml/d	£7.50m	£1.93m
WEF Visit Lower	2.13Ml/d	£1.11m	£0.21m	10.63Ml/d	£5.56m	£4.65m
WEF Visit Upper	1.15Ml/d	£1.40m	£0.11m	5.74Ml/d	£7.02m	£2.51m
WEF Visit Super High	2.19Ml/d	£0.52m	£0.22m	10.94Ml/d	£2.60m	£4.78m
Totals	**9.95Ml/d**	**£4.828m**	**£1.004m**	**49.74Ml/d**	**£24.144m**	**£21.766m**

Additionally, the cspl reduction option will result in the costs and benefits, below (Table 26):

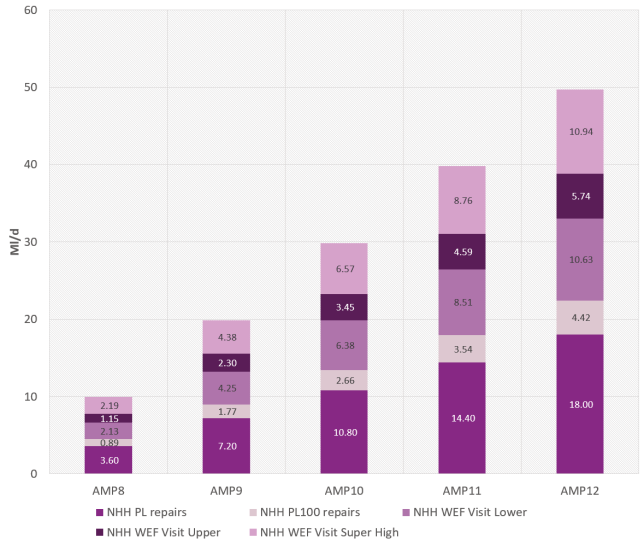
Table 26 Non-Household cspl savings from smart metering

	2030 water saving per year Ml/d	2030 Opex (£)	2030 Cost per Ml/d	2050 water saving per year Ml/d	2050 Opex (£)	2050 Cost per Ml/d
	AMP8	AMP8	AMP8	AMP12	AMP12	AMP12
CSPL leak investigations	0.13Ml/d	£0.05m	£0.36m/Ml	0.65Ml/d	£0.23m	£0.36m/Ml

Overall the options will save 10.08Ml/d in 2029/30 at a cost of £4.878m. By the end of the WRMP24 period, these options will save 50.39Ml/d at a cost of £24.374m (excluding opex savings).

These savings (excluding cspl) can be visualised as below (Figure 55):

Figure 55 Non-household water efficiency savings (excluding cspl)



9.4 Non-household water efficiency and the Defra/EA targets

9.4.1

9.4.2 Historic non-household consumption and EA targets.

Whilst developing our options we have been mindful of the EA (Defra) targets for reducing demand by 9% by 2037/38 and by 15% by 2049/50.

The EA (following Defra) have set a very ambitious target of a 9% absolute reduction in non-household demand by 2037/38 (from the 2019/20 base-line) and a 15% absolute reduction in non-household demand by 2049/50 (again from a 2019/20 base-line).

The initial estimates of future demand and water efficiency savings indicate that this will be a very challenging target (given that we expect growth in non-HH consumption, aligned with population growth in the region), noting that;

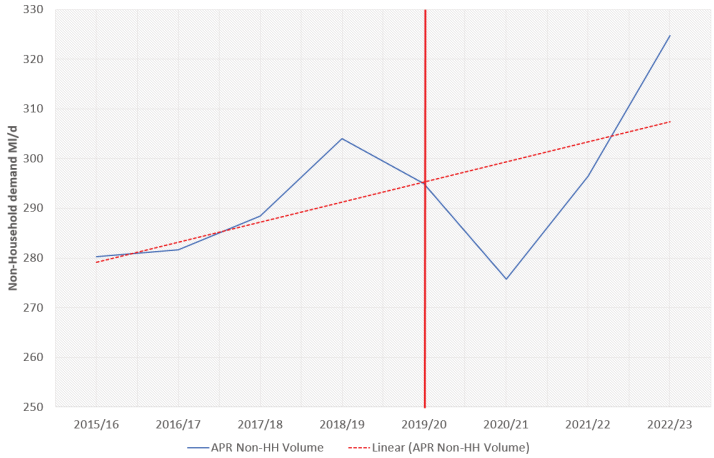
- The East of England has experienced the highest growth rates in the UK since the 2011 census (>8%).
- We expect significant growth in our region over the WRMP24 period and have population increases in line with local authority plans and strategic growth. We will need to plan for business growth in line with this population growth (an expected 914K population increase by 2049/50).
- We also expect significant requirements for water for the hydrogen power sector and carbon capture projects in our region.
- We are currently experiencing increasing volatility in non-household demand, post 'brexit' and post the Covid19 pandemic (with potential supply chain changes as companies relocate)

We have also considered recent non-household demand and the base-line value for 2019/20. The base-line figure for Non-HH consumption for Anglian Water would be 294.99Ml/d (2019/20) (Revised reporting methodology).

For the the WRMP24 base-line, we have reported a value of 296.49 Ml/d (2021/22), which is a 0.5% increase. We have also seen a very significant increase in 2022/23 to 324.76Ml/d, (the underlying reasons for this are currently under investigation).

This historic and recent non-household demand trend reinforces the challenges that will be faced in reducing non-household demand below current levels (Figure 56).

Figure 56 Historic Non-household demand



In response to these challenges we have included a preferred portfolio of non-household water efficiency options, which should mitigate future growth and achieve the following reductions in demand. These options could be considered conservative, but do achieve relative reductions in demand in line with EA/Defra expectations (accounting for growth) They also reflect the fact that these options are not fully under our control and must be implemented collaboratively with our Retail and business customer partners.

The currently modelled options would save:

- 10.08Ml/d in 2029/30,
- 26.22Ml/d for the year 2037/38 and
- 50.42Ml/d by 2049/50.

In absolute terms, once additional non-household demand growth is included (from the 2019/20 base-line), this would represent:

- a 1.2% increase by 2029/30,
- a 2.3% reduction by 2037/38
- and a 3.0% reduction by 2049/50.

However, note that for WRMP24 we have had to use our more recent higher base-line of 296Ml/d (from the 2021/22 forecast base-line) and have forecast Non-HH demand growth in line with household population growth and in line with recent increases (OxCam_2b_r_P projection).

Consequently, we estimate that:

- the 10.08Ml/d saving would be in comparison with a 309.4Ml/d BL (2029/30): a relative 3.2% reduction.
- the 26.22Ml/d saving would be in comparison with a 314.9Ml/d BL (2037/38): **a relative 8.2% reduction**
- the 50.42Ml/d would be in comparison with a 336.8Ml/d BL (2049/50): **a relative 14.8% reduction.**

The growth forecast for non-household demand implies a 3.3% decrease in demand by 2029/30, a 8.2% decrease in demand by 2037/38 and a 14.8% decrease in demand by 2049/50 relative to the increased growth forecast.

As can be seen below (Table 27), we are expecting the base-line non-household demand to grow by 13.8%, over the WRMP24 period, With water efficiency options, the growth will be mitigated (reducing demand by 4.1% from the 2021/22 base-line). However, meeting the Defra/EA targets in absolute terms does not appear to be possible, in the current circumstances.

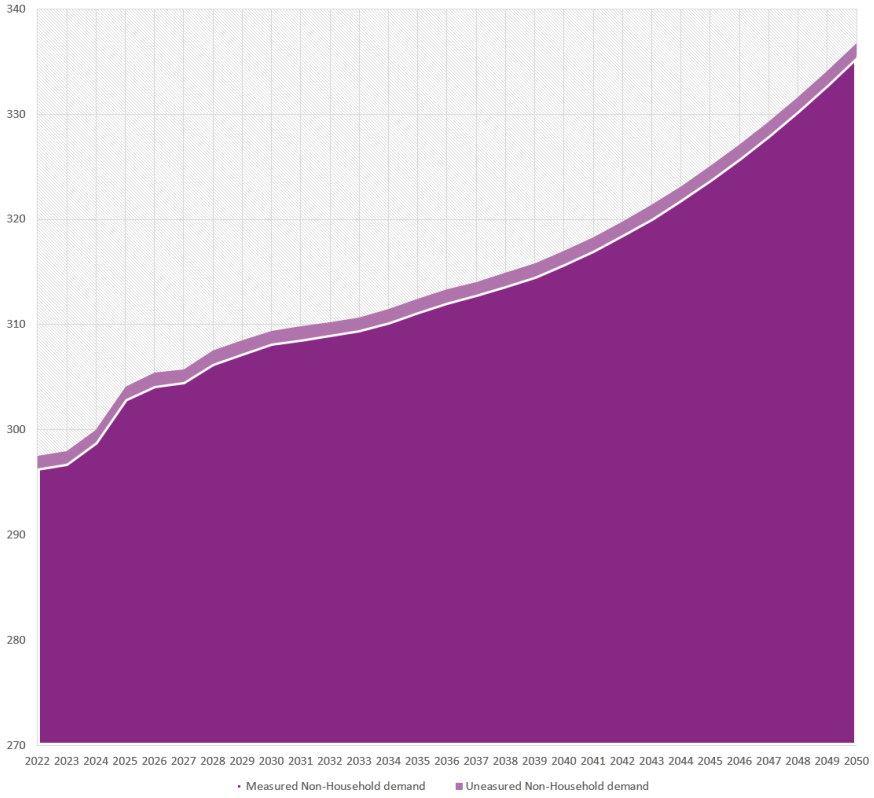
Table 27 Non-Household grwoth, the preferred plan and relative change

	2029/30	2034/35	2037/38	2039/40	2044/45	2049/50
Non-HH demand Base-line	309.4Ml/d	312.4Ml/d	314.9Ml/d	317.0Ml/d	325.1Ml/d	336.8Ml/d
Non-HH demand with demand management	299.4Ml/d	292.53	289.0Ml/d	287.1Ml/d	285.3Ml/d	287.0Ml/d
% Change	-3.2%	-6.4%	-8.2%	-9.4%	-12.2%	-14.8%

For the base-line forecast, without any demand management, measured and unmeasured non-household demand can be shown as below (Figure 57).

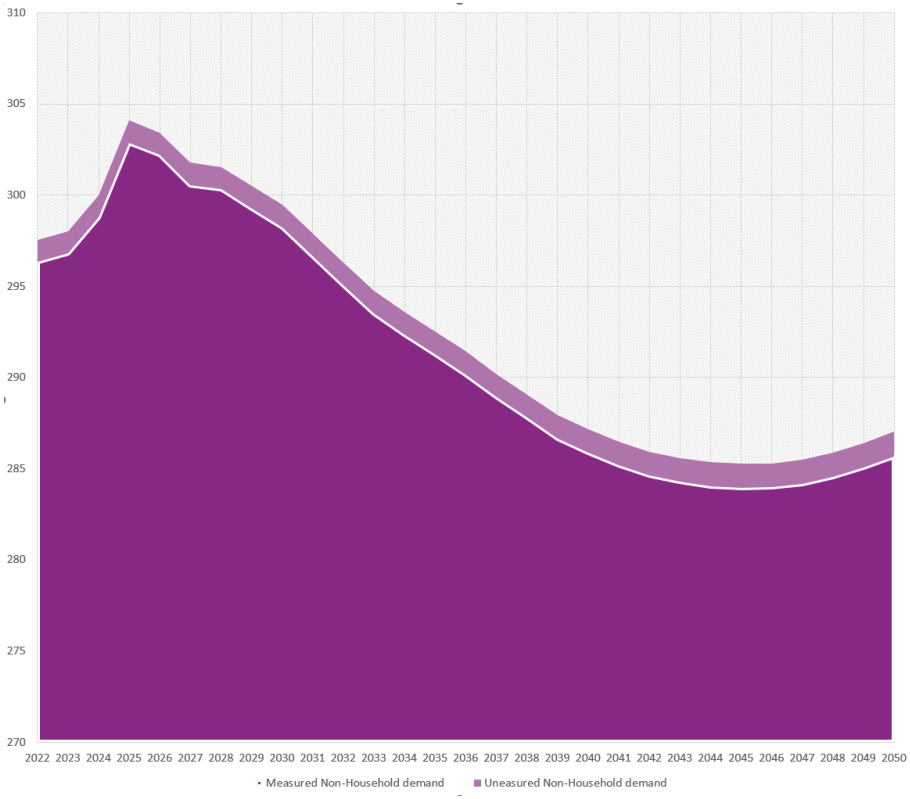
Note that these forecasts are for our potable demand projections and do not included non-potable demand (our South Humber Bank exports) and will not reflect potential growth due to H_2 production or carbon capture.

Figure 57 Base-line non-household forecast, measured, unmeasured demand



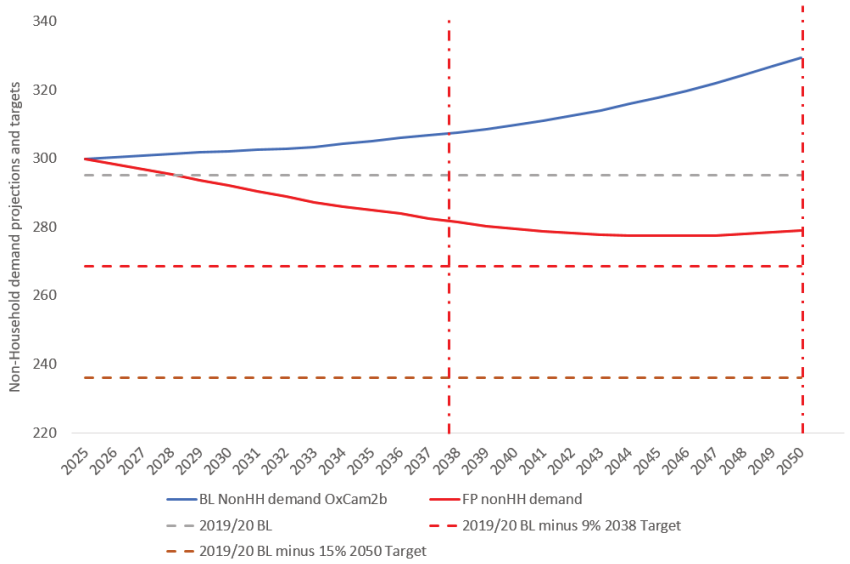
For our preferred plan, with water efficiency measures, measured and unmeasured demand can be shown as below (Figure 58):

Figure 58 Preferred plan non-household forecast, measured, unmeasured demand



We can show the base-line demand forecast, preferred plan forecast with demand management options and target levels, as below (Figure 59):

Figure 59 Baseline and preferred plan non-household demand forecasts and Defra/EA targets



Note that in addition to the trend based growth which has been included in the WRMP24 forecast, we have also included a number of specific sites which have been recently identified. These demands are included in the projections shown above.

Separately, we have also allowed for demand growth related to hydrogen production and carbon capture based upon values provided by relevant stakeholders during our WRMP24 consultation. This volume, of approximately 60Ml/d, which will potentially be required by the early 2030s, is for non-potable water and consequently does not appear in our potable non-household demand forecast (as shown).

Whilst recognising the challenging nature of the targets that have been set, we are very keen to develop ambitious water efficiency options for the non-household sector; understanding that all regional stakeholders must play their part in mitigating future demand growth and assisting us in reaching our environmental and sustainability destinations.

9.5 Non-household option summary

9.5.1 In summary:

- We have recognised the importance of demand management with regard to the Retail and non-household sector.
- We have consequently designed a portfolio of non-household options which are expected to save 10Ml/d of water by 2029/30 and 50Ml/d by 2049/50.
- Where feasible we have tailored options to achieve a 9% saving, whilst also reflecting current consumption volumes, smart meter data, and current savings estimations for ('plumbing loss' and cspl).
- We are currently experiencing significant growth in non-household demand, with requests for large volumes of water in the near term (Those regarded with certainty have been included in the WRMP24 forecast).
- We have pragmatically included a non-household forecast aligned with our WRMP24 population forecast, reflecting Local Authority growth and strategic growth associated with the OxCam arc (13.8% to 336Ml/d growth by 2049/50 - BL forecast).
- We have also been mindful of the Defra/EA 9% target for non-household demand reduction by 2037/38 and the 15% reduction by 2049/50.
- We have consequently designed a set of non-household water efficiency options to help us achieve these targets (with individual targets set at 9% and feasible target cohorts).
- Non-household options will need to be delivered in collaboration with, but mainly via our Retail partners.
- In total, these options help us achieve approximately 8% reductions by 2037/28 and 15% by 2049/50, but these reductions can only be achieved relative to the non-household demand position (including growth).
- We do not, therefore, believe that, achieving the absolute levels of non-household demand reduction, from the 2019/20 base-line, should be included in the revised WRMP24 plan, as this represents a degree of uncertainty with respect to the implementation of the newly developed options, which would not be prudent.
- As we prepare for WRMP24, we will trial options and their implementation, and develop options further for our WRMP29 plan, as we gain more experience.
- We are liaising with NAV companies in order to align our water efficiency programs, and ensure that customers in these areas also achieve the levels of water efficiency that we expect to achieve as part of our WRMP24 (110 l/h/d by 2049/50) and we are also in discussions regarding how smart metering benefits

might be provided to these customers. (Note that for business customers we are installing smart meters, despite them not being our customers, being served by Water Retailers).

- As part of our consultation, we have also been liaising with companies who will be involved with the South Humber Bank Hydrogen production and carbon capture development. These industries have provided Anglian Water with their current assessments of water requirements, indicating that they envisage an initial estimate of 60Ml/d will be needed in the near term (next 10 years). These requirements will, in the main, be for non-potable water, which does not appear in our potable water demand forecast, as described above. However, we have included a 60Ml/d export for non-potable demand, glide-pathed to 2031/32 (as well as an assessed volume of approximately 1Ml/d in the Central Lincolnshire WRZ for potable water) in the WRMP24.

10 Behavioural change, enhanced understanding and future forecasting

Overview

We recognise that developing our understanding of future demand, human behaviour and the potential for water efficiency, is a continual process.

As our smart metering program is being implemented, it is giving us unprecedented insight into water consumption and is opening up new avenues for interacting with and understanding our customers. Additionally, the data that smart metering is providing, is key to monitoring our demand management interventions, in addition to demographic changes that will occur in the future. This will allow us to forecast future demand with ever greater accuracy for future WRMP plans.

Understanding customer attitudes, behaviours and societal influences with regard to their water usage, will be critical to the success of any future water efficiency objectives.

We intend to build upon our current understanding by:

- conducting longitudinal studies into our customer base, to understand long term changes in behaviour.
- developing innovative concepts of 'water neutrality' and 'smart communities' into strategic actions for implementation in future WRMPs.
- researching new ways of understanding customer demographics and segmentation (cluster analysis and machine learning).
- trialling water efficiency initiatives with key stakeholders (including non-household options with Retailers, water re-use options with developers and innovative irrigation systems)
- development of our monitoring framework, in order to determine the long term benefits from our planned portfolio of water efficiency measures.
- Researching methods of achieving ever lower levels of leakage and per capita consumption.

Enhancing our understanding of human behaviour, with regard to water usage and the impact of our water efficiency strategies, will be key to improving our WRMP demand forecasting in future.

10.1 'Water Demand Reduction Discovery Programme'

Anglian water currently finds itself in the unique position:

- We will achieve full AMI smart meter roll-out by 2030, which will enable innovative behavioural change initiatives.
- We currently are in a frontier position with respect to leakage and will have exhausted several techniques for leakage reduction (pressure management) in the near term, meaning that we may have to rely on mains replacement programs in future.
- Due to abstraction reform, we face challenges in meeting growth (especially with respect to non-household growth).
- We are now in a position to investigate tariff trials (summer usage tariffs).

We, therefore, consider it prudent, as part of our preferred plan, to include an innovation fund, in order to further our understanding of customer behaviours and the potential for future water efficiency initiatives. We have termed this our 'Water Demand Reduction Discovery Programme'.

This programme will be used to identify and fill evidence gaps, regarding water demand, customer behaviours and water efficiency programs. It will help inform future forecasting for our WRMP, WRE and PR submissions along with our Long-Term Delivery Strategy (LTDS).

The additional knowledge generated will be key in facilitating our ambitions with respect to demand reductions, feeding into our adaptive planning processes. Demand reduction will be crucial for the sustainability and resilience of the water supplies in the East of England, whilst maintaining Anglian Water at the forefront of water efficiency in the sector.

It is envisaged that the programme will support research into the long-term effectiveness of demand management interventions. It will enable rigorously designed trials into the effectiveness of different types of metering, technological and behavioural change interventions over a five-year period. It will enable on-going monitoring of our 'Enabling Water Smart Communities' project, answering important questions about how we might encourage new developments to adopt an integrated water management approach and incorporate measures like localised water re-use (evidencing how these will be used by communities to reduce demand). Continuous monitoring and evaluation of this innovation project should provide valuable evidence to support future local plan policies, as well as demand options for future WRMPs.

Our intention, is also, that the programme should be used to evaluate water efficiency measures that we wish to implement with our Retail colleagues, for the non-household sector. These measures will include;

- the provision of detailed consumption data,
- the incentivisation of water efficiency through audit, advice and the potential for device replacement,
- leakage reduction in the non-household sector

We will also investigate the potential for water re-use options. These options will all need trials and evaluation, before full implementation.

Additionally, we are looking to trial flow restriction technology in the Anglian Water region and will look to validate potential savings through our 'Demand management monitoring framework'. If these fittings are seen to be effective, we would consider a wider roll-out, but would note that, as with smart metering, we would need a wide roll-out to have a major impact on the our demand requirements.

Water neutrality is both a risk and an opportunity which is quickly approaching our region. This programme will be used to help ensure that the region is better prepared for the potential impact of water neutrality on growth. It will be used to develop our understanding, and expand our evidence base of multiple aspects of water efficiency, re-use and offsetting, which feed into water neutrality.

10.2 The potential for tariff development and price signalling

As part of the WRMP24, we have continued to review the potential for applying tariffs and price signals, as part of our demand management strategy. The majority of household customers pay their water bill based on a simple two part tariff structure, with a fixed charge (calculated on a per diem basis) and a uniform unit charge for volumetric usage (currently in 2022/23, 84% of our customers pay on a measured/metered charge).

In order to assess the feasibility of more complex tariff options, we commissioned the University of East Anglia Centre for Competition Policy to review the international experience of price and non-price approaches to manage water demand. This research suggested that, before tariffs with differentiated price signals can be implemented successfully, certain pre-conditions must be met.

These include, but are not limited to, the points listed below.

- Customers need to be able to understand their consumption and engage positively in managing their demand, otherwise introducing tariff changes (such as Increasing block tariffs) may have, unintended, adverse consequences both to customer bills and to demand (smart meters will be essential in the implementation of these tariffs).
- Access to near 'real-time' information is key to informing the customer of the relationship between usage and cost, and thus, the impact on bills of particular customer behaviours.

Additional consideration needs to be given to the following:

- Tariffs and price differentials would need to be implemented fairly, so that no group of customers would be discriminated against.
- We would need to be mindful of impacts on particular demographic groups and vulnerable customers, in the implementation of tariffs and their structures.
- It is noted that the current framework for pricing determines the overall cost of water, such that any seasonal price rises that might be implemented, would need to be counteracted by price reductions at other points in the year. However, it is noted that despite this charging balance, seasonal demand management messaging could be reinforced by targeted seasonal tariffs, at key times of high summer demand.
- Tariffs will only be successful, if they can successfully be used to reinforce and emphasize behavioural change messaging.

We, consequently, believe that for the successful implementation of more complex tariffs, full smart meter rollout needs to be achieved (in our preferred plan we will fully roll-out smart meters by 2029/30, achieving 90.0% metered and measured status, by that point). We also understand from our engagement with customers that some find their bills and the basis for charging unclear or confusing and that our smart metering communications should be used to improve this understanding, by making consumption information more visible to customers, along with related costs. As part of our WRMP24/PR24 consultation process, we are contacting a selection of our most vulnerable customers to ascertain their views on their unmeasured status, and potential volumetric billing, in order to understand and alleviate their concerns.

Having reviewed more general IBT's (Increasing block tariffs), we believe that a more targeted seasonal approach regarding summer tariffs may prove more beneficial, when accompanied by relevant messaging (via our smart meter MyApp account system). Additionally, we would also note that 'perennial summer tariffs' should be considered separately from 'discretionary use drought tariffs' that might be implemented during times of severe weather stress We are currently developing our trial for a seasonal tariff, as we will describe below.

We believe that more complex price signals may have a role to play in our future demand management activities, once we have achieved full smart meter rollout. A key prerequisite for extending the use of price signals is that customers have real-time consumption data linked to price information available to them, and that they also understand their usage within the wider context of water conservation.

We would stress that potential tariffs should be viewed as a mechanism to reinforce seasonal messaging regarding behavioural change and water efficiency with regard to summer usage.

However, we note that there are certain pre-conditions to be met to enable successful pricing interventions.

- We need to improve our understanding of customer usage patterns (and particularly household occupancy) to effectively design price interventions.
- The roll-out of smart meters will vastly improve the quality of the data we have about consumption. In conjunction with this, our engagement with customers via the web-portal, regarding other ‘non-price’ initiatives, provides a route to obtain information about occupancy.
- We need to establish the scale of impact that price interventions would have in our region. We need to be confident that changing our simple two-part tariffs would have the intended consequences. Therefore, ahead of such an action we would need to undertake robust trials to establish the evidence base. As mentioned we are now taking initial steps and will be trialling a seasonal tariff, as part of our AMP7/8 program.
- The introduction of more complex price signals would need to be part of a wider package of pricing and billing initiatives designed to inform customers and influence their behaviour in such a way as to achieve meaningful reductions in demand.

We intend to build upon the work currently being undertaken with regard to our smart meter program and associated customer communications and design trials of potential tariff interventions (seasonal) as part of our 'Water Demand Reduction Discovery Fund' in AMP8. It is clear that any price interventions need to be supported by other, non-price activities. In the future, there is likely to be a strong link between our activities to promote water efficiency and our ability to successfully implement pricing interventions.

These trials will need to be closely linked with our other water efficiency options including (as described in Section 7):

- The provision of information on water consumption within the home (and how this might be reduced).
- ·Smart devices (e.g. shower timers).
- The provision of comparative information on customers’ usage (comparisons with neighbours and/ or other households with similar characteristics).
- Community engagement: Encouraging customers to take on challenges or pledges to achieve specified goals.
- Providing feedback on customers’ behaviour, including ‘alerts’ when consumption patterns vary, may indicate possible supply pipe leaks.

10.3 Our summer tariff trial

As we prepare for AMP8 and the WRMP24 program, we will implement our initial tariff trial from April 2024. We have, therefore worked with the Centre for Competition Policy (CCP) at the University of East Anglia (UEA) to develop a robust methodology and provide guidance on trial design and data analysis, aligned to Ofwat's principles.

As discussed the CCP report (2018) questioned the effectiveness of IBTs in the UK context given;

- low discretionary use,
- low Price Elasticity of Demand, and
- the relatively low value of water.

We have also been working with the Centre for Climate Change & Social Transformation (CAST) to better understand;

- how customers use water,
- how they understand their use and
- the value they place on that use.

Given that we operate in a water scarce region, we believe that innovative tariffs could be aimed at supporting customers struggling to pay or incentivising customers to reduce discretionary demand for water.

Our focus is on water efficiency, helping customers to value water more, use less, and so reduce the need for future bill increases, as well as reducing their charges as households today, whilst mitigating additional demand from future growth. We are concerned that the IBTs reliance on free or low cost blocks of water are inconsistent with the messaging to customers which we have used for the last 20 years to "love every drop". We are also concerned that without accurate occupancy data, free or low cost blocks of water benefit low occupancy/low demand households to the detriment of higher occupancy households, unless the relative income of households is taking into account.

The generosity of our customers demonstrated in the recent consultation on support for a maximum contribution of £24 for our social tariff LITE, means that we can focus support for customers with affordability issues through the LITE tariff system.

The current smart metering roll-out gives us an almost unique position to trial seasonal tariffs, as a means of encouraging greater water efficiency, but also to test whether an element of progressive charging can be in-built to lower charges for those customers with little or no non-essential use. We intended to share the results of this initial trial with the industry.

We note that price elasticity of demand suggests price alone will not drive demand reductions, so a comprehensible structure and messaging are crucial, linked to our WRMP24 strategic requirements and regional environmental goals.

We remain open minded regarding IBTs and will look to build on wider industry experience relating to their effectiveness in any future trials we undertake.

We are planning to start a trial of a seasonal tariff from 2024/25 (in preparation for AMP8). The tariff will consist of a higher volumetric charge in the summer months and a lower volumetric charge for the remainder of the year. We plan to test variations in price differentials across seasons and different communication strategies across several customer cohorts:

- 1. Control group
  - a. Standard messaging
  - b. Test messaging 1
  - c. Test messaging 2
- 2. Seasonal tariff 1
  - a. Standard messaging
  - b. Test messaging 1
  - c. Test messaging 2
- 3. Seasonal tariff 2
  - a. Standard messaging
  - b. Test messaging 1
  - c. Test messaging 2

This scientific study will help to inform future pricing structures as we complete our smart meter roll-out and develop our water efficiency strategies.

10.4 Local Authorities, developers and design standards

We have been working collaboratively with developers and local authorities in order to ensure that new housing developments are as water-efficient as possible.

We are actively supporting the development of Local Plan policies which require higher water efficiency standards, as a means to reduce demand (110 litres/head/day) and we track the current level of standards applied across the region.

In order to assist with this, we will liaise on the development of a blueprint for water efficient gardens, and update our Water Calculator (showing methods of meeting per capita consumption (PCC) standards of 110 l/h/d and 80 l/h/d).

We are also investigated trialling alternative water re-use solutions at a development scale (grey-water and/or rainwater harvesting technologies) in order to achieve 80 l/h/d potable consumption.

Our roll-out of smart metering will enable effective monitoring of water demand in new homes and inform the need for higher water efficiency standards in new homes and interventions to support existing customers to reduce their use of water.

Additionally, we have been liaising with government and local authorities in order to revise water building standards to reflect the risks within our region and support our path to net zero carbon by 2030.

New Appointments and Variations (NAVs) are companies appointed by Ofwat to provide water and/or sewerage services for a specific geographic areas. These companies are taking a more active role in delivering water services in our Region.

We note that water wholesalers are now facing a new challenge in introducing technologies to new build properties, as the incidence of NAVs is now increasing exponentially. Anglian Water will have no direct relationship with NAV new-build customers, who will be solely served by the NAV companies themselves.

We are, consequently, liaising with the NAV companies in order to co-ordinate our water efficiency programs, and ensure that customers in these areas also achieve the levels of water efficiency that we expect to achieve as part of our WRMP24 (110 l/h/d by 2049/50).

10.5 The impact of Government led interventions on PCC

As part of the WUK/Defra project Artesia developed a number of demand management scenarios based around the potential impact of Government-led interventions on per capita consumption.

In particular they found that the introduction of water labelling and the slow change to more efficient white goods, along with a set of government led mandatory standards for new-build and retrofit properties, might lead to very significant savings in the long-term (up to 31 l/h/d by 2050)

Given that the government has signalled its intent to introduce legislation to bring in labelling and promote more water efficient white goods, we have felt that it is prudent to include a demand reduction linked to these changes in our preferred plan (in alignment with the WRPG) (Table 28).

For the WRMP24 plan, we have included an updated savings trajectory based upon a combined view of the low, medium and high 'white good' labelling scenarios. This leads to a significant saving of 14.95 l/h/d by 2049/50, which would equate to a demand reduction of approximately 84.35Mld by this point. It is noted that this saving is required, in order to achieve the National Framework target of 110 l/h/d, along with the savings quantified for our smart metering and water efficiency programs.

Additionally, note that due to the uncertainty surrounding these savings the near term impact has been minimised for AMP8.

The chosen trajectory shown, allows us to achieve our target of 110l/h/d by 2049/50.

Table 28 Government led intervention scenarios and chosen trajectory

Scenario	2030	2035	2040	2045	2050
G1. Mandatory water labelling|With minimum standards|Saving|Lower - l/h/d	2.83	8.71	16.15	20.63	23.15
G2. Mandatory water labelling|With minimum standards|Saving|Middle - l/h/d	3.33	10.25	19.00	24.27	27.23
G3. Mandatory water labelling|With minimum standards|Saving|Upper - l/h/d	3.83	11.79	21.85	27.92	31.32
G4. Mandatory water labelling|No minimum standards|Saving|Lower - l/h/d	**1.35**	4.16	7.71	9.85	11.05
G5. Mandatory water labelling|No minimum standards|Saving|Middle - l/h/d	1.59	**4.89**	**9.07**	**11.59**	13.00
G6. Mandatory water labelling|No minimum standards|Saving|Upper - l/h/d	1.83	5.63	10.43	13.33	**14.95**
Demand Saving Ml/d - (based upon Oxcam Population projection)	3.52	11.26	21.73	29.06	34.14

10.6 Water neutrality

Whilst forming our views with regard to water resources in future, we are also considering the concept of 'Water Neutrality'.

Water neutrality would require that for every new development proposed in the region, water demand would first be minimised, and that any remaining additional water demand would need to be offset. Total demand on the public water supply, in a defined area, would be the same after development, as it was previously.

There are three necessary steps in order to achieve water neutrality;

- reduce water use by making the new build as water efficient as possible,
- install water re-use systems, such as rainwater harvesting or grey water recycling,
- offset any remaining demand in the existing local region.

Water neutrality could be achieved over a set period, such as ten or twenty years, and assessed at various stages of the build (e.g. planning and design, as constructed, and ongoing monitoring once the homes have been built and are occupied). Note, that water efficiency measures may deteriorate over time and so may need on-going maintenance or replacement in order to maintain water neutral operation.

The concept of water offsetting is new and as such, will require significant work in order to develop an understanding of how water saving units and a market might work and what the role of the water company might be in this process.

Water neutrality could present both a risk and an opportunity, if implemented across our region. We, consequently, will utilize the 'Water Demand Discovery Programme' to help ensure that we develop our understanding and expand our evidence base for multiple aspects of water efficiency, re-use and offsetting which feed into the water neutrality concept. Specifically we would be interested in:

- Utilizing spatial mapping to identify areas of supply/demand concern and potential locations where water neutrality might be enforced in the future.
- Developing a clear evidence base of the cost of water re-use systems, trialling and monitoring the benefits of these systems over time.
- Aligning with the Ofwat Innovation project “Enabling Water Smart Communities” to evaluate water reuse systems and behaviour change interventions.
- Exploring potential developer incentive approaches, based on our experience with similar incentives in the past.
- Adding to our understanding of peak demand and the behaviours associated with this, especially with regards to garden water usage.
- Understanding what a drought resistant and integrated garden of the future might look like, and what water companies can do to promote this.
- Evaluating whether buildings built to 110l/h/d PCC are actually delivering this over time.
- Understanding how water companies in liaison with developers might deliver water neutrality.
- Exploring water saving offsetting options. Investigating whether water companies could provide this service via already established routes of water efficiency audits or whether a 'water saving units trading system/market' might need to be established.

10.7 Water smart communities

Water smart communities will combine complementary water management programs together with town planning and design to deliver multiple benefits for communities and the environment. These communities will use a more integrated approach to urban water management, with the aim of:

- Enhancing quality of life, by contributing to green street-scapes and high quality open spaces.
- Promoting the sustainable use of water resources and infrastructure to enable growth.
- Building resilience against the potential impacts of climate change and extreme weather events.
- Contributing to natural capital and biodiversity through multi-functional water features.
- Delivering water efficient homes to reduce household bills and support affordability.

We will also investigate radical approaches to water management, including the potential for concepts such as 'Water Smart Communities'. As part of this project, we will need to understand how people engage with new technologies (smart metering data, dual plumbing systems etc.) and how this might affect consumption in future. In parallel we will need to understand how macro environmental factors, such as policy, planning and building practices will impact development of Water Smart Communities'.

10.8 Psychological approaches to behaviour change

As we progress our demand management program and smart meter installation, we are keen to develop our understanding of customer behaviours and how attitudes might be influenced over time.

10.9 Psychology

As part of our ongoing research we have, consequently, been involved in investigating psychological approaches that might be applied to influence customer behaviour (and drive demand reductions). This research has specifically looked at social norms and how 'nudge' theory might impact demand.

- Work has been conducted by UEA to investigate the impact of water efficiency messaging in student accommodation. Surveys showed that residents reported taking shorter showers and that this made them think more about water use in other contexts. Different types of messaging were tried (individual action, collective efficacy and conjunctive norms) with conjunctive norms showing the biggest impact. We are also following the University of Surrey, who are now conducting similar trials in residences and in their hotel conference centre (with metered data).
- We have also been working with Aquafresh (in The Forum, Norwich), where people were asked to brush their teeth and give feedback on the toothpaste. In this instance, the mirrors of the bathrooms had different messaging related to turning off the tap when brushing teeth. Microphones were used to detect whether taps were running or not. In this context, the results were not encouraging, however another study in Newmarket has shown that if customers are given 'toothbrushing kits' (comprising a toothbrush, cup and toothpaste which had a sticker on it with a collective efficacy message) water usage showed statistical differences to the norm.

Currently we are progressing additional research, regarding:

- messaging relating to outdoor usage (working with Cardiff University).
- messaging at key 'points of change' in customers lives. Theory suggests that there may be a correlation between effectively changing behaviours or forming new habits, when major life changes occur (moving house, having children). We are currently liaising with Cardiff/Bath University, in order to understand how effective interventions might be at some of these points (moving house); in this case, providing shower timers and advice and monitoring effectiveness with the shower timer data.

We will be keen to progress this type of research further as part of our WRMP24, and intend to leverage the hourly consumption data now becoming available through our smart metering program.

10.10 Cluster analysis and segmentation

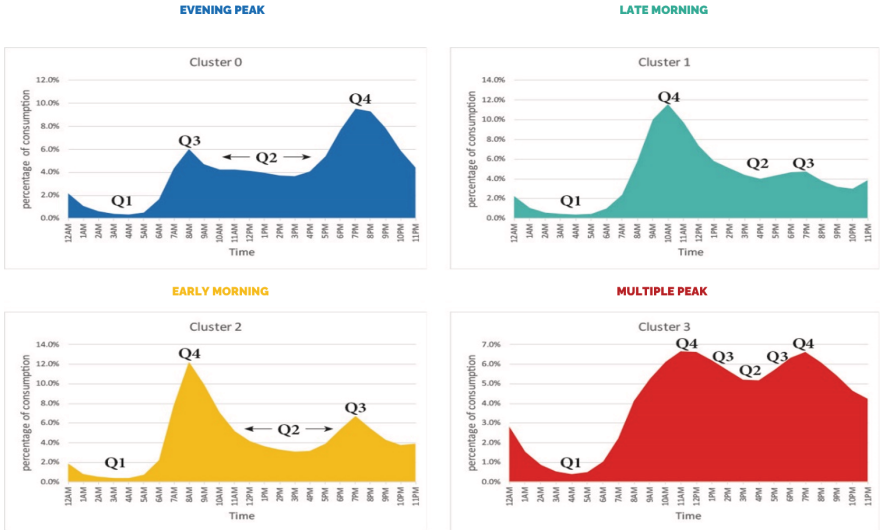
We have already begun, with Cranfield University, to interrogate the hourly smart meter data, using pattern recognition and artificial intelligence systems (termed unstructured data mining), in order to begin to characterise consumers into different segments or clusters, based upon patterns of usage. This understanding, along with complementary demographic information, will be used in the future to design and target water efficiency programs and communications, in the most relevant ways.

This analysis has indicated that there are four distinct groups of consumers (although it is noted that members of these groups do not remain static):

- Early morning peak users
- Late morning peak users
- Evening peak users
- Multiple peaks users

These usage patterns can be visualised (Figure 60).

Figure 60 Patterns of usage, characterised into segments



We will continue to pursue this type of analysis, for its' potential use in managing peak demand. Further work will explore the impact of different interventions on households in each segment, as we develop our 'smart meter monitoring framework'. Note that this project has been published in various journals.

10.11 Future opportunities and longitudinal studies

With the implementation of the smart meter roll-out and the hourly data that is being generated, we see great opportunities in using the 'Discovery Fund' to enable very long term, longitudinal studies and evidence gathering, in order to understand customer behaviour and attitudes to water usage in depth.

These could include:

- Furthering our understanding of how people engage with metering data.
- Understanding how long reductions in PCC last (decay rates) and how often interventions need to be refreshed.
- Understanding the key influences on PCC. (Does PCC impact other water behaviours).
- Implementing rigorously designed trials on different behavioural change interventions (i.e. 'nudge', 'behavioural-economics') enabling us to fully understand their effectiveness over the short and long term.
- Monitoring and analysis of the EWSC demonstrators alongside standard developments, retrofits, ‘normal’ existing housing.

We, additionally, envisage the creation of an ‘Observatory’ on Water, which would allow us to explore how people engage with water generally and how we can use those insights, in the design and delivery of demand management strategies. This would parallel the energy 'Observatory': An observatory for public engagement with energy and climate change'. These programs will complement our 'smart meter monitor monitoring framework'.

11 Demand management and our drought plan

As we approach drought conditions and during a drought, we would look to build upon our current demand management strategies, by implementing additional demand-side drought management measures.

During a drought there are several demand management options that we can use that help us to conserve water.

For the WRMP24, we have developed potential extensions of demand management options that we intend to implement as part of our water efficiency plan. In addition, we have reviewed 'Temporary Use Bans' (TUBs) and Non-Essential Use Ban (NEUBs).

We have re-assessed savings in the light of the UKWIR 'Drought and Demand' report. The UKWIR report aims to quantify the savings achieved from demand restrictions that have been imposed historically. These figures have been updated following the completion of a further report building on the lessons learned during the 2011-12 drought.

Savings are summarised below (Table 29) for comparison and are given as a range of percentage reductions in demand, dependent on the time of year that the restrictions are imposed. The savings are cumulative such that it is assumed that the preceding options will have been imposed to realise the total savings for the latter options.

These communications strategies, water efficiency measures and restrictions, will need to target both periods of drought and peak summer temperatures. For the WRMP24 we have used the minimum percentage values from the ranges previously derived, so as not to double count savings with the additional non-drought options that have been assessed.

Table 29 Savings included in WRMP24 for TUBs, NEUBs

Demand Options	Drought Plan 2022
Communications Campaigns	3-10% - For WRMP24 3%
Temporary Use (hosepipe) Bans (TUBs)	3-10% - For WRMP24 3%
Non-Essentail Use Ban (NEUBs)	14-20% - For WRMP24 14%
Provision of rota-cuts	34-52% - For WRMP24 34%

In addition to these options, we have also assessed extensions of our portfolio of water efficiency measures, included in our preferred 'Aspirational' demand management portfolio.

These options include:

- communications and messaging campaigns at a regional and local level.
- uplifts to our introduction of smart devices (smart shower devices)
- additional home water efficiency visits
- additional focus on fixing leaky loos and assistance for customers in fixing cspl leaks.
- additional advice on garden usage and the provision of 'garden kits'

These options have been assessed for their cost and benefit at WRZ level, as additional drought targeted options for inclusion in the WRMP24 drought table (Table 7), and are not, therefore included in our main option portfolios.

These drought/peak usage options can be described as below (Table 30):

Table 30 Extended demand management options for drought/peak conditions

Option	Uplift	Duration of activity	Duration of saving	Notes
1a - smart sensors	25% uplift	6 month duration	6 month duration	Smart showers - targeted by WRZ - uplift in short term installation - 1250 additional units
0h - Baby dams	25% uplift	6 month duration	6 month duration	additional 3000
$d - Leaky loos campaign - education/customer engagement, no fix	25% uplift	6 month duration	6 month duration	Leaky loos campaign (base option). This is a continuation of a service we offer in PR19. - additional 250.
2A,B,D,F - SM - Comms MyApp Comms - SM behaviour uplift	25% uplift	6 month duration	3 months summer saving	plus 25% for SM savings - 2% goes to 2.5% for the summer three months to reflect comms uplift through SM - Overall 2.125 over the year
2D inc above - Hyper local and seasonal messaging - community campaigns	-	6 month duration	3 months summer saving	included in above
3A inc above - Hyper local messaging drought messaging		6 month duration	3 months summer saving	included in above
2C - Garden advice - garden kits	25% uplift	3 month duration	3 months summer saving	Garden advice - garden kits - 25% uplift
4G (0f) -Drop 20 water visits	25% uplift	6 month duration	6 month duration	Home water efficiency visits
4A - Leaky loo assistance for vulnerable customers	25% uplift	6 month duration	6 month duration	Scheme for customers in vulnerable circumstances and customers with affordability issues to fix leaky loos
4B - Vulnerable customer cspl fix	target 80	6 month duration	6 month duration	Fix all customer side supply pipe leaks for all customers up to a value of £500? for P3 and above (P3, P3a, P2s, P1s). Vulnerable customer - Reduced runtime target 100 or below.
4C - cspl journey for non-vulnerable customers	target 80	6 month duration	6 month duration	Delivery of the the customer side leakage journeys relating to P1-P4 break out leaks. - Reduced runtime target 100 or below.

12 Links with our other Plans

Whilst developing the WRMP24 Demand forecast and Demand management technical supporting documents, we have sought to ensure alignments with our other planning commitments. We have, therefore, considered how alignments, with regard to both the core demand forecast and preferred demand management plan should be reflected in:

- The DWMP (Drainage and Wastewater Management Plan).
- PR24 (Price Review 24).
- Ofwat LTDS (Long Term Delivery Strategy).
- WRE (Water Resources East Regional Plan).
- the Drought Plan

12.1 WRMP24 and WRE alignment

As part of the development of our WRMP24 Demand forecast and Demand management technical supporting documents, we have been keen to collaborate and share understanding with our regional PWC (Public Water Company) colleagues.

Whilst understanding that water companies are all at different points in the water efficiency and demand management journey, we have sought to share knowledge and where possible align methodologies and assumptions (being mindful of the competition framework). We have also sought to align the inclusion of influent factors (i.e. Covid19 impacts on demand) in our preferred plan scenarios. The current state of alignment can be shown, as below (Table 31).

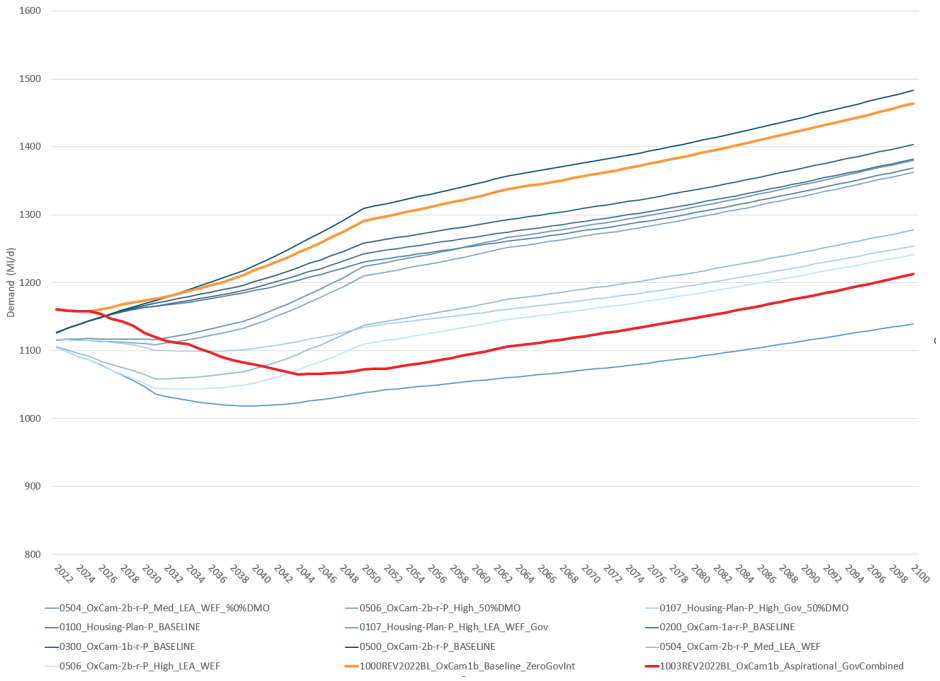
As WRMP24 preferred plan projections have been generated by the participating PWCs, these have been combined for submission into the WRE simulator for final analysis.

As can be seen in the figure below (Figure 61) our WRMP24 projections, sit within the envelope of previously generated WRE demand projections. Note that the WRMP24 base-line forecast, does not include government led interventions (in accordance with the WRPG). Additionally, the 2022 values on the graph now differ, as the WRE forecasts were base-lined to 2019/20 and the WRMP24 forecast is now base-lined to 2021/22.

Table 31 WRMP24 alignment within WRE

Parameter	Anglian Water	Essex and Suffolk	Cambridge
WRMP24 Preferred Growth	Edge - Local Plan (OxCam1b) - strategic uplift	Edge - Local Plan	Edge - Local Plan
Demand forecast Base-year	2021/22	2021/22	2021/22
Low Growth Scenario	ONS18	ONS18	ONS18
Ofwat Scenarios	Aligned	Aligned	Aligned
DY/CP method	Aligned	Aligned	Aligned
Critical period	3 day	7 day	7 day
Gov led Intervention inclusion	Artesia Combined Scenario 14l/h/d by 2050 inc. in BL/FP	Artesia Low Scenario 11l/h/d by 2050 inc. in BL/FP	Artesia Low Scenario inc. in FP only
Covid19 factor	Artesia analysis	Artesia analysis	Artesia analysis
Leakage Target	38% by 2050	40% by 2050	50% by 2050
PCC Target	110 l/h/d by 2050	110 l/h/d by 2050	110 l/h/d by 2050
Smart Meter Rollout	Full rollout by 2030	Full rollout by 2035	Full rollout by 2035
Smart meter savings assumptions	AMI - 2% Behaviour change - 4% plumbing loss - 2.5% cspl reduction	AMI - 3% behaviour change	AMI
Non-HH Forecast	Ovarro methodology	Ovarro methodology	Artesia NHH forecast
Non-HH DMO inclusion	Non-HH DMO savings in revised draft plan	Non-HH DMO savings in revised draft plan	9% reduction
Climate Change	UKCP09 climate projections UKWIR 'Impact of Climate Change on Water Demand methodology	UKCP09 climate projections UKWIR 'Impact of Climate Change on Water Demand methodology	cc circa 1%
WTU - DSOU as % of DI	WTU - 2% DSOU - 1%	2%	DSOU >1%-
New NonHH major users	Manual adjustment to include identified new Non-HH users	BL NHH all new NHH requests included.	No specific allowance for major users

Figure 61 WRMP24 BL/FP demand projections and WRE key forecasts



12.2 WRMP24 and the DWMP

As we have developed our WRMP24, we have sought to ensure alignment with the 'Drainage and wastewater management plan' recently submitted to Defra. We have, therefore, ensured that long term planning for water supply and wastewater is based upon aligned growth forecasts, per capita consumption and climate change assumptions.

12.3 WRMP24 and the Long Term Delivery Strategy (LTDS)

As we have developed our WRMP24, we have considered the Ofwat Long Term Delivery Strategy and Ofwat reference scenarios. We have, consequently, generated a number of scenarios in alignment with the Ofwat criteria. These are listed below (Table 32).

Table 32 Ofwat scenario detail

Reference	Growth Variant	WRMP aligned Population Growth	Gov. interventions	Ofwat Technology Description	Nearest WMP scenario	Scenario Reference
Ofwat Scenario 1	HIGH DI GROWTH SCENARIO	LAUA Plan	No Gov. Intervention	LOW TECHNOLOGY Smart Network by 2040 Full SM by 2045	OxCam1b - No Gov - 3AMP AMI-Low WEF - Low leakage	3001
Ofwat Scenario 2	HIGH DI GROWTH SCENARIO	LAUA Plan	Includes Gov led interventions (Artesia Low in alignment with WRMP24)	LOW TECHNOLOGY Smart Network by 2040 Full SM by 2045	OxCam1b - 100% Gov - 3AMP AMI-Low WEF - Low leakage	1001
Ofwat Scenario 3	HIGH DI GROWTH SCENARIO	LAUA Plan	No Gov Intervention	HIGH TECHNOLOGY Smart Network 2035 Full SM rollout by 2035 Internet of things	OxCam1b - No Gov - Aspriational - 2AMP - High WEF - High Leakage	3003
Ofwat Scenario 4	HIGH DI GROWTH SCENARIO	LAUA Plan	Includes Gov led interventions (Artesia Low in alignment with WRMP24)	HIGH TECHNOLOGY Smart Network 2035 Full SM rollout by 2035 Internet of things	OxCam1b - 100% Gov - Aspriational - 2AMP - High WEF - High Leakage	1003
Ofwat Scenario 5	LOW DI GROWTH SCENARIO	ONS Trend	Includes Gov led interventions (Artesia Low in alignment with WRMP24)	HIGH TECHNOLOGY Smart Network 2035 Full SM rollout by 2035 Internet of things	ONS 18-P -100%Gov - 2AMP highWEF - High++ Leakage	5003
Ofwat Scenario 6	LOW DI GROWTH SCENARIO	ONS Trend	No Gov Intervention	HIGH TECHNOLOGY Smart Network 2035 Full SM rollout by 2035 Internet of things	ONS-18-P - No Gov - 2AMP highWEF - High++ Leakage	5503
Ofwat Scenario 7	LOW DI GROWTH SCENARIO	ONS Trend	Includes Gov led interventions (Artesia Low in alignment with WRMP24)	LOW TECHNOLOGY Smart Network by 2040 Full SM by 2045	ONS 18-P -100%Gov - 3AMP SM - Low WEF - Low Leakage	5001
Ofwat Scenario 8	LOW DI GROWTH SCENARIO	ONS Trend	No Gov Intervention	LOW TECHNOLOGY Smart Network by 2040 Full SM by 2045	ONS 18-P - No Gov - 3AMP SM - Low WEF - Low Leakage	5501
WRMP24 Preferred	HIGH DI GROWTH SCENARIO	LAUA Housing Plan Plan	Includes Gov led interventions (Artesia Low in alignment with WRMP24)	2 AMP Smart meter - High WEF - Low Leakage	OxCam1b - 100% Gov - Preferred - 2AMP - High WEF - Low Leakage	1002

These scenarios have been assessed along with those already considered as part of the WRMP24 sensitivity testing process, as we have developed and reviewed the robustness of our plan.

12.4 WRMP19 and 2020 to 2025 (AMP7) demand management options

The WRMP24 forecast has been developed based upon a 2021/22 base-line water balance (post-dating the impacts of Covd19 lockdown and representing a more stable view of the water balance), as opposed to the 2019/20 base-line water balance, which informed the draft plan.

Consequently, we have had to model the impacts of water efficiency measures that are being implemented in AMP7 (WRMP19), as part of our WRMP24 base-line forecast. Post the Covid19 pandemic, options have been re-modelled to maximise their impact and help achieve our WRMP19 ODI targets, whilst accounting for post CMA alterations and AID impacts (Advanced infrastructure delivery). Additionally, we have realigned savings from smart meters, in accordance with revised draft WRMP24 findings, taking account of the additional information now available.

Note that the Covid19 pandemic significantly impacted our ability to pursue our water efficiency options in AMP7.

12.4.1 Water Efficiency

We have included costs and benefits from the following water efficiency interventions, as listed below (Table 33):

- **Multi-utility portal for smart metered properties:** working with gas and electricity to create a multi-utility portal e.g. HIVE. Trial approx. 1000 households as part of Shop Window
- **Toilet rebate:** 3,500 total visits in AMP7 (4 years).
- **Additional Leaky Loos Campaign**: the continuation of our current leaky loo campaign.
- **Smart homes with AMI meter:** 2,000 per year smart shower devices. Assumed savings 8 litres/person (based on 2 min average reduction in shower time per household)
- **Drop 20s:** 13,000 visits per year with CSR (smart and dumb metering visits) - 52,000 y2-y5. Assumed savings 20 litres/prop, AMP7 option
- **Baby Dams:** Supply of baby dam devices to reduce the size of bath needed for infants. Number of devices in year 2 is 120 number, year 3-5 is 53 number. Saving for each bath is 28 litre with a frequency of 1 bath per day

Water efficiency savings can be shown for AMP7, noting that for our calculations the base-year is 2021/22.

Table 33 AMP7 Water Efficiency Option Savings

Option	2023	2024	2025
Saving WEF: 0a. Multi-utility portal for smart metered properties	0.00 Ml/d	0.01 Ml/d	0.02 Ml/d
Saving WEF: 0b. Toilet rebate	0.42 Ml/d	0.84 Ml/d	1.25 Ml/d
Saving WEF: 0e. Smart homes with AMI meter	0.04 Ml/d	0.08 Ml/d	0.11 Ml/d
Saving WEF: 0f. Drop 20s	0.26 Ml/d	0.52 Ml/d	0.78 Ml/d
Saving WEF: 0h. Baby Dams	0.28 Ml/d	0.56 Ml/d	0.84 Ml/d
Saving WEF: 4d WRMP24. Leaky Loos Campaign	0.92 Ml/d	1.69 Ml/d	2.36 Ml/d
Grand Total	1.92 Ml/d	3.69 Ml/d	5.36 Ml/d

12.4.2 Smart Metering

The smart meter rollout has been re-profiled to take into account post CMA projections (Approx. 1 Million smart meters) and the AID (Advanced infrastructure delivery) program of an additional 60K smart meters in AMP7. Smart meter savings have been re-assessed, based upon smart meter data from the full-rollout (and long term Newmarket and Norwich trial data), giving the following estimated savings (Table 34). Note that plumbing loss and cspl savings have been significantly revised downwards in the near term.

Smart meter savings can be shown for AMP7, noting that for our calculations the base-year is 2021/22.

Table 34 AMP7 Smart Meter Savings

Item	2023	2024	2025
Saving Measured households - behaviour change	1.25 Ml/d	2.56 Ml/d	3.48 Ml/d
Consumption Saving MHH Plumbing loss	0.25 Ml/d	1.01 Ml/d	2.07 Ml/d
CSPL Saving MHH	0.12 Ml/d	0.47 Ml/d	0.95 Ml/d

12.4.3 Leakage

Leakage for AM7 has been modelled, as we aim to achieve our stated goal of a 14% (27Ml/d) reduction over the 5 -year period (Table 35). Leakage has been modelled at the DMA District Meter Area) level, accounting for current leakage levels and pressures to generate forecast savings. This includes savings from smart meter customer supply pipe find and fix. These reductions reduce the leakage level from 191Ml/d (new methodology) in 2019/20 to 164.2Ml/d in 2025.

Leakage savings can be shown for AMP7, noting that for our calculations the base-year is 2021/22.

Table 35 AMP7 Leakage savings

Item	2023	2024	2025
DL_Savings_AMP7	2.64 Ml/d	5.28 Ml/d	8.00 Ml/d
USPL_Saving_MHH_MET	0.32 Ml/d	0.47 Ml/d	2.54 Ml/d

The demand management savings outlined have been included in the base-line forecast for the WRMP24, with all water efficiency enhancements being included on top of these AMP7 interventions.

13 Risks and issues

Risks and issues

Whilst developing our program for future demand management, we have been keenly aware of the risks associated with implementing such an ambitious strategy.

We have, consequently, considered these risks, as an integral part of planning the demand management strategy.

These risks will be differentiated with regard to each element of the strategy, but might be characterized as being associated with the following issues:

- Our current understanding of potential behavioural changes as smart meters are introduced is at a very early stage. Significant research is currently underway in order to understand customer demographics and behaviours and the systems that we will need to develop in order to drive these attitudinal and behavioural changes.
- Whether we can realize the demand savings that have been anticipated in the plan for smart metering, leakage and our water efficiency program, will have direct implications for how we might need to adapt our plans in future.
- Issues associated with the scale of the roll-out of the smart meter network, and reaching our goal of full meter penetration (installing >2 million meters over 10 years).
- Deployment of new and innovative technologies, for leakage reduction, smart metering and water efficiency programs could prove problematic and challenging.
- Challenges with regard to the implementation of water efficiency strategies for Non-household customers, with our Retail partners (within the Retail framework).
- Implications for the delivery of water efficiency measures, whilst working with our NAV partners and their customers.
- Targeting the demand options to address WRZ supply-demand balance issues

Risk Mitigation

These risks will be mitigated by setting up clear monitoring programs for both the installation of new technologies and the realization of benefits. Additionally, through the WRMP24, we have developed an 'Adaptive Planning Strategy' in order to have options available as a contingency to mitigate alternative outcomes.

Monitoring will include:

- We are continuously reviewing processes for both AMP7 installation and roll-out programs and the assessment of benefits from smart metering (and leakage). This re-assessment has currently informed the WRMP24 plan and will continue as we work beyond WRMP24 towards WRMP29.
- Metrics have been designed to allow continuous monitoring of the progress of installation and roll-out programs, and our customer engagement.
- Analytical tools are being designed in order to assess current benefits and assess how we might achieve greater benefits.
- Trigger points and ‘signposts’ (leading up to WRMP24 and beyond) have been defined, as the demand management strategies are implemented, to track performance and indicate whether additional supply side options might be required or whether additional demand options should be considered. These trigger points will be integral to our adaptive planning processes.

13.1 Risk and uncertainty

Forecasting the future demand for water over the long term for a region the size of Anglian Water, is fraught with uncertainty, given the number of variables involved, especially considering that the key factors are human behaviour and our attitudes to water use. However, for our WRMP24 planning process we have attempted to mitigate these uncertainties, by;

- being pragmatic and conservative regarding forecast assumptions.
- making all the assumptions driving the forecast clearly visible and as simple as possible in their application.
- developing a scenario testing framework to explore sensitivities to different forecast assumptions.
- using Target Headroom to account for uncertainty in the WRMP24 planning submission.
- creating adaptive plan scenarios for future out-comes, such that, if forecasts (for example, demand management option savings) do not materialise as expected, we will be able to account for these differences in our plan.

Our evaluation and preferred plan selection process has included the following assessment methods:

- Cost benefit analysis and portfolio comparison.
- Sensitivity testing utilizing the EBSD (Economics of Balancing Supply and Demand) modelling system.
- Evaluation of our portfolios against the 'Best Value Plan' and 'Least Cost' criteria.
- Additional sensitivity stress testing of the preferred plan, based upon the Ofwat Reference Scenarios.

In order to fully test our key portfolios ('Extended Low', 'Extended Plus', and 'Aspirational', preferred), we have developed a large number of alternate scenarios. These alternate scenarios have been designed to test a range of outcomes dependent upon key influent factors including:

- alternate growth projections (plan, trend, strategic)
- alternate demand management option portfolios (i.e. high, low)
- alternate demand management options outcomes (i.e. high, low)
- the inclusion or non-inclusion of other influent factors (government led interventions)

Our newly revised modelling system has allowed cost benefit analysis for any, or all, of the scenarios, as described below. Note that, although we have tested all of these scenarios, the key CBA scenarios are highlighted.

Scenarios for CBA/EBSD sensitivity testing

- LOW DMO Portfolio - (Extended Low): 3AMP smart metering, Low Leakage, Low water efficiency, Non-HH options.
- MEDIUM DMO Portfolio - (Extended Plus): 2AMP smart metering, 24% leakage, Medium water efficiency, Non-HH options.
- **HIGH DMO Portfolio (Aspirational) - 2AMP smart metering, 38% leakage, High water efficiency, Non-HH options.**
- PREFERRED Portfolio (Aspirational) with Compulsory Metering.
- PREFERRED Portfolio (Aspirational) with LAUA PLAN Growth.
- PREFERRED Portfolio (Aspirational) with ONS TREND Growth.
- PREFERRED Portfolio (Aspirational) with zero Gov led Interventions.
- PREFERRED Portfolio (Aspirational) with 50% Gov led Interventions.
- PREFERRED Portfolio (Aspirational) with 3AMP SM Roll-out.
- PREFERRED Portfolio (Aspirational) with Lower DMO savings.
- PREFERRED Portfolio (Aspirational) with higher DMO savings.
- PREFERRED Portfolio (Aspirational) with Lower Non-HH growth.
- PREFERRED Portfolio (Aspirational) with Higher Non-HH growth.

In order to test our assumptions we have developed a comprehensive set of scenario variants as listed in detail below (Table 36):

Table 36 WRMP24 Sensitivity testing scenarios

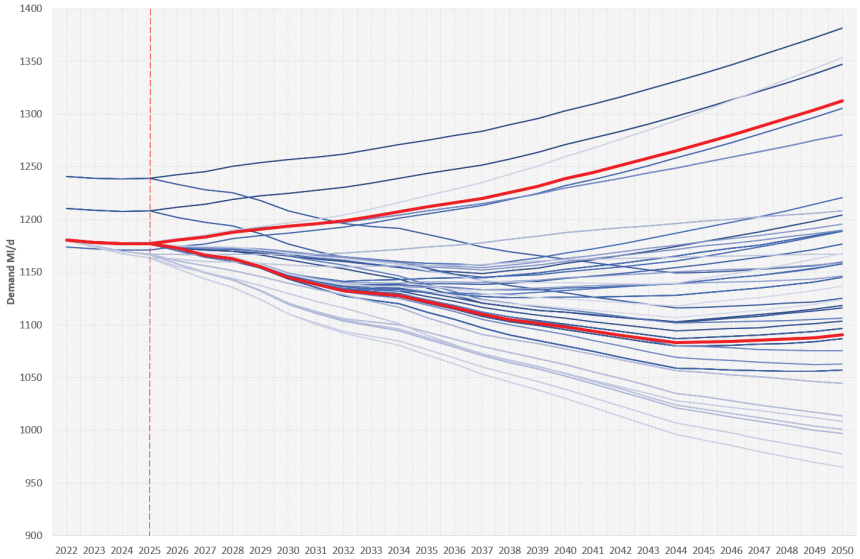
Package Name	Growth Forecast	DMOs portfolio	Variable	Gov led interventions
1000REV_WRMP_OxCam1b_Baseline_100GovInt	OxCam_1b_r_P Growth	NO DMOs beyond AMP7	AMP7 Smart Metering and WEF only	Incl. Gov. interventions
1001REV_WRMP_OxCam1b_Extended_Low_100GovInt	OxCam_1b_r_P Growth	Low DMOs - 3AMP SM	Low DMOs	Incl. Gov. interventions
1002REV_WRMP_OxCam1b_Extended_Plus_100GovInt	OxCam_1b_r_P Growth	Preferred Plan 2AMP SM	Preferred DMOs - with 2% SM	Incl. Gov. interventions
1003REV_WRMP_OxCam1b_Aspirational_100GovInt	OxCam_1b_r_P Growth	Aspirational	High DMOs	Incl. Gov. interventions
1002E_WRMP_OxCam1b_Extended_Plus_Compulsory2AMP_100GovInt	OxCam_1b_r_P Growth	Preferred Plan 2AMP SM	Compulsory metering	Incl. Gov. interventions
1002F_WRMP_OxCam1b_Extended_Plus_Reduced_SM_Savings_100GovInt	OxCam_1b_r_P Growth	Preferred Plan 2AMP SM	Reduced savings Same Costs	Incl. Gov. interventions
1002G_WRMP_OxCam1b_Extended_Plus_3AM_SM_100GovInt	OxCam_1b_r_P Growth	Preferred Plan 2AMP SM	with 2% SM saving	Incl. Gov. interventions
1002H_WRMP_OxCam1b_Extended_Plus_3percentWEF_100GovInt	OxCam_1b_r_P Growth	Preferred Plan 2AMP SM	3% SM WEF saving	Incl. Gov. interventions
1002J_WRMP_OxCam1b_Extended_Plus_NonHH_DMOs_100GovInt	OxCam_1b_r_P Growth	Preferred Plan 2AMP SM	with NonHH DMOs	Incl. Gov. interventions
1002K_WRMP_OxCam1b_Extended_Plus_HighNonHHgrowth_100GovInt	OxCam_1b_r_P Growth	Preferred Plan 2AMP SM	Higher NonHH Growth +5%	Incl. Gov. interventions
1002L_WRMP_OxCam1b_Extended_Plus_LowNonHHgrowth_100GovInt	OxCam_1b_r_P Growth	Preferred Plan 2AMP SM	Lower NonHH Growth -5%	Incl. Gov. interventions
1002N_WRMP_OxCam1b_Extended_Plus_High_Leakage_100GovInt	OxCam_1b_r_P Growth	Preferred Plan 2AMP SM	High Leakage 38% reduction	Incl. Gov. interventions
1002Q_WRMP_OxCam1b_Extended_Plus_HIGH+leakage_100GovInt	OxCam_1b_r_P Growth	Preferred Plan 2AMP SM	High Leakage 1500km mains	Incl. Gov. interventions
1000AltBL_WRMP_OxCam1b_ReducedAMP9PMX_100GovInt	OxCam_1b_r_P Growth	Preferred Plan 2AMP SM	No PMX past AMP7	Incl. Gov. interventions
1002T_WRMP_OxCam1b_Extended_Plus_MaximumLeakage	OxCam_1b_r_P Growth	Preferred Plan 2AMP SM	Feasible leakage 39%	Incl. Gov. interventions
1002U_WRMP_OxCam1b_Extended_Plus_MaximumLeakage	OxCam_1b_r_P Growth	Preferred Plan 2AMP SM	Leakage 50% reduction	Incl. Gov. interventions
2000REV_WRMP_OxCam1b_Baseline_50GovInt	OxCam_1b_r_P Growth	NO DMOs beyond AMP7	AMP7 Smart Metering and WEF only	50% Gov. intervention
2001REV_WRMP_OxCam1b_Extended_Low_50GovInt	OxCam_1b_r_P Growth	Low DMOs - 3AMP SM	Low DMOs	50% Gov. intervention
2002REV_WRMP_OxCam1b_Extended_Plus_50GovInt	OxCam_1b_r_P Growth	Preferred Plan 2AMP SM	Preferred DMOs - with 2% SM	50% Gov. intervention
2003REV_WRMP_OxCam1b_Aspirational_50GovInt	OxCam_1b_r_P Growth	Aspirational	High DMOs	50% Gov. intervention
3000REV_WRMP_OxCam1b_Baseline_0GovInt	OxCam_1b_r_P Growth	NO DMOs beyond AMP7	AMP7 Smart Metering and WEF only	0% Gov. intervention
3001REV_WRMP_OxCam1b_Extended_Low_0GovInt	OxCam_1b_r_P Growth	Low DMOs - 3AMP SM	Low DMOs	0% Gov. intervention
3002REV_WRMP_OxCam1b_Extended_Plus_0GovInt	OxCam_1b_r_P Growth	Preferred Plan 2AMP SM	Preferred DMOs - with 2% SM	0% Gov. intervention
3003REV_WRMP_OxCam1b_Aspirational_0GovInt	OxCam_1b_r_P Growth	Aspirational	High DMOs	0% Gov. intervention

Package Name	Growth Forecast	DMOs portfolio	Variable	Gov led interventions
4000REV_WRMP_HousingPlan_Baseline_100GovInt	Housing_Plan_P Growth	NO DMOs beyond AMP7	AMP7 Smart Metering and WEF only	Incl. Gov. interventions
4001REV_WRMP_HousingPlan_Extended_Low_100GovInt	Housing_Plan_P Growth	Low DMOs - 3AMP SM	Low DMOs	Incl. Gov. interventions
4002REV_WRMP_HousingPlan_Extended_Plus_100GovInt	Housing_Plan_P Growth	Preferred Plan 2AMP SM	Preferred DMOs - with 2% SM	Incl. Gov. interventions
4003REV_WRMP_HousingPlan_Aspirational_100GovInt	Housing_Plan_P Growth	Aspirational	High DMOs	Incl. Gov. interventions
4500REV_WRMP_HousingPlan_Baseline_zeroGovInt	Housing_Plan_P Growth	NO DMOs beyond AMP7	AMP7 Smart Metering and WEF only	0% Gov. intervention
4501REV_WRMP_HousingPlan_Extended_Low_zeroGovInt	Housing_Plan_P Growth	Low DMOs - 3AMP SM	Low DMOs	0% Gov. intervention
4502REV_WRMP_HousingPlan_Extended_Plus_zeroGovInt	Housing_Plan_P Growth	Preferred Plan 2AMP SM	Preferred DMOs - with 2% SM	0% Gov. intervention
4503REV_WRMP_HousingPlan_Aspirational_zeroGovInt	Housing_Plan_P Growth	Aspirational	High DMOs	0% Gov. intervention
5000REV_WRMP_ONS_18_P_Baseline_100GovInt	ONS_18_P Growth	NO DMOs beyond AMP7	AMP7 Smart Metering and WEF only	Incl. Gov. interventions
5001REV_WRMP_ONS_18_P_Extended_Low_100GovInt	ONS_18_P Growth	Low DMOs - 3AMP SM	Low DMOs	Incl. Gov. interventions
5002REV_WRMP_ONS_18_P_Extended_Plus_100GovInt	ONS_18_P Growth	Preferred Plan 2AMP SM	Preferred DMOs - with 2% SM	Incl. Gov. interventions
5003REV_WRMP_ONS_18_P_Aspirational_100GovInt	ONS_18_P Growth	Aspirational	High DMOs	Incl. Gov. interventions
5500REV_WRMP_ONS_18_P_Baseline_zeroGovInt	ONS_18_P Growth	NO DMOs beyond AMP7	AMP7 Smart Metering and WEF only	0% Gov. intervention
5501REV_WRMP_ONS_18_P_Extended_Low_zeroGovInt	ONS_18_P Growth	Low DMOs - 3AMP SM	Low DMOs	0% Gov. intervention
5502REV_WRMP_ONS_18_P_Extended_Plus_zeroGovInt	ONS_18_P Growth	Preferred Plan 2AMP SM	Preferred DMOs - with 2% SM	0% Gov. intervention
5503REV_WRMP_ONS_18_P_Aspirational_zeroGovInt	ONS_18_P Growth	Aspirational	High DMOs	0% Gov. intervention
6000REV_WRMP_ONS_18_Low_L_Baseline_100GovInt	ONS_18_Low_L Growth	NO DMOs beyond AMP7	AMP7 Smart Metering and WEF only	Incl. Gov. interventions
6001REV_WRMP_ONS_18_Low_L_Extended_Low_100GovInt	ONS_18_Low_L Growth	Low DMOs - 3AMP SM	Low DMOs	Incl. Gov. interventions
6002REV_WRMP_ONS_18_Low_L_Extended_Plus_100GovInt	ONS_18_Low_L Growth	Preferred Plan 2AMP SM	Preferred DMOs - with 2% SM	Incl. Gov. interventions
6003REV_WRMP_ONS_18_Low_L_Aspirational_100GovInt	ONS_18_Low_L Growth	Aspirational	High DMOs	Incl. Gov. interventions
7000REV_WRMP_OxCam2b_Baseline_100GovInt	OxCam2b_r_P Growth	NO DMOs beyond AMP7	AMP7 Smart Metering and WEF only	Incl. Gov. interventions
7001REV_WRMP_OxCam2b_Extended_Low_100GovInt	OxCam2b_r_P Growth	Low DMOs - 3AMP SM	Low DMOs	Incl. Gov. interventions
7002REV_WRMP_OxCam2b_Extended_Plus_100GovInt	OxCam2b_r_P Growth	Preferred Plan 2AMP SM	Preferred DMOs - with 2% SM	Incl. Gov. interventions
7003REV_WRMP_OxCam2b_Aspirational_100GovInt	OxCam2b_r_P Growth	Aspirational	High DMOs	Incl. Gov. interventions

These scenarios have been used to test a range of outcomes, dependent upon different growth forecasts, differing demand management option scenarios (including different smart meter rollout programs, leakage reduction, water efficiency measures and base-line demand starting points) and the inclusion of alternate factors (government interventions, covid19 factors).

The alternate demand forecast outcomes can be shown (Figure 62) (with the preferred WRMP24 base-line and final plan (red) out-comes):

Figure 62 Demand forecast scenarios and WRMP24 Base-line and Preferred Plan



Uncertainties with respect to the preferred plan forecast arise from the following areas:

13.1.1 The base-line water balance assessment of population, per capita consumption and the components of demand

- We have undertaken a further review of our water balance data, as we have moved from our 2019/20 to the 2021/22 base-line for the WRMP24. This has included a further detailed review of property, population and occupancy attributions at the Planning Zone Level, in order to confirm PCC values with more certainty. We have also reviewed the inter-year deviations over a period of time in order to ascertain the variability of our water balances over time, at our WRZ geographic level. We will continue to review the water balance, as part of our WRMP Annual Review process.

13.1.2 The achievement of our WRMP19 AMP7 out-turn reductions in demand from smart metering and leakage

- We are currently pursuing aggressive measures with regard to our PCC and leakage targets for AMP7, despite the impact of the Covid19 pandemic, the cost of living crisis, recent weather impacts (the driest summer in 2022, since 1976) and supply chain issues with regard to smart meter installation (we have installed over 550K smart meters in the past 3 years). As discussed above, we have reviewed our AMP7 out-comes as part of our WRMP24. We continue to monitor out-comes, as we progress through AMP7.

13.1.3 The inclusion of savings from Government led interventions and their realization

- Based upon the Artesia/WUK work, and aligning with the WRPG, we have included savings from government led interventions in our preferred plan. This leads to a very significant saving of 14.95 l/h/d by 2049/50, which would equate to a demand reduction of approximately 84.35Mld by this point.

Smart meter savings and their realization over the WRMP24 period, from our 2AMP smart meter installation program

- As discussed, we have revised our understanding of smart meter savings based upon on our full smart meter roll-out, (as well as our long-term Newmarket and Norwich trial areas). This revised assessment has informed the assumptions included in the plan, as described in Section 6.6.
- We are at the beginning of the process of understanding customer behaviour, how customers respond to the introduction of smart meter technology and how we need to tailor our systems in order to maximise water efficiency, so we expect that our assessments will need to adapt over time as we build a much more complete view. This analysis, will form a key part of our 'Demand management monitoring framework'.
- Further reviews of customer data and segmentation will form part of the update of the Demand Forecast Model as we move forward.

13.1.4 Leakage reduction over the WRMP24 planning period

- Significant uncertainty is involved with regard to leakage reduction and the maintenance of given leakage levels. We are already a frontier company, and significantly below our previously calculated SELL (Sustainable Economic Leakage Level) and so achieving lower levels will prove more difficult. We are also beginning to exhaust traditional methods of leakage reduction such as pressure management and, consequently, will need to develop innovative new methods to detect and repair leakage (noting that our smart meter installation program should have a significant impact with regard to the detection and repair of customer supply pipe leakage). We have, however, included an ambitious program for leakage reduction in our preferred plan, indicating our commitment to the National Framework target. This does come at significant cost, but we expect technological improvement and innovation to mitigate this over the next 25 years. We will continue to analyse leakage interventions for their costs and benefits, for future planning purposes.

13.1.5 The long term impacts of the Covid19 pandemic and the 'cost of living' crisis

- The Covid19 pandemic and associated lockdowns were seen to impact both household and non-household demand as, sections of the population worked from home, segments of the business sector were forced to shut and latterly as many people 'stay-cationed' in our region. We continue to review consumption patterns, post pandemic, in order to ascertain whether we have now entered a new normal, where home-working is seen as a more usual pattern of behaviour. We have included a revised assessment for future Covid19 pandemic impacts, based upon the fact that we have now moved the base-line for our demand forecast, from the pre-pandemic year (2019/20), to a post pandemic year (2021/22).
- We have also recently seen reductions in per capita consumption, that indicate changes in water usage, that might be associated with the rises in energy costs we have experienced (suppressed demand due to the cost of heating water). We will continue to monitor these changes over time.

13.1.6 Property and population growth over the next 25 years

- Property and population forecasts for the next 25 years, are also an area of great uncertainty. We have, therefore, modelled a number of high (strategic growth) and low (ONS trend) population projections, including Local Authority property and population projections, in alignment with WRMP Guidance.
- For our WRMP24, we have adopted a scenario (OxCam1b) that balances:
  - future risk from unexpected population growth in our region,
  - the potential for strategic growth in the area, and
  - the fact that the current Government position appears to have been revised with regard to the OxCam strategic plan development (supporting growth at a local level, as opposed to with a national plan).
- The chosen scenario maintains near term Local Authority planned growth (higher than trend) beyond AMP7 (rather than returning to trend in the long term) in our known high growth areas. This would seem to be the most pragmatic approach, given recent growth in the areas covered by the Arc, and the fact that the East of England has experienced the highest growth rates in the UK since the 2011 census (>8%). This forecast has been aligned with our WRE partners and is in accordance with WRMP24 Guidance.
- We have reviewed and updated our growth projections (January 2023), as a part of the WRMP24 submission.

13.1.7 Understanding customer cohort behaviours

- Our smart meter program is facilitating a step change in our understanding of our customers and their consumption. However, we are only at the beginning of our research and analysis into how and when our customers use water and how these patterns of consumption change within the family unit over time. We are currently progressing analysis on our hourly customer consumption data and statistically analysing consumers to characterise them into meaningful cohorts (e.g. early morning users; all day users) to better understand the demographics of our customer base at WRZ level. As part of our 'Smart meter monitoring framework) we will continue this analysis and use it to produce more sophisticated forecasts, and target demand management options in a more meaningful way.

13.1.8 Non-household, business sector demand

- Our non-household forecast is based upon regression analysis and estimates of future population, GVA and employment, as applied to relevant non-household segments. This simple methodology can only produce forecasts that are

relatively uncertain over the WRMP24 period (trend based). As stated we have sensitivity tested our central forecast with additional variants of future non-household demand.

- We can additionally be called upon to supply specific volumes of water to new non-household businesses, in the near term, which can have direct impacts at the WRZ level. Identifying when these requirements might be called upon, can cause issues within the planning process. We have, however, identified and reflected a number of these demands in the WRMP24 forecast.

13.1.9 Increasing NAV development

- We are closely monitoring the incidence of 'New appointments and variations' (NAVs) where alternate companies are appointed to provide a water and/or sewerage service to new development customers. We have noted that the numbers of these appointments are increasing significantly at the moment.
- A new appointment is made when a limited company is appointed by Ofwat to provide water and/or sewerage services for a specific geographic area. A new appointee has the same duties and responsibilities as the previous statutory water company. These companies install their own metering systems for their customers independent of our smart meter installation program, and as such might not achieve the savings we would expect. Despite the fact that these customers would not fall directly into our domain, we would still need to supply water as the regional wholesaler, which would impact our overall supply demand balance.
- Future household growth has been included in the revised draft WRMP24 (which would account for these new properties). However, if water efficiency measures implemented by the NAV company areas do not match our smart meter driven water efficiency strategy, this would pose a risk for our bulk supply requirements and our overall supply/demand balance
- We are liaising with these NAV companies in order to align our water efficiency programs, and ensure that customers in these areas also achieve the levels of water efficiency that we expect to achieve as part of our WRMP24 (110 l/h/d by 2049/50)and are in discussion regarding how smart metering benefits might be provided to these customers. (Note that for business customers we are installing smart meters despite these not being our customers, being served by Water Retailers).

Whilst considering all these risks and issues we also account for uncertainty in the WRMP24 plan using the concept of Target Headroom.

13.2 Target Headroom

As part of our forecast process, for our preferred plan projections we must quantify a level of uncertainty. One method of dealing with this, is the calculation of Target Headroom, in which an additional contingency volume of water that might be required, is determined. This Target Headroom is added to our preferred projections for both the base-line and final plan forecasts for our final calculations of supply-demand balance.

For the purposes of calculating Target Headroom, we use 'Monte Carlo' simulation. This process uses a number of demand variables (with pre-defined distributions), which are given parameters (producing high and low variants), so that when combined many scenario outputs can be generated.

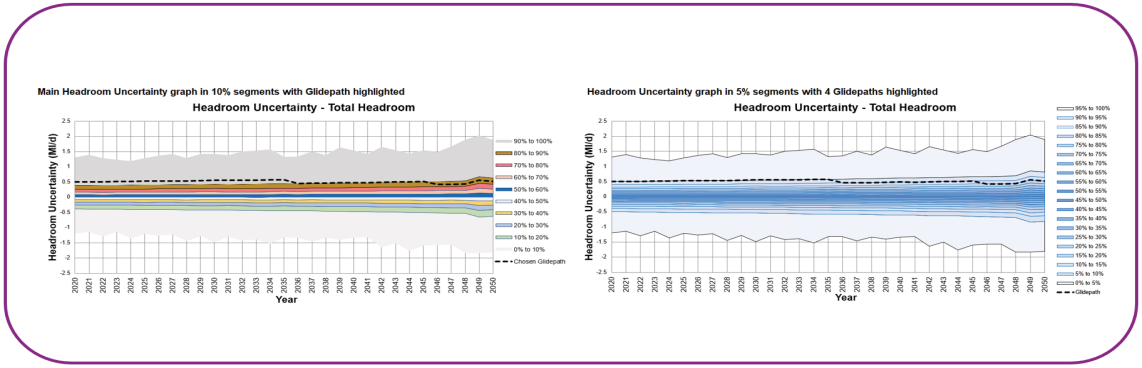
For demand-side uncertainty, the parameters included in the model can be listed, as below (Table 37):

Table 37 Component parameters used in Target Headroom analysis

Component Code	Component description	Distribution Type
D1-1	Accuracy of sub-component data - Overall HH (base year)	Normal/Alt
D1-2	Accuracy of sub-component data - Overall NHH (base year)	Normal/Alt
D1-3	Accuracy of sub-component data - Leakage (base year)	Normal/Alt
D2-1	Demand forecast variation - HH population	Triangular
D2-2	Demand forecast variation - HH PCC growth	Triangular
D2-3	Demand forecast variation - Overall NHH (subsequent years)	Triangular
D2-4	Demand forecast variation - Leakage (subsequent years)	Triangular
D3	Impact of climate change on demand	Triangular

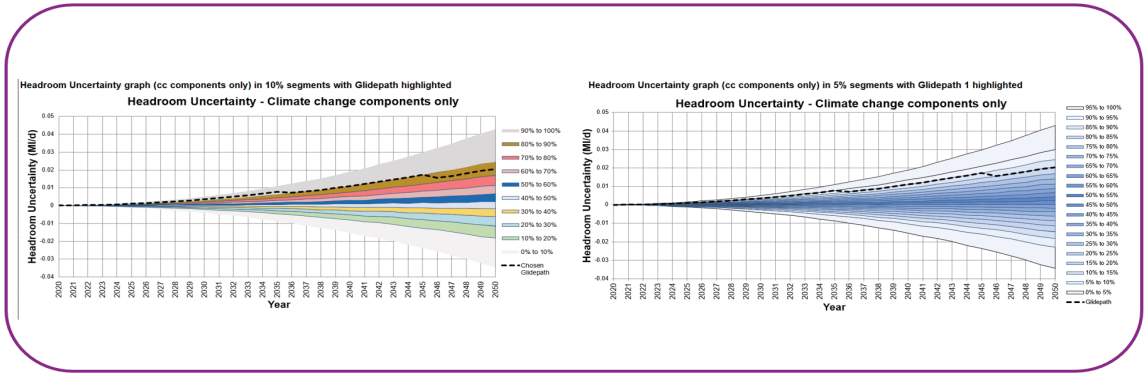
Using 'Oracle Crystal Ball'™ software, we have generated 30,000 scenarios per water resource zone. These have been used to generate a probability distribution of potential future outcomes, from which a glidepath has been selected. Modelled, glide-path outputs for a hypothetical WRZ, for all the parameters can be shown Figure 63):

Figure 63 Target Headroom modelled glidepaths



Additionally, the climate change parameter trajectories can be visualized (Figure 64):

Figure 64 Target Headroom: climate change projections and glidepath



This analysis has generated the following demand contingency at WRZ level (expressed as a percentage of DI uplift) (Table 38). As part of our WRE liaison, we have agreed preferred glidepaths, in order to align with our neighbouring PWCs.

These factors have been reviewed prior to our WRMP24 submission.

Table 38 Target Headroom Factors for each WRZ

Water Resource Zone	2025/26	2029/30	20334/5	2039/40	2044/45	2049/50
Essex Central	3.68%	3.72%	3.93%	2.46%	3.20%	2.50%
Essex South	4.55%	4.72%	5.57%	1.64%	2.44%	1.91%
Fenland	5.24%	6.29%	7.31%	0.69%	1.66%	1.38%
Hartlepool	3.91%	4.42%	4.97%	2.69%	3.02%	2.35%
Lincolnshire Bourne	3.14%	4.43%	5.55%	3.97%	4.66%	4.86%
Lincolnshire Central	4.54%	5.16%	5.93%	3.61%	4.33%	4.09%
Lincolnshire East	4.73%	5.96%	7.19%	5.35%	6.49%	6.26%
Lincolnshire Retford and Gainsborough	3.67%	3.74%	3.89%	2.51%	3.25%	2.76%
Norfolk Aylsham	3.56%	5.54%	7.02%	5.52%	6.56%	5.93%
Norfolk Bradenham	3.47%	3.65%	3.96%	2.97%	3.93%	3.40%
Norfolk East Dereham	4.18%	4.24%	4.35%	5.49%	6.51%	7.31%
Norfolk East Harling	3.86%	4.87%	4.66%	3.28%	3.68%	3.07%
Norfolk Happisburgh	1.76%	3.32%	4.31%	3.50%	3.67%	2.99%
Norfolk Harleston	2.95%	4.31%	9.06%	8.50%	9.20%	8.46%
Norfolk North Coast	3.64%	5.22%	6.42%	5.35%	6.10%	5.61%
Norfolk Norwich & the Broads	3.61%	3.74%	4.06%	3.21%	4.14%	3.87%
Norfolk Wymondham	3.31%	3.40%	4.12%	3.05%	3.83%	3.33%
Ruthamford Central	2.06%	2.20%	3.19%	2.94%	3.59%	3.18%
Ruthamford North	3.81%	4.24%	5.23%	7.78%	8.70%	7.83%
Ruthamford South	5.80%	7.84%	9.12%	12.93%	13.38%	11.29%
Ruthamford West	2.95%	4.03%	5.12%	4.81%	6.05%	5.51%
Suffolk East	3.06%	4.56%	5.82%	3.73%	4.89%	4.47%
Suffolk Ixworth	2.85%	4.31%	5.49%	4.36%	5.13%	4.60%
Suffolk Sudbury	4.52%	5.91%	7.12%	4.73%	5.54%	4.88%
Suffolk Thetford	3.74%	5.07%	6.12%	3.93%	4.70%	4.24%
Suffolk West & Cambs	6.05%	7.54%	9.39%	7.52%	9.26%	9.11%

The full derivation of Target Headroom is described in more detail in the 'WRMP24 Planning Factors' technical supporting document'.

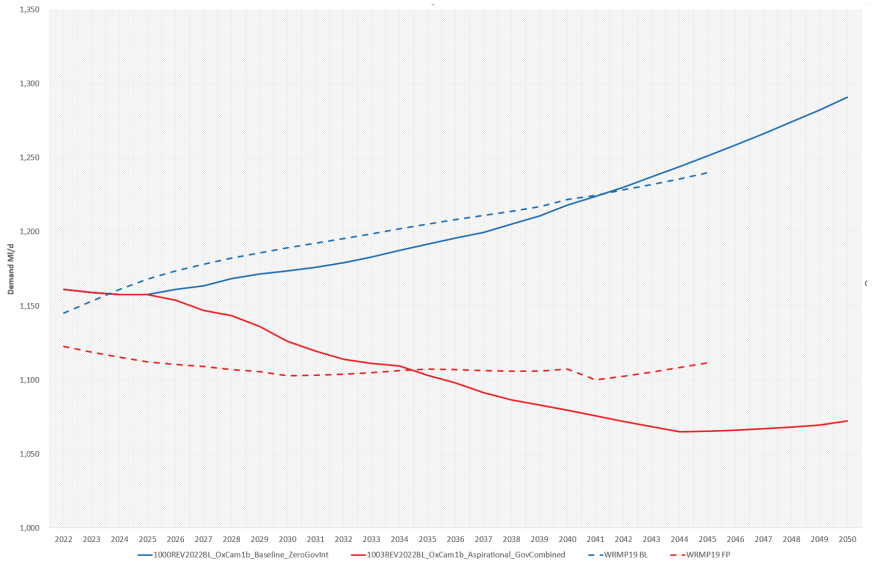
13.3 WRMP19 forecast comparison

As part of our evaluation of WRMP24 scenario out-comes, we have been mindful that they should also be considered in the context of our WRMP19 submission.

This comparison with our WRMP19 forecast, has been conducted in order to assess the deviation from previous estimations and check that revised forecasts sit within acceptable boundaries and tolerances of the forecast envelope.

The base-line and preferred plan forecasts for demand for WRMP24 and WRMP19 can be shown as below. (Figure 65).

Figure 65 WRMP19 and WRMP24 base-line and final plan demand forecasts



As can be seen, initially our updated forecasts, sit within our original forecast parameters, but in the longer term:

- the base-line forecast exceeds the WRMP19 forecast due to the inclusion of strategic growth in our region.
- the preferred plan forecast decreases below our WRMP19 forecast due to the impacts of our ambitious demand management plan and the effects of government led interventions.

With regard to overall AMP7 out-turns for WRMP19 and WRMP24:

For 2025/26 demand we anticipate:

- Base-line demand for the WRMP24 to be 1161Mld, as opposed to 1173Ml/d for the base-line for WRMP19.
- Final Plan demand for the WRMP24 to be 1153Mld, as opposed to 1110Ml/d for the base-line for WRMP19.

This reflects the impacts of Covid19, and strong growth through AMP7. Additionally, smart meter savings are proving to need time to materialize ,as we develop the systems to realize their full potential.

For 2025/26 PCC values we anticipate:

- For the WRMP24 final plan projection PCC will be 130.15 l/h/d, as opposed to 128.73 l/h/d for WRMP19.

Note that we have recently seen a decline in PCC (partially attributable to smart metering impacts), with a value of 131.28 l/h/d for 2022/23). However, we have seen significant volatility in recent behaviours due also to the impacts of the Covid19 pandemic and the 'cost of living crisis'.

For 2025/26 leakage values we anticipate:

- For the WRMP24 final plan projection leakage will be 163.2Ml/d, as opposed to 157.5Ml/d for WRMP19.

Note that leakage continues to prove to be a challenge, as reflected by recent issues with freeze thaw events and break-out leakage due to exceptional summer temperatures (ground movement).

13.4 Demand Management Monitoring Framework

Whilst considering the importance and critical role that demand management will play in achieving our preferred WRMP24 out-comes, we understand that we must keenly monitor the effectiveness of these measures, as the WRMP24 plan unfolds. This will be needed to ensure the effectiveness of our water efficiency measures and allow the timely implementation of adaptive plans, in the case that demand management options are less successful than initially expected.

We are consequently, currently instituting our ‘Demand management monitoring framework’. This will allow us to fully leverage the consumption data that smart meters are facilitating.

Analysis of the detailed daily smart meter data will allow us to look into underlying consumption patterns:

- understand current customer behaviours (through cohort analysis and usage patterns).
- investigate the effects of different demographic groups (age, occupancy, house type) on demand and how changes in these will impact consumption over time.
- analyse the impacts of weather, climate and drought on demand.
- understand the long term impacts of the Covid19 pandemic and resulting societal changes (working from home).
- determine the effectiveness of government led interventions including 'white good' labelling and mandatory standards.

As we implement water efficiency and demand management options we will need to determine how effective they are and how we might improve their efficiency.

The 'Demand management monitoring framework' will, therefore, be designed to allow us to:

- Investigate and understand our customers consumption patterns and attitudes to water consumption; this will allow us to model our base-line population and also understand how demographic change will modify our forecasts over time (aging).
- Scientifically analyse our current demand management portfolio and ensure that our water efficiency teams are concentrating on the most effective options and targeting them at customers who will benefit the most.
- Model and test demand management options, so that they can be realistically included in our future forecasts for WRMP29 and beyond.

As initial steps in our analysis we will look to:

- Monitor saving attributable to smart meters over time including;
  - Changes in consumption due to general behavioural change. Noting that this needs to be differentiated from other impacts (weather etc.)
  - Changes in consumption over time (potential glidepaths and decay rates); attitudinal changes; our 'leakage journey’.
  - Changes in leakage and continuous night-flow (cspl and plumbing loss): leakage detection for both cspl and 'plumbing losses' and the determination of the new normal for leakage breakout/find & fix. Values for leakage run-times.

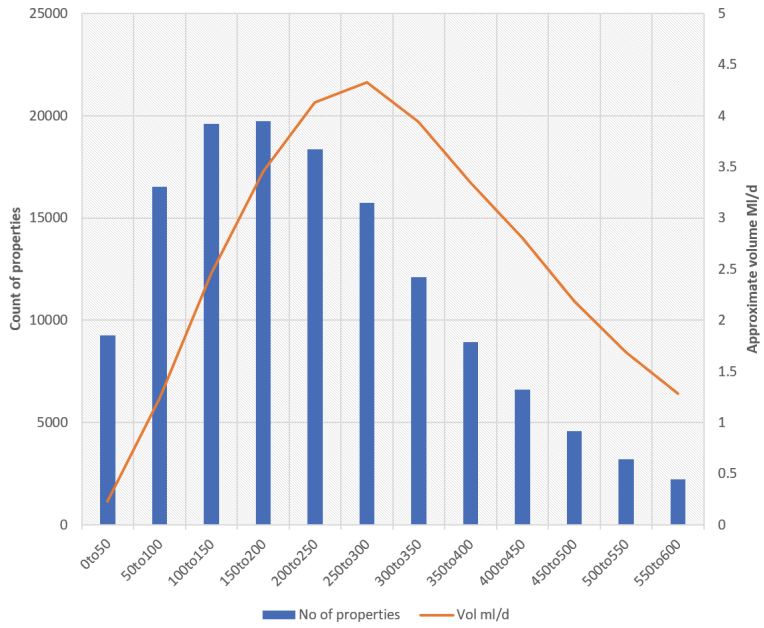
In order to enable this detailed analysis, we are currently starting to collate and correlate the following types of data:

- Smart Meter consumption data (cohort by cohort after a suitable time from installation) - this should indicate the ‘new normal’ - WRZ geography associated
- Long term consumption data to indicate intervention impacts / decay rates
- Smart meter night flow (by demographic / house type by PZ)
- Leak data (start data, end data, max flow; attribution of leak (plumbing loss, cspl (if possible)))
- Smart meter property demographic characterization
- Property occupancy rates (Acorn/Edge derived)
- Age profiles per PZ (Edge data)
- Weather data and other influences on demand
- Communications associated with smart meter (timings and cohort)
- Attitudinal survey information
- ‘MyApp’ Account enrolment and usage

Examples of current analysis can be shown including:

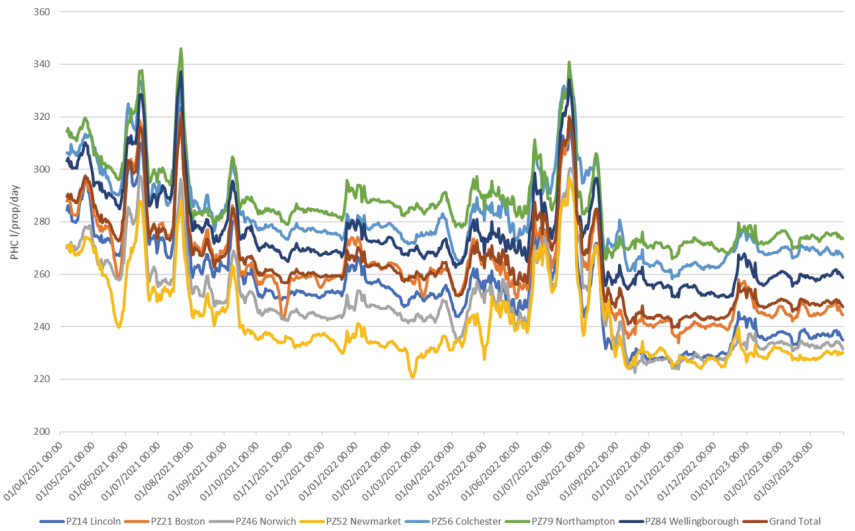
- Average daily consumption (ADC) distribution for April 23 from cohort of 142k customers that had meter in April 21 (Figure 66):
- This graph, interestingly, shows the distribution of per property consumption ranging from 50 l/property up to 600 l/property. These consumption values will be impacted by occupancy and demographic characteristics, and will be of interest in how we might target water efficiency options and communications.

Figure 66 Example average daily consumption profile



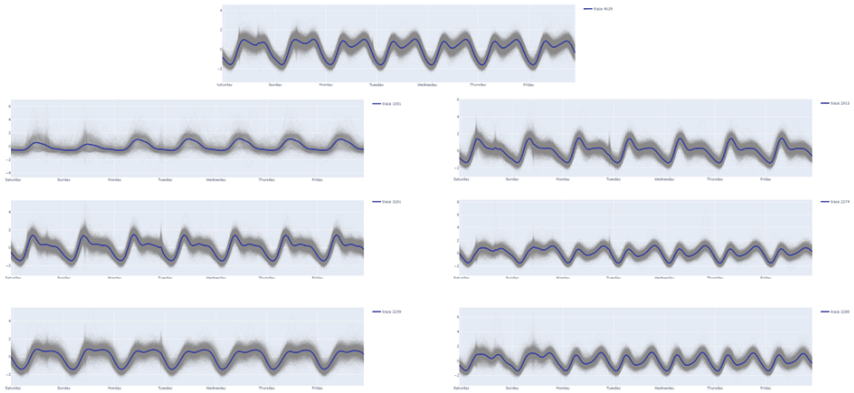
- Smart meter PHC by planning zone 7 day rolling - consistent set of customers (Figure 67).
- This graph demonstrates differences in per household consumption geographically across our region (in PZs where we have significant smart meter penetration). Further analysis of the demographic and property characteristics of these areas, will explain these differences and again help us to target water efficiency options in the most effective way.

Figure 67 Example PZ cohort analysis



- We have analysed smart meter data using AI / machine learning algorithms, to derive a number of discrete consumption pattern groups (Figure 68).
- The consumption data of each customer has been transformed to obtain the deviation at each hour of the week from their weekly average. This data has then been segmented into distinct groups via un-supervised machine learning, a method that doesn't rely on pre-existing labels or cluster definitions. The outcome revealed seven unique clusters, each signifying different patterns of consumption throughout an average week.

Figure 68 AI Cohort consumption pattern analysis



Insights such as these, will help inform our understanding of our customers and their consumption patterns. This will enable us to build more robust future forecasts and assist us in developing our future water efficiency strategies.

13.5 Targets and Metrics

Whilst developing our WRMP24, we have considered all relevant targets and commitments that have been included within the regulatory framework. These targets have informed the envelope within which future forecast demand should be viewed and the ambitions that should be embodied in our demand management strategy.

However, whilst developing our preferred plan, it must be understood that forecast projections are based upon current experience and analytical outputs, such that planning outcomes are rigorously based upon and reflect real demand data.

Forecasts and out-come metrics have, consequently, been grounded upon:

- the current position of Anglian Water with regard to key metrics; demand, PCC and leakage.
- known measurements and actual out-turns (i.e. base-line data and current demand management option saving assessments)
- agreed assumptions regarding future demand management option delivery and customer behaviours, based upon internal expert assessment and external peer reviewed research.
- regionally agreed views regarding future growth (and demographic change).

Thus, whilst we have been mindful that our WRMP24 plan should aim to achieve (or closely match), governmental targets, our planned out-comes have been based upon our current position with respect to key metrics and complex modelling analysis of future demand management impacts.

The targets may be listed (Table 39, Table 40, Table 41, Table 42):

Table 39 National Framework: Meeting our future water needs: a national framework for water resources (NF)

Description	Target	Date to be achieved	Notes
Reduce leakage	By 50%	2050	Measured from a 2017/18 base-line. Reference Section 1.3 and Section 9
Reduce household personal water use	110 l/h/d	2050	Reference Section 1.3 and Section 9

Table 40 AGRICULTURE, ENGLAND ENVIRONMENTAL PROTECTION, ENGLAND WATER: The Environmental Targets (Water) (England) Regulations 2023

Description	Target	Date to be achieved	Notes
Reduce the use of public water supply in England per head of population (from the 2019 /20 base-line reporting figures	By 20% than base-line	31/03/2038	to be measured by calculating the distribution input over population for a year from 1st April 2037 to 31st March 2038: (p6-7)

Table 41 HM Government: Environmental Improvement Plan 2023 - (EIP)

Description	Target	Date to be achieved	Notes
Reduce the use of public water supply in England per head of	By 20%	2038 2027	Reference (P105)

Description	Target	Date to be achieved	Notes
population (from the 2019/20 base-line reporting figures)	Interim 9% Interim 14%	2032	
Reduce leakage	By 20% By 30% By 50%	2027 2032 2050	Reference (p105)
Reduce household personal water use	122 lpd	2038	Reference (p105)
Reduce Non Household Demand	9%	2038	Reference (p105)

Table 42 Water Resource Planning Guidance - March 2023 - (WRPG)

Description	Target	Date to be achieved	Notes
Reduce the use of public water supply in England per head of population (from the 2019 to 2020 base-line reporting figures)	By 20% than base-line by 2038	31/03/2038	Reference (p67)
Reduce leakage (setting a trajectory for water companies to reduce leakage, with interim targets)	By 16% by 2025 By 20% by March 2027 By 30% by March 2032 By 37% by 2038	2025 2027 2032 31/03/2038	Reference (p73)
Reduce household personal water use	122 l/h/d by 2038 110 l/h/d by 2050	2038 2050	Reference (p67)
Reduce Non Household Demand	9% by 2038 15% by 2050	2038 2050	Reference (p67)

13.5.1 Per capita consumption

Our WRMP24 water efficiency strategy, includes;

- the full roll-out of smart metering across the Anglian Water region
- our most ambitious program of water efficiency options and tailored customer communications, designed to influence customer behaviours and attitudes
- the impact of government led interventions (these will also be integral to achieving our PCC target).

Using our Dry Year Annual Average (DYAA) forecast for per capita consumption we achieve the interim 2037/28 and 2049/50 targets (Table 43);

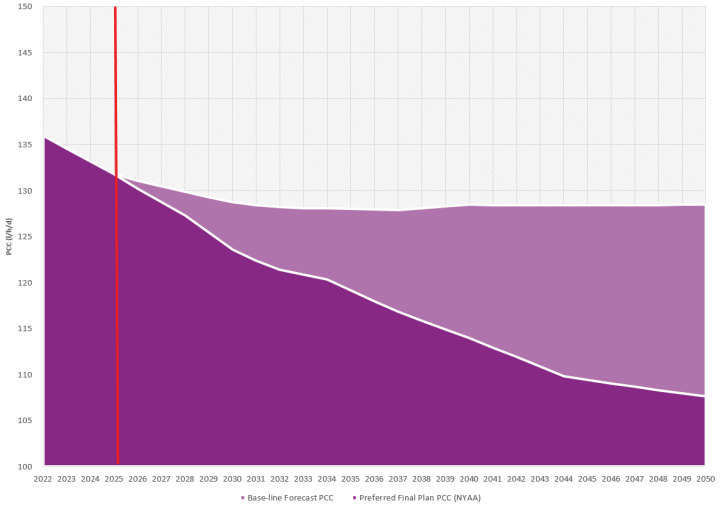
- In 2038 we expect to reach a value of 118.15 l/h/d, below the target of 122 l/h/d, as stated in the EIP and WRPG.
- In 2050 we expect to reach a value of 109.74 l/h/d, below the target of 110 l/h/d, as stated in the NF, EIP and WRPG.

Table 43 PCC targets and the preferred plan

PCC Scenario DYAA	2025	2030	2035	2038	2040	2045	2050
Base-line forecast	134.41 l/h/d	131.28 l/h/d	130.52 l/h/d	**130.63 l/h/d**	131.00 l/h/d	130.95 l/h/d	**131.04 l/h/d**
Preferred (Aspirational) Plan	134.41 l/h/d	126.00 l/h/d	121.51 l/h/d	**118.15 l/h/d**	116.23 l/h/d	111.97 l/h/d	**109.74 l/h/d**
Target Value	-	-	-	**122 l/h/d**	-	-	**110 l/h/d**

Our base-line and preferred plan PCC projections can be shown (Figure 69).

Figure 69 Per Capita Consumption - DYAA for the base-line and preferred plan



13.5.2 Leakage reduction

We have recognised the importance of our role as an industry leader in leakage reduction, in helping to meet the National Framework 50% leakage reduction target. We have also taken into account consultation responses to our initial draft WRMP24 suggested leakage reduction program.

We must also note that we currently record very low levels of leakage compared to the rest of the industry. This makes the realization of additional leakage reduction more difficult and costly.

Whilst considering our consultation responses and the National Framework target, we have revised and increased our ambition for leakage reduction for our WRMP24 plan. We originally proposed a conservative 24% reduction in leakage (from the 2017/18 National Framework) based upon an assessment of cost and benefit, but have now revised.

For the WRMP24 program we intend to reduce leakage by 38% (from the 2017/18 base-line position), reaching a leakage level of 118Ml/d (11% of demand) (Table 44).

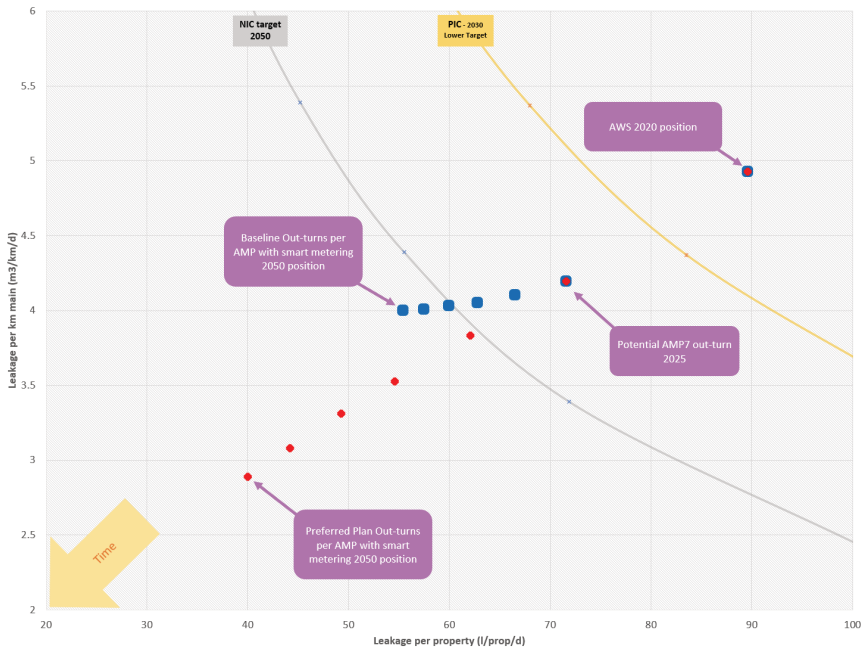
This 38% reduction indicates our commitment to assisting the industry in achieving the National Framework target of a 50% reduction by 2049/50, and represents the maximum reduction in leakage that we consider feasible with current technologies (achieving our minimum leakage level).

However, this augmented plan does come at a very significant cost in the longer term (>£4 billion). We have, therefore, sequenced the plan such that the vast majority of the cost should impact AMP9 and beyond (post 2030). As we review the plan for WRMP29, we will investigate how technological improvement can mitigate these costs.

If the National Framework target is translated into nationally representative metrics (leakage per property / leakage per km of main, we easily reach the required attainment levels, whilst not necessarily meeting an absolute company level 50% reduction in leakage.

With our preferred plan for our WRMP24 we expect to be below the NIC target by 2030, reaching the exceptionally low levels of 2.9m^3 per km of main/day or 40l/prop/day respectively, by 2050, compared to 4.2m^3 per km of main/day or 71.6l/prop/day in 2025. These levels will be unprecedented across the industry (Figure 70).

Figure 70 Base-line and preferred plan leakage forecasts with PIC/NIC targets



We do not consider achieving a 50% reduction at a company level to be feasible or desirable (from the cost perspective);

- as we have now exhausted more cost effective leakage reduction options
- this would require a very significant mains replacement program, (beyond that currently included)
- due to the uncertainty associated with the possibility of realizing this reduction (potentially being below our background minimum leakage level)
- and a theoretically estimated cost of >£20 billion.

We would not consider it fair or equitable to expect certain customers to pay very high costs for relatively low additional water savings and leakage reductions, while other customers face much lower costs. Additionally, achieving these levels of leakage is associated with great uncertainty.

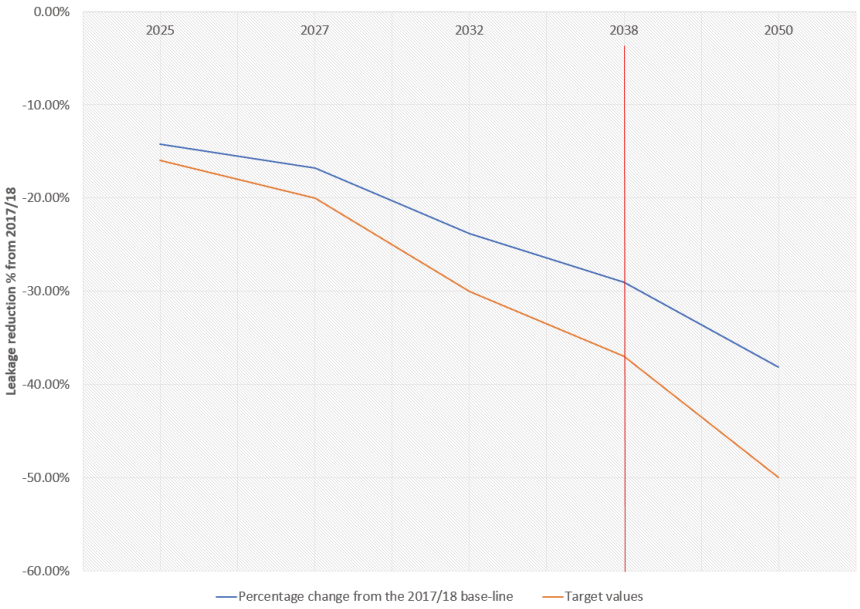
Table 44 Leakage targets and the preferred plan

Leakage projection	2025	2027	2032	2038	2050
Preferred (Aspirational) Plan	164.22 Ml/d	159.10 Ml/d	145.85	135.82 Ml/d	118.49 Ml/d
Percentage change from the 2017/18 base-line	-14.2%	-16.8%	-23.8%	-29.0%	-38.1%
Target values	-16%	-20%	-30%	-37%	-50%

Note the base-line value for leakage for Anglian Water, for 2017/18 was 191.3 Ml/d.

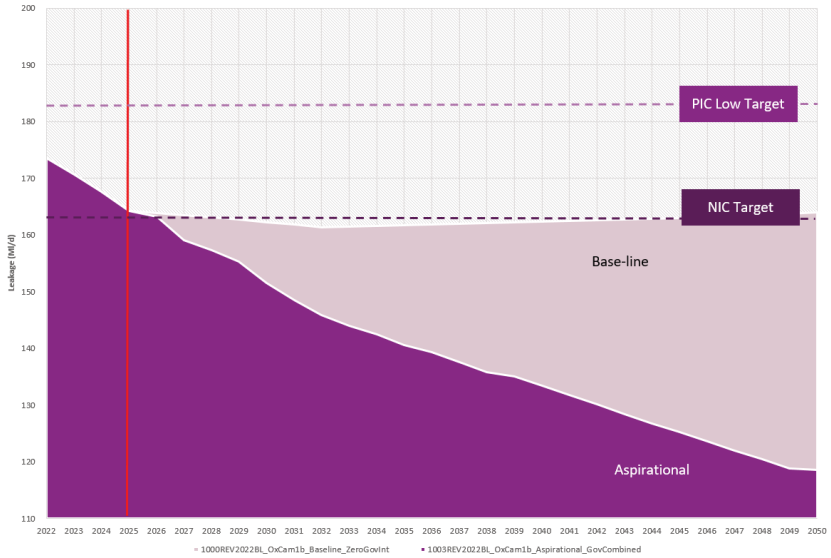
As can be seen, despite our frontier position and the challenges that this presents, our reduction trajectory tracks that of the EIP, WRPG target profile (Figure 71).

Figure 71 Leakage reduction (%) form the 2017/18 base-line (preferred plan and targets)



We consider this revised position (Aspirational option) indicates our level of ambition in making a fair and equitable contribution to the overall national leakage target of a 50% reduction in leakage from the 2017/18 base-line for England and Wales (Figure 72).

Figure 72 Leakage scenarios and NIC/PIC targets



We would, therefore, argue that although we fully support the National Framework target of a 50% reduction in leakage, this must be seen as a national target and should only be considered at the public water company (PWC) level, once each company's current position has been reviewed.

13.5.3 Non-household demand reduction

We have recognised the importance of demand management with regard to the Retail and non-household sector. We have also been mindful of the Defra/EA 9% target for non-household demand reduction by 2037/38 and the 15% reduction by 2049/50. We have consequently designed a set of non-household water efficiency options to help us achieve these targets.

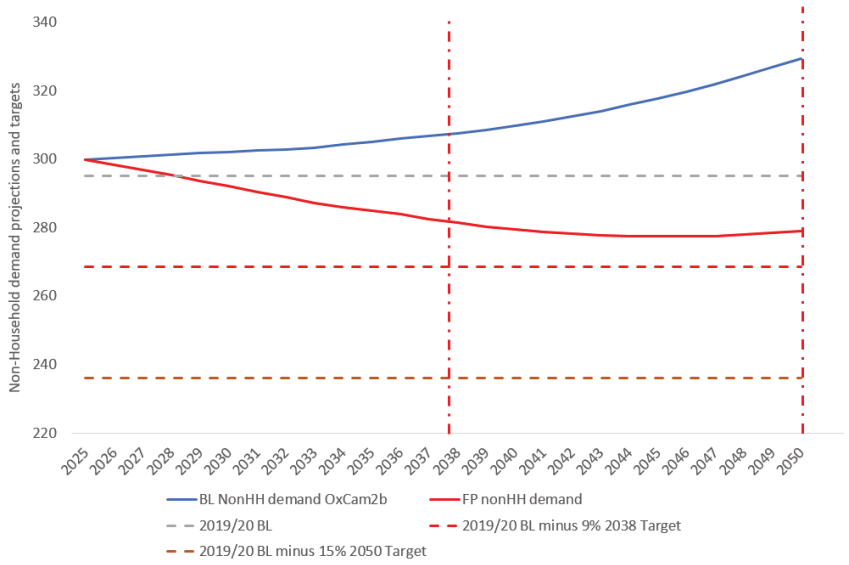
Where feasible we have tailored options to achieve a 9% saving, whilst also reflecting current consumption volumes, smart meter data, and current savings estimations for ('plumbing loss' and cspl).

We are currently experiencing significant growth in non-household demand, with requests for large volumes of water in the near term (Those regarded with certainty have been included in the WRMP24 forecast).We have, therefore, pragmatically included a non-household forecast aligned with our WRMP24 population forecast, reflecting Local Authority growth and strategic growth associated with the OxCam arc (13.8% to 336Ml/d growth by 2049/50 - BL forecast). On the basis of our consultation responses, we have included demand that might be associated with potential H2 production and carbon capture (approximately 60Ml/d by 2031/32).

Non-household options will need to be delivered in collaboration with, but mainly via, our Retail partners.

In total, these options help us achieve approximately 8% reductions by 2037/28 and 15% by 2049/50, but these reductions can only be achieved relative to the non-household demand position (including non-household demand growth). We do not, therefore, think that achieving the absolute levels of non-household demand reduction, from the 2019/20 base-line, should be included in the WRMP24 plan. Note we also must consider representing a degree of uncertainty in the plan, with respect to the implementation of these newly developed options (Figure 73).

Figure 73 Base-line and preferred plan non-household forecast and targets



As we prepare for WRMP24, we will trial options and their implementation, and develop options further for our WRMP29 plan, as we gain more experience.

13.5.4 Demand and DI per person consumption

As described in our preferred plan, we have included our most ambitious program of demand management options, including:

Preferred portfolio (Aspirational Portfolio - Code 1003)

- Reduction of leakage by 10.7Ml/d to 151Ml/d by 2029/30 (AMP8) and 45.5Ml/d to 118.5Ml/d by 2049/50 (AMP12), by a combination of leakage and smart metering strategies.
- Implementation of smart metering over a 2AMP (10 year) program to maximum feasible penetration (96%); 18.1Ml/d saving by 2029/30, 31.9Ml/d by 2049/50 (note this includes AMI cspl savings).
- High 'Aspirational' program of water efficiency strategies, saving 9.4Ml/d by 2029/30 and 14.6Ml/d by 2049/50.
- Non-household water efficiency options saving 10Ml/d by 2029/30 and 50Ml/d by 2049/50.
- Total Option savings from base-line:
  - End of AMP8 (2030): 44Ml/d.
  - End of AMP12 (2050): 134Ml/d.
- Note that the preferred plan also includes government led intervention savings of 84.35Ml/d by 2049/50.

We expect demand to have declined from 1172Ml/d (DYAA _ 2019/20) to 1105Ml/d by 2037/38, a decrease of 5.7%. In the same period we expect household population to increase from 4.695m (2019/20) to 5.435m (2037/38), an increase of 15.7%.

Even with the full panoply of demand management options, including full smart metering, leakage reduction and government led interventions, we currently can only reach the EIP and WRPG target for the DI/person reduction in 2039/40, as opposed to 2037/38.

Table 45 % Reduction in demand per person

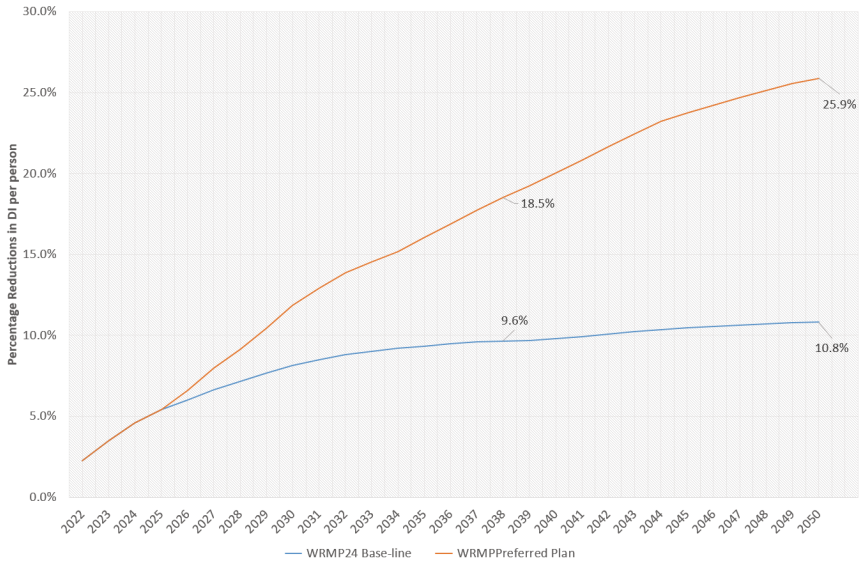
	2025	2030	2035	2038	2040	2045	2050
Preferred Plan DI Ml/d	1177 Ml/d	1145 Ml/d	1122 Ml/d	1105 Ml/d	1098 Ml/d	1084 Ml/d	1091 Ml/d
Preferred Plan Population (000)	4,987	5,205	5,355	5,435	5,501	5,694	5,899
demand per person l/h/d	236.0 l/h/d	220.0 l/h/d	209.5 l/h/d	203.3 l/h/d	199.6 l/h/d	190.3 l/h/d	184.9 l/h/d
% Reduction from 2019/20	5.4%	11.8%	16.0%	18.5%	20.0%	23.7%	25.9%

Base-line values, regarding demand per person have been calculated as (Table 45);

- 1172 Ml/d - demand (DYAA).
- 4.695m - household population.
- 249.6l/h/d - DI per person

The saving trajectories (as a percentage reduction from our 2019/20 values), based upon forecast demand and population growth can be visualised (Figure 74):

Figure 74 Percentage reduction in DI per person - Base-line and preferred plan



This is a very significant change in overall demand, but it must be noted that these changes also reflect the relative scale (and relative change) of each of our demand segments and how these combine to form the forecast. Anglian Water has a relatively large non-household demand segment (28%) and so growth in this sector outweighs reductions in household demand.

Relative change in each sector can be shown, as below;

Household demand is forecast to be reduced by 7.7% by 2038 (from the 2019/20 base-line of 696 Ml/d). Note that this accounts for expected growth in household demand and demand management options, saving 125 Ml/d by 2049/50 (Table 46).

Table 46 % Reduction in household demand

	2025	2030	2035	2038	2040	2045	2050
Base-line HH-demand Ml/d	670.4 Ml/d	686.3 Ml/d	698.9 Ml/d	709.9 Ml/d	720.6 Ml/d	745.6Ml/d	772.9 Ml/d
Preferred Plan HH-demand Ml/d	670.4Ml/d	655.8 Ml/d	650.7 Ml/d	642.1 Ml/d	639.4 Ml/d	635.2Ml/d	647.3 Ml/d
% Reduction from 2019/20	-3.6%	-5.7%	-6.5%	-7.7%	-8.1%	-8.7%	-7.0%

Non-household demand is forecast to be reduced by 0.4% by 2038 (from the 2019/20 base-line of 295.99 Ml/d). Note that this accounts for expected growth in non-household demand and water efficiency options, saving 50 Ml/d by 2049/50 (Table 47).

Table 47 % Reduction in non-household demand

	2025	2030	2035	2038	2040	2045	2050
Base-line Non- HH demand Ml/d	310.1 Ml/d	315.6 Ml/d	318.7 Ml/d	321.2 Ml/d	323.3 Ml/d	331.5 Ml/d	343.5 Ml/d
Preferred Plan ~~Non-HH demand~~ Ml/d	310.1 Ml/d	305.4 Ml/d	298.4 ml/d	294.8 Ml/d	292.9 Ml/d	290.9 Ml/d	292.7 Ml/d
% Reduction from 2019/20	+4.7%	+3.1%	+0.8%	-0.4%	-1.0%	-1.7%	-1.1%

As can be seen, overall leakage is forecast to be reduced by 29% by 2038 (from the 2019/20 base-line of 193.3Ml/d) (Table 48).

Table 48 % Reduction leakage

	2025	2030	2035	2038	2040	2045	2050
Base-line Leakage Ml/d	164.2 Ml/d	162.2 Ml/d	161.7 Ml/d	**162.0 Ml/d**	162.3 Ml/d	162.9 Ml/d	**164.0 Ml/d**
Preferred Plan leakage Ml/d	164.2 Ml/d	151.5 Ml/d	140.6 Ml/d	**135.8 Ml/d**	133.3 Ml/d	125.2 Ml/d	**118.5 Ml/d**
% Reduction from 2019/20	-14.2%	-20.1%	-26.5%	**-29.0%**	-30.3%	-34.5%	**-38.1%**

As we have demonstrated we have a hugely ambitious strategy for demand management. Through our 'Smart meter monitoring framework' we will ensure that demand management options are thoroughly tested and validated, whilst continuing to develop our robust and defensible forecast modelling systems.

14 Conclusion

As described, for our WRMP24, we plan to build upon our proven track record of delivering demand management savings, through our leakage reduction strategy, ambitious smart metering program and innovative water efficiency initiatives. We will extend our ambitious program of demand management options, in order to support our new WRMP24 plan; one that provides economic benefits, delivers substantial water savings, but is also achievable.

Our previous success, however, does mean that there is limited potential to achieve further savings through 'tried and tested' demand management activities.

Our ambition is to drive the next 'step-change' in demand management through:

- technological innovation,
- enhanced communication strategies,
- improved understanding of our customers behaviour, and
- the implementation of 'industry leading' water efficiency initiatives.

Savings from our smart meter program, leakage reduction and water efficiency options, in combination with government led interventions are expected to more than compensate for regional increases in demand due to population growth during the WRMP24 planning period.

With our ambitious program for full smart meter installation and associated water efficiency measures, our customers should achieve a per capita consumption of less than 110 l/h/d, in line with the 2050 National Framework Target. Note that this includes a significant impact from government led interventions ('white good' and water utility labelling and mandatory design standards).

Additionally, we expect to achieve record low levels of leakage that exceed the National Framework Target, as applied at a National Level, without this implying a 50% reduction in leakage at a company level (noting the significant cost that this would imply for Anglian Water).

We have also recognised the importance of demand management with regard to the Retail and non-household sector. We have consequently designed a set of non-household water efficiency options to help us achieve these targets (with individual targets set at 9% and feasible target cohorts). In total, these options help us achieve approximately 8% reductions by 2037/28 and 15% by 2049/50, but these reductions can only be achieved relative to the non-household demand position, including demand growth. Non-household options will need to be delivered in collaboration with, but mainly, via our Retail partners.

Anglian Water has a key role to play in protecting the natural environment. It is a priority for us to act as stewards of our local eco-systems and to be leaders in environmental protection. As discussed, through our Best Value Planning Framework, in collaboration with our customers and in partnership with our WRE colleagues, we have sought to develop a WRMP24 plan that successfully achieves these aims of maintaining high quality water supplies, with environmental enhancement and biodiversity net-gain.

Demand management will be essential in mitigating short-term environmental risks and longer term population growth. Increasing our current abstractions to meet growth related requirements, would represent a serious environmental deterioration risk.

By choosing our preferred 'Aspirational' plan, we are using demand management to more than offset any growth in demand, mitigating deterioration risks and assisting with near term supply/demand issues.

Our analysis shows that our 'Aspirational' plan is cost beneficial in AMP8 and we believe that despite the significant long term costs associated with the 'Aspirational' option, it strikes the right balance between protecting the environment, maintaining a sustainable and resilient future, and ensuring affordability for our customers.

love every drop
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