Water Resources Management Plan 2024

Section 11 – The Overall Best Value Plan

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Background and Introduction

What's in this section?

In this section, we present our Overall Best Value Plan (BVP). As required by the National Framework, the Plan is fully consistent with the Regional Water Resources Plan for the South East of England as developed by the Water Resources in the South East Group. It is also compliant with the Water Resources Planning Guideline.

The Plan covers 50 years (2025-75) and addresses the supply demand deficits in each of the six water resource zones (WRZ) in our supply area. The Plan has been adopted as representing the overall best value balance of schemes for the Thames Water area and wider South East region, having regard to affordability, impacts on the environment, the preferences of customers, and the need to manage a range of risks. We have considered the Ofwat public value principles when deriving our plan and our consideration is that the plan aligns with these principles.

The Plan adopts a 'twin track' approach to address the predicted supply demand balance deficits and to meet policy objectives. It consists of demand management and resource development to ensure a resilient and robust plan. Initially the focus is on delivering ambitious programmes of demand management. In the longer-term, when demand management of the use of water can no longer keep pace with the increasing need for water, and therefore there is a deficit in water supply, the plan turns, as it must, to strategic resource development for Thames Water's WRZs and the South East region as a whole.

We set out below the details of the Overall Best Value Plan at Company and WRZ-level, including the profiles of demand management measures and the timings of resource developments and transfers.

The Plan is adaptive and consists of nine pathways. However, in accordance with the WRPG and following detailed and extensive discussions with our regulators, Ofwat and the Environment Agency, we are required to select a preferred programme along a pathway of our best value, adaptive plan. We describe what the best value plan is, following an adaptive approach which allows us to be flexible should future uncertainties prove more or less challenging than currently forecast, and set out our preferred programme along a pathway compliant with WRPG.

We set out the key decision points across the period, highlighting what decisions will be needed and how we will inform those decisions. There are decisions to be made now that will set the direction for water resources in the region and in our supply area. The plan contains least regrets resource options that need to be either completed or commenced in the first ten years of the plan irrespective of future uncertainties or changes to different pathways.

We also include a Monitoring Plan that we will use in subsequent Annual Reviews to track our progress with delivering the plan to 2030. We will also use it to take stock as to whether the future is turning out as expected or if we need to change course to a different pathway.

11.1 In this section we present and discuss the Overall Best Value Plan (BVP).

11.2 As required by the National Framework for Water Resources, the plan is fully consistent with the Regional Plan for Water Resources in the South East of England. The WRMP24 is endorsed and approved by our Executive Team and Board.

11.3 The structure of this section is as follows:

- Presentation of the plan at company-level
- Presentation of the plan at WRZ-level
- A plan summary discussing important overall characteristics of the plan such as:
  - The decision points
  - Environmental assessment
  - Cost (including an estimation of customer bill impact) and carbon emissions
  - Risk and uncertainties which could influence our plan
- The Monitoring Plan – how we will track delivery and changes to the forecast for reporting in Annual Reviews
- A Summary – What is our plan and why have we selected it?

11.4 Overall, our decisions and conclusions in this plan remain broadly consistent with earlier drafts of WRMP24 and WRMP19 and, whilst by no means determinative, this continuity of conclusion helps to give us confidence in our planning processes.

Plans, Pathways and Programmes

11.5 In our WRMP19 we presented a programme of options for each WRZ for the period 2020 to 2100 and referred to the programmes collectively as the preferred plan. We also set out the investments that we would make when considering a single forecast of supply-demand balance for each WRZ. Our WRMP24 takes an adaptive approach, recognising that several of the key factors in our planning present very significant uncertainty in the medium to long-term, to such an extent that to plan for a single future supply-demand balance over a fifty-year period could be very likely to result in either an ineffective or inefficient plan. As described in Sections 6 and 10, we have considered different potential future scenarios of supply-demand balance in order to derive a fully adaptive BVP.

11.6 The nomenclature that we have used for WRMP24 is slightly different to that which we used in WRMP19, due to the application of adaptive planning techniques. We will refer to a ***programme*** of options as those investments which we would make under a given future supply demand balance **pathway** (e.g. invest in option A in 2025, option B in 2035, option D in 2050), and will refer to the combination of programmes of options, future pathways, and decision points as a ***plan***.

11.7 Our aim in deriving our preferred plan is primarily to establish the investment that we need to make in the next five years, while looking to the medium and long-term to make

sure that we are making the right decisions in the short-term. As per Ofwat guidance on adaptive planning[1] we are looking to make:

- Low regret investments, that is to say:
  - Those investments which are needed to ensure supply-demand balance in the short-term
  - Investments which would form an efficient programme of investment across a wide range of plausible future scenarios
- Investment which is needed in order that we do not preclude achievement of a supply-demand balance in medium to long-term under future adverse scenarios
- Investments which may be needed in the longer-term under different future scenarios, giving consideration to how our short-term investment decisions may influence the decisions that we could make further into the future
- Investment which is required to keep future options open, for example enabling work or monitoring

Preferred Programme

11.8 There is an inherent tension currently present in the Water Resources Planning Guideline (WRPG[2]), which also exists in the way that we have presented our preferred plan, and preferred programme of options. We are using adaptive planning techniques which are designed to ensure that we have a robust, resilient plan which is efficient in the face of significant uncertainty, but should also describe a single preferred programme of options which we should lay out in the tables that accompany our WRMP. Section 1.1 of the WRPG states that we should present our preferred programme as the pathway through the 'most likely' future. Given that the major uncertainties present in our planning are exogenous factors which we cannot influence (population growth, the impact of climate change, and future licence reductions determined by environmental legislation, alongside risks posed by the requirement to plan on the basis of achieving a 50% reduction in leakage and 110 l/h/d PCC, both by 2050), careful consideration is necessary to determine what a 'most likely' future scenario would be. In the development of our draft plan we considered the WRPG and engaged in pre-consultation with the Environment Agency to determine which future pathway would be most suitable to consider when presenting our preferred programme.

11.9 As described in Section 10, rather than formulate our adaptive plan based on stochastic analysis of different future supply-demand balance pathways, we have, as part of the Water Resources South East (WRSE) regional group, decided to determine future supply-demand balance pathways as being formed of discrete scenarios associated with exogenous factors. We have a single supply-demand balance pathway for the immediate future, three supply-demand balance pathways in the medium term associated with different population growth scenarios, and nine supply-demand balance pathways in the long-term in which each of the three medium-term scenarios is split into three, considering different climate change and environmental destination scenarios. We have taken this approach because it allows us to best describe meaningful future pathways (e.g. ***"under a high population growth scenario"***, as opposed to ***"in the 75th***

[1] Ofwat, 2022, PR24 and beyond: Final guidance on long-term delivery strategies, https://www.ofwat.gov.uk/wp-content/uploads/2022/04/PR24-and-beyond-Final-guidance-on-long-term-delivery-strategies_Pr24.pdf
[2] EA, Ofwat, Natural Resources Wales, 4th April 2022, 'Water resources planning guideline, version 10', page 91 - 92

percentile of possible future supply-demand balances"), and because it allows us to show compliance with aspects of guidance.

11.10 We therefore have a choice of nine supply-demand balance pathways along which to describe our preferred programme of options, all of which are initially common. These pathways are presented and discussed in Section 6 and Section 10. We have chosen pathway 4, for the reasons described below.

11.11 Pathways 1-3 are based on high demand forecasts, pathways 4-6 are based on 'local authority plan-based' demand forecasts (identified in the WRPG as being what our planning should be based on and therefore a policy requirement for us to follow), and pathways 7-9 are associated with lower demand forecasts. As it is specified in the WRPG, our preferred programme needs to ensure a supply-demand balance assuming a local authority plan-based demand forecast, i.e. along either pathway 4, 5 or 6. Our programme appraisal has therefore emphasised the outcomes from plans and programmes associated with these pathways more strongly than outcomes for other pathways. The difference between these pathways is that pathway 4 considers 'High' environmental destination and climate change scenarios, pathway 5 'Medium', and pathway 6 'Low'.

11.12 The National Framework for Water Resources[3], published in March 2020 sets the environmental ambition required to address unsustainable abstraction between 2025 and 2050 on a national scale. The Framework sets out that Regional Water Resource Plans are required to develop an agreed environmental destination to achieve sustainable abstraction. WRSE worked with the Environment Agency and all water companies in the South East region to develop agreed Environmental Destination scenarios. Five scenarios were developed, of which three ("Low", "Medium" and "High") are incorporated into our supply-demand balance pathways and the Regional Plan. Supplementary guidance[4] states that companies and regional groups should use scenarios set out in Appendix 4 of the National Framework for Water Resources[5], which were developed by the Environment Agency on the basis of ensuring compliance with Environmental Flow Indicator (EFI) calculations, in essence applying the precautionary principle in planning required future licence reductions. The supplementary guidance states that the "BAU" scenario (Business As Usual) should be used as the starting point to demonstrate compliance with statutory and regulatory requirements, and the "Enhanced" scenario used "to identify where it may be necessary to provide enhanced protection to buffer from climate change impacts". For Thames Water, the "BAU+" and "Enhanced" scenarios give similar required abstraction reductions (of around 450 Ml/d for the BAU+ scenario and around 500 Ml/d for the Enhanced scenario) and so, as is described in Section 5 of our WRMP, we developed our "High" scenario to include reductions consistent with the "Enhanced" scenario, and developed "Medium" and "Low" scenarios using a different approach to ensure a range of scenarios is considered

[3] Environment Agency, 2020, Meeting our future water needs: a national framework for water resources, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/872759/National_Framework_for_water_resources_main_report.pdf

[4] Environment Agency, 2020, Long-term water resources environmental destination – Guidance for Regional Groups and Water Companies, https://wre.org.uk/wp-content/uploads/2021/02/201012-Long-Term-Destination-Guidance-FINAL.pdf

[5] Environment Agency, 2020, Water resources national framework – Appendix 4: Longer term environmental water needs, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/872344/Appendix_4_Longer_term_environmental_water_needs.pdf

in our adaptive plan (recognising that a degree of uncertainty exists in identifying licence reductions which will be required in the future). In order to meet the requirements of the National Framework and guidance, and to meet the expectations of our regulators, we have adopted the "High" scenario in our preferred programme – this scenario features in pathways 1, 4 and 7.

11.13 In pathways 1, 4 and 7, a "High" climate change scenario is also used, which is around a 75th percentile of climate change impacts when considering all of the UKCP18 projections (all emissions scenarios). The Environmental Destination scenarios in Appendix 4 of the National Framework for Water Resources are based on a severe climate change scenario (the driest of the scenarios from the Future Flows[6] dataset) and thus use of this climate change scenario is consistent with use of the "High" Environmental Destination scenario.

11.14 In conclusion, given that, in accordance with the WRPG, we are required to follow local authority plan based population projections (pathways 4-6), and that the "High" environmental destination scenario should be adopted (pathways 1, 4 and 7), 'pathway 4' is the future supply-demand balance pathway along which our preferred programme should be described, and is the pathway which we apply most consideration to in our programme appraisal.

Presentation of Preferred Plan

11.15 The way that we have presented our preferred plan has also changed slightly from WRMP19, due to the nature of the planning problem we are solving, and the methods that we have applied in solving this problem. In WRMP19 we presented a preferred plan for each WRZ individually, which was possible because the solutions identified were, to a reasonable degree, independent of one another, with our London WRZ having by far the largest supply-demand balance problem to solve and so dominating option selection decisions. The greater scale of potential supply-demand deficit in our Thames Valley WRZs, driven by the potential for large volumes of licence reduction under future "high" environmental destination scenarios, means that large supply-side solutions may be required for many of our WRZs in the next 25 years, and not only in our London WRZ. Additionally, Southern Water and Affinity Water have also forecast large needs for water in the future. These factors lead to the selection of large, strategic solutions which would serve customers across the WRSE region, rather than individual resources being built to serve customers of a single WRZ.

11.16 As required, our plan reflects the WRSE regional plan. Within this document, we have first presented the major schemes contained within the WRSE plan which are relevant to our supply area, described in the Section below as "The Plan at Company Level". We then present the preferred plan and preferred programme of options for each individual WRZ, with the WRZ-level plans being further cascaded versions of the regional plan.

11.17 The starting point for building our preferred plan has been the least cost adaptive plan for the WRSE region, described in Section 10. From this base we have used the programme appraisal approach to develop a BVP.

[6] Prudhomme, C., Dadson, S., Morris, D., Williamson, J., Goodsell, G., Crooks, S., Boelee, L., Davies, H., Buys, G., Lafon, T., and Watts, G., 2012, Future Flows Climate: an ensemble of 1-km climate change projections for hydrological application in Great Britain, Earth Syst. Sci. Data, 4, 143–148, https://doi.org/10.5194/essd-4-143-2012

11.18 Consistent with WRMP19, demand management activities form the largest element of our plan for each WRZ, particularly in the short-term.

11.19 All plans presented assume that we improve our resilience to drought events over time, reducing the risk that we would need to impose emergency restrictions on our customers during an extreme drought event. We will move to a '1 in 200-year' level of resilience by the early 2030s (0.5% annual chance of occurrence of emergency drought restrictions), and a '1 in 500-year' level of resilience by 2039/40 (0.2% annual chance of occurrence of emergency drought restrictions) as required by the WRPG and government expectations. Alternative dates are tested as part of the sensitivity analysis.

Governance of the selection of our overall Best Value Plan

11.20 We presented our programme appraisal analysis to the Thames Water Executive and Board during 2021-2024, explaining our decision-making processes. We also held technical discussions with Executive and Board sub-committees.

11.21 In addition to governance within Thames Water, the WRSE governance groups, notably the Oversight Group and Senior Leadership Team, have unanimously approved the WRSE preferred plan, which our plan reflects, as required by the National Framework.

The Plan at Company-level

Demand Management

Our Customers' Views

11.22 Through both the consultation on our draft WRMP and via customer research, we have gained a firm understanding of what our customers think about leakage and consumption reduction, and what customers think the role of demand management in our overall plan should be. We have considered these views when building our plan.

11.23 Reducing leakage has been highlighted as being a top priority for customers. Customers find current levels of leakage unacceptable and think that we need to act decisively to reduce the amount of leakage. Customers largely support the government target of 50% leakage reduction by 2050. Some customers think that we should reduce leakage further or faster, while others recognise that disruption may be caused if we fix a large amount of water pipes, particularly in a heavily populated area such as London, and so feel that 2050 is an appropriate target.

11.24 Customers generally support action to reduce water consumption, and as such are supportive of smart metering as an effective way of helping people become more water efficient, though customers tend to feel that we should reduce our leakage before it asks customers to reduce their usage. Some customers think that we should be lobbying the government to take more action on water efficiency by introducing water labelling, minimum standards, and buildings regulations changes. While the government's ambition of achieving 110 l/h/d per capita consumption (PCC) is supported, customers are also supportive of an approach which recognises that this is a very ambitious target, and that if it is not achieved the region could run out of water. As such, customers are supportive of Thames Water taking a proactive approach to mitigating risk in this area.

Our plan

11.25 The WRPG states, "if you are a water company in England your preferred programme should deliver a PCC of 110 litres per person per day by 2050 under your dry year annual average scenario". This target is consistent with the national target set out in the Environmental Improvement Plan[7]. In accordance with this guidance, our WRMP24 preferred programme includes demand management measures which are predicted to reduce average PCC to 110 l/h/d by 2050. Decisive government action and interventions to deliver household consumption reduction are required to ensure our plan's resilience.

11.26 The actions which we as a company can take to help customers reduce their demand for water are limited to the installation of water meters, water efficiency interventions including fixing wastage issues such as leaky loos and digital engagement, and (when sufficient meter penetration is achieved) introduction of tariffs which discourage the excessive use of water. The constraints on measures over which we have control have not changed, and as such, if the 110 l/h/d target is to be achieved, we must assume that the government will take decisive action to reduce household consumption. In our draft WRMP, our assumption was that the government would introduce water labelling measures (as has already been committed to) and that this would reduce PCC by 6 l/h/d by 2050. In our final plan, our assumption is that the government will introduce measures

[7] HM Government, 2023, Environmental Improvement Plan 2023, We met our leakage targets in 2021-22, https://www.gov.uk/government/publications/environmental-improvement-plan

which will, in aggregate, reduce average PCC by 24 l/h/d by 2050, which we think will require introduction of water labelling, minimum standards on white goods, and changes to buildings regulations.

11.27 In Section 8 of our WRMP, we describe in detail the different actions which we could take to reduce leakage and consumption of water, and how we have created different demand management programmes, including how we have prioritised different interventions within a given programme. We presented our investment modelling tool with 'high' and 'high plus' company-led demand programme options (we also presented the model with 'low' and 'medium' scenarios in sensitivity testing, although these programmes do not meet government policy expectations and so were not considered as "feasible" options). The 'high' demand management scheme was selected in cases where the model was presented only with programmes which meet government expectations, as the additional cost of making greater demand reductions in the 'high plus' scenario was shown to be prohibitive.

11.28 Adopting the "high plus" leakage reduction programme would deliver an additional 40 Ml/d of leakage reduction for an additional £2.8bn by 2050. This is expensive in comparison to new supply options, and so we do not consider that additional leakage reduction beyond what is in our plan would represent best value to our customers. Furthermore, this plan would rely on as-yet unknown leakage reduction techniques to a greater degree increasing deliverability risks of our plan.

11.29 Our demand management programme is the largest component of our plan throughout the planning period, particularly so in the short-term (Figure 11-1). Everything aside from the bottom section of each bar is demand management in some form. This figure also demonstrates that significant government-led initiatives will be needed to drive household consumption reduction, and that government-led demand reduction alone represents 29% of our total supply-demand balance need by 2050.

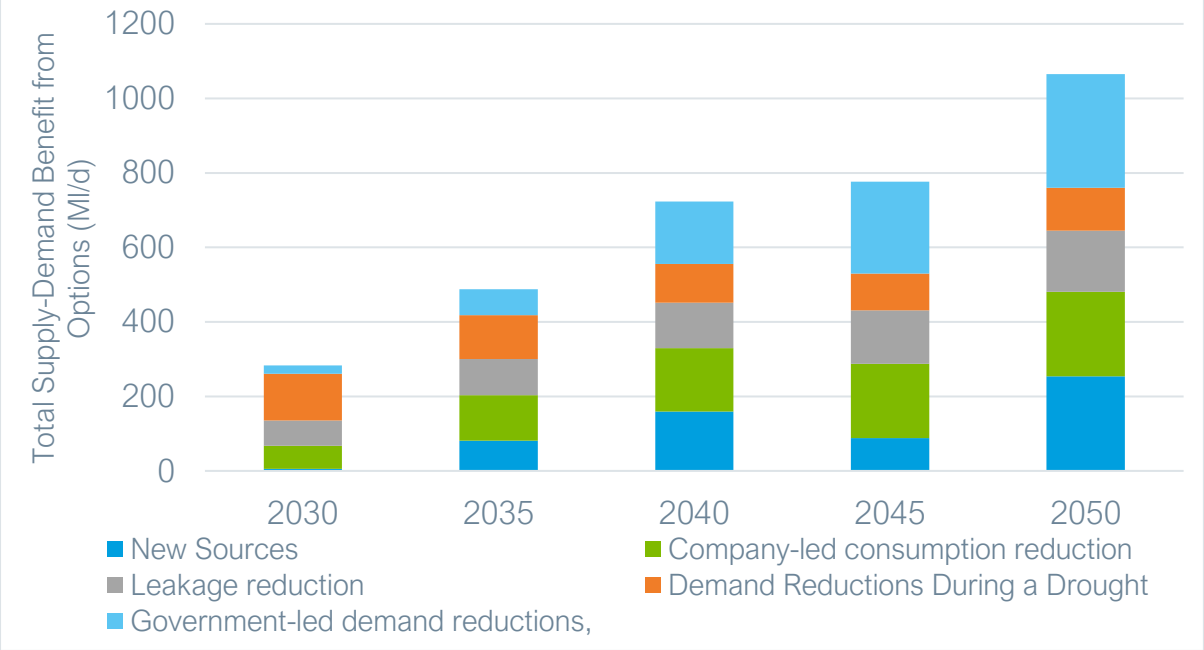

Figure 11-1: Contribution of Different Types of Option to our Preferred Programme[8]

[8] Figure not updated between rdWRMP24 and fWRMP24, as only small changes to the plan were made

11.30 Overall, our plan contains more demand reduction activity than is economically optimal (i.e. more than a true least-cost plan would require), as was the case in the WRMP19, driven by our policy objectives in this area. Future water mains rehabilitation programmes, which form a large part of our demand management programme, are necessary to reduce leakage by 50% when compared to 2017-18 levels. This activity is expensive relative to other options in delivering supply-demand balance benefit. The total volume of demand reduction in our "High" programme up to 2050 is shown in Figure 11-2. In our draft WRMP, company-led demand management actions accounted for 324 Ml/d and government-led actions accounted for 73 Ml/d of demand reduction. In our final WRMP, company-led demand management actions account for 441 Ml/d and government-led actions account for 305 Ml/d. The primary increase in our company-led demand reduction action is the volume of non-household (NHH) demand reduction, with planned NHH consumption reduction being 26 Ml/d in the draft WRMP and 94 Ml/d in the final. This enables achievement of the Environmental Improvement Plan targets of 9% reduction in NHH consumption by 2037-38, 15% NHH consumption reduction by 2050, and 20% reduction in Distribution Input per capita by 2038, as well as meeting the PCC target.

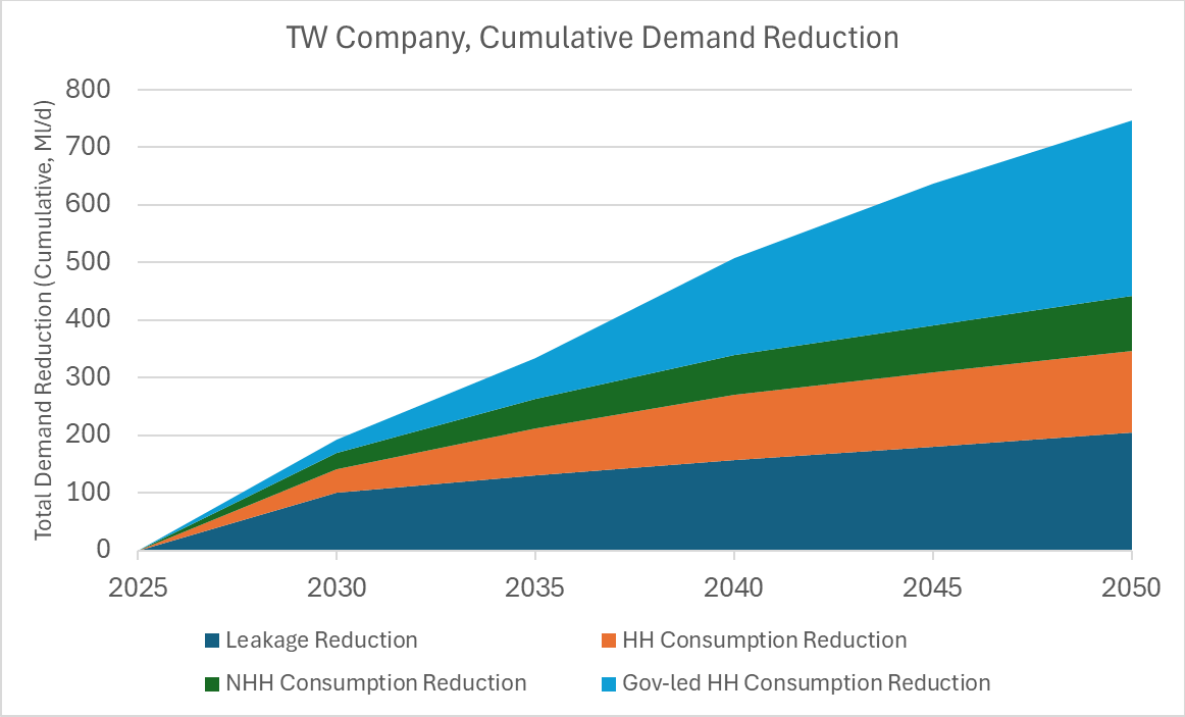

Figure 11-2: Total Demand Reduction (Company-level)

11.31 Our company-led programme is one that is evidence based and which we consider strikes a balance between ambition and the risk of under-deliverability of demand reductions. We have included leakage and consumption reductions that would be delivered through 'innovative' activities (which are not yet known) but have limited the volume of reductions that we assume would be delivered through these as yet unknown means. If we were to over-rely on these measures, there is a risk that these may not materialise, posing a risk to security of supply for our customers and further stress and pressure on the environment.

11.32 Company-led interventions alone, which we can be reasonably confident in, would result in a company-wide Dry Year Annual Average (DYAA) PCC figure of 132 l/h/d by 2050. There is a clear gap between the government ambition of 110 l/h/d by 2050 and the interventions that we as a water company can make in encouraging people to use less water. The 2022 summer heatwave and drought showed marked increases in customer water usage; the impacts of climate change on the likelihood and severity of future droughts and heatwaves may mean that there is more to do to achieve the 110 l/h/d target which would require further government intervention.

11.33 We now break down our demand management programme by component: Leakage reduction, household demand reduction (company and government-led) and non-household (NHH) demand reduction, before providing a tabulated summary of activity.

Leakage Reduction

11.34 We met our leakage targets in 2021-22, but the hot and dry summer of 2022 (causing a high soil moisture deficit and thus soil movement, causing leaks) and December freeze-thaw event contributed to significant increases in burst water mains and associated leakage, and as a result we fell short of our 2022-23 leakage target. During 2023-24 we implemented our leakage turnaround plan and leakage reduced significantly, to the lowest annual average we have achieved. Although leakage has reduced significantly at company level it remains above the levels forecast by WRMP19. In our revised draft plan, we set out that the expected 2024-25 average would be 507 Ml/d; we now expect leakage in 2024-25 to be 527 Ml/d.

11.35 Our leakage reduction programme delivers the industry ambition and government priority of 50% leakage reduction by 2050, compared to 2017-18 levels. This includes a 23% reduction (120 Ml/d) in AMP8. In 2030 our total company leakage will be 408 Ml/d, compared to 698 Ml/d in 2017-18 (a 40% reduction) and 613 Ml/d reported in 2022-23 (a 33% reduction). Leakage levels stated are from our normal year planning scenario.

11.36 The total leakage reduction activity required between 2025 and 2050 to meet the 50% leakage reduction target is 224 Ml/d. This is in addition to 101 Ml/d of leakage reduction that is being carried out during AMP7. Our leakage in 2050 will be 303 Ml/d, compared to 698 Ml/d in 2017-18.

11.37 In AMP8, a significant proportion of leakage reduction will be achieved through reduction in customer-side leakage, enabled by our smart meter upgrade programme. Installing smart meters allows us to see where leaks are likely to exist on customer-owned pipes by analysing data, and we are then able to undertake targeted fixes. This makes it a cost-effective activity.

11.38 When we have significantly reduced customer-side leakage and have exhausted the activities that we can take in active management of leakage, in order to make continued progress in leakage reduction we will need to undertake mains rehabilitation. This is the most expensive demand reduction option, but this action is necessary if we are to reduce leakage significantly.

11.39 Figure 11-3 shows how we plan to reduce our total company leakage across the planning period, and so how we will progress towards the target of 50% leakage reduction by 2050. By 2030, we will have made significant progress towards the 50% leakage reduction target and will already have reduced leakage by over 40% compared to 2017-18 levels by this point.

11.40 The leakage reduction planned between 2022 and 2050 is 10.7% of 2021-22 Distribution Input. By this measure, our leakage reduction programme is (as of the rdWRMP24, March 2024) the most ambitious in the industry.

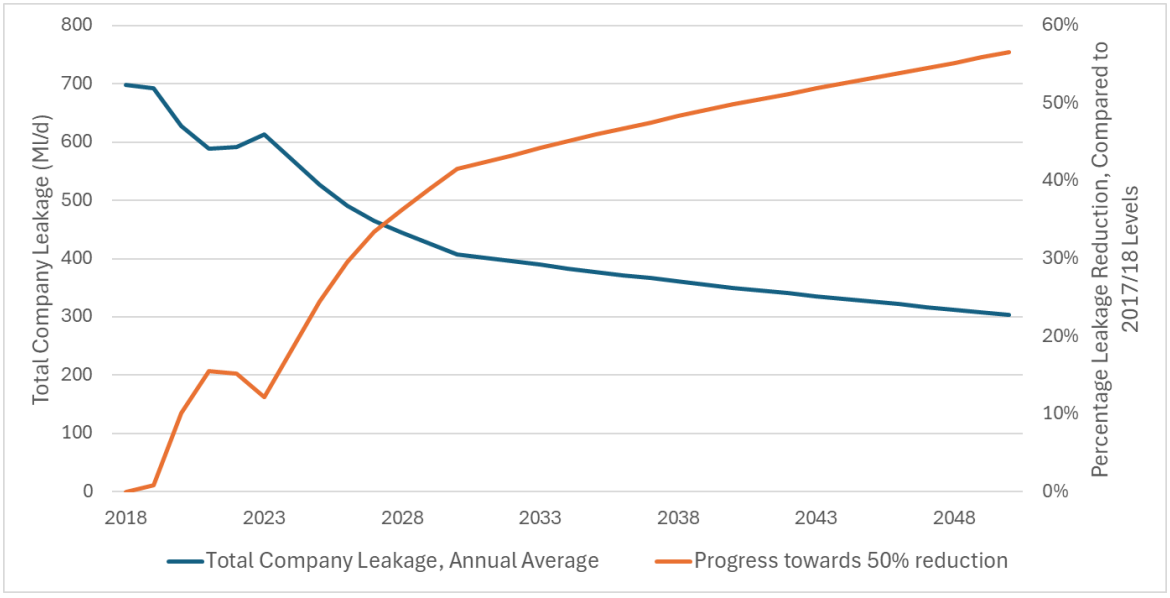

Figure 11-3: Leakage (Ml/d) and progress towards 50% leakage reduction target (Company-level)

Household Demand Reduction

11.41 Household demand reduction will be brought about by a combination of company and government-led measures.

11.42 In AMP8, in addition to any carry-over activity which is necessary to complete our AMP7 metering programmes, we will install or upgrade over 900,000 domestic meters. Around 650,000 of these will be upgrades from existing 'normal' meters to 'smart' meters. The installation of smart meters will give us an opportunity to detect wastage and leakage, allowing us to target fixes and communication where it will have the most benefit. In addition to these upgrades, we will install new meters on domestic properties, and bulk meters which will measure the water use of large buildings such as blocks of flats.

11.43 By 2030 we will have completed our main progressive metering programme (PMP, our compulsory metering programme) and will have finished most of our programme of smart meter upgrades. In the 2030s we will finish our programme of smart meter upgrades and will install more bulk meters, which will provide usage per building rather than individual billed property. During the 2030s we also aim to install or upgrade an additional 900,000 meters in properties where it has so far been impracticable to do so. By 2030 we will have a 72% meter penetration, which will rise to 90% by 2040 (Figure 11-4).

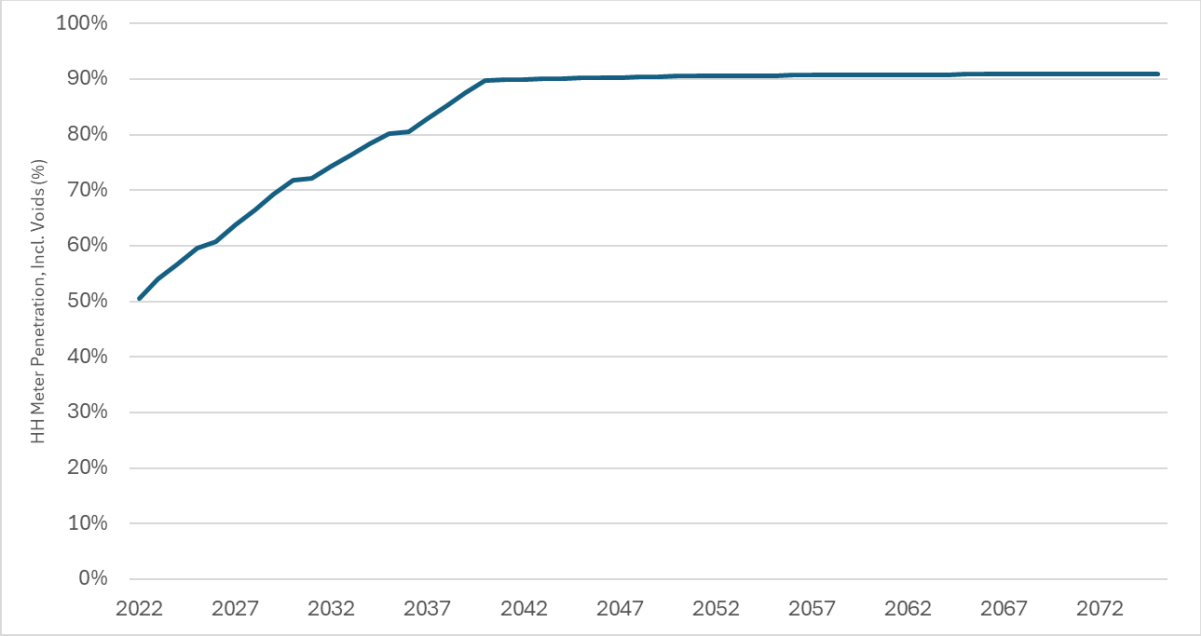

Figure 11-4: Thames Water Household Meter Penetration, Including Voids (%)

11.44 When we have a sufficiently high proportion of metered properties, we plan to introduce tariffs in which the cost of water will rise incrementally with water use. This will incentivise those who use an exceptionally high amount of water to reduce their usage, although evidence from abroad[9,10] suggests that the elasticity of demand for water may not be sufficient for tariffs to have a marked impact on overall PCC.

11.45 Throughout the planning period we will continue to promote water efficiency, building digital engagement tools to do so. Data obtained from smart meters will allow us to target engagement.

11.46 Figure 11-6 shows the total reduction in household demand that we anticipate. Our PCC forecast is shown in Figure 11-5. In this figure, the important role of government can be plainly seen, with separate PCC forecasts for a plan involving only company-led actions and a plan with company- and government-led actions.

[9] Reynaud, A. and Romano, G. (2018) Advances in the economic analysis of residential water use: An introduction, Water, 10, 1162-1172

[10] Joint Research Centre Technical Reports Modelling Household Water Demand in Europe. Insights from a cross-country econometric analysis of EU-28 countries. Arnaud Reynaud 2015 EUR 27310 EN

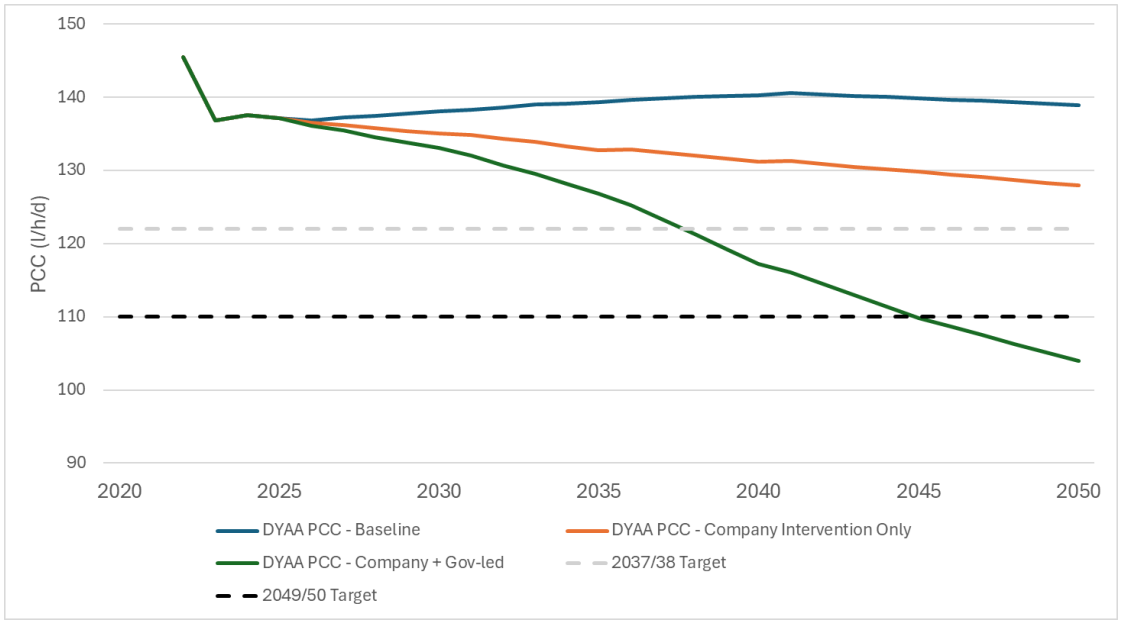

Figure 11-5: Company-wide PCC Projection

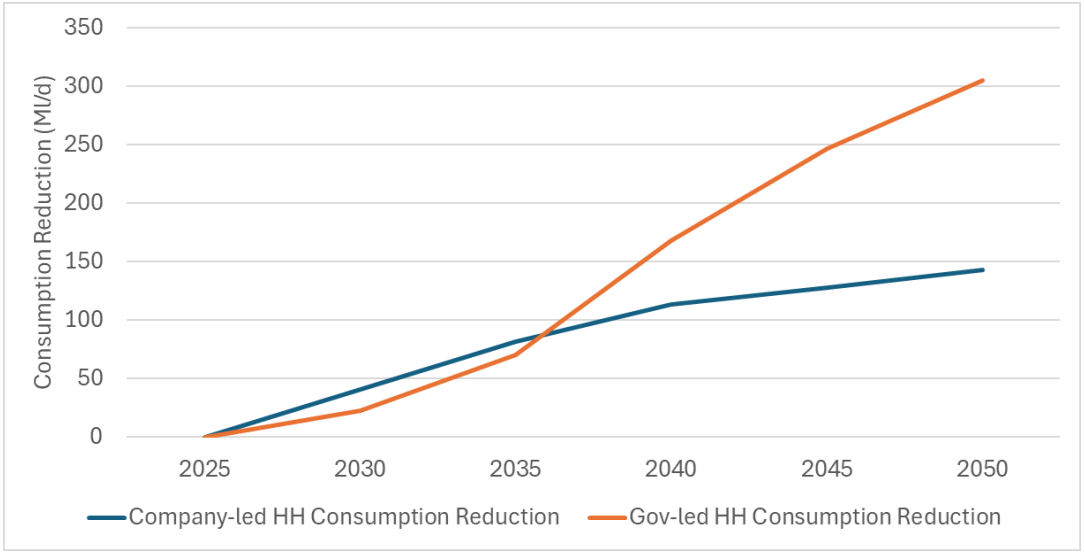

Figure 11-6: Cumulative Household demand reduction

Government-led Reductions

11.47 In addition to the activities that we can instigate, our plan relies on the government continuing, and expanding, its action to promote water efficiency. To inform estimates of how much water government-led actions could save, WRSE looked at different sources of evidence regarding the effectiveness of interventions which the government could introduce[11], with the report being shared with government and wider stakeholders. The three main government policies that our plan relies upon are:

[11] Water Resources South East, 2022, Government demand management savings and implementation profiles, https://www.wrse.org.uk/media/tp2jdo5o/wrse-defra-demand-management-savings-profile-report-november-2022.pdf - please note, an updated version of this report will be published to accompany the final WRSE Regional Plan

- Water labelling, without a requirement for minimum standards. We have assumed that this policy will be enacted very soon, beginning from 2025, with 6 l/h/d benefit delivered by 2035.
- Water labelling, including a requirement for minimum standards, enacted from 2030 with an additional 6 l/h/d benefit delivered by 2045.
- Full government support, including action to reduce water use in new developments, assumed to be in place from 2035, delivering an additional 12 l/h/d benefit by 2050.

11.48 Using methods and data analysis aligned with the WRSE Regional Plan, our plan assumes that government-led actions will result in reduced household consumption of 24 l/h/d by 2050, which in aggregate across our 2050 forecast of over 12 million customers equates to around 300 million litres per day, or around 16% of our 2050 baseline forecast of water supply, or 29% of our forecast supply-demand deficit. This is clearly a very significant amount, and we do not yet have confirmation from the government regarding the measures that they intend to implement, nor when such measures might be implemented. Placing such heavy reliance on measures outside our control clearly presents a risk to the security of supply in the future. To mitigate this risk, we have presented a comprehensive monitoring plan (see later section) which looks to the longer-term and identifies when we may need to make additional interventions beyond those in our preferred plan.

Non-household Demand Reduction

11.49 As well as making efforts to reduce household consumption, we will continue to undertake significant activity to reduce NHH demand. This will include upgrading smart meters on NHH properties (around 110,000 by 2030), water efficiency savings enabled by our Smarter Business Visits, targeted NHH continuous flow fixes, and the development of new NHH tariffs.

11.50 The NHH demand reduction programme set out in the final WRMP is significantly larger than the programme included in the earlier drafts. The enhanced plan for reductions is in response to the Environmental Improvement Plan targets of 9% and 15% reduction in non-household usage by 2038 and 2050 respectively. This increase in planned reduction, a response to government policy to which our planning must adhere, again brings risk which is addressed through our monitoring plan.

11.51 Non-household demand makes up around 15% of the demand for water. Without action, we are forecasting significant increases in non-household demand. To meet the non-household demand targets and ensure the security of supply, non-household demand reduction is of great importance. As a wholesaler, we will look to ensure universal NHH smart metering by the end of AMP8, work with individual NHH customers to drive NHH water efficiency through our Smarter Business Visit programme, focus on fixing continuous flow issues, and work with retailers to drive further water efficiency.

Demand Management Programme Summary

11.52 Table 11-1 shows the activity and resultant benefit of our company-level demand management plan, as well as the number of meters that we will install, up to 2050.

	Supply Demand Benefit (Ml/d)				
Company	AMP8	AMP9	AMP10	AMP11	AMP12
AMP7 Carry-over leakage	26.00				
Household metering CSL	3.41	0.00	0.00	0.00	0.00
Non-household metering CSL	2.88	0.00	0.00	0.00	0.00
Bulk metering CSL	22.65	2.79	1.82	0.00	0.00
Replacement metering CSL	12.25	3.74	0.00	0.00	0.00
Mains replacement	2.78	15.10	13.49	10.00	10.39
Leakage innovation	1.62	1.69	5.09	10.90	10.99
Metering innovation CSL	0.00	0.00	0.40	0.00	0.00
Advanced DMA Intervention	28.17	6.97	6.85	2.20	2.00
Total leakage reduction	99.77	30.30	27.64	23.10	23.38
AMP7 Carry-over metering	6.46				
Household metering	13.45	0.00	0.00	0.00	0.00
Non-household metering	1.59	0.00	0.00	0.00	0.00
Household water efficiency	13.25	13.99	0.00	0.00	0.00
Non-household water efficiency	28.40	22.00	16.50	14.00	12.00
Metering innovation	2.00	14.54	17.89	0.00	0.00
Innovative tariffs	5.21	12.66	13.69	14.70	15.00
Total usage reduction	70.36	63.18	48.08	28.70	27.00
Total benefit from DMP	170.13	93.48	75.73	51.80	50.38

	New & Replacement Meters				
Company	AMP8	AMP9	AMP10	AMP11	AMP12
Bulk Metering	55,295	61,225	48,988	0	0
Household Metering (New)	284,062	323,262	416,919	0	0
Household Metering (Upgrades)	645,491	337,803	80,878	0	0
Non-Household Metering (Upgrades)	113,286	0	0	0	0

Table 11-1: Preferred Plan – Demand Management Programme – Company Level

Supply enhancement

Key Questions

11.53 The scale of supply-demand deficit in our supply area and the wider WRSE region means that, despite the extensive and ambitious demand management programme which has been described, new sources of water supply will be required. In our planning we have considered the supply-demand balance needs under the nine pathways of the adaptive plan, but have given most consideration to pathway 4, as this pathway aligns with guidance and the expectations of our regulators and is the supply-demand balance pathway along which we describe our preferred programme. Following this pathway, while the need for new sources of water is not immediate, the long processes of planning, consenting, and construction mean that decisions must be made well in advance.

11.54 In Section 10 of our WRMP, a Candidate Overall Best Value Plan is identified. This plan was identified using the WRSE investment model, which is a regional-level decision support tool. This appraisal considered the overall costs of different plans and programmes, as well as carbon emissions and wider Best Value metrics. In Section 11 we take this candidate plan and appraise it more broadly to identify whether we should adopt this plan, or whether alterations should be made. Our consideration is that the Best Value approach taken aligns with Ofwat's public value principles.

11.55 Our programme appraisal journey, described in Section 10, has led us to consider that major supply-side investment will be required to provide additional sources of water for at least two key points in our programme, with the timing of the need for these new sources aligned with the major step-changes in our supply-demand balance. These are the early 2030s, when we aim to increase the level of drought resilience offered to our customers such that emergency restrictions would not be required more often than once every two hundred years, and 2040, when we plan to increase the level of drought resilience offered to our customers such that emergency restrictions would not be required more often than once every five hundred years. The decisions made regarding the provision of new supplies at these points in time should consider the other general trends in our supply-demand balance, which are a gradual deterioration of the supply-demand balance over time due to forecast population growth and climate change impacts, and a step-change (deterioration) in 2050 associated with supply reductions to enable our environmental destination.

11.56 As is discussed in Section 10, analysis of the investment model runs indicates that there are clear, low-regrets supply-side solutions that meet our needs for new supplies in the early 2030s and 2040. These are the Teddington DRA (a new abstraction on the River Thames close to Teddington Weir, with abstraction compensated for by the transfer of highly treated recycled water from Mogden sewage treatment works) and the South East Strategic Reservoir Option (also known as SESRO, a new storage reservoir which would be sited in the Upper Thames catchment, south west of Abingdon in Oxfordshire), respectively. These findings are consistent with our WRMP19.

11.57 In the draft WRMP24 we identified that we could reasonably proceed with either the 100 Mm^3 or 150 Mm^3 reservoir options, with the draft plan appraisal indicating that the 100 Mm^3 reservoir resulted in a plan which performed better from an environmental standpoint, and the 150 Mm^3 reservoir resulted in a plan which was more resilient to risks. As is described in Section 10 of our final WRMP24, our revised programme appraisal (Section 10) leads us to consider that the 150 Mm^3 option should be adopted in our WRMP24 Candidate Best Value Plan.

11.58 In the draft WRMP24, regardless of whether we adopted a 100 Mm^3 or 150 Mm^3 SESRO, we identified that additional sources were required in the long-run (2050) to enable licence reductions to meet our environmental destination. Section 10 of our final WRMP24 identifies that, if we adopt a reservoir larger than 75 Mm^3 and demand management interventions result in achievement of the 110 l/h/d target, further major investment is not required until at least 2060. However, we should consider whether additional investment would present best value to our customers and the region as a whole.

11.59 Based on the Candidate Plan identified in Section 10, in this section we provide a summary of the programme appraisal analysis, in order to answer the following questions:

- Question 1: Why is Teddington DRA the best value option for provision of 1 in 200-year drought resilience by the early 2030s?
- Question 2: Why is SESRO the best value option for the provision of 1 in 500-year resilience?
- Question 3: Why is 150 Mm^3 the preferred size of SESRO?

- Question 4: Are there additional supply-side options which may be needed after 2040 to provide a Best Value solution for the longer-term?

Decision-making process, and key decision-making factors

11.60 Having carried out our BVP analysis we have been able to distil the Thames Water portion of the regional planning problem into the questions listed above. We now summarise the programme appraisal journey and answer these questions, considering the modelled programme appraisal and incorporating considerations outside the modelling.

Investment Modelling - Least Cost Programme

As explained in Section 10, the first step in our decision-making was to find the 'least cost' adaptive plan which satisfied supply-demand balance in all years of the planning horizon, in all WRZs across the WRSE region. The specific definition of "least cost" specifically considers the net present cost (i.e., discounting future costs according to government guidance) of the options in the plan, including the monetised social cost of carbon emissions (again, calculated according to government guidance), but in this step we do not consider environmental or resilience metrics. The large options of relevance for Thames Water selected by the model for the least cost adaptive plan in 'Pathway 4' were as seen in Table 11-2.

Option Name	WRZ	DO	Year First Used
Teddington DRA	London	67	2033
SESRO, 150 Mm^3	London	271	2040
Oxford Canal	SWOX	12	2040
South East Water Import	Guildford	10	2050

Table 11-2: Large options (> 20 Ml/d for London and > 10 Ml/d for Thames Valley) Selected in Pathway 4 of Least Cost Adaptive Model Run

11.61 SESRO 150 Mm^3 variant is used to provide water to a number of WRZs:

- Thames to Southern Transfer, 120 Ml/d variant, used from 2040 onwards
- Thames to Affinity Transfer, 50 Ml/d used from 2045 onwards, and an additional 50 Ml/d constructed for use from 2050
- Thames Water zones – London (from 2040, via the River Thames), SWOX (from 2040, via pipeline transfer), SWA (from 2050, via a new abstraction at Medmenham), and Kennet Valley (via the Thames to Southern Transfer spur)

11.62 This plan is similar to our dWRMP adaptive least cost plan, with other large options from 2050 removed. They are no longer required due to the forecast achievement of the 110 l/h/d target by 2050 leaving a diminished need for new sources.

11.63 These options were selected by our investment model in this order because:

- Teddington DRA is the cheapest of the water resources options which can provide enough water for us to increase our drought resilience in London to a 1 in 200-year level, and which we can construct by the early 2030s. The option has both lower capital costs and lower operational costs than alternatives.

- Solving the regional supply-demand balance deficit in pathway 4 requires a major new resource development in the west of the Thames catchment due to the large deficit in the west of the WRSE region. We have investigated through sensitivity runs, and the magnitude of the deficit means that either a reservoir or the Severn Thames Transfer (STT) must be constructed. The least-cost way of fulfilling this need is with SESRO (150Mm^3). In order to establish why SESRO forms part of our least cost plan, we conducted a sensitivity test using the WRSE investment model where we excluded all SESRO options, which forced the selection of the STT. The "pathway 4" programme cost for the WRSE region is around £600 million more expensive in Net Present terms, highlighting that SESRO is a clearly more cost-effective option for the WRSE region. The 150Mm^3 SESRO variant is selected because larger reservoir sizes are most cost effective and because the total regional need in pathway 4 exceeds the Deployable Output of even the largest reservoir size (i.e., some, more expensive, additional sources are needed in the WRSE region, and selection of larger reservoir sizes reduces the need for these more expensive additional solutions) – for example, a 150Mm^3 reservoir delivers around twice the supply benefit of a 75Mm^3 reservoir, for around only 25% additional cost. The cost difference between programmes involving different sizes of SESRO is less marked than the difference between the cost difference between SESRO and STT-centric plans, with "pathway 4" programme costs for plans including 125 Mm^3, 100 Mm^3, and 75 Mm^3 being £150m, £220m, and £310m more expensive than the "least cost" plan, respectively.
- In the dWRMP there was a sufficiently large supply-demand balance requirement to drive the selection of another large option in the Thames Water area in 2050, due to the large licence reductions in the "High" environmental destination scenario. In the final WRMP these licence reductions remain (the supply-demand balance deterioration in our London WRZ alone between 2049 and 2050 is nearly 250 Ml/d), but our preferred programme is based, as it must be to comply with guidance, around the achievement of the government's 110 l/h/d PCC target. Achievement of this target would deliver sufficient supply-demand balance benefit to mean that, with the selection of a reservoir of more than 100 Mm^3, no further large supply-side schemes are required after 2040, except in the most challenging future pathway (pathway 1), in which a desalination plant and reuse plant would be required further in the future.

Investment Modelling - Best Value Criteria Runs

11.64 The next step in our decision-making process was to undertake investment model runs in which solutions to the adaptive regional plan problem were found while seeking improvements in metrics other than cost (e.g. improvement in environmental metrics, or resilience metrics). Section 10 contains more detail of the analysis carried out on these runs. The following broad conclusions were drawn:

- The model is able to find alternative solutions to the Least Cost Plan that offer improved performance on best value metrics, in a trade-off with cost.
- The picture is complicated at the individual metric level (there being 9 metrics other than cost which are considered, which can sometimes be traded off against one another), but the use of a summarised "Best Value Plan aggregate metric" allows for simplified comparative analysis.

11.65 Regarding the large options, the following commonalities were observed between the "least cost" and "best value metric" runs:

- Teddington DRA continues to be selected for use in 2033
- SESRO continues to be selected for use in 2040

11.66 There were, however, differences in option selection observed in these model runs, compared to the least cost model run which require consideration in the later stages of programme appraisal:

- The Grand Union Canal scheme (a scheme which would be delivered and used by Affinity Water, involving transfer of water from the Minworth Sewage Treatment Works in Birmingham to the South East via canal transfer) is selected at a 50 Ml/d size in the least cost plan, but a larger option variant (100 Ml/d) is selected in the best value metric runs.
- SESRO is selected at a 75 Mm^3 size, rather than the 150 Mm^3 size selected in the least cost run.
- The reduced contribution from SESRO is made up, in 2050, with additional supplies from desalination and/or the Severn Thames Transfer via pipeline

11.67 We explore this further in our sensitivity testing and do not expand on the results here for three reasons. Firstly, the best value metric runs involve changes in many option selection decisions not involving the large TW options; as such, sensitivity runs provide a better insight into the comparative performance of plans centred on different key options. Secondly, the model is not able to give an indication of the performance of the plan against the next-best alternative (or the trade-offs involved); as such sensitivity runs are preferred when assessing comparative performance differences. Thirdly, as noted previously, the investment model is a "decision support tool", not a "decision making tool" and as such it is important to thoroughly explore the implications of key decisions.

Investment Model Sensitivity Runs

11.68 Further runs were undertaken in which options were excluded or alternatives "forced in", in order to compare the modelled least cost and best value outputs observed with other feasible alternatives. These runs either excluded the Teddington DRA option to help answer Question 1, excluded SESRO to help answer Question 2, or limited SESRO to a single option variant to help answer Question 3. We have considered sensitivity runs in which the 110 l/h/d target is not achieved, to explore whether our option selection should be influenced by the risk associated with this target, to help answer Question 4. All of these runs discussed are presented in more detail in Section 10.

Investment Model Sensitivity Run – Question 1

11.69 To help answer Question 1 (Why is Teddington DRA the best value option for provision of 1 in 200-year resilience by the early 2030s?), we first explore a model run in which the Teddington DRA scheme was ruled out, to determine the implications of moving to the next best alternative, which was, in the dWRMP, found to be the Beckton water recycling scheme.

11.70 In contrast to the dWRMP, a plan where we simply exclude the Teddington DRA did not result in the selection of the Beckton Water Recycling scheme. Instead, in this model run, 1 in 200-year resilience for London was achieved via a large (50 Ml/d) licence trade with Affinity (enabled by the construction of the Grand Union Canal 100 Ml/d option, this licence trade option was not considered in our dWRMP), a large (25 Ml/d) transfer from SES Water, and the development of seven groundwater schemes in South East London. This plan was found to be £250m more expensive, in net present terms, than the least

cost plan, and our consideration is that this is not a plan which we can be confident would be resilient, as it is reliant on all three companies (Thames Water, Affinity Water, and SES Water) delivering ambitious demand management schemes, and it is reliant on the delivery of many individual schemes.

11.71 Due to the lack of resilience associated with the alternative plan found through exclusion of Teddington DRA, we explored further investment model sensitivity runs whereby we "force in" the construction of the Beckton Water Recycling scheme (we explored 50, 100 Ml/d and 150 Ml/d variants as they are the three feasible "phase 1" sizes). The results of these sensitivity runs (Table 11-3, more detailed results in Section 10) show that replacement of the Teddington DRA with the Beckton Water Recycling scheme would result in plans which would be £650-900m more expensive in Net Present terms than the least cost plan, depending on the size of the recycling plant developed. If Beckton Water Recycling is developed instead of Teddington DRA, there are marginal improvements in the environmental metrics (natural capital, biodiversity net gain and SEA benefit), but there would be an increase in carbon emissions (c.250,000-400,000 tonnes) and no change in the resilience metrics, and so our consideration is that replacing the Teddington scheme with Beckton does not present "best value", as it would not perform materially better when considering best value criteria (detailed metrics are presented in Section 10) and would involve significant additional expense for customers and higher carbon emissions. As is noted later in the "Monitoring Plan" section, Beckton Water Recycling nonetheless plays an important role in our adaptive plan and forms part of our alternative short-term plan.

	Least Cost	Force Beckton (50 Ml/d) Use in 2033	Force Beckton (100 Ml/d) Use in 2033	Force Beckton (150 Ml/d) Use in 2033
Large Options	Teddington DRA (2033)	Beckton 50 (2033)	Beckton 100 (2033)	Beckton 150 (2033)
	SESRO 150 (2040)	SESRO 100 (2040)	SESRO 75 (2040)	SESRO 100 (2040)
		Teddington DRA (2050)	Teddington DRA (2050)	Teddington DRA (2050)
			Crossness desal (2050)	
Cost (£bn)	19.05	19.70	19.94	20.02
Carbon Emissions ($MtCO_2e$)	8.8	9.0	9.0	9.2

Table 11-3: Large TW resource options (> c.50 Ml/d) and key metrics for Pathway 4 of sensitivity runs used to explore Teddington DRA selection

Investment Model Sensitivity Runs – Question 2

11.72 From analysis of the need for water in the west of the WRSE region, we are led to consider plans where either SESRO or the STT is available for use from 2040, as there is a need for water in Southern Water's western area and our SWOX WRZ by 2040, and a need in our Kennet Valley and SWA zones in the longer-term. In the longer-term it

could be that both are required, and this is addressed in answer to Question 4. To help to answer Question 2 ("Why is SESRO the best value option for the provision of 1 in 500-year resilience?"), we explore investment model sensitivity runs in which we ruled out SESRO. Outputs from these runs (Table 11-4) indicate that, if we were to rule SESRO out we would indeed need to construct the STT for 2040.

11.73 In the run where SESRO is ruled out and STT's selection is required instead, construction of the STT is required by 2040, with Minworth (full 115 Ml/d) support required by 2041, and support from Vyrnwy phased from 2040 (phases 1 and 2) through to 2050, 2059 and 2070 (phase 3, 4 and 5 respectively). The "pathway 4" programme cost for the WRSE region is around £600m more expensive in Net Present terms, highlighting that SESRO is clearly a more cost-effective option for the WRSE region under the supply-demand balance challenge in pathway 4. A plan centred around the STT also results in more carbon emissions than plans in which SESRO is constructed, both on average across the nine pathways considered (by around 300,000 tonnes CO2e), and in pathway four (by around 1 million tonnes CO2e), and performs less well when considering other best value criteria, such as environmental and resilience metrics (e.g., STT-centric plans resulting a deterioration of 40,000-80,000 BNG units (which is c.20-40% worse) compared to SESRO-centric plans, and a deterioration of around 70-75m Natural capital units (a reduction of c.95%) compared to SESRO-centric plans.

11.74 If the STT is selected instead of SESRO, as discussed, water would be needed from both the Vyrnwy and Minworth support sources. We note that, due to environmental impacts, the Environment Agency have raised concerns regarding the feasibility of developing both a 100 Ml/d Grand Union Canal (GUC) transfer (water for the GUC transfer would be provided by Minworth) together with 115 Ml/d support to the STT from Minworth, demonstrating the risk that a plan centred around the STT would bring.

11.75 In order to answer this question more fully, we have also explored sensitivity runs where the PCC target is not achieved and where we again compare runs in which we exclude SESRO (results also in Table 11-4). If we consider a scenario in which our DYAA PCC reaches 126 l/h/d (compared to the 108 l/h/d by 2050 in our preferred programme), explored through the use of a government-led scenario with only 6 l/h/d savings by 2050 (compared to 24 l/h/d in our preferred plan), a plan excluding SESRO and instead focussed on the STT would be around £1bn NPV more expensive than one in which a 150 Mm^3 SESRO is built in a 'pathway 4' supply-demand balance, again with a marked reduction in "best value" metrics. This further confirms our preference for SESRO over STT. We return to Question 2 in sections below (Further considerations and risks) and so do not summarise our overall conclusions here.

	Least Cost (108 l/h/d 2050)	Least Cost (108 l/h/d 2050), No SESRO	Adverse PCC (126 l/h/d in 2050), SESRO 150	Adverse PCC (126 l/h/d in 2050), No SESRO
Large Options	Teddington DRA (2033)	Teddington DRA (2033)	Teddington DRA (2033)	Teddington DRA (2033)
	SESRO 150 (2040)	STT 300 Pipeline + Netheridge (2040)	SESRO 150 (2040)	STT Pipeline + Netheridge (2040)

	Least Cost (108 l/h/d 2050)	Least Cost (108 l/h/d 2050), No SESRO	Adverse PCC (126 l/h/d in 2050), SESRO 150	Adverse PCC (126 l/h/d in 2050), No SESRO
		Vyrnwy Phases 1 & 2 (2040)	STT 400 Pipeline + Netheridge (2050)	Minworth 115 Ml/d (2040)
		Minworth 115 Ml/d (2041)	Beckton Desaliantion 150 Ml/d (2050)	Vyrnwy Phases 1-5 (2042-2045)
		Vyrnwy Phases 3, 4 & 5 (2050-2070)	Beckton Recycling 50 Ml/d (2050)	Marsh Gibbon Reservoir, 30 Mm^3 (2047)
				Beckton Recycling 100 Ml/d (2050)
				Beckton Desalination 150 Ml/d (2050)
				Deephams Recycling 46.5 (2064)
Cost (£bn)	19.05	19.68	21.65	22.66
Carbon Emissions (tCO2e)	8.8	9.7	9.8	10.7

Table 11-4: Large TW resource options (> 50 Ml/d), cost and carbon for pathway 4 of sensitivity runs used to explore SESRO vs STT

Investment Model Sensitivity Runs – Question 3

11.76 Having explored through sensitivity runs why SESRO is the best value preferred option to solve the 2040 supply-demand balance problem due to its performance in terms of cost, carbon and other best value metrics, we are led to explore why the Candidate Best Value Plan, identified in Section 10, includes a 150 Mm^3 SESRO. To help answer Question 3 (Why is 150Mm^3 the preferred size of SESRO?), we explore the investment model sensitivity runs in which we limited the availability of the SESRO option to a single size variant (note: phased options are not preferred by the modelling or stakeholders and so were not explored). In these runs we did not force the model to select the SESRO option (i.e. a plan involving STT and recycling/desalination was feasible), but it selected the available SESRO option for use from 2040 onwards in all cases. The selection of different sizes of SESRO can drive different timing and combinations of other schemes (2040-2050, and beyond) under pathway 4, and other pathways.

11.77 In the case where a 110 l/h/d PCC target is achieved by 2050, regarding schemes required for use by Thames Water, selection of a 75 Mm^3 reservoir would necessitate development of a 100 Ml/d desalination plant by 2050, selection of a 100 Mm^3 reservoir would mean no further large resource development would be needed until 2060 (at which point a small, c.50 Ml/d, water recycling plant would need to be developed), while selection of either a 125 Mm^3 or 150 Mm^3 reservoir would mean that only small groundwater schemes would be needed further in the future.

	SESRO 150 only	SESRO 125 only	SESRO 100 only	SESRO 75 only
Large Options	Teddington DRA (2033)	Teddington DRA (2033)	Teddington DRA (2033)	Teddington DRA (2033)
	SESRO 150 (2040)	SESRO 125 (2040)	SESRO 100 (2040)	SESRO 75 (2040)
			Deephams Recycling 46.5 (2061)	Beckton Desal 100 (2050)
Cost (£bn)	19.05	19.2	19.27	19.37
Carbon Emissions (tCO2e)	8.8	8.8	8.9	8.9

Table 11-5: Large TW resource options (> c.50 Ml/d), cost and carbon for pathway 4 of sensitivity runs used to explore SESRO size under preferred demand management future (108 l/h/d by 2050)

11.78 As these results demonstrate, the WRSE programme-level cost increases slightly as progressively smaller reservoirs are developed, as a result of needing to build additional resource options (noting that other companies in the WRSE region may need to build resources other than those included in the table, with SESRO providing water to Affinity and Southern Water) and/or needing to use more expensive sources more, while the total carbon emissions are close between different programmes.

11.79 There were differences in the other option metric outputs (detail presented in Section 10), but these were relatively minor. Programmes with smaller reservoirs perform slightly better (2-4m Natural Capital Units, 3-6% improvement, and 15,000-40,000 BNG units, 7-20% improvement). We note, however, that all SESRO schemes have positive Natural Capital contributions.

11.80 In order to ascertain whether the decision on SESRO size is impacted by the risk that household consumption will not fall to the government's target levels, we again explore sensitivity tests in which a 2050 PCC of 126 l/h/d (compared to 108 l/h/d in our preferred plan) is achieved. If PCC does not reduce as the government is aiming for and we follow a "Pathway 4" supply-demand balance trajectory (i.e., if we are required to make licence reductions in accordance with the Environment Agency's "Enhanced" scenario), plans involving a larger reservoir option are more cost effective, with a plan built around a 150 Mm^3 reservoir being around £200m less expensive than a plan which built a 100 Mm^3 reservoir in this scenario (Table 11-6). We observe similar differences between the

metrics as in the runs looking at different SESRO sizes with PCC at the preferred 108 l/h/d level by 2050 (i.e., selection of smaller reservoirs resulting in slight increases in carbon emissions, and small improvements in Natural Capital and Biodiversity Net Gain metrics).

11.81 In the model runs where we explored the implication of achieving 126 l/h/d PCC, rather than 108 l/h/d, SRO options in addition to SESRO were required in 2042 if we select the 75 Mm^3, 2045 if we select the 100 Mm^3 option, or 2050 if we select the 125 Mm^3 or 150 Mm^3 options. The larger the reservoir size selected, the fewer/smaller the support options required, and the later they can be developed. Plans with larger SESRO schemes would thus allow us to better manage the risks associated with the potential for under-performance of demand management actions, the results of which are currently uncertain. If we find that, despite company-led and government-led actions, customers' PCC does not fall as quickly as we have planned for to accord with the WRPG, a reservoir larger than 100 Mm^3 would provide more resilience, allowing time to plan for and deliver required additional options; this means that we would be more able to adapt plans to react in a way that would be beneficial for the long-term if we build a reservoir larger than 100 Mm^3, but may need to react and build options quickly if we build a smaller reservoir (100 Mm^3 or less).

11.82 The factors of reduced overall programme cost under pathway 4, the better management of supply-demand balance risk, and the minimal difference in BV metrics between programmes incorporating reservoirs of different size led us to conclude that the 150 Mm^3 should be included in the Best Value Candidate Plan.

	SESRO 150 only	SESRO 125 only	SESRO 100 only	SESRO 75 only
Large Options	Teddington DRA (2033)	Teddington DRA (2033)	Teddington DRA (2033)	Teddington DRA (2033)
	SESRO 150 (2040)	SESRO 125 (2040)	SESRO 100 (2040)	SESRO 75 (2040)
	STT 400 Pipeline + Netheridge (2050)	STT 300 Pipeline + Netheridge (2050)	STT 300 Pipeline + Netheridge (2045)	STT 300 Pipeline + Netheridge (2042)
	Beckton Desaliantion 150 Ml/d (2050)	STT Minworth Support 115 Ml/d (2050)	STT Minworth Support 115 Ml/d (2050)	STT Minworth Support 115 Ml/d (2050)
	Beckton Recycling 50 Ml/d (2050)	Beckton Desaliantion 150 Ml/d (2050)	Beckton Desaliantion 150 Ml/d (2050)	Beckton Desaliantion 150 Ml/d (2050)
	Vyrnwy Phase 1 (2065)	Deephams Recycling 46.5 (2061)	STT Vyrnwy Support Phases 1-3 (2050)	STT Vyrnwy Support Phases 1-5 (2050)

	SESRO 150 only	SESRO 125 only	SESRO 100 only	SESRO 75 only
		Vyrnwy Phase 1 (2075)	Deephams Recycling 46.5 (2061)	Deephams Recycling 46.5 (2060)
Cost (£bn)	21.65	21.72	21.83	21.97
Carbon Emissions (tCO2e)	9.8	9.8	9.9	10.1

Table 11-6: Large TW resource options (> 50 Ml/d), cost and carbon for pathway 4 of sensitivity runs used to explore SESRO size under adverse demand management future (126 l/h/d by 2050)

Further Considerations and Risks

11.83 As set out in Section 10 of our WRMP, the investment model should be used as a decision **support** tool, not a decision-**making** tool. Having summarised and explored the programme appraisal outputs detailed in Section 10 to identify reasons suggested by the modelling for adoption of the Candidate Best Value Plan, we now consider a broader view of programme appraisal. Model outputs should be considered alongside practical experience and judgement, based on our real-world knowledge of how new, large-scale infrastructure could best be delivered and operated. As such, alongside those factors which we can consider through programme appraisal modelling, it is important that we also consider programme appraisal from a holistic perspective, applying professional judgement. As such, we have had regard to the following considerations to apply to these questions, alongside the modelling outputs.

1. Simplicity is preferable to complexity, and consideration of operability
   - Our sources of water need to be reliable and available during drought periods. Based on our experience in maintaining and operating our existing assets, complex treatment processes require a great deal of maintenance and can therefore sometimes be unavailable when they are most needed.
   - It is important that we consider how sources would be used during periods of drought, considering the regional picture. As an example, SESRO would be easier to operate than STT (particularly as a source for the Thames to Southern Transfer), with water in SESRO being available for release to multiple parties immediately, whereas water from STT would require fairly significant advanced notice.

2. Limitations of the investment model in considering supply-demand balance risk
   - The options selected by the investment model are generally those which perform best with regard to cost, carbon and environmental performance. It follows that the next-best options will perform less favourably.
   - The investment model is used to identify the solutions required under defined supply-demand balance pathways. The model is less able to answer the question of how much additional supply-demand deficit would be required to trigger the development of additional (next-best) option(s).

- The 150 Mm^3 reservoir delivers 271 Ml/d of DO for an initial capital cost of around £2.4bn. The 75 Mm^3 reservoir delivers 149 Ml/d of DO for an initial capital cost of around £1.9 bn. As such, selecting the 150 Mm^3 reservoir, rather than the 75 Mm^3 reservoir means that we would deliver an additional 122 Ml/d DO for around £500m, or c.£4.1m capex per Ml/d of DO. This compares to around £1.15bn for 130 Ml/d DO from the 150 Ml/d Beckton Water Recycling scheme (£8.8m capex per Ml/d DO), £1bn for 133 Ml/d DO for the 150 Ml/d Beckton desalination scheme (£7.5m capex per Ml/d DO) or £1.4bn for 158 Ml/d DO from the construction of the 500 Ml/d STT interconnector and support from Netheridge (£8.9m capex per Ml/d DO), noting that these additional options all come with significant opex requirements. As such, if there is a risk of needing more water in the future, building the larger reservoir is clearly the lower regret option.
- Wider consideration of supply-demand balance "risk" is required, considering these limitations.

3. Policy requirements have become more challenging over time

- We have produced our WRMP24 in line with the Water Resources Planning Guideline, and programme appraisal has been undertaken according to the guidelines as they exist now. We are, however, aware that policies evolve in response to an increasingly uncertain and rapidly changing environment. We have seen increasingly stringent environmental and resilience measures be put in place over the last 10 to 15 years, and our consideration is that, in respect of future policies, we are more likely to end up with more supply-demand balance requirements than fewer, though uncertainty on this point clearly remains.
- Following public inquiry, we were required to revise our draft WRMP09 on the basis that we had included an allowance for future sustainability reductions beyond those that had been specifically included in the statutory WINEP programme at the time (with the WRPG at the time not requiring forward planning for licence reductions). The allowance that we had included in the draft WRMP09 was 100 Ml/d. In our WRMP24 we have been required by our regulator to consider future abstractions reductions of more than 400 Ml/d, demonstrating just how significant the policy change has been in this area in a relatively short period of time.

11.84 In addition to these further considerations, it is important that we consider the risks to our plan. In the Environment Agency's representation on our dWRMP, a range of risks to our plan were highlighted. In this section we discuss these risks and how they inform our programme appraisal decisions. Key risks highlighted by the Environment Agency were as follows and have informed the decisions in relation to the questions set out above.

1. The success of our demand management programme in the short-term

- In the short-term, our demand management programme is reliant on significant leakage reduction. By 2030 we will need to have reduced leakage by 33% compared to 2021-22 levels to meet our plan. The Environment Agency highlights that we will need to reduce leakage and then maintain leakage at significantly lower levels than we have previously achieved in order for

customers' supplies to be secure. The Environment Agency states that we should consider a back-up plan with trigger points to mitigate the risk that we are unable to deliver forecast leakage reductions.

2. The reliable capability of the Gateway desalination plant in London

   - The Gateway desalination plant was unavailable during the 2022 drought event due to required planned maintenance.
   - In the dWRMP we highlighted that we anticipate the plant to be available at a reliable 50 Ml/d during the period up to 2030, and 75 Ml/d from then on.
   - The Environment Agency's representation highlights that there is a risk that we may not be able to achieve these planned rates in either the short-term or long-term. The Environment Agency state that we should consider whether to continue operating the asset in the long-term.

3. Abstraction issues in the Lower Thames which were highlighted in the 2022 drought event, which will be exacerbated by the River Thames Scheme, a flood alleviation scheme which is planned for development by 2030

   - As is described in Appendix CC of our WRMP, during the 2022 drought event we experienced constraints on our abstractions which we did not anticipate. Abstraction in the Lower Thames above the confluence with the River Wey was limited due to the need to maintain water levels for navigation, while there was a surplus of water available below the confluence with the River Wey. The end result of this was that we were able to abstract less, in aggregate, than our hydrological modelling would tell us should be feasible, that the Teddington gauged flow was above the 300 Ml/d level on which our planning is based, and as such our reservoir storage levels in the 2022 drought were significantly below where we would have anticipated.
   - It is currently unclear whether none, some or all of the following are true:
     - The 2022 drought was unusual in respect of the inflows from different tributaries of the Lower Thames (e.g., perhaps a greater proportion of total flow was coming from the Rivers Wey, Ash, Mole, and Hogsmill)
     - The Environment Agency have altered their river management control protocols, meaning that 300 Ml/d Teddington gauged flow would once have been achievable but would now not be achievable. If this is the case, it is unclear whether river management protocols should be altered to allow achievement of 300 Ml/d gauged flow.
     - Changes in our abstraction capability, due perhaps to the installation of eel screens, mean that less abstraction is feasible at a given river level.
   - The River Thames scheme will involve construction of new channels which will bypass one of our key abstraction points above the confluence with the River Wey (Laleham abstraction point, or Littleton Pumping Station) and weirs on the River Thames upstream of the confluence with the River Wey where maintaining appropriate river levels for navigation is an existing challenge. While the scheme would be built to mitigate flood risk, the new channels would become habitat for animals and plants and could not be left stagnant during drought periods, and as such an "augmentation flow" will be needed in these channels during drought

periods. If it is the case that 300 Ml/d Teddington Gauged flow is already not achievable or would be a challenge to achieve, the River Thames flood alleviation scheme would exacerbate this situation.

- Should these constraints exist, or should the River Thames Scheme cause them, the following could be true:
    - We may have over-stated our Deployable Output in the London WRZ by up to 150 Ml/d: Studies are underway to review this risk and to understand the volume at risk.
    - The River Thames Scheme may cause an additional deterioration of up to c.170 Ml/d, with the magnitude of deterioration depending on modelling which the River Thames Scheme team are currently undertaking
    - The Teddington DRA scheme and Mogden Water Recycling scheme would not provide net Deployable Output benefit.

4. The success of household consumption reduction in the long-term:
    - This has been considered explicitly within our programme appraisal modelling, as discussed in preceding sections, but noting the limitations of the investment model it is important that wider consideration is given to this risk.
    - While our programme appraisal is able to consider the scheme selection implications of different deterministic scenarios of demand reduction, it is not able to identify the reduction in probability of needing to make additional investments under different circumstances. What is clear, however, is that adopting larger schemes in our plan will reduce the likelihood of needing to make further interventions in the future.
    - If the 110 l/h/d target is not met due to the failure of government to take the necessary steps to achieve it, then companies across the region and country will likely have supply-demand balance challenges alongside Thames Water.
5. The long-term viability of the West Berkshire Groundwater Scheme:
    - The Environment Agency have identified that the West Berkshire Groundwater Scheme is likely to continue to be operated until 2060, but that its future beyond this point is uncertain. This scheme contributes significantly towards Deployable Output in our London and Kennet Valley WRZs and, should it no longer be operable, would result in a requirement for additional resource of around 75 Ml/d for London.
    - Following its representation, the Environment Agency have also advised, through the WRSE Regional Group, that we should consider scenarios where the scheme's operation is stopped from 2050 and 2040.
6. Concerns over the environmental feasibility of the Teddington DRA scheme
    - While no specific environmental issues which cannot be mitigated have been found to date, there are several priority actions raised through the RAPID gated process that are being investigated with regulator involvement.
    - Since nothing has been found which would lead us to screen this option out of consideration, we will continue to consider it as a feasible option, but will continue progressing alternatives, subject to being funded to do so.

7. Doubts over the viability of the Severn-Thames Transfer

    - Concerns were raised in the Environment Agency's representation on our dWRMP which stated that the scheme has not been demonstrated to be either viable or environmentally acceptable. In the Environment Agency's representation to the WRSE draft Regional Plan, it was further highlighted that environmental concerns exist around using Minworth to provide water for both the GUC and STT schemes. Treated effluent discharges from Minworth currently comprise a significant component of the low flows in the River Trent.

11.85 Alongside risks highlighted by the Environment Agency in its representation, we have also considered the following additional risk:

8. Our ageing raw water storage reservoir asset base

    - As was noted in our WRMP19, our existing reservoir asset base is ageing, with several of our reservoirs being in excess of 100 years old. Consulting reservoir panel engineers highlighted that there is an increasing risk that these assets may need to be taken out of supply for an extended period at short notice (1 year or more), for either planned or unplanned maintenance. Our reservoirs in West London are up to around 30,000 Ml capacity, a significant proportion of our existing storage.
    - Our programme appraisal has demonstrated that Southern Water, Affinity Water and our SWOX WRZ all have such significant needs for water such that a 100 Mm^3 reservoir may not provide sufficient resource to also provide meaningful supply to London. As such, a larger reservoir contributes to a greater degree towards the mitigation of this risk.

11.86 Each of these risks is something which could have a detrimental impact on our customers' supplies. The chance that all of these risks materialise is small, however the chance of one or some of these risks materialising is significant and should factor in our decision making.

11.87 The implications of these additional considerations and risks for our decision-making are:

- Consideration 1 (preference for simplicity and regard to operability) and Risks 1 (short-term demand management success), 2 (Gateway desalination plant), 3 (Lower Thames risks), 6 (Teddington DRA feasibility): these factors concern our decision-making for new supply sources which will be needed to provide supplies in the relatively short-term.

    - Our preference is for the more operationally simple scheme, the Teddington DRA, rather than the operationally complex Beckton Water Recycling scheme.
    - Risks 3 and 6 question the viability of the Teddington DRA scheme. If the Teddington DRA scheme were to be found to be unviable, we would adopt the Beckton Water Recycling scheme as an alternative. These risks are, however, as yet unproven and our modelled programme appraisal demonstrates that our strong preference for short-term investment should be the Teddington DRA scheme. Our response to these risks is not to alter our preferred programme, but to highlight the importance of our monitoring plan and to identify preferred and alternative programmes for the short-term.

  - Risks 1 and 2 highlight that our preferred programme relies on the successful delivery of our leakage and consumption reduction programmes, and on the success of the maintenance programme at our Gateway desalination plant, both of which bring an element of uncertainty. Given that our candidate preferred programme does not include the development of excess capacity for our early 2030s challenges, this brings into question whether we should adopt additional interventions or adopt an alternative solution which could deliver a greater volume of water. Our response to these risks is three-fold: firstly, we will look to proceed with the development of additional schemes which are low-cost, but which will give us additional headroom in the very short-term. In our revised draft WRMP24 we set out that we would deliver three schemes in AMP8 to mitigate this risk; in our final plan we include additional four schemes as a result of direction from our regulators and funding allocated in our Draft Determination. The schemes we will look to deliver in AMP8 are Horton Kirby ASR (5 Ml/d, included in WRMP19 but not delivered due to diminished need – we will not request enhancement expenditure due to already having been funded to deliver this option), Addington groundwater scheme (2.7 Ml/d), the RWE licence trade (22.6 Ml/d), Southfleet and Greenhithe groundwater scheme (8.8 Ml/d), increasing the output of our Woods Farm groundwater source (2.4 Ml/d average, 2.9 Ml/d peak), disaggregation of licences resulting in increased Deployable Output from our Dapdune source (2.2 Ml/d on peak), and increasing the output at our Datchet groundwater source (1.6 Ml/d on average, 6.2 Ml/d on peak). Secondly, we will continue to work with Affinity Water and SES Water to determine whether importing water is likely to be feasible and will proceed with discussions on the basis that imports from both companies may be required; thirdly, our monitoring plan (see later section) outlines how, in conjunction with the learning investigations required to mitigate Risk 3, we will determine whether to trigger our alternative plan.
  - Further explanation of our response to these risks is given in the Monitoring Plan section of this chapter.

- Consideration 1 (preference for simplicity) and Risks 7 (viability of STT) and 8 (ageing reservoir asset base): these factors concern our decision-making regarding the choice of SESRO over the STT. SESRO is an operationally and contractually simpler scheme than the STT, and so our preference for simplicity gives greater weight to the preferred programme which is suggested by our modelling The risks do not suggest that we should alter the preferred programme suggested by our modelling, and instead give greater weight to the preferred programme which is suggested.
- Considerations 2 (wider consideration of supply-demand balance risk) and 3 (increasing policy requirements over time), and Risks 2 (Gateway desalination plant capability), 4 (long-term success of household consumption reduction), 5 (long-term viability of West Berkshire Groundwater Scheme), and 8 (ageing existing reservoir asset base): these factors concern our decision-making regarding the size of reservoir which we should adopt in our preferred programme.

  - Given our programme appraisal now indicates that SESRO **or** STT is now required, rather than SESRO **and** STT, building a larger SESRO scheme and reducing the possibility of needing to make additional interventions should be our preference.

- These noted risks would all cause a deterioration of the supply-demand balance. As our programme appraisal has demonstrated, under more challenging supply-demand balance scenarios our preference should be for larger reservoir sizes. The larger the reservoir which we build, the smaller the probability that additional (more costly and carbon-intensive) resources will be needed in the future, and the longer we will have to establish whether other investments are required.
- Table 11-7 (explored further in the monitoring plan, see later section) shows the 2040 supply-demand balance impact of uncertain factors within our SDB forecast. More of these factors show supply-demand balance detriment than benefit, with many supply-demand balance detriments being very significant in the context of the benefit that different resources bring (e.g., 150 Mm^3 reservoir DO = 271 Ml/d while 100 Mm^3 reservoir DO = 185 Ml/d), and as such we should look to maximise the available buffer.
- As such, consideration of these risks does not alter our programme appraisal outcome, and instead strengthens our view that adoption of the 150 Mm^3 reservoir results in the best value plan for the South East.

Assessment Area / Risk	Range of scenarios	2040 Supply-Demand Balance Impact, Compared to "Situation 4" (positive = SDB improvement), Ml/d
Leakage reduction	50% success	-116
	75% success	-58
	100% success	0
	100% success, accelerated - 50% reduction by 2040	+43.5
Company-led consumption reduction	50% effective	-85
	75% effective	-43
	100% effective	0
Government action on demand reduction	Apathy	-96
	Moderate	-73
	Preferred plan	0
Population	Low demand & guidance changes[12]	+159
	Low demand	+89
	Preferred plan	0
Environmental Destination	High, accelerated	-372
	High	0
	Medium	+56
	Low	+56
Climate Change	Low	+87
	Medium	+40
	High	0
	Available 2040	0

[12] Note: Guidance change referenced here would be that we should plan on the basis of ONS forecasts and not local authority plans

Assessment Area / Risk	Range of scenarios	2040 Supply-Demand Balance Impact, Compared to "Situation 4" (positive = SDB improvement), Ml/d
West Berkshire Groundwater Scheme	Unavailable 2040	-77
Gateway desalination plant	75 Ml/d reliable	0
	50 Ml/d reliable	-8
	Decommission	-48
Reservoir outage	30,000 Ml reservoir unavailable	-c.110-160

Table 11-7: Magnitude of different risks to the supply-demand balance in 2040

Our Customers' Views

11.88 As is detailed in Appendix T of our WRMP, we conducted customer research alongside our statutory consultation. In this customer research, we found that there was strong support for our dWRMP overall, and, for the most part, the schemes contained within it. This customer research was undertaken in order to provide a balanced view from our whole customer base, as consultations tend to result in self-selection of respondents with strong views for or against certain proposals. According to our customer research, when our customers learn about the deficit of water supplies that we are facing in the Thames catchment and that water saving measures would not go far enough, they think that investing in new sources is the prudent thing to do.

11.89 Support was strongest for SESRO, with reservoirs viewed as a natural solution that could benefit the environment and provide a reliable water supply in the future. There were minor concerns about the impact building the reservoir will have on the local community and the environment however the concerns raised by the local community were not considered, by our customers, strong enough to prevent the build. Customers were, on the whole, disappointed that the proposal was for the smaller size (100 Mm^3) in our draft plan, as building a larger reservoir was thought to better protect the area from running out of water in the future. With no obvious downside bar the immediate disruption of the build, it was felt that having a larger reservoir seemed like the best approach to ensure a secure water supply for the future without the need for further investment.

11.90 Customers were supportive of the Teddington DRA scheme, on the basis that it is low cost, low carbon, and relatively quick to implement. Whilst there was some sympathy to the objections being raised by local communities, overwhelmingly customers felt the benefit to water supplies outweighed any local concerns around environmental harm to this part of the river.

11.91 Of the three strategic water resource schemes in our draft plan, the transfer had the least customer support. Customers felt the scheme was ambitious and there were concerns that Thames Water would not be able to deliver this. The reliability of the scheme was also questioned, noting that it relies on other water catchments and suppliers, and concerns were raised as to whether it could cause potential water shortages elsewhere. There were concerns about the disruption and impact on the areas the pipeline will travel through. There were also significant environmental concerns

that transferring water would impact negatively on wildlife. To gain support, there would need to be assurances it is feasible and will work, rather than something that could end up costing money but not delivering.

The Answers – Strategic Regional Options in the Overall BVP

11.92 Referring back to the previous section, our programme appraisal has delivered conclusions to the questions that we identified. In this section we also consider whether, having answered the question, we should make alterations to the Candidate Best Value Plan.

Question 1: Why is Teddington DRA the best value option for provision of 1 in 200-year drought resilience by the early 2030s?

11.93 The Teddington DRA is the best value option for us to move to 1 in 200-year resilience by the early 2030s, because it is an option which is deliverable on the required (relatively short) timescale, and which is inexpensive and low-carbon compared to other available options.

11.94 Our wider programme appraisal does not lead us to change the Candidate Best Value Plan with respect to selection of the Teddington DRA, as the option is more operationally simple than alternatives, and our consideration is that other risks can be managed through the development and implementation of a robust monitoring plan (see later section).

11.95 Recognising the risks which exist prior to the early 2030s, we have, however, made some small amendments to the candidate plan. These are to include the Didcot Licence Trade option (2026, 22.6 Ml/d, a continuation of an existing agreement), the Addington Groundwater Option (2028, 2.7 Ml/d), the Horton Kirby ASR option (2030, 5 Ml/d), Southfleet and Greenhithe groundwater scheme (2030, 8.8 Ml/d), increasing the output of our Woods Farm groundwater source (2030, 2.4 Ml/d average, 2.9 Ml/d peak), disaggregation of licences resulting in increased Deployable Output from our Dapdune source (2030, 2.2 Ml/d on peak), and increasing the output at our Datchet groundwater source (2030, 1.6 Ml/d on average, 6.2 Ml/d on peak).. These options are included to manage the short-term risks to our supply-demand balance. Selecting these schemes means that we may not need to seek to use the licence trade with Affinity Water in the Lower Thames (which is a relatively high-risk option, being dependent on successful delivery of Affinity water's demand management plan and being contingent on delivery of the Grand Union Canal SRO), and so this licence trade is considered as an adaptive solution rather than being part of our preferred plan.

Question 2: Why is SESRO the best value option for the provision of 1 in 500-year resilience?

11.96 SESRO is our preferred option for delivery in 2040 as it presents the best value solution considering the long-term needs of the region. Plans that do not involve SESRO would be more expensive, would involve greater carbon emissions, and would not deliver the same environmental or resilience benefits.

11.97 Our wider programme appraisal has strengthened our preference for SESRO over STT, as SESRO would be significantly simpler to operate, with water being available in the right location during times of need, and with the Environment Agency having raised concerns over the viability of the STT.

11.98 As such, our wider programme appraisal does not lead us to change the Candidate Best Value Plan with respect to selection of SESRO.

Question 3: Why is 150 Mm^3 the preferred size of SESRO?

11.99 The 150 Mm^3 option is preferred because plans with this reservoir size perform best with respect to cost in the supply-demand balance pathway of our preferred plan, and with there being relatively little between the different options with regards to other best value metrics.

11.100 Our wider programme appraisal has strengthened our view that the candidate best value plan decision to adopt the 150 Mm^3 reservoir option is correct. The primary reason for this is that there are a large number of risks to our future supply-demand balance which we should consider when appraising the different solutions and which our regulator has highlighted, and selection of the largest reservoir option available provides the best mitigation of these risks. Selection of a smaller reservoir variant would increase the chance that additional, less preferable options would need to be selected in the future. The selection of the largest reservoir would also maximise the time available to appraise the success of company-led and government-led demand management measures. The selection of the largest reservoir, rather than a smaller variant, comes at a low marginal cost and is, as such, a low-regret decision. The largest reservoir also provides the best base for regional transfers, recognising that other companies in the South East also face a similar range of risks.

11.101 As such, our wider programme appraisal does not lead us to change the Candidate Best Value Plan with respect to selection of the 150 Mm^3 option.

Question 4: Are there additional supply-side options which may be needed after 2040 to provide a Best Value solution for the longer-term?

11.102 If we achieve the government target of 110 l/h/d, we will not need to develop additional large sources of water to ensure resilient supplies and as such our candidate preferred programme does not include the development of additional large supply-side sources (noting that several small groundwater sources are selected in the future). However, there is a risk that the 110 l/h/d target may not be achieved, and other noted risks may materialise.

11.103 Having selected the 150 Mm^3 reservoir option means that there is a supply-demand balance buffer available during the 2040s. We will be able to appraise whether risks materialise, and we will be able to respond in an adaptive way.

11.104 As such, we do not consider that we should alter the Candidate Best Value Plan to include selection of additional large solutions in the longer term, as the selected plan allows for adaptive selection of additional solutions in the future, but minimises the need for additional solutions in the longer term.

Overall Best Value Plan

11.105 Our overall BVP, therefore, contains the following core, large schemes:

- Teddington DRA, 75 Ml/d variant, constructed to facilitate 1 in 200-year drought resilience by 2033
- SESRO 150 Mm^3 variant for first use in 2040
- Beckton desalination plant, 150 Ml/d, delivered in 2050 in pathway 1
- Deephams Water Recycling, in 2069 in pathway 1
- Thames to Affinity Transfer, capacity of up to 100Ml/d, with different volumes used in different pathways 1-5 and 7, and different utilisation across the planning period
- Thames to Southern Transfer, capacity of 120 Ml/d in pathways 1-9

11.106 In the following sections we present the plan in more detail.

The Plan at WRZ-level

11.107 Having described the decision-making process for our Plan at a high level, we now describe the Plan in more detail. We start with the West Thames Strategic Hub which can supply several WRZs, then go on to discuss each WRZ in turn.

West-Thames Strategic Hub

11.108 In our WRMP19 we had a large need for new resources in the London WRZ, a limited need in other zones, and a set assumption for transfers that would be needed by other companies. As such, we described major new water resources as being needed for London.

11.109 Our work with the WRSE regional group has shown that there is a need to consider the potential for Affinity Water, Southern Water and ourselves to adopt integrated solutions which can yield benefits through both the conjunctive operation of water resource systems and the efficiency gains associated with constructing and sharing large assets. Additionally, the need to consider a 1 in 500-year drought scenario and large volumes of future licence reductions through Environmental Destination has led us to need to consider futures in which our SWOX, SWA and Kennet Valley WRZs have a significant need for new resources.

11.110 As such, it is no longer appropriate to consider the major options that could be developed in the west of the Thames catchment as being mainly for the benefit of the London WRZ. We have, therefore, presented this initial section in which we describe our preferred plan and preferred programme for the supply options which would feature in the West of the Thames catchment and subsequently distributed to different companies and WRZs.

11.111 London Water Recycling schemes would be for the benefit of the London WRZ only, and so are not included in this description.

11.112 The large new resource options selected in the overall BVP in the west of the catchment are shown in Table 11-8. To be ready for use in 2040, the SESRO scheme will need to go through planning and detailed design before 2030, with construction starting in the early 2030s.

11.113 The strategic transfer options selected in the WRSE preferred plan are shown in Table 11-9. This shows that in the WRSE preferred plan there is a need, in all except the most benign future scenarios, for a 50 Ml/d transfer from the River Thames to Affinity Water (T2AT), in some cases beginning in 2040 and in others up to 2053, with further expansion possible dependent on the scenario. This table also shows that there is a need for a 120 Ml/d Thames to Southern Transfer (T2ST), with this water being used to supply Southern Water primarily, with onward transfer to South East Water and Portsmouth Water in some scenarios.

Option	Max DO	Year Option is First Utilised in Pathway								
		1	2	3	4	5	6	7	8	9
SESRO 150 Mm^3	271	2040	2040	2040	2040	2040	2040	2040	2040	2040

Table 11-8: New resource options selected in West-Thames Hub

11.114 The variation in the transfer options selected demonstrates the adaptability of the WRSE plan, with different volumes being needed at different times by Southern and Affinity Water. This also demonstrates the ability for resource options which may appear static, such as SESRO, to provide an adaptable solution to a dynamic problem.

Option	Max DO	Year Option is First Utilised in each Pathway								
		1	2	3	4	5	6	7	8	9
T2AT West 1st 50 Ml/d	50	2040	2040	2040	2045	2052	-	2053	-	-
T2AT West 2nd 50 Ml/d	50	2041	2050	-	2050	2052	-	-	-	-
T2AT East 50 Ml/d	50	2060	-	-	-	-	-	-	-	-
T2ST 50 Ml/d	50	-	-	-	-	-	-	-	-	-
T2ST 80 Ml/d	80	-	-	-	-	-	-	-	-	-
T2ST 120 Ml/d	120	2040	2040	2040	2040	2040	2040	2040	2040	2040
T2ST 200 Ml/d	200	-	-	-	-	-	-	-	-	-

Table 11-9: Transfers to Southern and Affinity Water in the Preferred Plan

Utilisation of the options in the preferred pathway

11.115 Here we demonstrate in more detail the utilisation of the options seen in Pathway 4 of our preferred plan, our preferred programme, Table 11-10 and Table 11-11 show the utilisation of new resource options, while Table 11-12 and Table 11-13 show the utilisation of transfers to Southern Water and Affinity Water (note: the T2ST is primarily used to supply Southern Water's customers, but there are also onwards transfers to South East Water and Portsmouth Water in some scenarios). The figures presented are for Deployable Output utilisation under the critical drought scenarios, "dry year annual average" and "dry year critical period".

11.116 The SESRO option would come online in 2040 in our preferred plan. At this stage in the planning period the utilisation information shows that there would be spare capacity for additional utilisation. In reality, however, a source with low operating costs and emissions such as the reservoir would be well utilised and would instead provide additional resilience to supplies across the region. The reservoir could also be used to provide additional supplies required should some of the risks we have identified above and noted in our monitoring plan materialise. In the longer-term, the capacity of the reservoir would be fully utilised. The SESRO option forms part of a fully adaptable plan when integrated with transfers and other supply options, providing an efficient, resilient, low-cost, and low-carbon source of water.

Option	Option Utilisation by year (Ml/d)									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
SESRO 150 Mm^3	0	0	87	122	271	271	271	271	271	271

Table 11-10: West-Thames option utilisation in Pathway 4, DYAA

Option	Option Utilisation by year (Ml/d)									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
SESRO 150 Mm^3	0	0	45	150	232	245	254	262	255	262

Table 11-11: West-Thames option utilisation in Pathway 4, DYCP

Option	Option Utilisation by year (Ml/d)									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
T2AT 1st 50 Ml/d	0	0	0	50	50	50	50	50	50	50
T2AT 2nd 50 Ml/d	0	0	0	0	8	20	23	17	20	22
T2ST 120 Ml/d (inc. spur to KV)	0	0	19	60	73	75	77	78	79	80

Table 11-12: Transfers to Southern and Affinity Water in Pathway 4, DYAA

Option	Option Utilisation by year (Ml/d)									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
T2AT 1st 50 Ml/d	0	0	0	50	50	50	50	50	50	50
T2AT 2nd 50 Ml/d	0	0	0	0	8	20	23	17	20	22
T2ST 120 Ml/d (inc. spur to KV)	0	0	21	51	53	57	60	61	62	65

Table 11-13: Transfers to Southern and Affinity Water in Pathway 4, DYCP

11.117 We now set out our preferred plan and preferred programme for each of our WRZs.

London WRZ

11.118 Section 6 of our WRMP describes the supply-demand balance situation in the London WRZ across the planning period. In all future scenarios we are faced with a significant supply-demand balance challenge by the early 2030s, which grows to very large volumes in the future, particularly in scenarios 1, 4, and 7 (those which are based on a High Environmental Destination scenario). By 2050 the supply-demand balance challenges range from a deficit of around 360 Ml/d to a deficit of nearly 890 Ml/d.

11.119 The implementation of our preferred plan, a twin-track approach combining demand management with resource development, resolves the supply-demand deficit in all years of the planning period.

Demand Management

11.120 Being consistent across all nine future scenarios, we will first describe our demand management programme for the London WRZ. Demand management is the largest component of our plan, particularly in the short-term.

11.121 Table 11-14 shows a detailed breakdown of the demand management options adopted in our preferred plan for the London WRZ. Figure 11-7 shows our leakage forecast, Figure 11-8 shows our meter penetration forecast, and Figure 11-9 shows our PCC forecast.

	Supply Demand Benefit (Ml/d)				
LON	AMP8	AMP9	AMP10	AMP11	AMP12
AMP7 Carry-over leakage	26.00				
Household metering CSL	1.28	0.00	0.00	0.00	0.00
Non-household metering CSL	1.15	0.00	0.00	0.00	0.00
Bulk metering CSL	21.07	2.42	1.53	0.00	0.00
Replacement metering CSL	6.48	1.84	0.00	0.00	0.00
Mains replacement	2.35	12.18	11.03	7.11	7.96
Leakage innovation	1.30	1.50	4.90	8.97	8.28
Metering innovation CSL	0.00	0.00	0.40	0.00	0.00
Advanced DMA Intervention	24.00	4.00	4.00	0.00	0.00
Total leakage reduction	83.62	21.93	21.86	16.08	16.24
AMP7 Carry-over metering	6.46				
Household metering	7.84	0.00	0.00	0.00	0.00
Non-household metering	1.10	0.00	0.00	0.00	0.00
Household water efficiency	9.39	10.69	0.00	0.00	0.00
Non-household water efficiency	26.70	20.68	15.51	13.16	11.28
Metering innovation	1.81	12.87	16.96	0.00	0.00
Innovative tariffs	4.72	9.69	8.89	14.01	15.00
Total usage reduction	58.03	53.93	41.36	27.17	26.28
Total benefit from DMP	141.65	75.86	63.21	43.25	42.52

	New & Replacement Meters				
LON	AMP8	AMP9	AMP10	AMP11	AMP12
Bulk Metering	47,032	52,017	41,298	0	0
Household Metering (New)	175,295	292,376	398,768	0	0
Household Metering (Upgrades)	349,031	205,513	68,183	0	0
Non-Household Metering (Upgrades)	73,903	0	0	0	0

Table 11-14: London WRZ Demand Management Programme Breakdown

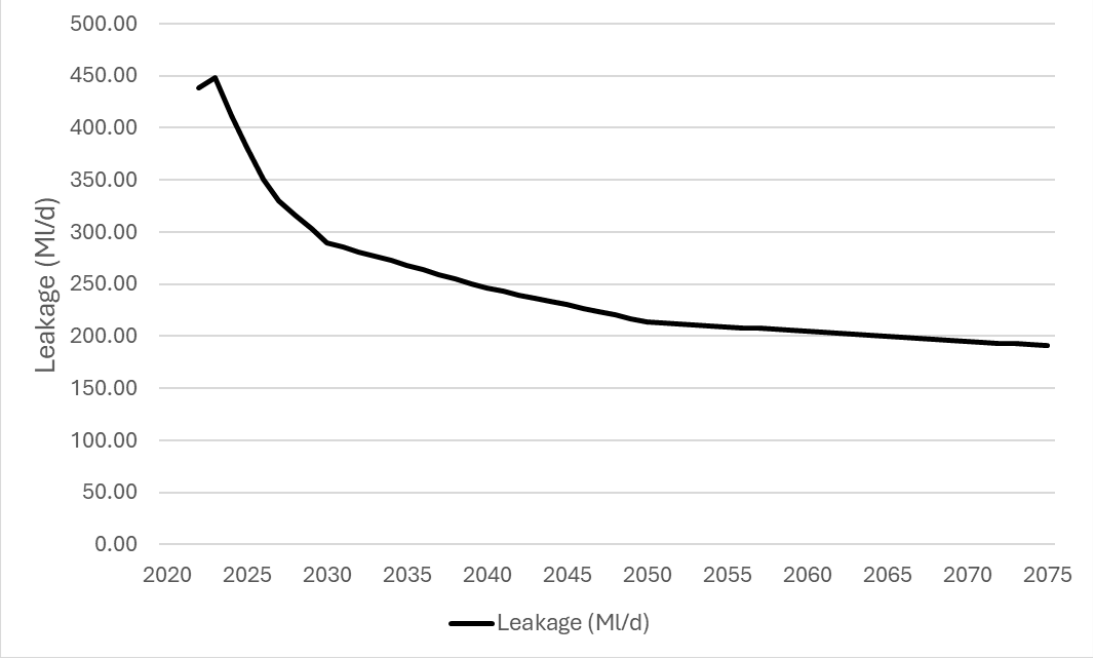

Figure 11-7: London WRZ DYAA Leakage

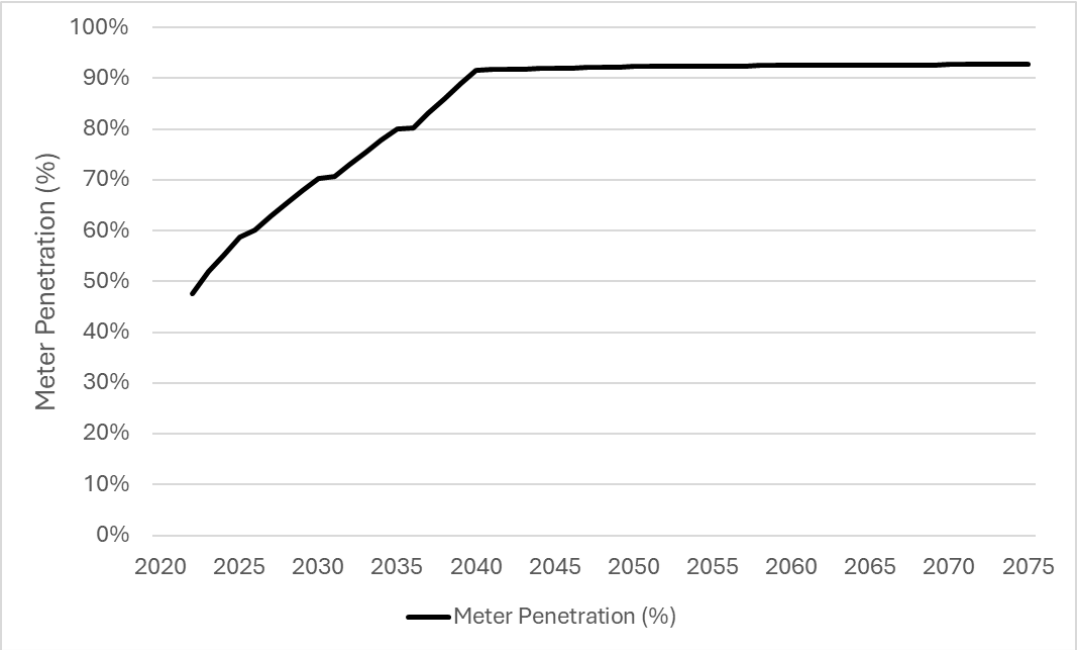

Figure 11-8: London WRZ Meter Penetration

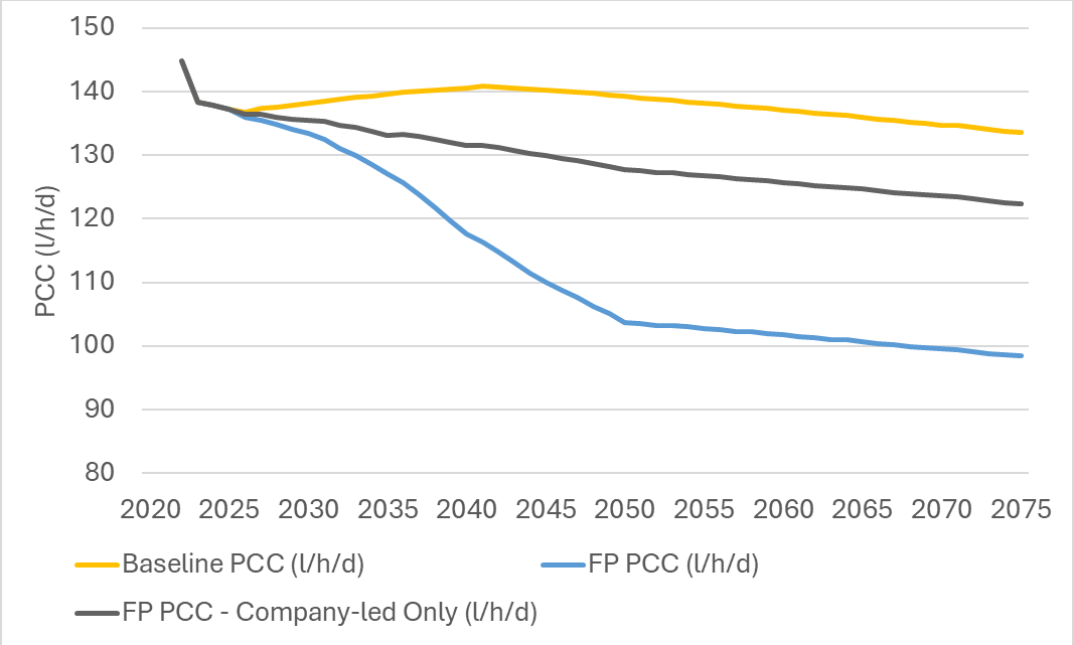

Figure 11-9: London WRZ DYAA PCC

Short-term – 2025-2030

11.122 We will continue our PMP, with 175,000 new household meters being installed in AMP8, finishing our main household PMP campaign, achieving a total meter penetration of 70% by the end of AMP8 (The large proportion of flats in the London WRZ makes it harder to meter properties here, and so our meter penetration is lower in London WRZ than other

WRZs). We will also undertake a significant upgrade programme, replacing 349,000 old household meters with smart meters to ensure that we are able to harvest data about our customers' water use, allowing us to analyse this data to help customers reduce their water use.

11.123 We will reduce leakage by 91 Ml/d during AMP8, enabled by our smart meter programme, which allows us to analyse data to predict where leaks may exist on customer-owned pipes and then fix these leaks on behalf of customers. In addition, we will undertake Advanced DMA leakage reduction, mains rehabilitation, and leakage innovation programmes to reduce our leakage.

11.124 We will continue our programme of Smarter Business Visits, helping businesses to use less water, resulting in a NHH demand reduction of 22 Ml/d across the AMP. In addition to this, we will target continuous flow where it is detected at NHH properties and look to work with retailers, delivering an additional 5 Ml/d reduction.

11.125 We will continue to promote water efficiency activity to help customers use water wisely, including the continuation of a reward-based incentive scheme introduced in AMP7 which promotes water efficiency.

11.126 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service. These actions bring around 90 Ml/d of benefit to our supply-demand balance.

Medium-term – 2030-2045

11.127 We will finish almost all of our metering activity in AMP9, continuing to install bulk meters, upgrading existing 'normal' meters to ensure that all metered customers are using smart meters, and will install new meters into flats. We will achieve a total meter penetration of 92% (including voids) by 2045.

11.128 With enough of our supply area being covered by smart metering, we will implement a financial incentive-based tariff scheme from 2035. This scheme will encourage those who use exceptionally high volumes of water to reduce their usage.

11.129 We will deliver further leakage reduction over this period, with an increasing proportion of our leakage reduction needing to be delivered through mains rehabilitation.

11.130 In our plan we will continue to promote water efficiency activity to help customers use water wisely, building on digital tools.

11.131 We will continue to deliver substantial NHH consumption reduction, to meet government targets.

11.132 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

11.133 Our plan relies on the introduction of government-led interventions from 2035 onwards, including both minimum standards on white goods and the introduction of amendments to buildings regulations. This will be required to achieve the government ambition of 110 l/h/d per capita consumption.

Long-term – 2045-2075

11.134 We will continue to undertake mains rehabilitation to continue to drive down leakage. We expect that a greater proportion of our mains rehabilitation efforts will make use of innovative techniques in the long-term, reducing costs.

11.135 Our demand management programme in the longer-term relies heavily on the intervention of government, as described earlier in this section. When leakage has been reduced to very low levels, and we have undertaken those actions in our control which can influence customers' demand for water, actions will need to be driven by government to alter water use through societal changes, primarily through the adoption of minimum standards and amendments to buildings regulations.

11.136 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

Supply enhancement

11.137 The new resources required under different scenarios of future supply-demand balance are detailed in Table 11-15. This table does not highlight the new treatment or network assets that may be required under these scenarios, instead focussing on new resource options that will be required. Treatment and reinforcement options that would be required can be found in our WRMP tables and are discussed in Section 7.

11.138 Water which would come from SESRO is described as coming from "West-Thames sources", to align with our dWRMP description (where both SESRO and STT were selected).

Short-Term (2025-2030)

11.139 Through AMP8, if our demand management efforts are successful, there is no strict need for new supply-side interventions, with our demand management programme giving sufficient benefit to provide the level of drought resilience that is needed. However, given the range of risks which exist in the short-term, our consideration is that we should develop three supply schemes. The first is Horton Kirby Aquifer Storage and Recharge (ASR), an innovative scheme which will store water underground for use during droughts, providing 5 Ml/d of Deployable Output; the second is a scheme which would allow us to make use of existing licence headroom at our Addington groundwater source, providing 2.7 Ml/d of benefit during drought for annual average conditions, and 4.7 Ml/d additional peak capability; the third is the Southfleet and Greenhithe groundwater sources, providing 8.8 Ml/d of benefit during annual average conditions. We will also continue an existing trading agreement with RWE, associated with Didcot Power Station. This is consistent with our WRMP19, in which we highlighted a need for new supply-side schemes to combat local resilience issues, but no new schemes to deliver a supply-demand balance.

11.140 These options present excellent value to customers. The Horton Kirby ASR option would be delivered under "base" expenditure (i.e., we would not increase water bills to deliver this option), and both the Addington and RWE Didcot licence trade options are very low cost when considering the supply benefit that they bring. These options can also be brought online quickly, with the licence trade extension being available immediately, and Addington, Southfleet & Greenhithe, and Horton Kirby ASR being deliverable within AMP8.

11.141 Additionally, AMP8 will be a time of great importance in working towards delivering schemes for the future. We will need to undertake planning, development, and begin construction of the Teddington DRA water recycling scheme, and we will need to progress through the consenting and design of SESRO.

Medium-Term (2030-2045)

11.142 In order to deliver our commitment of providing a 1 in 200-year level of drought resilience to our customers, we will need to expand the supply capability, as we won't be able to reduce demand quickly enough to give this level of resilience with only our existing supplies. The option selected to provide this new resource is the Teddington DRA scheme.

11.143 The work that we have done to develop a programme to deliver the Teddington DRA option has shown us that the option will be deliverable during the early 2030s, with the exact date depending on the speed with which we are able to negotiate the planning and consenting processes. Our preferred plan assumes that we can meet the timescale of delivering the option by 2033.

11.144 Our WRMP includes selection of a 75 Ml/d Teddington DRA scheme. This is the largest Teddington DRA variant that we believe to be promotable at this time. We have previously found that significantly larger (300 Ml/d) scheme variants would not be environmentally acceptable. In our rdWRMP24 we stated that we would look to engage in a licence trade with Affinity Water in the mid-2030s. Selecting additional schemes for delivery in AMP8, alongside a slightly improved underlying supply-demand balance position means that we may not need to seek to use the licence trade with Affinity Water in the Lower Thames (which is a relatively high-risk option, being dependent on successful delivery of Affinity Water's demand management plan and being contingent on delivery of the Grand Union Canal SRO), and so this licence trade is considered as an adaptive solution rather than being part of our preferred plan.

11.145 As described in the preceding sections, during AMP9 and AMP10 we will be constructing SESRO, ready to be used in 2040. In the medium term, the main new sources of water are Teddington DRA (up to 2040), and then both Teddington DRA and SESRO (from 2040 onwards).

11.146 There are no actions that we would take to adapt to different demand forecast observations at 2030, with actions being common across all pathways in the 2030s. After 2035 we would, however, review the outcomes of investigations into licence reductions needed to protect the environment, such that we can make necessary licence reductions by 2050. At this point we will appraise the demand situation alongside our assessments for required licence reduction and may make different decisions depending on the situation that we face in the long-term (please see later section on our monitoring plan). If demand is very high then around 2035 we may also need to develop some small groundwater sources in London and begin a transfer with SES water in 2040. The balance of use of the SESRO option in the medium-term between different Thames Water WRZs and other companies would be dependent on the licence reductions identified as being necessary and the pace at which they must be made, the future demand scenario that we encounter, and the success of demand management efforts in different parts of the region.

Long-term (beyond 2045)

11.147 Our long-term plan is dependent on which scenario of future licence reductions is necessary, and on the impacts of climate change. In all scenarios we will continue to make use of water from the SESRO scheme. Our dWRMP highlighted the need for the STT, and potentially other schemes, to be developed alongside SESRO to meet future supply-demand balance needs. The diminished need for new sources of water in our WRMP compared to the dWRMP, driven by the requirement to plan on the basis of

achievement of the 110 l/h/d PCC target, means that very few sources will be required, unless demand is very high and we need to make licence reductions in line with the "High" scenario, in which case further desalination and water recycling schemes will be needed.

11.148 If the 110 l/h/d target is not achieved, then additional sources of water may be required, with the number, scale, and timing of options required depending on the degree to which the target is missed. As is described in our monitoring plan (later in this section), there are also other factors which could lead us to need more sources of water in the future, for example if the West Berkshire groundwater scheme is decommissioned earlier than planned. If things don't go to plan with demand management or other factors, having selected the largest single-phase option available to us means that we will have time to properly appraise whether additional new sources are needed, rather than needing to rush the decision as may be required if we opted for a smaller SESRO scheme or the STT.

Option	Max DO	Year Option is First Utilised in each Pathway								
		1	2	3	4	5	6	7	8	9
SESRO – as per West-Thames Option Table										
RWE Licence Trade	23	2026	2026	2026	2026	2026	2026	2026	2026	2026
Horton Kirby ASR	5	2030	2030	2030	2030	2030	2030	2030	2030	2030
Addington Groundwater	3	2028	2028	2028	2028	2028	2028	2028	2028	2028
Water from combination of West-Thames Options	N/A	2040	2040	2040	2040	2040	2040	2053	-	-
Teddington DRA	67	2033	2033	2033	2033	2033	2033	2033	2033	2033
Beckton Desalination 150 Ml/d	133	2050	-	-	-	-	-	-	-	-
Southfleet and Greenhithe	9	2030	2030	2030	2030	2030	2030	2030	2030	2030
Deephams Reuse, 46.5 Ml/d	42	2069	-	-	-	-	-	-	-	-
London Confined Chalk	2	2075	-	-	-	-	-	-	-	-
Recommissioning Merton GW Source	2	2072	-	-	-	-	-	-	-	-
Addington MAR	3	2075	-	-	-	-	-	-	-	-
Kidbrooke MAR	8	2074	-	-	-	-	-	-	-	-
Merton MAR	6	2074	-	-	-	-	-	-	-	-
Import from Cheam (SES) to Merton	15	2040	2040	2040	-	-	-	-	-	-
SE London Catchment Portfolio	1	2075	-	-	2075	-	-	-	-	-

Table 11-15: Options used in London WRZ

Utilisation in the preferred pathway

11.149 Option utilisation in the preferred programme, i.e. the utilisation of options assuming that we follow the supply-demand balance in pathway 4, is set out in Table 11-16. Note that we have only set out utilisation under the DYAA scenario because we do not assess a DYCP supply-demand balance for London WRZ.

Short-term (2025-2030)

11.150 In the short-term, existing supplies provide a 1 in 100-year level of resilience. Recognising the risks around delivery of our short-term demand management plan, we will continue our licence trade with RWE (associated with Didcot Power Station, which RWE have indicated is only available during AMP8 due to other possible uses of their abstraction licence), and will develop the Horton Kirby ASR, Southfleet & Greenhithe, and Addington groundwater schemes. During this period, we will export water to Affinity Water, continuing the use of assets constructed to facilitate construction of HS2, an efficient solution for Affinity Water's short-term supply needs.

Medium-term (2030-2045)

11.151 In the early 2030s, we will begin using the Teddington DRA scheme. In 2033 (not seen in Table 11-16) we will use Teddington DRA at its full capacity, 67 Ml/d, but as demand management reduces our need for water through the 2030s our use of Teddington DRA shows some decline. In practice, we would utilise the option at its full capability throughout this period, offering a higher level of service to our customers during this period. With the Grand Union Canal providing enough water for all of Affinity Water's needs (and indeed more), we will cease the Fortis Green and Hampstead Lane transfers from 2031 onwards. From 2040 onwards, when we move to a 1 in 500-year level of resilience, we would begin to make use of water from the SESRO scheme.

Long-term (beyond 2045)

11.152 As we continue through the planning period, additional water would be supplied from SESRO. In the further future, groundwater sources will be needed to supplement supplies.

Option	Option Utilisation by year (Ml/d)									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
ASR Horton Kirby	5	5	5	5	5	5	5	5	5	5
Addington Groundwater	3	3	3	3	3	3	3	3	3	3
Didcot Licence Trade	23	0	0	0	0	0	0	0	0	0
Water from West-Thames Options, Incl. Conjunctive Benefit from T2AT	0	0	50	25	97	112	119	122	116	122
Teddington DRA	0	54	54	19	67	67	67	67	67	67
Southfleet & Greenhithe GW Source	9	9	9	9	9	9	9	9	9	9
SE London catchment scheme	0	0	0	0	0	0	0	0	0	1
Treated Exports to Affinity Water Zone 4	-7	0	0	0	0	0	0	0	0	0
Raw Export to Affinity Water Zone 4	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Export to Affinity Water, Cockfosters	-5	0	0	0	0	0	0	0	0	0
Export to Affinity Water, Perivale	-10	0	0	0	0	0	0	0	0	0

Table 11-16: Option Utilisation in Preferred Programme, London WRZ

Swindon and Oxfordshire (SWOX) WRZ

11.153 Section 6 of our WRMP24 describes the supply-demand balance situation in the SWOX WRZ across the planning period. We are faced with supply-demand deficits in all future scenarios throughout the planning period. By 2050 the range of deficits we have considered ranges from around 30 Ml/d to over 110 Ml/d.

11.154 The implementation of our preferred plan, a twin-track approach combining demand management with resource development, will resolve the supply-demand deficit in all years of the planning period.

Demand Management

11.155 Being consistent across all nine future scenarios, we will first describe our demand management programme, the main components of which are common across all of our WRZs. As such, the narrative here is identical to that from the London WRZ, however the figures presented in this section are specific to the SWOX WRZ.

11.156 Demand management is the largest component of our plan, particularly in the short-term.

11.157 Table 11-17 shows a detailed breakdown of the demand management options adopted in our preferred plan. Figure 11-10 shows our leakage forecast, Figure 11-11 shows our meter penetration forecast, and Figure 11-12 shows our PCC forecast.

	Supply Demand Benefit (Ml/d)				
SWX	AMP8	AMP9	AMP10	AMP11	AMP12
AMP7 Carry-over leakage	0.00				
Household metering CSL	0.90	0.00	0.00	0.00	0.00
Non-household metering CSL	0.96	0.00	0.00	0.00	0.00
Bulk metering CSL	0.56	0.06	0.03	0.00	0.00
Replacement metering CSL	3.18	0.94	0.00	0.00	0.00
Mains replacement	0.20	1.18	0.80	1.24	0.88
Leakage innovation	0.10	0.10	0.00	0.85	1.23
Metering innovation CSL	0.00	0.00	0.00	0.00	0.00
Advanced DMA Intervention	2.80	2.60	2.40	2.20	2.00
Total leakage reduction	8.71	4.87	3.24	4.29	4.11
AMP7 Carry-over metering	0.00				
Household metering	2.40	0.00	0.00	0.00	0.00
Non-household metering	0.27	0.00	0.00	0.00	0.00
Household water efficiency	2.01	1.77	0.00	0.00	0.00
Non-household water efficiency	0.00	0.00	0.00	0.00	0.00
Metering innovation	0.08	0.52	0.26	0.00	0.00
Innovative tariffs	0.18	1.89	2.27	0.06	0.00
Total usage reduction	4.94	4.17	2.53	0.06	0.00
Total benefit from DMP	13.64	9.05	5.77	4.35	4.11

	New & Replacement Meters				
SWX	AMP8	AMP9	AMP10	AMP11	AMP12
Bulk Metering	1,024	1,130	879	0	0
Household Metering (New)	46,355	8,727	4,427	0	0
Household Metering (Upgrades)	162,778	64,343	6,192	0	0
Non-Household Metering (Upgrades)	21,592	0	0	0	0

Table 11-17: SWOX WRZ Demand Management Programme Breakdown

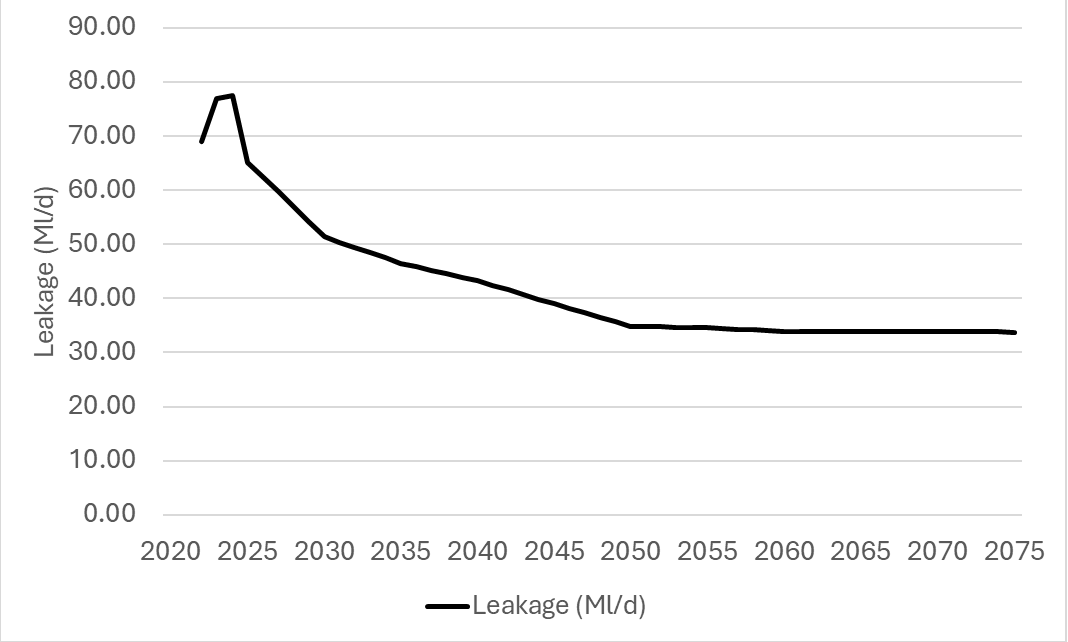

Figure 11-10: SWOX WRZ Final Plan Leakage

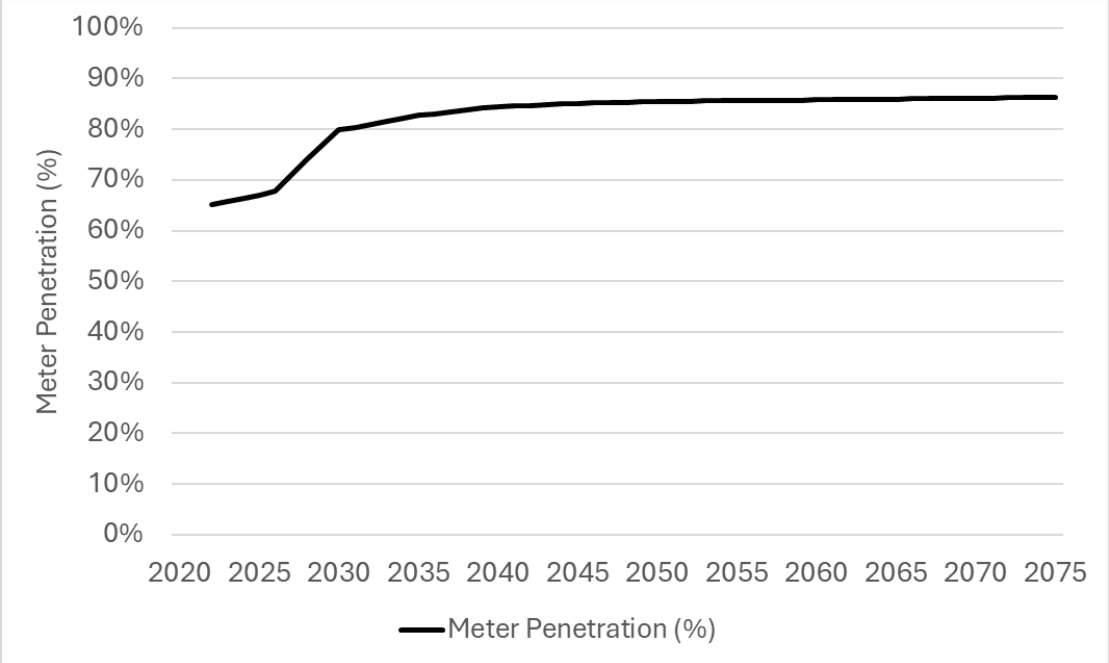

Figure 11-11: SWOX WRZ Final Plan Meter Penetration

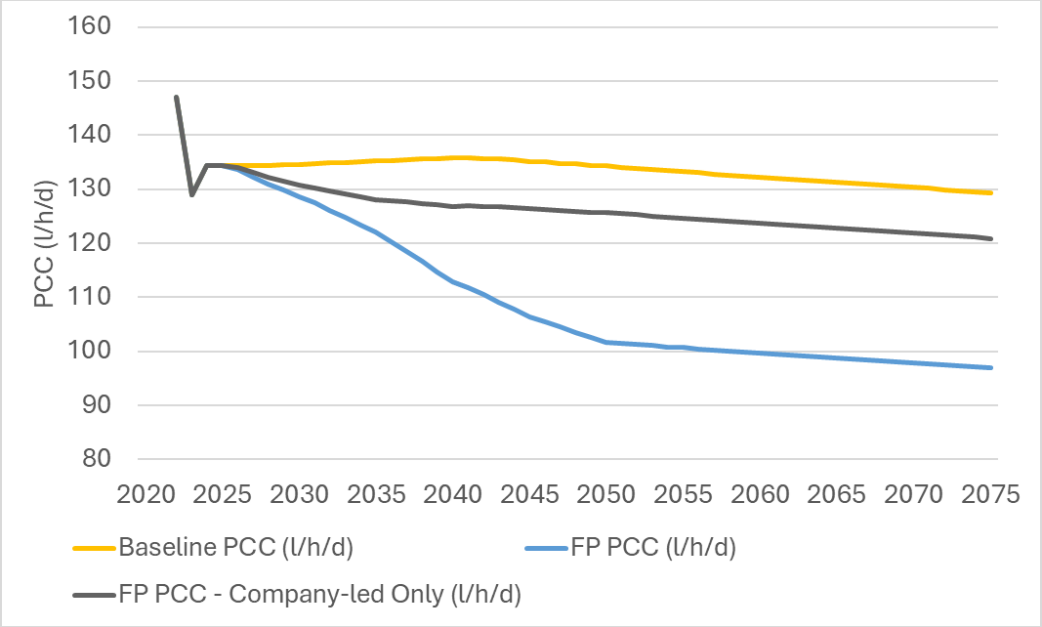

Figure 11-12: SWOX WRZ DYAA PCC

Short-term – 2025-2030

11.158 We will continue our PMP, with around 46,000 new household meters being installed in AMP8, finishing our household PMP campaign, achieving a total meter penetration of 80% by the end of AMP8. We will also undertake a significant upgrade programme, replacing old meters with smart meters to ensure that we are able to harvest data about our customers' water use, allowing us to analyse this data to help customers reduce their water use.

11.159 We will reduce leakage by 14 Ml/d during AMP8, enabled by our smart meter programme, which allows us to analyse data to predict where leaks may exist on customer-owned pipes. In addition, we will undertake Advanced DMA leakage reduction, mains rehabilitation, and leakage innovation programmes to reduce our leakage. Between the revised draft and final WRMP, our regulators asked us to revisit the amount of leakage reduction included for the SWOX WRZ. As a result of this, we increased the amount of leakage reduction activity included in our plan for SWOX (increasing the reduction activity by 1.8 Ml/d in AMP8, and by 11 Ml/d by 2050) and have not offset that additional reduction by removing leakage reduction activity in other WRZs.

11.160 We will continue to promote water efficiency activity to help customers use water wisely, including the continuation of a reward-based incentive scheme introduced in AMP7 which promotes water efficiency.

11.161 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

Medium-term – 2030-2045

11.162 We will finish almost all of our metering efforts in AMP9, continuing to install bulk meters and upgrade meters to ensure that all metered customers are using smart meters. We will achieve a total meter penetration of 85% (including voids) by 2045.

11.163 With enough of our supply area being covered by smart metering, we will implement a financial incentive-based tariff scheme from 2035. This scheme will encourage those who use exceptionally high volumes of water to reduce their usage.

11.164 We will deliver further leakage reduction over this period, with an increasing proportion of our leakage reduction needing to be delivered through mains rehabilitation.

11.165 We will continue to promote water efficiency activity to help customers use water wisely.

11.166 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

11.167 Our plan relies on the introduction of government-led interventions from 2035 onwards, including both minimum standards on white goods and the introduction of amendments to buildings regulations. This will be required to achieve the government ambition of 110 l/h/d per capita consumption.

Long-term – 2045-2075

11.168 We will continue to undertake mains rehabilitation to continue to drive down leakage. We expect that a greater proportion of our mains rehabilitation efforts will make use of innovative techniques in the long-term, reducing costs.

11.169 Our demand management programme in the longer-term relies on the intervention of government, as described earlier in this section. When leakage has been reduced to very low levels, and we have undertaken those actions which can influence customers' demand for water, actions will need to be driven by government to alter water use through societal changes and the adoption of minimum standards and buildings regulations changes.

11.170 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

Supply enhancement

11.171 The new resources required under different scenarios of future supply-demand balance are detailed in Table 11-18.

Short-term (2025-2030)

11.172 In the short-term, our existing supplies will be sufficient to provide our customers with a 1 in 100-year Level of Service. We will increase the output of the Woods Farm groundwater source in AMP8 to boost resilience. During this period, we will also need to undertake the design and construction of the Moulsford groundwater source, to ensure that its output will be available in 2033.

Medium Term (2030-2045)

11.173 In order to facilitate achievement of a 1 in 200-year resilience level, in 2033 we will need to begin using the Moulsford groundwater source.

11.174 In 2035 we will need to appraise the outcome from all of the investigations that we will undertake to determine the future licence reductions that will be necessary at our existing sources. At this point we will also need to assess what population growth has occurred and the success of our demand management schemes.

11.175 Water is needed from SESRO in SWOX WRZ in all but the most benign scenarios, with water from SESRO being used in pathways 1-7. In some pathways, a transfer from

Henley WRZ is also needed from 2040. In the dWRMP, both raw water and treated water were transferred from SESRO around SWOX WRZ. In the final WRMP, our appraisal indicates that raw water transfer only is required, but we will monitor the need for new treatment and network assets according to the success of demand management and licence reductions which may need to be made. In a very adverse scenario, we may require works to expand the capacity of our existing source, Woods Farm. If the 110 l/h/d target looks as though it will not be achieved, we may need to develop additional treatment assets to treat water from SESRO.

Long-Term (Beyond 2045)

11.176 In the long-term, if the 110 l/h/d target is hit, in many situations it is likely that water available from SESRO will be sufficient to provide SWOX with the water that it needs, along with construction of the Oxford Canal option being required in more adverse scenarios. If the 110 l/h/d target is missed, then SWOX will require more water from SESRO and we may need to construct additional treatment assets or transfer water from our other zones.

Option	Max DO (DYAA)	Year Option is First Utilised in each Pathway								
		1	2	3	4	5	6	7	8	9
Water from West-Thames Options	N/A	2040	2040	2040	2040	2040	2040	2040	-	-
Moulsford GW	2	2033	2033	2033	2033	2033	2033	2033	2033	2033
Woods Farm GW	2	2030	2030	2030	2030	2030	2030	2030	2030	2030
Import from Henley	5	2042	-	-	2040	2040	2040	-	-	-
Transfers with SWA	2	2026	2026	2026	2026	2026	2026	2026	2026	2026
Gatehampton Drought Permit	4	2033	2033	2033	2033	2033	2033	2033	2033	2033
Oxford Canal, Duke's Cut	12	2065	-	-	2040	-	-	-	-	-

Table 11-18: Options Used in SWOX WRZ

Utilisation in the preferred pathway

11.177 In the supply-demand balance scenario in pathway four, our supplies would be supplemented from the following sources (Table 11-19 and Table 11-20).

Short-term (2025 to 2030)

11.178 In the short-term, we would continue to use our existing supplies, and increase the output from the Woods Farm source.

Medium-term (2030 to 2045)

11.179 From 2033 onwards, we would temporarily make use of the Gatehampton Drought permit, and would use water from a new groundwater source to move to a 1 in 200-year level of resilience. In 2040 we would then begin making use of water from SESRO, would transfer water from our Henley WRZ, and will construct and use the Oxford Canal scheme. Using SESRO will allow us to make a licence reduction at our Farmoor source and will facilitate a 1 in 500-year level of resilience.

Long-term (Beyond 2045)

11.180 In the long-term, we would continue to make use of water from SESRO and the Oxford Canal.

11.181 Compared to the dWRMP24, the volume of new sources required is significantly reduced, due to the preferred plan including achievement of the 110 l/h/d target.

Option	Option Utilisation by Year (Ml/d)									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
Water from West-Thames Options	0.0	0.0	24.0	24.0	24.0	24.0	24.0	21.8	24.0	18.1
Moulsford GW	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Woods Farm GW	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Import from Henley	0.0	0.0	3.2	0.4	1.2	1.2	1.2	1.2	1.2	1.2
Oxford Canal	0.0	0.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Gatehampton Drought Permit	0.0	3.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Import from SWA, existing transfers	0.4	0.4	3.5	3.2	-0.3	0.3	0.1	0.9	1.9	0.2

Table 11-19: Preferred Programme Option Utilisation in SWOX WRZ, DYAA

Option	Option Utilisation by Year (Ml/d)									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
Water from West-Thames Options	0.0	0.0	24.0	23.9	24.0	24.0	24.0	24.0	24.0	24.0
Moulsford GW	0.0	0.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Woods Farm GW	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Import from Henley	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Oxford Canal	0.0	0.0	0.5	0.0	1.4	3.1	4.1	5.7	7.2	6.0
Gatehampton Drought Permit	0.0	3.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Import from SWA, existing transfers	0.4	0.7	3.5	3.2	3.2	3.2	3.2	3.2	3.2	3.2

Table 11-20: Preferred Programme Option Utilisation in SWOX WRZ, DYCP

Slough, Wycombe and Aylesbury (SWA) WRZ

11.182 Section 6 of our WRMP describes the supply-demand balance situation in the SWA WRZ across the planning period. In the short-term we do not have a supply-demand imbalance. In the long-term we would face a deficit in all scenarios. By 2050 the range of supply-demand balances that we have considered ranges from a 1 Ml/d deficit to a 53 Ml/d deficit.

11.183 The implementation of our preferred plan, a twin-track approach combining demand management with resource development, resolves the supply-demand deficit in all years of the planning period.

Demand Management

11.184 Being consistent across all nine future scenarios, we will first describe our demand management programme, the main components of which are common across all of our WRZs. As such, the narrative here is identical to that from the London WRZ, however the figures presented in this section are specific to the SWA WRZ.

11.185 Demand management is the largest component of our plan, particularly in the short-term.

11.186 Table 11-21 shows a detailed breakdown of the demand management options adopted in our preferred plan. Figure 11-13 shows our leakage forecast, Figure 11-14 shows our meter penetration forecast, and Figure 11-15 shows our PCC forecast.

	Supply Demand Benefit (Ml/d)				
SWA	AMP8	AMP9	AMP10	AMP11	AMP12
AMP7 Carry-over leakage	0.00				
Household metering CSL	0.48	0.00	0.00	0.00	0.00
Non-household metering CSL	0.44	0.00	0.00	0.00	0.00
Bulk metering CSL	0.40	0.11	0.08	0.00	0.00
Replacement metering CSL	1.54	0.60	0.00	0.00	0.00
Mains replacement	0.10	0.63	0.89	0.80	0.77
Leakage innovation	0.10	0.00	0.00	0.20	0.42
Metering innovation CSL	0.00	0.00	0.00	0.00	0.00
Advanced DMA Intervention	0.50	0.00	0.00	0.00	0.00
Total leakage reduction	3.56	1.33	0.98	1.00	1.19
AMP7 Carry-over metering	0.00				
Household metering	1.39	0.00	0.00	0.00	0.00
Non-household metering	0.11	0.00	0.00	0.00	0.00
Household water efficiency	0.91	0.73	0.00	0.00	0.00
Non-household water efficiency	0.00	0.00	0.00	0.00	0.00
Metering innovation	0.04	0.81	0.48	0.00	0.00
Innovative tariffs	0.13	0.02	1.01	0.14	0.00
Total usage reduction	2.58	1.57	1.49	0.14	0.00
Total benefit from DMP	6.14	2.90	2.47	1.14	1.19

	New & Replacement Meters				
SWA	AMP8	AMP9	AMP10	AMP11	AMP12
Bulk Metering	2,420	2,699	2,265	0	0
Household Metering (New)	27,264	15,974	9,852	0	0
Household Metering (Upgrades)	79,016	39,912	3,291	0	0
Non-Household Metering (Upgrades)	10,094	0	0	0	0

Table 11-21: SWA WRZ Demand Management Programme Breakdown

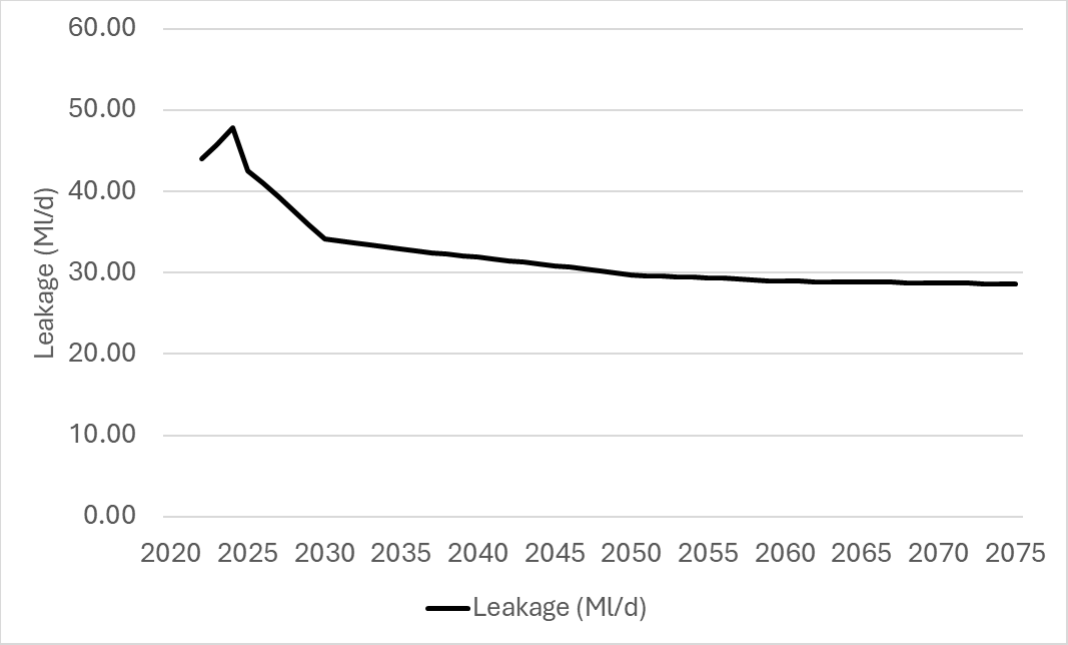

Figure 11-13: SWA WRZ Final Plan Leakage

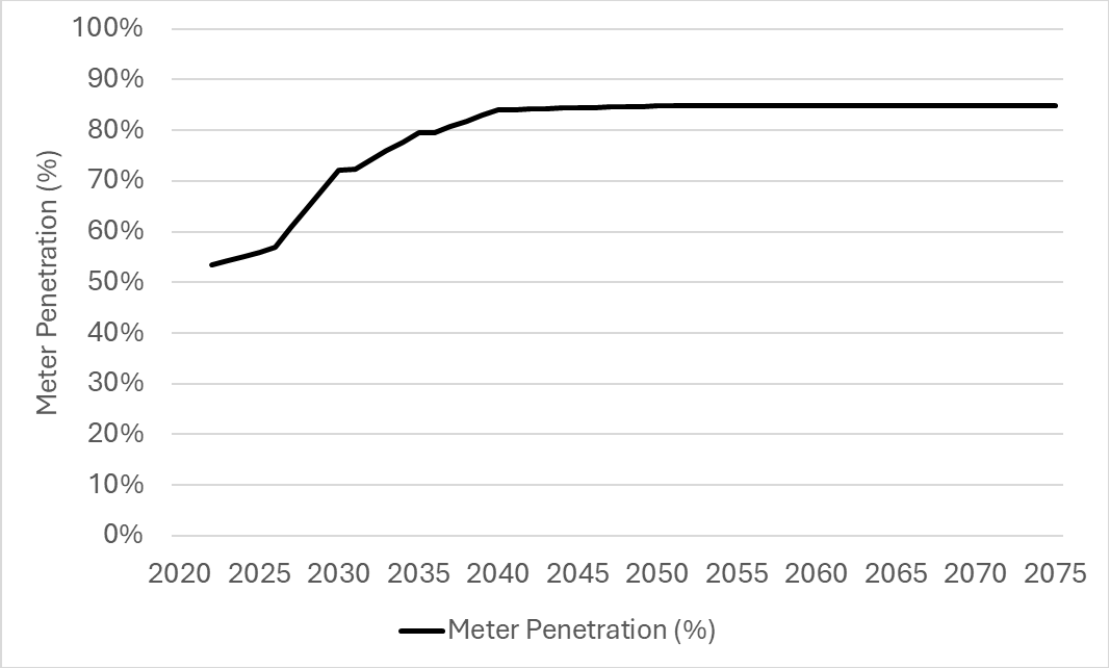

Figure 11-14: SWA WRZ Final Plan Meter Penetration

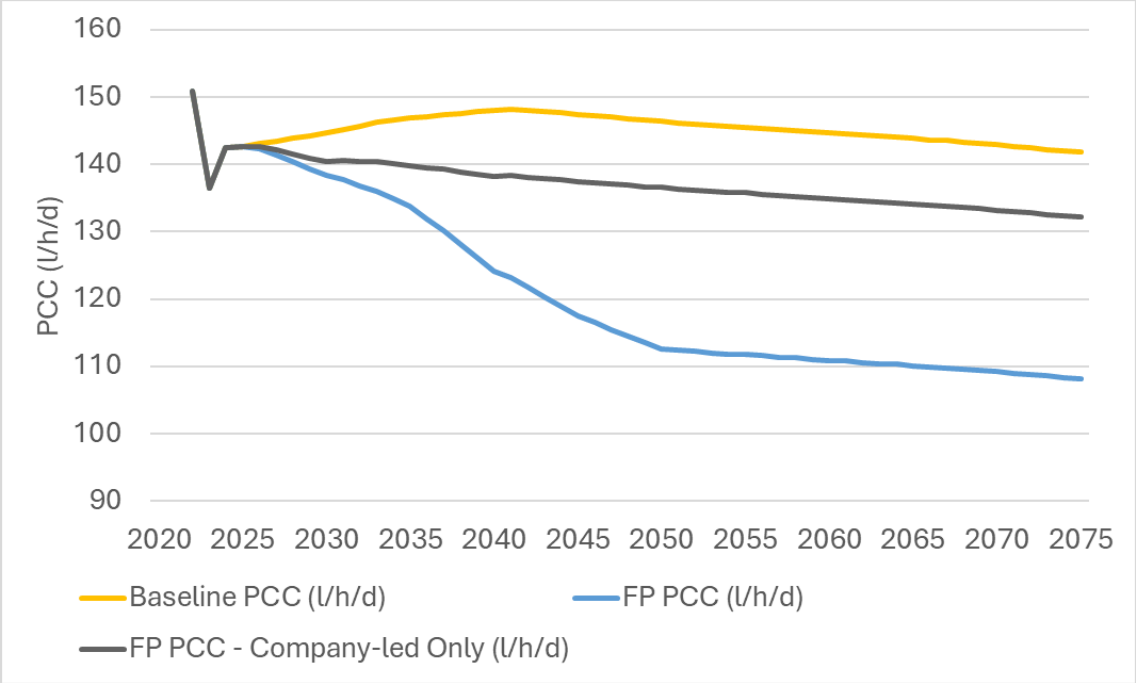

Figure 11-15: SWA WRZ PCC

Short-term – 2025-2030

11.187 We will continue our PMP, with around 27,000 household meters being installed in AMP8, finishing our household PMP campaign, achieving a total meter penetration of 72% by the end of AMP8. We will also undertake a significant upgrade programme including installation of around 79,000 smart meters, replacing old meters with smart meters to ensure that we are able to harvest data about our customers' water use, allowing us to analyse this data to help customers reduce their water use.

11.188 We will reduce leakage by 8.4 Ml/d during AMP8, enabled by our smart meter programme, which allows us to analyse data to predict where leaks may exist on customer-owned pipes. In addition, we will undertake Advanced DMA leakage reduction, mains rehabilitation, and leakage innovation programmes to reduce our leakage.

11.189 We will continue to promote water efficiency activity to help customers use water wisely, including the continuation of a reward-based incentive scheme introduced in AMP7 which promotes water efficiency.

11.190 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

Medium-term – 2030-2045

11.191 We will finish almost all of our metering efforts in AMP9, continuing to install bulk meters and upgrade meters to ensure that all metered customers are using smart meters. We will achieve a total meter penetration of 84% (including voids) by 2045.

11.192 With enough of our supply area being covered by smart metering, we will be able to implement a financial incentive-based tariff scheme from 2035. This scheme will encourage those who use exceptionally high volumes of water to reduce their usage.

11.193 We will deliver further leakage reduction over this period, with an increasing proportion of our leakage reduction needing to be delivered through mains rehabilitation.

11.194 Our plan is to continue to promote water efficiency activity to help customers use water wisely.

11.195 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

11.196 Our plan relies on the introduction of government-led interventions from 2035 onwards, including both minimum standards on white goods and the introduction of amendments to buildings regulations. This will be required to achieve the government ambition of 110 l/h/d per capita consumption.

Long-term – 2045-2075

11.197 In the long-term we will continue to undertake mains rehabilitation to continue to drive down leakage. We expect that a greater proportion of our mains rehabilitation efforts will make use of innovative techniques in the long-term, reducing costs.

11.198 In the longer-term, our demand management programme relies on the intervention of government, as described earlier in this section. When leakage has been reduced to very low levels, and we have undertaken those actions which can influence customers' demand for water, actions will need to be driven by government to alter water use through societal changes and the adoption of minimum standards and buildings regulations changes.

11.199 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

Supply enhancement

11.200 The new resources required under different scenarios of future supply-demand balance are detailed in Table 11-22. Our plan shows that, assuming that demand management interventions are successful, no new sources of water would be needed until 2050 at the earliest, aside from increasing output from our Datchet source by 2030 to improve resilience. In several future scenarios, there is no need for new sources of water throughout the planning period. New sources of water would only be needed in scenarios of "High" environmental destination.

11.201 In the dWRMP, the total amount of resource required across the SWOX and SWA WRZs meant that the best option was to transfer water from SESRO across SWOX and into SWA, via a treated water pipeline. In the final WRMP, with less water being needed, construction of a new WTW at Medmenham, which would abstract water released by SESRO, is the more efficient option. If PCC reduction does not go as planned and more water is needed, we would choose to transfer treated water from SESRO across from SWOX, rather than build this new treatment works.

The utilisation of options in pathway 4 is shown in Table 11-23 and Table 11-24.

Option	Max DO	Year Option is First Utilised in each Pathway								
		1	2	3	4	5	6	7	8	9
Water from West-Thames Sources, Treated at new Medmenham WTW	24	2050	-	-	2050	-	-	2050	-	-
Groundwater - Datchet	2	2064	-	-	2074	-	-	-	-	-

Table 11-22: Options Used in SWA WRZ

Option	Option Utilisation by year (Ml/d)									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
Water from West-Thames Sources, imported via SWOX	0.0	0.0	0.0	0.0	15.9	16.1	15.2	15.7	16.3	14.3
Groundwater - Datchet	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Net Export to SWOX	-0.4	-0.4	-3.5	-3.2	0.3	-0.3	-0.1	-0.9	-1.9	-0.2

Table 11-23: Preferred programme option utilisation in SWA WRZ, DYAA

Option	Option Utilisation by year (Ml/d)									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
Water from West-Thames Sources, imported via SWOX	0.0	0.0	0.0	0.0	8.0	8.0	8.0	8.0	8.0	8.0
Groundwater - Datchet	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
Net Export to SWOX	-0.4	-0.7	-3.5	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2

Table 11-24: Preferred programme option utilisation in SWA WRZ, DYCP

11.202

Kennet Valley WRZ

11.203 Section 6 of our WRMP describes the supply-demand balance situation in the Kennet Valley WRZ across the planning period. We do not have a supply-demand deficit in the short-term, but as we transition to a 1 in 500-year resilience we anticipate a deficit in all future scenarios. By 2050 the range of deficits that we have planned for ranges from 5 Ml/d to 37 Ml/d.

11.204 The implementation of our preferred plan, a twin-track approach combining demand management with resource development, resolve the supply-demand deficit in all years of the planning period.

Demand Management

11.205 Being consistent across all nine future scenarios, we will first describe our demand management programme, the main components of which are common across all of our WRZs. As such, he narrative here is identical to that from other WRZs, however the figures presented in this section are specific to the Kennet Valley WRZ.

11.206 Demand management is the largest component of our plan, particularly in the short-term.

11.207 Table 11-25 shows a detailed breakdown of the demand management options adopted in our preferred plan. Figure 11-16 shows our leakage forecast, Figure 11-17 shows our meter penetration forecast, and Figure 11-18 shows our PCC forecast.

	Supply Demand Benefit (Ml/d)				
KVZ	AMP8	AMP9	AMP10	AMP11	AMP12
AMP7 Carry-over leakage	0.00				
Household metering CSL	0.55	0.00	0.00	0.00	0.00
Non-household metering CSL	0.23	0.00	0.00	0.00	0.00
Bulk metering CSL	0.36	0.05	0.04	0.00	0.00
Replacement metering CSL	0.86	0.23	0.00	0.00	0.00
Mains replacement	0.04	0.40	0.34	0.39	0.39
Leakage innovation	0.11	0.05	0.09	0.39	0.76
Metering innovation CSL	0.00	0.00	0.00	0.00	0.00
Advanced DMA Intervention	0.60	0.25	0.15	0.00	0.00
Total leakage reduction	2.76	0.99	0.62	0.78	1.15
AMP7 Carry-over metering	0.00				
Household metering	1.31	0.00	0.00	0.00	0.00
Non-household metering	0.08	0.00	0.00	0.00	0.00
Household water efficiency	0.66	0.51	0.00	0.00	0.00
Non-household water efficiency	0.24	0.19	0.14	0.12	0.10
Metering innovation	0.04	0.28	0.16	0.00	0.00
Innovative tariffs	0.11	0.65	0.90	0.47	0.00
Total usage reduction	2.44	1.63	1.21	0.59	0.10
Total benefit from DMP	5.20	2.61	1.82	1.38	1.25

	New & Replacement Meters				
KVZ	AMP8	AMP9	AMP10	AMP11	AMP12
Bulk Metering	1,125	1,249	1,017	0	0
Household Metering (New)	25,312	5,183	3,264	0	0
Household Metering (Upgrades)	44,456	17,576	2,174	0	0
Non-Household Metering (Upgrades)	5,281	0	0	0	0

Table 11-25: Kennet Valley WRZ Demand Management Programme Breakdown

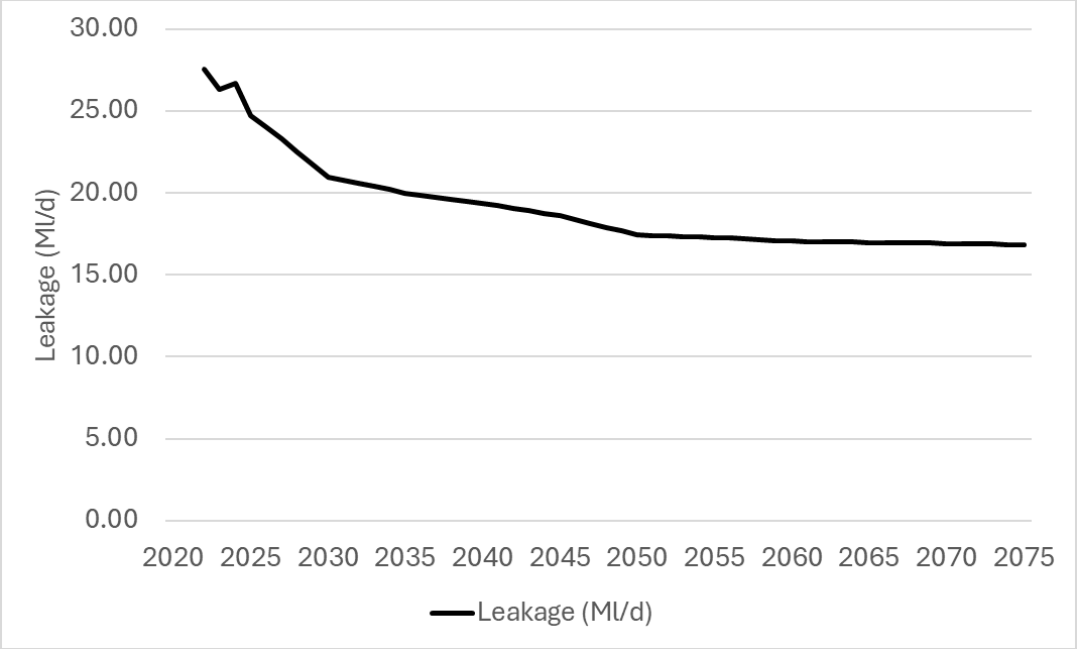

Figure 11-16: Kennet Valley Final Plan Leakage

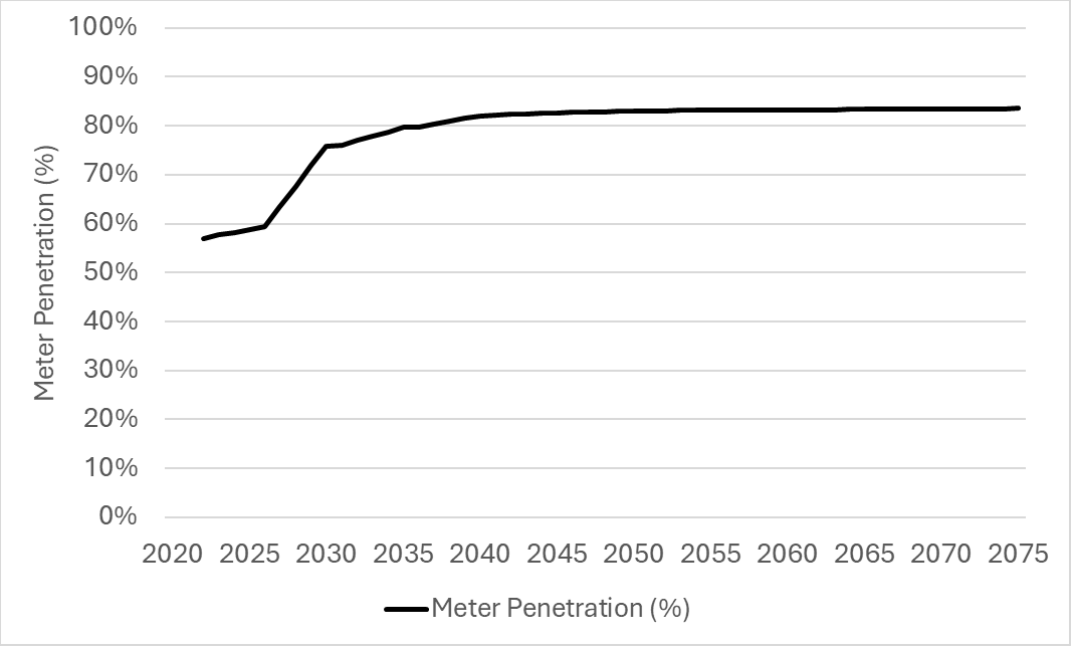

Figure 11-17: Kennet Valley Final Plan Meter Penetration

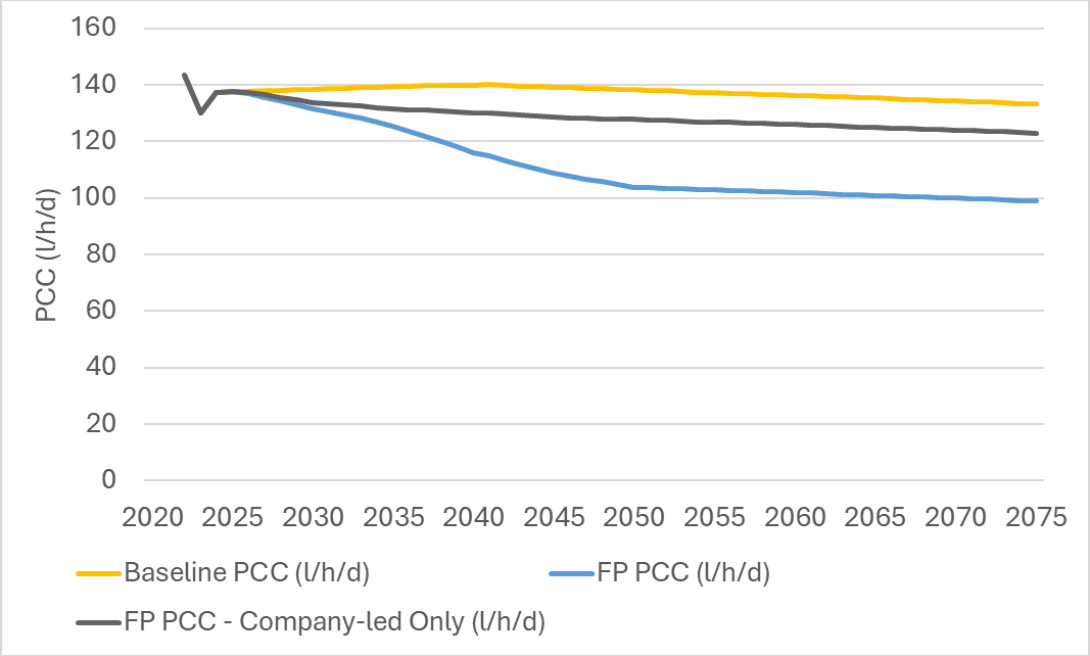

Figure 11-18: Kennet Valley WRZ PCC

Short-term – 2025-2030

11.208 We will continue our PMP, with over 25,000 new household meters being installed in AMP8, finishing our household PMP campaign, achieving a total meter penetration of 76% by the end of AMP8. We will also undertake a significant upgrade programme, replacing over 44,000 old meters with smart meters to ensure that we are able to harvest data about our customers' water use, allowing us to analyse this data to help customers reduce their water use.

11.209 We will reduce leakage by 3.7 Ml/d during AMP8, enabled by our smart meter programme, which allows us to analyse data to predict where leaks may exist on customer-owned pipes. In addition, we will undertake Advanced DMA leakage reduction, mains rehabilitation, and leakage innovation programmes to reduce our leakage.

11.210 Continue to promote water efficiency activity to help customers use water wisely, including the continuation of a reward-based incentive scheme introduced in AMP7 which promotes water efficiency.

11.211 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

Medium-term – 2030-2045

11.212 We will finish almost all of our metering efforts in AMP9, continuing to install bulk meters and upgrade meters to ensure that all metered customers are using smart meters. We will achieve a total meter penetration of 83% (including voids) by 2045.

11.213 With enough of our supply area being covered by smart metering, we will be able to implement a financial incentive-based tariff scheme from 2035. This scheme will encourage those who use exceptionally high volumes of water to reduce their usage.

11.214 We will deliver further leakage reduction over this period, with an increasing proportion of our leakage reduction needing to be delivered through mains rehabilitation.

11.215 We will continue to promote water efficiency activity to help customers use water wisely.

11.216 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

11.217 Our plan relies on the introduction of government-led interventions from 2035 onwards, including both minimum standards on white goods and the introduction of amendments to buildings regulations. This will be required to achieve the government ambition of 110 l/h/d per capita consumption.

Long-term – 2045-2075

11.218 We will continue to undertake mains rehabilitation to continue to drive down leakage. We expect that a greater proportion of our mains rehabilitation efforts will make use of innovative techniques, reducing costs.

11.219 Our demand management programme in the longer-term relies on the intervention of government, as described earlier in this section. When leakage has been reduced to very low levels, and we have undertaken those actions which can influence customers' demand for water, actions will need to be driven by government to alter water use through societal changes and the adoption of minimum standards and buildings regulations changes.

11.220 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

Supply enhancement

11.221 The new resources required under different pathways are detailed in Table 11-26. Utilisation in our preferred programme scenario is shown in Table 11-27 and Table 11-28.

11.222 These tables show that new resources would not be needed until after 2040 under any future scenario. We will need to monitor population growth and the success of our demand management interventions through the 2020s and 2030s to identify additional resources that may be needed. The main reason for new resources being needed after 2040 is the move to a 1 in 500-year level of resilience, which has a major impact on the water we can rely on from the run-of-river source in Reading.

11.223 If demand is high in the 2030s and we need to make licence reductions in line with the "High" scenario, we would need to recommission our groundwater source at Mortimer, for use in 2042.

11.224 If SESRO and the T2ST are built, it would be very efficient to add a spur from the T2ST to the Kennet Valley WRZ to supply Newbury, as the route for the T2ST is planned to be very close to Newbury, and this additional supply would add resilience to the Newbury area. Our supply-demand balance shows that, in situations where we follow the "High" environmental destination scenario, this transfer is needed from 2040.

11.225 We may have to transfer water to South East Water, according to their need.

11.226 If PCC reduction does not hit the 110 l/h/d target, then we may need to construct a tunnel from the Thames to our Fobney WTW.

Option	Max DO (DYAA)	Year Option is First Utilised in each Pathway								
		1	2	3	4	5	6	7	8	9
Transfer from T2ST Spur	10	2040	-	-	2040	-	-	2040	-	-
Recommission Mortimer GW Source	5	2042	-	-	2042	-	-	-	-	-
Playhatch drought permit	4	2040	2036	2036	2031	2031	2031	2031	2031	2031
Export to SEW	4	2061	-	-	2070	-	-	-	-	-

Table 11-26: Options used in Kennet Valley WRZ

Option	Option Utilisation by year (Ml/d)									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
Transfer from T2ST Spur	0.0	0.0	4.9	1.9	10.0	10.0	10.0	10.0	10.0	10.0
Recommission Mortimer GW Source	0.0	0.0	0.0	0.0	4.5	4.5	4.5	4.5	4.5	4.5
Playhatch Drought Permit	0.0	4.1	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Export to SEW	0	0	0	0	0	0	0	0	0	0

Table 11-27: Preferred programme option utilisation in Kennet Valley WRZ, DYAA

Option	Option Utilisation by year (Ml/d)									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
Transfer from T2ST Spur	0.0	0.0	0.0	0.0	1.5	1.5	1.5	1.5	3.9	4.6
Recommission Mortimer GW Source	0.0	0.0	0.0	0.0	0.0	0.4	0.8	1.3	4.5	4.5
Playhatch Drought Permit	0.0	4.1	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Export to SEW	0	0	0	0	0	0	0	0	-5	-5

Table 11-28: Preferred programme option utilisation in Kennet Valley WRZ, DYCP

Guildford WRZ

11.227 Section 6 of our WRMP describes the supply-demand balance situation in the Guildford WRZ across the planning period. We have a significant surplus in the short-term, which is maintained in all except the most severe future scenarios. By 2050 we could face a supply-demand balance of anything from a 14 Ml/d surplus to a 19 Ml/d deficit.

11.228 The implementation of our preferred plan, a twin-track approach combining demand management with resource development, resolves the supply-demand deficit in all years of the planning period.

Demand Management

11.229 Being consistent across all nine future scenarios, we will first describe our demand management programme for the Guildford WRZ, the main components of which are common across all of our WRZs. As such, the narrative here is identical to that from other WRZs, however the figures presented in this section are specific to the Guildford WRZ.

11.230 Demand management is the largest component of our plan, particularly in the short-term, and is all that is required in many future scenarios.

11.231 Table 11-29 shows a detailed breakdown of the demand management options adopted in our preferred plan. Figure 11-19 shows our leakage forecast, Figure 11-20 shows our meter penetration forecast, and Figure 11-21 shows our PCC forecast.

	Supply Demand Benefit (Ml/d)				
GUI	AMP8	AMP9	AMP10	AMP11	AMP12
AMP7 Carry-over leakage	0.00				
Household metering CSL	0.18	0.00	0.00	0.00	0.00
Non-household metering CSL	0.10	0.00	0.00	0.00	0.00
Bulk metering CSL	0.23	0.15	0.12	0.00	0.00
Replacement metering CSL	0.05	0.11	0.00	0.00	0.00
Mains replacement	0.08	0.63	0.33	0.39	0.30
Leakage innovation	0.01	0.04	0.10	0.49	0.30
Metering innovation CSL	0.00	0.00	0.00	0.00	0.00
Advanced DMA Intervention	0.27	0.12	0.30	0.00	0.00
Total leakage reduction	0.92	1.05	0.86	0.88	0.60
AMP7 Carry-over metering	0.00				
Household metering	0.44	0.00	0.00	0.00	0.00
Non-household metering	0.03	0.00	0.00	0.00	0.00
Household water efficiency	0.20	0.22	0.00	0.00	0.00
Non-household water efficiency	1.46	1.13	0.85	0.72	0.62
Metering innovation	0.02	0.04	0.02	0.00	0.00
Innovative tariffs	0.05	0.31	0.62	0.02	0.00
Total usage reduction	2.19	1.69	1.49	0.74	0.62
Total benefit from DMP	3.12	2.74	2.35	1.62	1.22

	New & Replacement Meters				
GUI	AMP8	AMP9	AMP10	AMP11	AMP12
Bulk Metering	3,519	3,935	3,365	0	0
Household Metering (New)	8,445	576	338	0	0
Household Metering (Upgrades)	3,144	7,643	791	0	0
Non-Household Metering (Upgrades)	2,416	0	0	0	0

Table 11-29: Guildford WRZ Demand Management Programme Breakdown

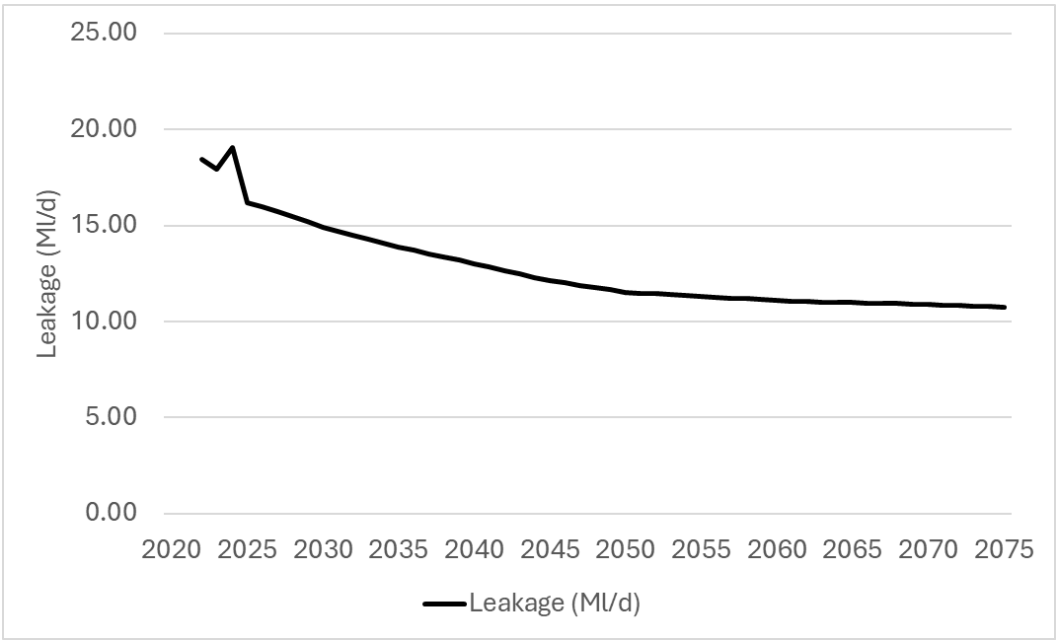

Figure 11-19: Guildford WRZ Final Plan Leakage

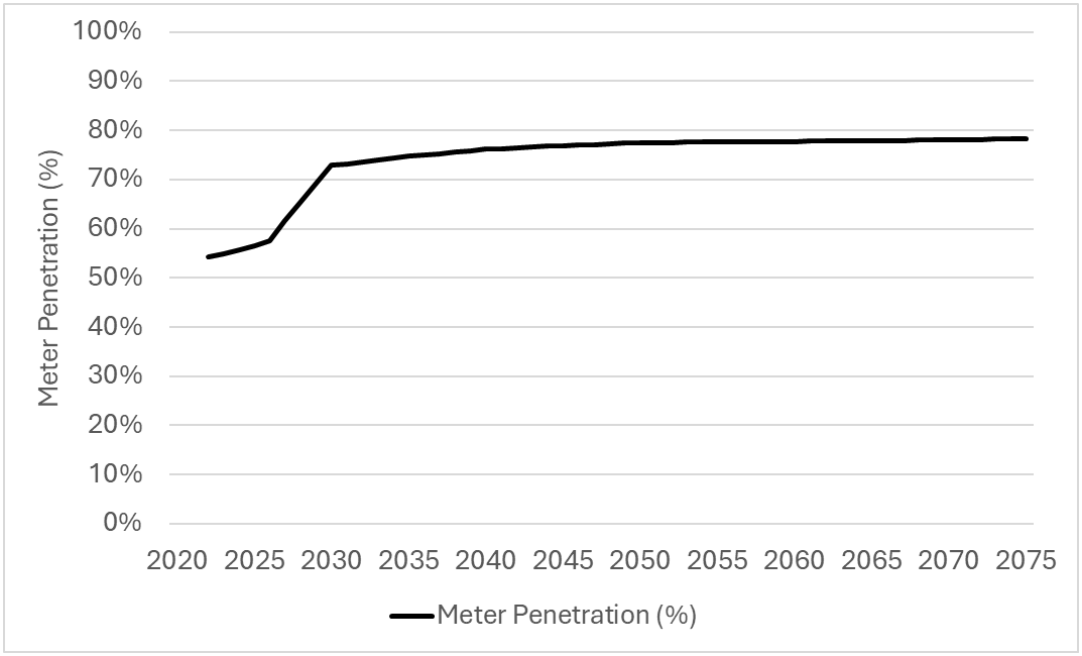

Figure 11-20: Guildford WRZ Final Plan Meter Penetration

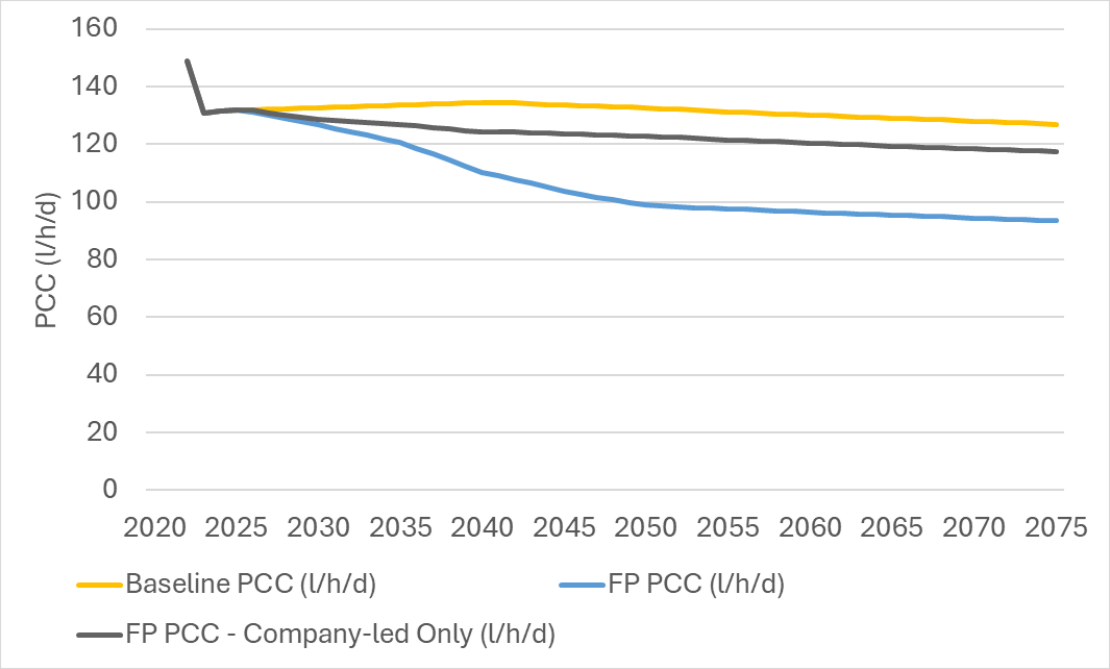

Figure 11-21: Guildford WRZ PCC

Short-term – 2025-2030

11.232 We will continue our PMP, with over 8,000 new household meters being installed in AMP8, finishing our household PMP campaign, achieving a total meter penetration of 73% by the end of AMP8. We will also undertake a significant upgrade programme, replacing over 3,000 old meters with smart meters to ensure that we are able to harvest data about our customers' water use, allowing us to analyse this data to help customers reduce their water use.

11.233 We will reduce leakage by 1.3 Ml/d during AMP8, enabled by our smart meter programme, which allows us to analyse data to predict where leaks may exist on customer-owned pipes. In addition, we will undertake Advanced DMA leakage reduction, mains rehabilitation, and leakage innovation programmes to reduce our leakage.

11.234 We will continue our programme of Smarter Business Visits, helping businesses to use less water, resulting in a NHH demand reduction of 1 Ml/d across the AMP.

11.235 Continue to promote water efficiency activity to help customers use water wisely, including the continuation of a reward-based incentive scheme introduced in AMP7 which promotes water efficiency.

11.236 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

Medium-term – 2030-2045

11.237 We will finish almost all of our metering efforts in AMP9, continuing to install bulk meters and upgrade meters to ensure that all metered customers are using smart meters. We will achieve a total meter penetration of 77% (including voids) by 2045.

11.238 With enough of our supply area being covered by smart metering, we will be able to implement a financial incentive-based tariff scheme from 2035. This scheme will encourage those who use exceptionally high volumes of water to reduce their usage.

11.239 We will deliver further leakage reduction over this period, with an increasing proportion of our leakage reduction needing to be delivered through mains rehabilitation.

11.240 We will continue to promote water efficiency activity to help customers use water wisely.

11.241 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

11.242 Our plan relies on the introduction of government-led interventions from 2035 onwards, including both minimum standards on white goods and the introduction of amendments to buildings regulations. This will be required to achieve the government ambition of 110 l/h/d per capita consumption.

Long-term – 2045-2075

11.243 We will continue to undertake mains rehabilitation to continue to drive down leakage. We expect that a greater proportion of our mains rehabilitation efforts will make use of innovative techniques in the long-term, reducing costs.

11.244 Our demand management programme in the longer-term relies on the intervention of government, as described earlier in this section. When leakage has been reduced to very low levels, and we have undertaken those actions which can influence customers' demand for water, actions will need to be driven by government to alter water use through societal changes and the adoption of minimum standards and buildings regulations changes.

11.245 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

Supply enhancement

11.246 The new resources required under different scenarios of future supply-demand balance are detailed in Table 11-30. This table shows that, aside from increasing the output from our Dapdune source in AMP8 for resilience purposes, new sources of water would only be needed in severe future licence reduction scenarios. In these cases, an import from South East Water would be our preferred option. We will not need to make a decision on which of these options would be preferred until the 2040s. Our utilisation of the SEW transfer under pathway 4 is shown in Table 11-31 and Table 11-32.

Option	Max DO (DYAA)	Year Option is First Utilised in each Pathway								
		1	2	3	4	5	6	7	8	9
Import from SEW	10	2050	-	-	2050	-	-	-	-	-
Shalford Drought Permit	5	-	2035	2035	2031	2031	2031	2031	2031	2031
Dapdune Licence Disaggregation	0 (peak only)	2030	2030	2030	2030	2030	2030	2030	2030	2030

Table 11-30: Options used in Guildford WRZ

Option	Option Utilisation by Year (Ml/d)									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
Import from SEW	0.0	0.0	0.0	0.0	1.0	0.6	0.6	0.6	0.6	1.1
Existing Export to Affinity	0.0	-0.4	-2.3	-2.3	-1.2	0.0	-0.1	-0.5	-0.8	-1.1

Option	Option Utilisation by Year (Ml/d)									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
Dapdune Licence Disaggregation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 11-31: Preferred programme option utilisation in Guildford WRZ, DYAA

Option	Option Utilisation by Year (Ml/d)									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
Import from SEW	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5	0.5
Existing Export to Affinity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dapdune Licence Disaggregation	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2

Table 11-32: Preferred programme option utilisation in Guildford WRZ, DYCP

Henley WRZ

11.247 Section 6 of our WRMP describes the supply-demand balance situation in the Henley WRZ across the planning period. We have a significant surplus in the short-term, which is maintained in all except the most severe future scenarios. By 2050 we could face a supply-demand balance of anything from a 7 Ml/d surplus to a 2 Ml/d deficit.

11.248 The implementation of our preferred plan, a twin-track approach combining demand management with resource development, resolves the supply-demand deficit in all years of the planning period.

Demand Management

11.249 Being consistent across all nine future scenarios, we will first describe our demand management programme for the Henley WRZ, the main components of which are common across all of our WRZs. As such, the narrative here is identical to that from other WRZs, however the figures presented in this section are specific to the Henley WRZ.

11.250 Demand management is the largest component of our plan, particularly in the short-term. In almost all future scenarios, no investment in supply-side schemes will be needed, assuming that demand management interventions deliver the benefits that we anticipate.

11.251 Table 11-33 shows a detailed breakdown of the demand management options adopted in our preferred plan. Figure 11-22 shows our leakage forecast, Figure 11-23 shows our meter penetration forecast, and Figure 11-24 shows our PCC forecast.

	Supply Demand Benefit (Ml/d)				
HEN	AMP8	AMP9	AMP10	AMP11	AMP12
AMP7 Carry-over leakage	0.00				
Household metering CSL	0.02	0.00	0.00	0.00	0.00
Non-household metering CSL	0.00	0.00	0.00	0.00	0.00
Bulk metering CSL	0.03	0.01	0.01	0.00	0.00
Replacement metering CSL	0.14	0.04	0.00	0.00	0.00
Mains replacement	0.01	0.08	0.09	0.06	0.10
Leakage innovation	0.00	0.00	0.00	0.00	0.00
Metering innovation CSL	0.00	0.00	0.00	0.00	0.00
Advanced DMA Intervention	0.00	0.00	0.00	0.00	0.00
Total leakage reduction	0.20	0.13	0.10	0.06	0.10
AMP7 Carry-over metering	0.00				
Household metering	0.07	0.00	0.00	0.00	0.00
Non-household metering	0.00	0.00	0.00	0.00	0.00
Household water efficiency	0.08	0.07	0.00	0.00	0.00
Non-household water efficiency	0.00	0.00	0.00	0.00	0.00
Metering innovation	0.01	0.02	0.01	0.00	0.00
Innovative tariffs	0.01	0.10	0.00	0.00	0.00
Total usage reduction	0.18	0.20	0.01	0.00	0.00
Total benefit from DMP	0.37	0.32	0.11	0.06	0.10

	New & Replacement Meters				
HEN	AMP8	AMP9	AMP10	AMP11	AMP12
Bulk Metering	175	195	164	0	0
Household Metering (New)	1,392	425	269	0	0
Household Metering (Upgrades)	7,067	2,815	247	0	0
Non-Household Metering (Upgrades)	0	0	0	0	0

Table 11-33: Henley WRZ Demand Management Programme Breakdown

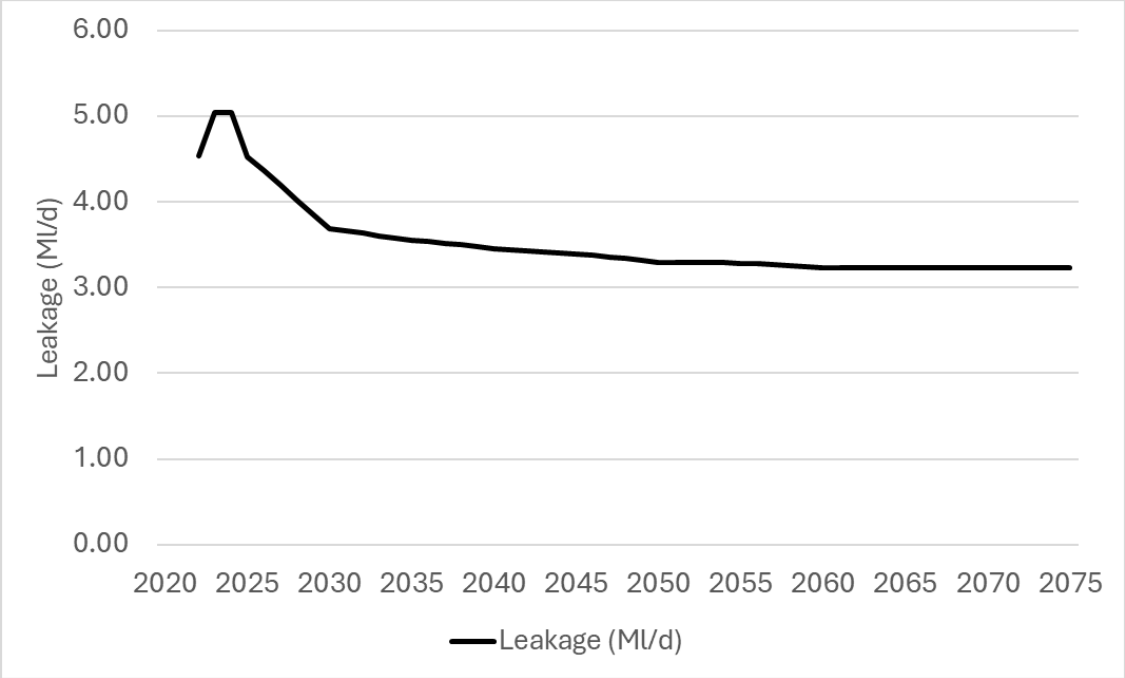

Figure 11-22: Henley WRZ Final Plan Leakage

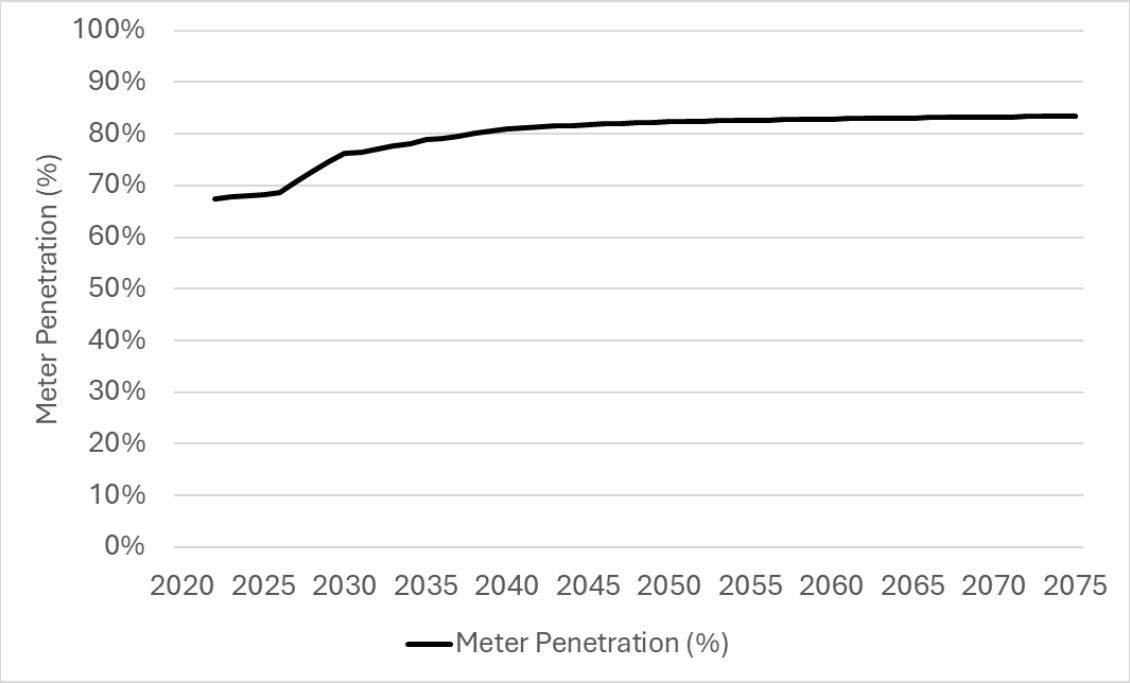

Figure 11-23: Henley WRZ Final Plan Meter Penetration

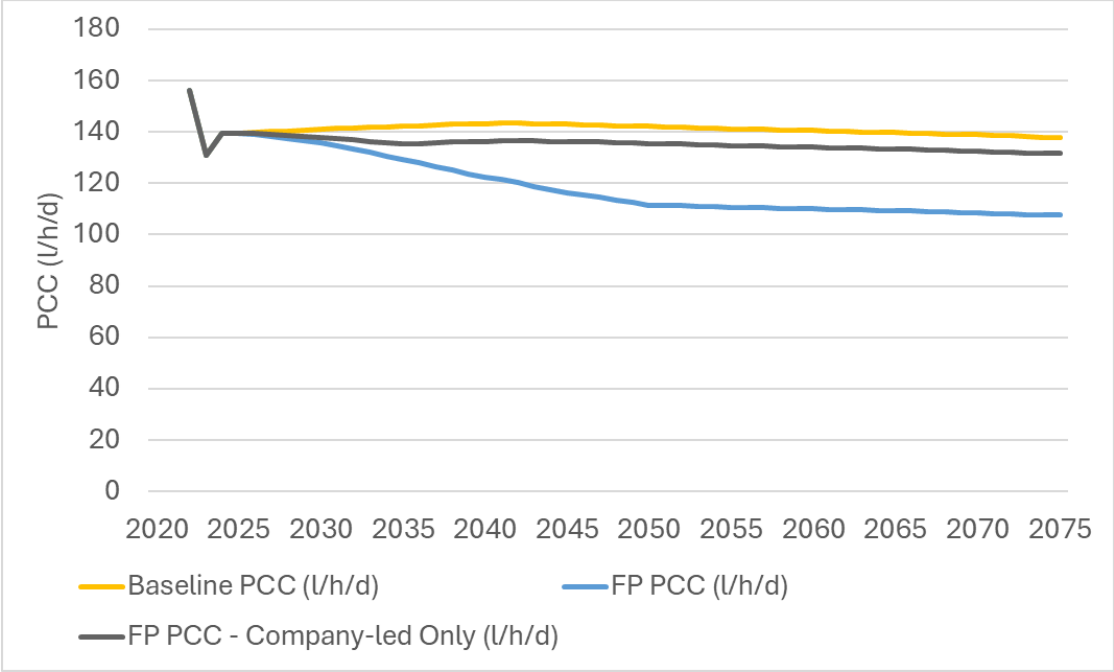

Figure 11-24: Henley WRZ PCC

Short-term – 2025-2030

11.252 We will continue our PMP, with nearly 1,500 household meters being installed in AMP8, finishing our household PMP campaign, achieving a total meter penetration of 76% by

the end of AMP8. We will also undertake a significant upgrade programme, replacing over 7,000 old meters with smart meters to ensure that we are able to harvest data about our customers' water use, allowing us to analyse this data to help customers reduce their water use.

11.253 We will reduce leakage by 0.85 Ml/d during AMP8, enabled by our smart meter programme, which allows us to analyse data to predict where leaks may exist on customer-owned pipes. In addition, we will undertake Advanced DMA leakage reduction, mains rehabilitation, and leakage innovation programmes to reduce our leakage.

11.254 We will continue to promote water efficiency activity to help customers use water wisely, including the continuation of a reward-based incentive scheme introduced in AMP7 which promotes water efficiency.

11.255 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

Medium-term – 2030-2045

11.256 We will finish almost all of our metering efforts in AMP9, continuing to install bulk meters and upgrade meters to ensure that all metered customers are using smart meters. We will achieve a total meter penetration of 82% (including voids) by 2045.

11.257 With enough of our supply area being covered by smart metering, we will implement a financial incentive-based tariff scheme from 2035. This scheme will encourage those who use exceptionally high volumes of water to reduce their usage.

11.258 We will deliver further leakage reduction over this period, with an increasing proportion of our leakage reduction needing to be delivered through mains rehabilitation.

11.259 We will continue to promote water efficiency activity to help customers use water wisely.

11.260 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

11.261 Our plan relies on the introduction of government-led interventions from 2035 onwards, including both minimum standards on white goods and the introduction of amendments to buildings regulations. This will be required to achieve the government ambition of 110 l/h/d per capita consumption.

Long-term – 2045-2075

11.262 We will continue to undertake mains rehabilitation to continue to drive down leakage. We expect that a greater proportion of our mains rehabilitation efforts will make use of innovative techniques in the long-term, reducing costs.

11.263 Our demand management programme in the longer-term relies on the intervention of government, as described earlier in this section. When leakage has been reduced to very low levels, and we have undertaken those actions which can influence customers' demand for water, actions will need to be driven by government to alter water use through societal changes and the adoption of minimum standards and buildings regulations changes.

11.264 We will continue to use media campaigns, temporary use bans and non-essential use bans according to our current levels of service.

Supply enhancement

11.265 The new resources required under different scenarios of future supply-demand balance are detailed in Table 11-34. This shows that supply-side investment will not be needed.

11.266 In several future scenarios, water would be exported to SWOX WRZ. Table 11-35 shows the utilisation of a transfer to SWOX in pathway 4, which would need to be used from 2040 onwards.

Option	Max DO (DYAA)	Year Option is First Utilised in each Pathway								
		1	2	3	4	5	6	7	8	9
Export to SWOX	5	2042	-	-	2040	2040	2040	-	-	-
Harpsden/Sheeplands Drought Permit	6	-	2036	2036	2031	2031	2031	2031	2031	2031

Table 11-34: Options selected for Henley WRZ

Option	Option Utilisation by Year (Ml/d) …									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
Export to SWOX	0.0	0.0	-3.2	-0.4	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
Drought Permit – Harpsden and Sheeplands	0.0	5.6	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 11-35: Preferred programme option utilisation in Henley WRZ, DYAA

Option	Option Utilisation by Year (Ml/d) …									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
Export to SWOX	0	0	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
Drought Permit – Harpsden and Sheeplands	0.0	5.6	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 11-36: Preferred programme option utilisation in Henley WRZ, DYCP

Plan Assessment

11.267 In this section we describe our assessments of our plan, including the key decisions that we need to make, and when we need to make them, a description of the environmental assessment of our plan, the costs and carbon emissions arising from our preferred programme, and the risks and uncertainties that we have identified.

Decision points

11.268 The key decision points that we identify in our plan are aligned with our adaptive plan branch points. The summary decisions that we need to take in the future are:

Now

11.269 As discussed throughout this section, we need to decide which options to invest in for our medium-term security of supply, to build towards 1 in 200-year and 1 in 500-year levels of drought resilience. These decisions have been detailed in the preceding sections.

11.270 The investment decisions set out in our preferred plan provide a resilient, efficient solution to long-term regional planning issues. The key outcomes in the short to medium term are the progress of leakage reduction and usage reduction alongside increased output capability from our Gateway desalination plant. We will assess whether we are seeing the benefits that we anticipate from these options, and make a risk-based decision as to whether further investment is needed to ensure the sufficiency of supply (see our monitoring plan for further details). In addition, we will need to appraise whether regulatory expectations shift between WRMP24 and WRMP29, whether local authority plans and government projections are significantly altered, and whether understanding regarding climate change impacts and extreme drought events progresses, and so whether our investment plan needs to be altered as a result.

2035-2040

11.271 Following the conclusion of our two-AMP programme of investigations, we will need to determine the licence reductions that need to be made at our existing sources to ensure environmental protection and enhancement for the future. Our adaptive planning scenarios mean that we have developed a plan which will be efficient and adaptable to a plausible range of future scenarios of licence reduction. At this point we will also need to use the latest climate evidence available to appraise how climate change has impacted drought risk and to examine what the latest science says about impacts for the future, and so determine the long-term decisions which we need to make to mitigate the risks of climate change to customer supplies and the environment.

11.272 In addition to consideration of climate change impacts and required future licence reductions, we will continually need to appraise the success (and anticipated future success) of demand management programmes, including action which the government takes. In our preferred programme no further schemes are required after 2040, but if key risks emerge then we may need to progress with the construction of further water resource schemes, such as the STT or Water Recycling.

11.273 The uncertain factors of demand management and licence reduction act in opposite directions, insofar as it is unlikely that a PCC of significantly less than 110 l/h/d will be achieved (but significant risk that this target will not be achieved, which would create an additional requirement for new water resources), but it could also be that fewer licence

reductions are required to ensure environmental requirements are met (which would reduce the overall quantum of need). The different possible scenarios for these two factors are of similar overall magnitudes, and so we will need to consider these factors together when identifying action which is required.

Environmental assessment

11.274 We have carried out environmental assessment of all Constrained List option elements, including Strategic Environmental Assessment (SEA), Habitat Regulations Assessment (HRA), Biodiversity Net Gain (BNG), Natural Capital (NC), Water Framework Directive (WFD) and Invasive Non-Native Species (INNS) as relevant.

11.275 For all options considered in our investment modelling, we have carried out 'Stage 1' assessments of all six types listed above as relevant, based on the option information available. For options selected in our preferred programme (pathway 4) and pathways 1 and 8 of our BVP, as well as programmes from pathways 4 of the Best Environment and Society and Least Cost plans, we have then identified those options for which we needed to undertake more detailed, 'Stage 2', assessments, and have undertaken these assessments.

11.276 Our environmental assessments mean we have ensured that necessary mitigation measures to ensure compliance with the WFD and HRA have been identified, or that we have identified where further option development work is required, and that options that we have considered, if constructed, would meet the requirements of relevant legislation, subject to further investigations being carried out when more detailed design of options is undertaken.

11.277 As we have carried out ever more detailed assessments, engaging with regulators and stakeholders, we have inevitably identified issues that had not been foreseen at previous option development stages. In most cases we have been able to identify mitigation measures or design alterations, but in some cases we have needed to remove options from consideration. A notable example is that, in our WRMP19, we set out our preferred option for delivering 1 in 200-year resilience by the early 2030s as being the Deephams water recycling scheme. Through investigation and engagement with the Environment Agency, followed by the drafting of a statement of common understanding, we have identified that environmental impacts from this scheme present an ongoing risk, and so have screened this scheme out of consideration in our WRMP24 until such a time as other options can be put into place to provide sufficient compensatory flows in the River Lee to allow us and the Environment Agency to support promotion of this option. We have also rejected Teddington DRA 100Ml/d, Britwell Removal of Constraints, and Wansunt and Crayford drought options, on environmental promotability or acceptability grounds; full rejection reasoning is available in Appendix Q (Rejection register).

11.278 As well as having assessed the environmental impacts of individual schemes within our plan, we have also carried out an assessment of the environmental impacts of our plan as a whole and of the environmental impacts of our plan when considered alongside other plans and programmes.

11.279 We have identified reasonable alternative programmes through our programme appraisal, detailed in Section 10 of our WRMP24. As required by the WRPG, one of these alternative programmes was a plan deemed the 'Best for Environment and Society'. We

have carried out our plan-based environmental assessments on our Least Cost and Best for Environment and Society plans alongside the Best Value plan and these are included in Section 10 of the WRMP24.

11.280 Throughout the process of environmental assessment of our options and plans we have undertaken extensive discussion with our regulators and stakeholders, primarily Natural England and the Environment Agency. We are grateful for the advice and guidance received from our regulators.

11.281 For a more comprehensive discussion of the environmental assessments that we have undertaken and their results, please see Section 9 and Appendices B, C, D, AA, and BB.

SEA – Preferred Programme

11.282 The Best Value plan involves the construction of multiple infrastructure projects. There are 'standard' cumulative impacts associated with this construction activity (e.g. material use and waste generation, impact on soils, temporary impact on roads, cycle paths and national trails, and community facilities), and best practice mitigation for these impacts which we would implement as part of option delivery. These have been described in Appendix B.

11.283 The SEA cumulative effects assessment for the Preferred Programme identified cumulative positive effects for the SEA objectives on biodiversity, water quality and vulnerability to climate risks due to the inclusion of the 'High' Environmental Destination scenario, consumption reduction options, changes in levels of service to enhance water available for use (WAFU), i.e. media campaigns, TUBs, NEUBs, and leakage reduction. The cumulative effects of these options will result in more water being kept within the natural environment. Positive cumulative effects were also identified for the SEA objective on delivering reliable and resilient water supply to customers through delivery of new water supply options, increased capacity and improving transfers across the region.

11.284 The SEA cumulative effects assessment for the Preferred Programme identified cumulative negative effects for SEA objectives on soil due to cumulative loss of agricultural land, carbon due to construction and operational carbon emissions across the plan, and resource use due to the cumulative effects of materials and resource use and waste production across the plan. We will continue work to identify mitigation for these effects as we develop our options through to detailed design and delivery.

11.285 The SEA cumulative effects assessment identified several options with the potential for interactions with the same sensitive receptors. This was largely due to construction effects such as disturbance from noise, air and light pollution from different options where the construction periods overlapped. These sensitive receptors included Local Nature Reserves (LNRs), Sites of Special Scientific Interest (SSSI), heritage assets and community assets. However, it was concluded that with implementation of best practice construction techniques and a Construction Transport Management Plan, cumulative effects are not anticipated.

11.286 Further details of the SEA are included in Appendix B.

HRA – Preferred Programme

11.287 We have undertaken 'Stage 2' HRA assessments for options which feature in our preferred programme, where Stage 1 assessment has indicated that this is required.

11.288 The HRA identified two options within the Preferred Programme with low effects that were therefore taken forward into the in-combination effects assessment. Although the Appropriate Assessment concluded no adverse effects on site integrity (AESI) for these options alone, low level effects could combine to cause significant effects affecting site integrity and this was investigated through the in-combination effects assessment. Low effects on Cannock Extension Canal SAC were identified for the Oxford Canal to Dukes Cut option and low-level effects on Oxford Meadows SAC from the Dukes Cut to Farmoor option. The two options affect different Habitats Sites and, therefore, there are no in-combination effects. No other options in the Preferred Programme had low level effects, therefore, in line with UKWIR guidance no other options were not required to be included in the in-combination effects assessment.

11.289 Further details of the HRA are included in Appendix C.

WFD – Preferred Programme

11.290 One waterbody was assessed to have the potential for an increased risk of WFD deterioration due to the impacts of multiple options; this is water body GB40601G600900 Berkshire Downs Chalk. T2ST is likely to require dewatering, which could lead to temporary reduced groundwater levels in this water body (construction between 2038 and 2050). The Woods Farm option will involve a new abstraction borehole and installation of a new pipeline (bringing a DO benefit of 2.4Ml/d by 2030). Moulsford will involve drilling of new boreholes and a new abstraction licence (peak DO benefit of 3.5Ml/d by 2033). All of these options could therefore lead to reductions in groundwater levels (water balance) and could lead to a reduction in flow in surface water bodies supported by this groundwater body (cumulative peak DO benefit will be 5.9Ml/d). This water body already has a Poor status for qualitative dependent surface water body status so this could further exacerbate the issue. The environmental destination scenarios include closure of Bradfield and licence reduction at Pangbourne (reducing abstraction by 1.64Ml/d by 2030 and a further 5Ml/d by 2035 respectively) in this water body. These environmental destination reductions will help to reduce the cumulative impact of these options, and it is anticipated that with appropriate mitigation there would be no increased risk of deterioration. Further investigation will be undertaken (such as scenario modelling, hydroecology assessment etc) to confirm this.

11.291 Further details on the WFD assessments undertaken are available in Appendix D.

Natural Capital and Biodiversity Net Gain – Preferred Programme

11.292 Regarding Natural Capital, a number of natural capital stocks are likely to be temporarily and permanently impacted by the Preferred Programme in the absence of mitigation. The preferred programme is likely to generate the loss of natural capital stocks during construction of some supply options. Habitat is expected to be reinstated and/or compensated for to pre-construction conditions following best practice techniques, and therefore will likely have no permanent impact to the provision of ecosystem services. The unmitigated predicted permanent impact on the provision of ecosystem services for the Preferred Programme Non-SRO options is -£25,777.12 (overall change in value in £/year). This being said, via application of best practice mitigation the preferred programme presents an opportunity to improve existing habitats through post-construction remediation and replacement of low value habitats with higher value habitats. The planned BNG associated with options will also help support provision of ecosystem services. The plan crosses several Natural England Habitat Network Enhancement Zones and is therefore suitable for the planting of new high value habitats.

For the SROs, as part of the Gate 2 process additional site-specific information was used that led to different assumptions within the method for the assessment. Therefore, it was not comparable to add these into the Non-SRO cumulative effects assessment. The Teddington DRA scheme is likely to provide overall environmental benefits in relation to climate regulation, natural hazard regulation and agriculture ecosystem services. The estimated 30-year net present value (NPV) benefits are £219,311. For SESRO, in the absence of mitigation, disbenefits are seen for food production, air pollutant removal, and natural hazard regulation services. Details of planned mitigation are available in Appendix AA. SESRO has an overall positive impact on climate regulation, water purification, and recreation ecosystem service provision. The estimated change in present net value benefits of ecosystem service provision is £32m.

11.293 Regarding Biodiversity Net Gain (BNG), the Preferred Programme is expected to result in an unmitigated predicted 19.80% net loss of biodiversity units from Non-SRO options, as a result of most options generating a net loss of biodiversity as part of construction. It should be noted that the desk-based BNG assessments have been carried out using open-source data. Habitat identification will need to be refined at the project level with both habitat survey data and further development of habitat mitigation/enhancement proposals as the options progress through further development through to planning (as relevant) and delivery. The number of units required to achieve a 10% BNG is estimated at 786.394 for the Non-SRO options. However, several of the selected options fall within Local Planning Authorities (LPA) with a higher minimum BNG requirement including 20% and 30%. The BNG assessments have been updated to take into account the LPA requirements and assumptions around the BNG Metric trading rules. A BNG Strategy has been developed for the Preferred Programme options selected up to and including 2045. The BNG Strategy, included within Appendix AA, describes how we plan to deliver this gain following the mitigation hierarchy. The SROs used different BNG assumptions as part of the Gate 2 process as there was more site-specific information available on habitats, habitat condition and strategic significance (which affect assumptions made in the BNG Metric and the BNG units achieved). Therefore, it was not comparable to add these into the non-SRO cumulative effects. The mitigation required to achieve a minimum of 10% BNG was calculated for each SRO. The Teddington DRA SRO is estimated to provide a net increase of 2.37 habitat units and a net loss of -0.12 river units. Mitigation measures to enhance off-site sections of river will be required to deliver a minimum of 10% net gain, such as enhancing 1.8km of 'other river and stream' located outside the catchment. Enhancement may include the removal of structures within the watercourse to reduce the encroachment, planting, removal of invasive non-native species or restoration measures. Plans to deliver this gain will be further developed as part of the next stages of the RAPID gated process.

11.294 It is noted that for all sizes of SESRO the Woodland Trust Ancient Tree Inventory indicates that there are potentially veteran trees which are situated within the reservoir footprint. A bespoke mitigation and compensation strategy would therefore be required and would be designed to make a contribution to biodiversity that is considered proportionate to the nature and extent of the likely loss once this has been determined , and will be agreed with the relevant conservation bodies. This will not replace the habitat lost but can retain some of the local genetic material stock of ancient plants, soil biota and other attributes.

11.295 As the project will potentially result in the loss of veteran trees, which are categorised as irreplaceable habitat, the scheme cannot mitigate for their loss and compensation

cannot be provided on a 'like-for-like' basis or achieve overall negligible impact. However, the project will generate meaningful gains for other biodiversity features, such as neutral grassland, wet woodland and wetland areas.

11.296 SESRO (150Mm^3) is estimated to provide a net unit increase of habitat units equating to a net gain of 33.09%. As much of the baseline habitats will be lost to the reservoir, this significant net gain in biodiversity indicates that the replacement habitats and future landscape surrounding the reservoir will be more beneficial to biodiversity than the current landscape. This is because the habitats to be created, such as the ponds and wetland habitat mosaic, will provide habitat for a range of species from invertebrates and amphibians to riparian mammals and breeding and wintering birds. The species rich grassland habitats will attract birds and invertebrates and the woodland habitats will develop into highly biodiverse areas. SESRO will also result in a net unit loss of hedgerow units. Consequently, off-site compensation for the loss of these hedgerow units may be sought, and at a minimum, an additional 143 hedgerow units will need to be gained to achieve a ≥10% net. This will be undertaken within a location where hedgerows will improve ecological connectivity in landscapes nearby to the scheme impact. The current metric does not take account of any potential advanced planting of hedgerow and tree lines which is likely to occur in order to maintain connectivity across the site during construction. Opportunities for advanced planting will be discussed during further iterations of Abingdon Reservoir masterplan. SESRO is also estimated to provide a net unit increase of 70.26 river units (16.41% net gain). The more naturalised planform and enhanced connectivity of the river channel to wetland floodplain habitats will significantly improve the quality and natural functioning of the river compared to the artificial conditions present currently.

11.297 Further details on the NC and BNG assessments are available in Appendix AA.

Invasive Non-Native Species – Preferred Programme

11.298 The INNS in-combination effects assessment identified several combinations of options where raw water with potential for INNS transfer would be discharging to the same water bodies. In-combination effects were identified for the Abingdon to Farmoor and Duke's Cut to Farmoor options. Mitigation such as a water treatment works at Abingdon was discussed as part of the Level 2 assessments and would help reduce effects. In-combination effects were also identified for Oxford Canal to Duke's Cut, Duke's Cut to Farmoor, Abingdon to Farmoor and SESRO. These options relate to transfer of water around the network and it is likely that mitigation measures can be incorporated into the options design and through discussion with the Environment Agency to reduce risks. In-combination effects were also identified for the Duke's Cut to Farmoor and Medmenham Intake options, and the Duke's Cut to Farmoor and Teddington DRA options. However, given the distances between these options further investigation is likely to conclude no additional effects and therefore, mitigation is unlikely to be needed.

11.299 The Environment Agency SAI-RAT tool used for the assessment makes a number of recommendations for biosecurity mitigation measures which can be implemented to reduce effects. These can be found in Appendix BB. It is likely that mitigation measures are available which will reduce INNS transfer risk across the plan. These will be incorporated into option design as each option is progressed and discussed with the Environment Agency.

11.300 Further detail on the INNS assessments are available in Appendix BB.

In-combination Effects of our Preferred Programme with Other Plans and Programmes

11.301 In addition to WRMP24, Local Plan allocations, other major planning applications and projects along with other water company WRMP options could lead to the potential for in-combination effects to some receptors. The WFD in-combination effects assessment identified 14 water bodies where multiple options and other plans occur. The in-combination effect assessment indicated that only one of these water bodies (GB40601G604100: Chiltern Chalk Scarp) is at risk of further WFD deterioration due to the combination of options and planning projects. Further information on the implications of HS2 phase 1 on the waterbody would be required to quantify the in-combination effects on this water body. The HRA concluded that no in-combination effects on Habitats Sites are likely with other plans and programmes. The SEA identified potential negative cumulative effects on sensitive receptors relating to construction; in particular for objectives on Biodiversity, Soil, Landscape and Historic environment; all identified effects can likely be mitigated with best practice construction mitigation and the developments themselves will go through a design and planning process to develop their own mitigation.

Environmental Net Gain Provided by our Preferred Programme

11.302 The WRMP24 will deliver a number of environmental benefits.

11.303 Within our plan we have proposed reducing abstraction from our vulnerable chalk streams and other watercourses to improve flows and the habitats for fish and other wildlife. We plan to reduce abstraction to sustainable levels by 2050, and our preferred programme would involve taking over 500Ml/d less water from sensitive rivers and waterways.

11.304 Options such as demand management and maximising use of existing capacity within the network will have benefits to different elements of the environment such as biodiversity and water quality. This is achieved through leaving more water in the natural environment, helping to support terrestrial and aquatic habitats and species, water environments and the resilience of these environments to climate impacts such as drought conditions. These options also have benefits for climate, carbon and resource (materials) use by reducing the need for new supply side options.

11.305 Where new supply side options are required, the WRMP24 makes a commitment to achieving environmental net gain through delivery of BNG and provision of ecosystem services associated with habitat creation and enhancement, such as new woodland sequestrating carbon and reducing run-off rates.

11.306 We are committed to achieving a minimum BNG of 10% across our plan and for certain options this will be higher due to Local Planning Authority (LPA) requirements. We have developed a BNG strategy to guide delivery for the WRMP24; this strongly prioritises achieving effective BNG on-site where possible. Where this is not possible, we plan to deliver BNG within the same LPA as part of measures to enhance and connect existing wildlife areas, only delivering outside of these areas if delivery within the LPA is infeasible. Certain options within the WRMP24 such as SESRO will deliver substantial environmental and social benefits through multi-benefit design such as new landscaping and habitat creation, providing benefits and support for diverse local wildlife populations and recreational and health benefits for the community and visitors, and leaving a lasting positive legacy for the environment.

Environmental Assessments - Best Value Plan – Situations 1 and 8

11.307 Environmental Assessments were also undertaken for the Best Value Plan (BVP), Situations 1 and 8, as they are representative of the range of ways in which the eight other pathways for the Best Value Plan differ to Situation 4. These Situations encompass all of the options selected across the nine Best Value Plan pathways. Further details on all assessments for the Best Value Plan scenarios 1 and 8 are in the environmental appendices (Appendix B for SEA, Appendix C for HRA, Appendix D for WFD, Appendix AA for NC & BNG, Appendix BB for INNS).

SEA – Best Value Plan Situations 1 and 8

11.308 The outcomes of the SEA cumulative effects assessment for BVP Situations 1 and 8 were very similar to those for the Preferred Programme. Situation 8 has fewer supply side options and therefore, the magnitude of cumulative effects is smaller. Situation 1 includes Beckton desalination; we have considered the potential for this option to have cumulative effects on water quality and Habitats Sites with other water company desalination options, and given the location and size of other water company options proposed, we do not expect any cumulative effects to be present.

HRA – Best Value Plan Situations 1 and 8

11.309 Similar to the Preferred Programme, the HRA identified two options within the BVP Situation 1 with low effects that were therefore taken forward into the in-combination effects assessment. Although the AA concluded no adverse effects on site integrity (AESI) for these options alone, low level effects could combine to cause significant effects affecting site integrity and this was investigated through the in-combination effects assessment. Low effects on Cannock Extension Canal SAC were identified for the Oxford Canal to Duke's Cut option and low-level effects on Oxford Meadows SAC from the Duke's Cut to Farmoor option. The two options affect different Habitats Sites therefore, there are no in-combination effects. No other options in the BVP Situation 1 had low level effects therefore, in line with the UKWIR guidance, were not required to be included in the in-combination effects assessment. The BVP Situation 8 does not contain the two options mentioned above or any other options with low level effects, therefore, there will be no in-combination effects.

WFD – Best Value Plan Situations 1 and 8

11.310 When compared to the preferred programme, the cumulative effects assessment has not identified any additional water bodies at increased risk of WFD deterioration due to the combinations of options selected in BVP (Situation 1). The BVP (Situation 8) does not include any options not already considered in the core BVP (Situation 4) and therefore no new cumulative effects on any water bodies are anticipated.

Natural Capital and Biodiversity Net Gain – Best Value Plan Situations 1 and 8

11.311 Regarding Natural Capital, as with Preferred Programme, BVP Situations 1 and 8 will likely result in natural capital stocks being temporarily and permanently impacted in the absence of mitigation. The BVP Situations 1 and 8 are likely to generate the loss of natural capital stocks during construction of some supply options. Habitat is expected to be reinstated and/or compensated for to pre-construction conditions following best practice techniques and will likely have no permanent impact to the provision of ecosystem services. The unmitigated predicted permanent impact on the provision of ecosystem services for the BVP Situation 1 non-SRO options is -£41,050.53 (overall change in value in £/year) and for the BVP Situation 8 -£181.41. Via application of best

practice mitigation both Situations present an opportunity to improve the existing habitats through post-construction remediation and replacement of low value habitats with higher value habitats. The planned BNG associated with options will also help support provision of ecosystem services. The plan crosses several Natural England Habitat Network Enhancement Zones and is therefore suitable for the planting of new high value habitats. The SRO effects on natural capital are the same as for Situation 4.

11.312 Regarding Biodiversity Net Gain, the BVP Situation 1 is expected to result in an unmitigated predicted 19.28% (-509.95 net unit change) net loss of biodiversity units from Non-SRO options, as a result of most options generating a net loss of biodiversity during construction. The number of units required to achieve a 10% BNG for this programme is estimated at 774.426 for Non-SRO options. The BVP Situation 8 is expected to result in an unmitigated predicted -34.63% (-4.78 net unit change) net loss of biodiversity units from non-SRO options, as a result of most options generating a net loss of biodiversity during construction. The number of units required to achieve a 10% BNG is estimated at 6.16 for non-SRO options (the relatively small number is due to fewer options being included in Situation 8 resulting in a relatively small baseline amount compared to the other situations). The SRO effects are the same as for Situation 4 across both Situations 1 and 8.

INNS – Best Value Plan Situations 1 and 8

11.313 The INNS in-combination effects for Situation 1 are similar to Situation 4. Situation 8 contains fewer options with potential INNS risk interactions. Mitigation for these risks is again proposed within Appendix BB.

Costs and Carbon emissions

11.314 As part of our options appraisal, we have undertaken the most detailed cost and carbon emissions assessments for our options that we have ever undertaken in a WRMP. Details of methods used in these assessments can be found in Section 7 of our WRMP24. As with our environmental assessments, cost and carbon assessments are undertaken at a level of detail commensurate with option salience and maturity.

11.315 We have undertaken cost and emissions assessments at the option level, considering the embedded carbon and capital cost associated with construction of each option, and the operational carbon and costs that would be associated with each option's use. These option-level assessments have been used to appraise the overall costs and carbon emissions associated with plans and programmes of options. We have included the costs and emissions associated with the use of electricity, incorporating government guidance on the forecast decarbonisation of the grid to ensure that we do not unduly bias against options with a high need for electricity based on the emissions of today's electricity grid. Using the option-level emissions assessments, which identify the capital carbon emissions, fixed operational carbon emissions, and variable operational carbon emissions associated with the construction and use of each option, alongside the investment model which identifies when each option should be constructed, and how it should be used, we are able to identify the carbon emissions associated with our preferred programme as a whole.

11.316 We have also incorporated the social cost of carbon emissions into the programme cost that we consider when determining a programme's total Net Present Value (NPV) cost,

ensuring that externalities from carbon emissions are embedded within our economic decision-making processes.

11.317 The costs of, and carbon emissions associated with, our different options can be found in the WRMP tables. These tables incorporate a step-change in the level of detail in cost visibility compared to WRMP19.

11.318 The impact that our plan has on customers' bills is a key consideration when determining our preferred plan. The profile of bill impact associated with our preferred programme can be seen in Table 11-37, with the investment required shown in Table 11-38. It is important to note that bill impact calculation incorporates all expenditure that would go towards implementing actions identified in our preferred programme, but that this does not necessarily imply a commensurate increase in water bills. In their 2019 Price Review, Ofwat for the first time dictated to us that we could not raise water bills in order to reduce leakage, considering that it was part of the 'base' expenditure associated with operating our business. Ofwat will make a determination regarding expenditure that can be considered to deliver an 'enhancement' and expenditure that we should consider as 'base', and this balance will determine the increase in water bills that will be seen in the future.

	2026-30	2031-35	2036-40	2041-45	2046-50	2071-75
Demand Management (£)	12.50	15	40	60	85	85
Supply-side Schemes (£)	2.50	10	15	15	20	20
Total Cumulative Bill Impact, per year (£)	15	25	55	75	105	105

Table 11-37: Estimated Impact of Programme on Water Bills

Note: Bill impacts stated are cumulative, not additive (i.e, the values stated in the 2046-50 column are the estimated bill impact of the programme at that point, not the additional bill impact in that five-year period)[13]

Note: This is an estimated bill impact calculated assuming an asset life for each option and is not a forecast of actual bill increases. This bill impact calculation only accounts for increased investment set out in the WRMP, and other bill increases will be needed to support investment in other aspects of our business.

	AMP8	AMP9	AMP10	AMP11	AMP12
Capex (£m)	800	2500	2450	2000	2500
Opex (£m)	70	90	110	130	140

Table 11-38: Preferred Programme Cost, "Enhancement" Expenditure Only, Split into Capex (including land) and Opex, rounded to nearest £50m for capex and £10m for opex

Note: this table describes investment needed in each AMP and does not describe the cumulative investment required. This table details all investment required, including investment required to replace assets in new schemes.

[13] This table was not updated between rdWRMP24 and final WRMP24, as the changes between these plan iterations would not have a significant impact on bill impacts.

11.319 Table 11-39 shows the profile of carbon emissions from options that we would feature in our plan across the planning period. Table 11-40 shows the embodied carbon emissions associated with different options in our preferred plan. This table includes the need for 'repeat' emissions (the emissions associated with replacing sub-components of options, for example pumps, at the end of their designed asset life). Please note that the inclusion of 'repeat' emissions across the preferred programme means that a like-for-like comparison between options cannot be made based on this table (e.g. Teddington DRA features in the preferred programme from 2033 onwards, but SESRO from 2040 onwards). In order to compare the carbon emissions of options in a like-for-like way, please refer to our WRMP tables.

11.320 We, along with the rest of the water industry in England, will incorporate the emissions anticipated to arise from the WRMP into our net-zero pathway; our journey towards net-zero will support the delivery of the national and company-level overall net-zero target of 2050. In further developing options, we will investigate where the use of low-carbon materials or construction techniques may be feasible (discussed in more detail in Section 7 of our WRMP); further decarbonisation of construction materials/techniques will further help us and the UK to meet our net-zero commitments.

11.321 Planned interventions required to provide our statutory service to our customers have the potential to impact our greenhouse gas emissions. This may in turn have consequences for regional and national net-zero targets. We are committed to reducing our greenhouse gas emissions and will seek to minimise the carbon impact of our solutions wherever practicable. Some of our interventions, such as the reduction of leakage and per capita consumption, will result in a reduction in emissions as we treat less water, but to achieve this, there will be a capital carbon intervention such as mains rehabilitation, or metering. Other capital schemes, such as the supply schemes included in our WRMP, will result in emissions during construction. We will continue to report the operational and capital carbon emissions attributed to our investments as we report our progress towards Net Zero. Our decarbonisation plans for 2030 build on the work of the previous 10 years and include reducing the use of fossils fuels, improving energy and fuel efficiency and generating more renewable energy.

11.322 In the reporting year 2022/23, our net operational emissions (Scope 1 and 2 emissions as CO_2e and including outsourced Scope 3 emissions) were 321.9 kT CO_2e, while our total capital carbon emissions for the year 2022/23 were 423.9kT CO_2e. Noting that the figures in the Tables below are either for whole AMP (5-year) periods (Table 11-39), or for the whole 50-year planning period (Table 11-40), in the context of our overall operational emissions, those required to ensure a reliable supply of water is maintained are relatively small. In AMP8, the net operational emissions introduced by the new interventions in our WRMP will result in 0.015 kTCO_2e per annum (0.005% of our total current operational emissions), increasing to 2.3 kTCO_2e per annum (0.7% of our total current operational emission) by 2045-2050, with the operational emissions increasing as more new sources come online.. It can be seen that the capital emissions associated with the delivery of the WRMP (38kT CO_2e per annum in AMP8, c.60-70 kT CO2e per annum in the 2030s, and c.45-60 kT CO_2e per annum in the 2040s) are more significant, with these figures ranging from around 9-17% of our current capital carbon emissions. As such, measures to reduce the capital emissions associated with new options' construction, noting ongoing investigation by the SRO projects into low-carbon construction methods, are likely to yield the most benefit in ensuring achievement of total net-zero targets.

11.323 While carbon emissions will arise from the implementation of the WRMP, we note three factors. Firstly, as highlighted earlier, programmes which substitute the two largest supply-side options in our plan (Teddington DRA and SESRO) with alternatives would result in higher total emissions levels. Secondly, our plan ensures supply-demand balance is maintained subject to the requirements of national policy and guidance (e.g., ensuring compliance with statutory and regulatory requirements regarding required licence reductions, and ensuring that higher levels of drought resilience are achieved); meeting policy and guidance will require new interventions which result in emissions. Thirdly, the largest sources of carbon emissions in our plan are demand management interventions, with the primary carbon source being our mains rehabilitation programme; our demand management programmes have been designed in order to ensure achievement of government targets (e.g. 50% leakage reduction) and as such complying with policy is again driving emissions in our plan.

	AMP8	AMP9	AMP10	AMP11	AMP12	Total AMP8-12
Capital Emissions (tCO_2e)	190,344	352,270	312,714	223,787	295,027	1,374142
Operational Emissions (tCO_2e)	75	6,590	7,245	6,342	11,597	31,850
Total Emissions (tCO_2e)	190,420	358,860	319,959	230,129	306,623	1,405,991

Table 11-39: Emissions from Options in Thames Water Plan

Scheme	Capital Carbon	Operational Carbon	Total Emissions (tonnes CO_2e)	Scheme Yield / Capacity	Year First Used
Addington Groundwater Source	2,640	66	2,706	3	2028
Datchet GW Source DO Increase	2,412	84	2,496	2	2030
Dapdune Licence Disaggregation[14]	0	0	0	2	2030
Guildford WRZ Demand Management Programme	39,906	0	39,906	11	2026
Henley to SWOX Transfer	3,610	163	3,773	5	2040
Henley WRZ Demand Management Programme	8,535	0	8,535	1	2026
Kempton WTW Enhancement - 100 Ml/d	42,287	134,767	177,054	100	2040
Kennet Valley WRZ Demand Management Programme	45,116	0	45,116	12	2026
London WRZ Demand Management Programme	893,987	0	893,987	367	2026
Medmenham WTW and Intake	36,284	21,938	58,222	24	2050
Mortimer GW Source Recommissioning	1,913	66	1,978	5	2042
Moulsford Groundwater Source	2,093	27	2,120	2	2033
Oxford Canal	13,064	166	13,230	12	2040
Ring Main - New River Head Pump	439	524	963	-	2050
SESRO 150 Mm3	238,311	585	238,896	149	2040

[14] This scheme involves disaggregating the peak licences of our Dapdune and Ladymead sources, with few capital works required

Scheme	Capital Carbon	Operational Carbon	Total Emissions (tonnes CO_2e)	Scheme Yield / Capacity	Year First Used
SESRO to Farmoor Pipeline	13,323	454	13,778	24	2040
South East Water to Guildford Transfer	1,753	4	1,757	10	2050
Southfleet and Greenhithe	10,845	2,188	13,033	9	2030
SWA WRZ Demand Management Programme	83,022	0	83,022	14	2026
SWOX WRZ Demand Management Programme	137,129	0	137,129	37	2026
T2ST Spur to Kennet Valley WRZ (Speen)	178	0	178	10	2050
Teddington DRA	90,830	74,732	165,562	67	2033
Woods Farm DO Increase	2,666	225	2,891	2	2030
Didcot Licence Trade	0	0	0	23	2026
Horton Kirby ASR	10,673	357	11,030	5	2030
Total	**1,681,016**	**236,346**	**1,917,361**		

Table 11-40: Embodied Emissions from Schemes in the Preferred Programme, 2025-2075[15]

Please note that, for SESRO, as it is a shared option, the carbon emissions in the table above reflect an estimation of our share in the use of that option. As such, 55% of the emissions from SESRO and 55% of its DO benefit are stated in the table above. In the WRSE programme appraisal 100% of the carbon emissions have been taken into account, and the 55% proportion reflects the anticipated allocation to us for our WRMP reporting only.

Risks and uncertainties

11.324 Although we are confident that our preferred plan presents the best value solution to securing water supplies for our customers, and for the wider South East region, there are risks and uncertainties which we have evaluated, and which we will monitor through the implementation period of our plan. In line with the WRPG, these are described below:

Risk: Demand Management

11.325 Our plan incorporates nearly 140 Ml/d of company-level demand reduction during AMP8, in addition to 32 Ml/d of 'carry over' activity from AMP7, alongside 22 Ml/d of government-led activity delivered through the introduction of water labelling. In the longer-term, our plan involves 440 Ml/d of company-led demand reduction up to the year 2050, incorporating over 200 Ml/d of leakage reduction and over 240 Ml/d of household demand reduction. In addition to this company-led activity, in the expectation that the government will act to ensure that the 110 l/h/d target is met with the recognition that there is a limited range of activities which we can take to reduce household demand for water, we have assumed that over 300 Ml/d (24 l/h/d) of demand reduction will be brought about by societal change and government-led intervention.

[15] Estimated emissions from demand management interventions were not updated between the revised draft and final plan iterations, as the changes in the demand management plan were small and not related to the main emissions source in the demand management plan (mains rehabilitation)

11.326 While we have a significant degree of control over leakage, reducing leakage to a very low level and keeping it there would require us to rehabilitate a large proportion of our existing ageing network, which is currently vulnerable to climatic shocks.

11.327 The volume of demand reduction in our plan will require an unprecedented shift in society's priorities, will require significant support from government, and will be costly to implement. While we have based our company-led demand reduction programme on available evidence and reasonable assumptions, the lack of firm commitment from the government regarding policy changes to help meet the 110 l/h/d by 2050 target means that there is a significant risk that we may not see the reductions that we anticipate, a risk that was made clear when household consumption increased significantly during lockdown periods in 2020 and 2021, to levels that we did not expect.

11.328 In response to short-term risks around demand management we will extend our contract for licence trading with RWE (Didcot Power Station) in order to offset the risk of short-term under-achievement of demand management actions, and will invest in new sources of supply, which are planned to be available by 2030.

11.329 As is described in our monitoring plan, we have a mitigation plan for long-term risks and as such, while demand reduction does not represent a risk to the security of supply in the long-term, there is a risk that further investment will be necessary if policy changes are not implemented by the government over the next 10 years.

Risk: Capability of Thames Gateway Desalination Plant

11.330 The Thames Gateway desalination plant has faced a number of outage issues during recent years and was unavailable throughout 2022. The Gateway desalination plant presents a risk to our WRMP, as there is a forecast of WAFU delivered from the plant as outlined in Section 4 of our WRMP. If that WAFU is not available, then our supply-demand balance will deteriorate compared to the position we forecast. As such, it is important that we have a programme in place to manage this risk.

11.331 We have reviewed the condition, and have tested the capability, of the Gateway WTW desalination plant. Recently (in 2024), Gateway WTW has been tested into supply reaching 46 Ml/d. An ongoing programme of work will continue to improve the resilience of the plant to achieve a reliable 75Ml/d by 2030.A high-level plan for the Gateway WTW is shown in Figure 11 - 25. This plan gives the expected timing of the internal governance gates and of the development of Phase 3 of the delivery plan. A key milestone plan will be shared with the Environment Agency in June 2025. It is expected that this programme will primarily focus on planned maintenance over autumn and winter periods to ensure the plant is available should a drought occur.

11.332 We will continue to update the Environment Agency on developments to the key milestone plan through 2030, and will provide updates at the Annual Review and 6 monthly meetings.

11.333 Alongside having a programme to track the improvement in capability of the Gateway desalination plant, it is important that we are able to mitigate the risk should slippage in the programme occur. Our Monitoring Plan sets out actions which we could take if our demand management programme is not as successful in reducing demand as we forecast (see sub-section, Adaptive Plan: Demand Management). The same actions set out in that adaptive plan could be adopted if our maintenance programme for Gateway WTW falls behind schedule.

	2024	2024/25		2025/26		2026/27		2027/28		2028/29		2029/30	
Gateway WTW - High Level plan to 2030 (pre Stage Gate process)	spring / summer	autumn/winter	spring / summer	autumn/winter	spring / summer	autumn/winter	spring / summer	autumn/winter	spring / summer	autumn/winter	spring / summer	autumn/winter	spring / summer
Phase 2 Delivery (H&S)	Test	MCC's; Drip tray and undercroft drainage.	Test & Standby chiller	Chemical Dosing Rigs and Lines; UF Clean System	Test	Chemical Dosing Rigs and Lines ; UF Clean system	Test		Test		Test		Test
Phase 3 Design		Stage Gate 0	**Detailed Milestone Plan**	Stage Gate 1	Milestone plan review	Stage Gate 2	Milestone plan review & Stage Gate 3		Milestone plan review		Milestone plan review	Stage Gate 4	
Phase 3 Delivery (Reliable 75)						Delivery Stage 1 - Detailed design		Delivery Stage 2		Delivery Stage 3		Stage 4 inc Plant Commissioning	
Note:													
1) Spring / summer left free for potential drought risk, therefore work aimed at delivering in autumn / winter months.													
2) Splitting delivery will lengthen the time for overall delivery.													
3) Phase 3 detailed milestone plan in June 2025. This will confirm key stages of delivery for Phase 3: Stage 1 to 4 across the various processes of the plant.													
4) This timeline does not show the delivery path for new RO membranes to meet Reg 31.													
5) A site test is planned to be carried out each year.													
6) This programme assumes that any dry weather event / site outages in London do not effect delivery progress.													
7) Stage Gates: These are internal gates that control all capital projects within Thames Water, allowing the project to progress to the next stage. SG0: Describe Need; SG1: Design for contract; SG2 Let contract/release main funding; SG3: Proceed to site; SG4: Commissioning/Handover to Ops.													

Figure 11 - 25: Gateway WTW High Level Programme

Risk: Obtaining planning consent

11.334 Our plan includes the development of SESRO by 2040, and the Teddington DRA by the early 2030s. The SESRO scheme has a lead time of approximately 15 years and the Teddington DRA has a lead time such that 2033 is the earliest delivery date that we can be confident in (both including the time taken to acquire planning consent). As such, we must proceed with consenting these options.

11.335 As such, it is critical that our WRMP24 is robust and properly evidenced, and finalised in a timely manner, in order that the "need" for these schemes, both of which are nationally significant infrastructure projects (meaning they need to go through the Development Consent Order process to be consented), is properly established - as stated in Section 1.4.5 of the National Policy Statement for Water Resources Infrastructure[16], which would allow us to continue with confidence into the Development Content Order process.

11.336 As is detailed in the monitoring plan, we have a back-up option for both schemes, to mitigate the security of supply risk associated with the denial of consent.

11.337 The Environment Agency has raised concerns regarding certain aspects of the environmental feasibility of the Teddington DRA scheme, particularly in relation to potential fisheries impacts from temperature and velocity changes. While our consideration is that these concerns will be able to be overcome, they have not yet been fully addressed, and as such present some risk within the consenting process. It will be for the Planning Inspectorate and Secretary of State to examine the evidence in our application and make a decision on whether to grant or refuse development consent. Further environmental feasibility issues may be identified as the scheme progresses into the DCO process and as such, as with any consenting application, there is a risk that the scheme may not be able to proceed. In relation to mitigation measures, while environmental assessments which have been undertaken have concluded that, with best practice mitigation measures, environmental concerns should be surmountable, as is normal for a scheme at this stage in development, detailed mitigation measures have not yet been agreed. While this is usual for the strategic planning stage of the WRMP,

[16] Department for Environment, Food & Rural Affairs, 2023, National Policy Statement for Water Resources Infrastructure, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1150075/E02879931_National_Policy_Statement_for_Water_Resources.pdf

this nonetheless presents a risk which must be acknowledged. We will continue to review the viability of the Teddington option as we progress more detailed investigations into mitigation measures and will continue to work on actions raised through RAPID's gated process.

Risk: WRZ integrity under severe environmental destination scenarios

11.338 We have considered the supply-demand balance implications of an environmental destination scenario which would mean that EFIs across the Thames catchment are achieved. Due to the scale of licence reductions in these scenarios, and the complex networks within our WRZs, it has not been possible to assess whether WRZ integrity (see Appendix A for further details) would be maintained under all severe scenarios of future licence reduction. WRZ integrity is achieved when all customers in a WRZ experience the same level of risk of failure; this is generally achieved through interconnected networks which mean that customers can be supplied from different sources. Severe licence reductions implemented across a WRZ could, however, result in these networks needing to be significantly modified to ensure that all customers remain in supply, in addition to new water resources schemes being necessary to maintain supply-demand balance. While we would not alter our plan for new water resources investments that we would make if we found that WRZ integrity would be compromised, if we find that the combination of licence reductions that need to be made result in loss of integrity for our existing WRZs, we could need to resort to additional network solutions which may not have been incorporated into our WRMP24, meaning that an additional burden of cost would be placed on customer bills.

11.339 The current Environmental Destination guidance sets out that licence reductions should be made by 2050. If sufficient time is available between when licence reductions are confirmed and when they are expected to be implemented, we will be able to respond and maintain WRZ integrity. Should timescales be too short for us to plan and implement network solution then we would face WRZ integrity issues.

Risk: Re-assessment of option costs and benefits

11.340 As we continue the option development process and undertake more detailed design of options, we may find that cost and benefit estimates for the options within our plan change. We have also seen changes to our mains rehabilitation costs due to increasing inflationary effects in recent years.

11.341 However, our consideration is that these risks have been minimised in our plan due to the inclusion of "optimism bias" (an allowance made to reflect cost uncertainty) and due to the many years' worth of cost estimations that have been undertaken for many of the schemes in our plan.

Risk: Lower Thames Abstraction Issues and the River Thames Scheme

11.342 During the 2022 drought event, we were not able to abstract as much water as our water resources modelling indicated should have been possible. The need to maintain levels for navigation in some sections of the River Thames meant that we had to switch off pumps in the reach of the Thames between Windsor and Weybridge. This meant that some of our larger reservoirs, which abstract from this reach, reached low levels. Our reservoirs which abstract from points on the River Thames below Weybridge, after the confluence of the River Wey with the River Thames, and those in the Lee Valley, were largely full and as such we were unable to abstract the surplus water available below the confluence with the Wey. This meant that more water was left over Teddington Weir than

is expected during a drought period, with around 500 Ml/d going over the weir compared to expected flows of 300 Ml/d.

11.343 In the past we have been able to abstract volumes of water which are in line with our hydrological modelling, with a 300 Ml/d Teddington flow (or less) having been achieved for extended periods in 1921, 1934, 1976, and 1990. There is a risk that something may have changed over recent years which could mean that our supply capability during drought conditions may be less than we currently think.

11.344 Exacerbating this risk is the proposed flood alleviation scheme being developed by the Environment Agency and Surrey County Council, the River Thames Scheme[17]. This scheme, the Development Consent Order submission for which is due to be submitted in 2024 and which would be constructed by 2030, would involve the construction of new channels in the Lower Thames which would take water from the Thames above the confluence with the Wey and divert it to a point below this confluence. This would clearly exacerbate the issues experienced in 2022, with the potential flow required in these channels during dry periods being around 170 Ml/d.

11.345 Our response to this risk is described in more detail in the Monitoring Plan section below, but it broadly involves:

- Learning: We have begun a programme of learning and modelling to identify the magnitude of issues which may exist. We will also identify the extent to which the River Thames Scheme may create or exacerbate issues
- Solutioneering and options development: We have also begun a programme of option identification and development, whereby we will design solutions which will create greater connectivity in our raw water abstraction network to solve problems, should they exist
- Making the right decisions: We have explored the implications of the issues which may exist within our programme appraisal and investment modelling and have established preferred and alternative solutions, as is set out in the monitoring plan. We have confirmed that, regardless of whether an additional intervention is required to overcome these issues, our plan is the Best Value solution
- Taking action: If we identify that a solution is required, our proactive options development will mean that we will be in a position to progress towards implementation

Uncertainty: Acceleration and changes in policy ambitions.

11.346 We have seen increasing policy ambitions from government, promoting greater protection for the environment and resilience for customers, which we support. Our plan is based on policy ambitions as we know them today, and while it is adaptive, it is nonetheless based on scenarios of 'known unknowns', rather than 'unknown unknowns'. Should new policy ambitions emerge, or our existing policy position be required to change leading to a further need for water, we may need to adapt our plan to account for the change.

11.347 We consider policy changes as an uncertainty, rather than a risk, because we have seen the Environment Agency and Ofwat generally looking to implement policies in the longer-term, allowing our plans to adapt, rather than rushing policies through to implementation on a short timescale. The exception to this is the recent introduction of the 'licence capping' policy, where the policy was finalised 2022 with the expectation that we would

[17] https://www.riverthamesscheme.org.uk/

plan for implementation by 2030. While the timescale between policy finalisation and the expected date of implementation is short, Environment Agency colleagues have been helpful and pragmatic in setting out expectations and making allowances for licence reductions that would be feasible and infeasible on such a short timescale.

Uncertainty: Population Growth, Environmental Destination and Climate Change

11.348 The uncertainties of population growth, environmental destination and climate change have all been considered within our adaptive planning framework. These are the major planning uncertainties that we face in the future. Our adaptive planning approach means that our plan will be resilient and efficient under a range of plausible scenarios of all three of these factors, but we will need to monitor and respond to changes that we see. As noted in our programme appraisal, these are the factors which are considered within our adaptive planning framework, but there are other risks and uncertainties to our supply-demand balance that we will need to consider alongside these.

Uncertainty: West Berkshire Groundwater Scheme

11.349 Water supply under drought conditions in our Kennet Valley WRZ is particularly dependent on the availability of the West Berkshire Groundwater Scheme. Our London WRZ also depends to a significant degree on water supplied through this scheme.

11.350 The WBGWS is made up of a large number of boreholes which are owned, maintained and operated by the Environment Agency. In drought conditions the WBGWS is used to abstract water from a number of chalk aquifers and augment river flows.

11.351 During AMP8 we will be undertaking a programme of collaborative investigation with the Environment Agency into the long-term feasibility of continued use of the WBGWS. Alongside this we will look to investigate the potential for amendment to the operating triggers for WBGWS such that the scheme can continue to be effective.

11.352 The Environment Agency have indicated that they will look to keep the WBGWS in operation until 2060, but have stated that this is subject to “future policy changes (e.g., long-term sustainability of river support schemes in relation to climate change)”. As such, it is important that our plan is resilient to the potential closure of this scheme after 2060, and perhaps before.

11.353 After discussion with the Environment Agency, and as a result of representations raised on our dWRMP24, we have explored whether our plan would be impacted by closure of the WBGWS in 2040, 2050, or 2060. Our plan, and in particular the selection of the 150 Mm^3 SESRO scheme, mitigates the risk which is posed.

Uncertainty: New Supply Schemes Proposed in Draft Determination.

11.354 In the Draft Determination on our PR24 business plan, Ofwat allocated funding for the delivery of 18 Ml/d of new supply-side schemes in AMP8. We are supportive of delivery of additional resilience through new supplies. We intend to accept the additional allowance and associated commitments in our response to the Draft Determination and have included proposed schemes to make up this 18 Ml/d in our final WRMP24.

11.355 We have identified potential options for the 18 Ml/d of new supply schemes by bringing forward schemes already selected in the rdWRMP24 from later in the planning period, or in another branch of the adaptive plan. This ensures that each option will have the necessary technical assessments and the proposed options will be consistent with options selected in the regional plan solution. We have reviewed our plan-level in-

combination and cumulative environmental assessments, and these have not been impacted by the changes.

11.356 However, having been planned for later in the planning period, these schemes have not been subject to the same degree of more detailed investigation as those planned for the beginning of our planning period, and so bring an element of uncertainty. We will conduct further environmental assessments and more detailed design scoping for the proposed options which have been brought forward to further increase the confidence in the environmental feasibility and costs of the proposed options. We will carry out a wider review of the potential feasible options to identify alternatives should the more detailed work for the proposed solutions identify that large cost uplifts or environmental feasibility issues exist. Note that these alternatives may not have been in our preferred plan, and so would themselves be the subject of the required environmental assessments. Review of the plan-level assessments may also be needed.

11.357 We will keep in regular contact with the Environment Agency regarding the progress of investigations into preferred and alternative solutions. If necessary, we will substitute proposed options with alternative options in our delivery plan and report this in our WRMP Annual Reviews.

Monitoring Plan

11.358 We will maintain a system of proactive monitoring and reporting to enable us to track progress, manage risk and adapt our plans where required. This system of monitoring and reporting is set out in this Monitoring Plan which explains how we will:

- Monitor how our plan evolves over time using key water resource metrics.
- Evaluate how effectively our planned programme is being implemented and whether there are any gaps between planned and achieved results.
- Adapt our plan to manage risks to the supply demand balance.

11.359 We will use the existing WRMP Annual Review to review the progress with the Monitoring Plan. In addition, we will provide six-monthly reporting to government and regulators. We will provide distribution input data by water resource zone monthly to the Environment Agency. Additional information regarding key water resources metrics will be provided at a granularity and frequency agreed.

11.360 We will continue to report progress through our Water Resources Forum and associated stakeholder meetings. In addition, we will submit quarterly progress reports to the Regulators' Alliance for Progressing Infrastructure Development (RAPID) relating to the work programme associated with investigations of the SROs.

11.361 Our proactive work with WRSE, as well as RAPID, will ensure our work programme is aligned with neighbouring water companies as well as those further afield who are working with us to investigate and develop the SROs. We will report the outcomes of our monitoring plan into WRSE, to inform the regional monitoring plan.

Short term vs long term risks

11.362 This monitoring plan sets out how we will manage both the short-term and longer-term risks in our plan. By short-term, we refer to risks which materialise prior to the divergence of adaptive plan supply-demand balance pathways in 2035. This timescale is considered both due to the inclusion of adaptive supply-demand balance pathways in our plan from 2035, and because solution development for medium to large solutions takes approximately 5-10 years. There are risks which we are facing in the short-term (e.g., reducing leakage from 620 Ml/d in 2022-23 to 417 Ml/d in 2029-30, or by around a third), and those which are of more relevance for the long-term (e.g., reducing PCC to 110 l/h/d by 2050 and the resultant c.300 Ml/d supply-demand reduction which we are relying on the government to implement).

11.363 There being risks of relevance for the long-term and short-term is also aligned with the decisions we need to make, i.e., determining the supply option that should provide new supplies for the early 2030s (relatively short-term), the option we should develop to provide new supplies for 2040 (a decision which we must make now, considering long-term risks), and whether additional supplies are required in the future (a decision which we do not need to make now, but which factors into the decisions which we are making now). As such, some aspects of our monitoring plan are focussed more on the short-term decisions we need to make, while other aspects are more focussed on long-term resilience.

11.364 In the short-term, the focus is on reacting to new information, updating our plan and ensuring that short-term risks are managed. In addition, we need to track the consenting of the SRO options.

11.365 In the longer-term, we need to assess delivery, appraise new information and respond if required. The aim here is to identify whether additional investment beyond our preferred programme is required to ensure resilient supplies.

11.366 There is a clear link between our adaptive plan, in which we will develop different solutions according to different combinations of factors which influence our supply-demand balance, and our monitoring plan, in which we identify and set out the metrics which we will monitor and how we will use these metrics to inform decisions.

11.367 The use of the monitoring plan to both trigger actions to counter the emergence of risks and to assess the supply-demand balance pathway which is followed in relation to those considered within our adaptive plan is in line with the Supplementary Guidance on Adaptive Planning[18]. Consideration of this guidance has informed the development of our monitoring plan and our adaptive plan overall.

Water Resources Metrics

11.368 The metrics we propose to track as part of our on-going monitoring are summarised in Table 11-41, including aspects which track past progress and aspects where we will track current delivery plans (labelled "forecast" below). Both past performance and forecasts are important in monitoring and adapting. Table 11-41We have summarised how and when each metric is tracked and reported externally; we willbe tracking and monitoring these metrics more frequently internally (for example, there is very frequent monitoring of leakage undertaken internally, and this monitoring is used to tailor delivery plans). Table 11-41

Assessment Area	Metric(s)	How and when metric is tracked and reported externally
Leakage	Past progress: - Outturn Leakage (Ml/d) - Dry year uplifted leakage (Ml/d)	Reported in the Annual Review and six-monthly review, with more frequent reporting potentially required.
	Forecast: - Updated leakage reduction plan	If leakage reduction is significantly off track in a WRZ, production of a revised leakage plan at WRZ level may be necessary.
Company-led consumption reduction	Past progress: - PCC (l/h/d) - Meter and water efficiency activity delivery - Measures reduction in usage following meter and water efficiency activity	Reported in the Annual Review, with more frequent reporting potentially required.
	Forecast: - Updated meter delivery programme	If meter delivery is significantly different to the plan, production of a revised metering plan may be necessary.
Government Action on consumption reduction	Past progress: - Water labelling policy implemented - Measures effectiveness of water labelling policy	Track policy implementation and calculate benefits at the appropriate time

[18] Environment Agency, 2020, Water resources planning guideline supplementary guidance – Adaptive planning

Assessment Area	Metric(s)	How and when metric is tracked and reported externally
	Forecast: - Commitment to future policy changes	We will track commitments to future policy changes which will improve water efficiency
Distribution Input	Past progress: - Outturn DI (Ml/d) - Dry year uplifted DI (Ml/d)	Reported monthly to the Environment Agency, and in the 6-monthly update and Annual Review If DI is off track, such that a supply-demand balance problem may result, additional options may need to be considered
	Forecast: - Forecast DI (Ml/d)	Distribution Input will be re-forecast as part of WRMP29.
Population	Past progress: - Measured population (000s)	Reported in the Annual Review
	Forecast: - Population forecasts - Water resources planning guideline policy	Population will be re-forecast as part of WRMP29. This will take account of revised local plans and other population growth forecasts, alongside any updates to policy/guidance.
Environmental Destination	Past progress: - Abstraction reduction scheme implementation and benefits	Progress will be reported via the WINEP reporting process. The effectiveness of sustainability reductions will inform the forecast of future reductions needed.
	Forecast: - Investigation outcomes, leading to per-AMP reductions confirmed	As investigations are carried out and more data is gathered, prioritisation will be carried out. Taking account of updated policy and guidelines, forecasts of licence reductions will be included in WRMP29. Investigation progress communicated with the EA, and summarised in WRMP Annual Review
Climate Change	Past progress: - Global temperature (°C)	Forecasts in WRMP29 will account for updates in the interim.
	Forecast: - Updated UKCP forecasts - Water resources planning guideline	WRMP29 will include new information (if available) and will follow any updates to the WRPG.
Gateway desalination plant	Past progress: - Capability identified through use/testing (Ml/d)	Progress reports provided to the Environment Agency
	Forecast: - Maintenance and improvement plan	Progress reports provided to the Environment Agency
SRO Consenting and Delivery	Past progress: - Progress through RAPID programme and into DCO process	Reported through RAPID process – meetings, quarterly updates and Gated documentation
	Forecast: - Delivery timescales - Feasibility	Reported through RAPID process – meetings, quarterly updates and Gated documentation
	Past progress:	Annual Review

Assessment Area	Metric(s)	How and when metric is tracked and reported externally
Supply-demand balance	- Supply-demand balance (Ml/d)	
	Forecast: - Supply-demand balance forecast (Ml/d)	Updated forecasts produced for WRMP29.
Lower Thames	Past progress: - Findings from investigations - River Thames Scheme progress through DCO	Reporting on investigations circulated with Environment Agency River Thames Scheme progress reported by the project team Updates includes in Annual Review and 6-month review
	Forecast: - River Thames Scheme – go/no-go and timing	River Thames Scheme progress reported by the project team Updates includes in Annual Review and 6-month review

Table 11-41: Monitoring Plan Metrics

Evaluating progress using metrics

11.369 As we move into the future, our monitoring plan metrics will be used to evaluate progress against our plan and guide decisions where specific adaptations may be required. Table 11-42highlights the key decisions which will be needed between now and our next WRMP, when decisions will be made, and the metrics and threshold which will influence them.

When?	Metric(s)	Threshold	Decision
Annual Review 2025	Leakage and leakage forecast	Leakage under-delivery threatens forecast supply-demand balance*	Trigger additional adaptive plan measures (see Adaptive Plan: demand management monitoring plan)
Annual Review 2025 and six-monthly reporting	Lower Thames findings and River Thames Scheme progress	New solution needed and feasible	Proceed with solution development (see Adaptive Plan: Lower Thames)
		New solution needed but not feasible - Deployable Output of London WRZ reduced	Revisit aspects of WRMP24. See Adaptive Plan: Lower Thames[19]
Until c.2026	Teddington DRA Environmental Assessment	Option found to be not environmentally promotable due to environmental impacts which cannot be mitigated	Adopt alternative plan (see Adaptive Plan: Teddington DRA)

[19] Please note that, as stated in our response to Issue 1.7, our consideration regarding the River Thames Scheme is that it is unlikely that the scheme would be consented if it is found that it has a negative impact on our water resources which cannot be mitigated. We do, however, acknowledge that there is a risk.

When?	Metric(s)	Threshold	Decision
2025-28 (i.e., before next WRMP)	PCC, leakage, DI	Distribution input is higher than was planned, and threatens forecast supply-demand balance*	Trigger additional adaptive plan measures (see Adaptive Plan: demand management)
2025-28 (i.e., before next WRMP)	Gateway desalination plant progress and plan	Plant not able to deliver 75 Ml/d reliably	Either further investment in plant required in AMP8 or AMP9, or new supply sources needed in WRMP29. Possible that aspects of WRMP24 may need to be revisited.
2025-27 (i.e., before next WRMP)	Teddington consent	Consent not granted, or infeasibility identified, or not deemed environmentally promotable	Adopt alternative plan (see Adaptive Plan: Teddington DRA monitoring plan)
2025-28 (i.e., before next WRMP)	SESRO consent	Consent not granted, or infeasibility identified, or not deemed environmentally promotable	Adopt alternative plan (see Adaptive plan: SESRO)
2027-28 (next WRMP)	Water labelling policy and commitment to further action	Water labelling not implemented, or is ineffective	Trigger additional adaptive plan measures (see Adaptive Plan: demand management monitoring plan)
	WINEP Investigations and evidence from licence reduction implementation	Licence reduction scenario updated/confirmed	Follow adaptive plan pathway which aligns most closely
	Climate change and WRPG	Climate change impact forecasts and/or guidance updated and scenarios change the expected outcome	Follow adaptive plan pathway which aligns most closely
	Climate change and WRPG	WRPG changed to require greater consideration of climate change impacts on demand	Update climate change uplift methodology
	PCC and PCC forecast Leakage and leakage forecast Population and population forecast WINEP investigations and Environmental Destination Forecast SESRO progress	Licence reductions confirmed, SESRO consent confirmed, and combined supply-demand balance impact indicates surplus available*	Accelerate licence reductions to 2040 (see Adaptive plan: accelerated licence reductions)

When?	Metric(s)	Threshold	Decision
	PCC and PCC forecast Leakage and leakage forecast Population and population forecast WINEP investigations and Environmental Destination Forecast	Combined supply-demand balance impact indicates additional new resources are required*	Identify Best Value Plan considering increased scale of need
2032-33 (WRMP34)	WINEP Investigations and evidence from licence reduction implementation	Licence reduction scenario updated/confirmed	Follow adaptive plan pathway which aligns most closely
	Commitment to future water efficiency measures	No or limited further action on water efficiency by government*	Identify whether additional supply-side solutions are required
	PCC and PCC forecast Leakage and leakage forecast Population and population forecast WINEP investigations and Environmental Destination Forecast SESRO Consent	Licence reductions confirmed, SESRO delivery progressed, and combined supply-demand balance impact indicates surplus available	Accelerate licence reductions to 2045 (see Adaptive plan: accelerated licence reductions)

Table 11-42: Monitoring Plan Metrics and Thresholds

* Threshold value dependent on other factors which influence the supply-demand balance. When identifying the threshold value, we will follow the principles of the WRSE monitoring plan approach, which will use available headroom and target headroom to identify whether action is needed.

Adapting our plan

11.370 We have identified 5 key decisions for which specific adaptations to our plan may be required. These are:

- Does the short-term success of demand management indicate that secure supplies will be ensured without additional intervention?
- Lower Thames – is an engineering intervention needed, and is such an intervention feasible?
- Teddington DRA – is the option environmentally promotable and is consent granted?
- SESRO – is consent granted?
- Could confirmed licence reductions be accelerated?

11.371 These decisions are all focussed on factors which could cause us to divert from our preferred plan. In addition to these discrete decisions, we will link our monitoring plan to our adaptive plan in the longer term. Rather than causing us to divert from our preferred plan, our monitoring plan for the longer term will help us to identify the adaptive pathway from our plan which we are following most closely.

11.372 In the following sub-sections we highlight the adaptive plan decisions which would be made according to these discrete decisions, and then discuss our monitoring for the longer term and the link to our adaptive pathways.

Adaptive plan: Demand Management

11.373 In the short-term, much of our planned supply-demand balance improvement is reliant on demand-side interventions. Factors such as the weather can significantly impact the success of our demand management interventions, and so there is a level of risk in the short term.

11.374 As an example, in 2022/23, a combination of drought and freeze-thaw conditions led our leakage levels to increase sharply. The high level of leakage that resulted meant that a significant amount of leakage reduction was necessary within the remainder of the AMP7 (2020-2025) period for us to achieve our forecast starting position for WRMP24.

11.375 While demand-side risks exist in relation to both leakage reduction and consumption reduction, in order to identify the level of supply-demand balance risk in our plan, as a representative high-risk scenario, we identified from our revised draft plan the supply-demand balance for AMP8 and AMP9 in each of our WRZs under a scenario in which 50% of our planned leakage reduction is achieved from 2022/23 onwards[20]. This scenario is unlikely but helps us to understand the magnitude of the risk and when it could materialise. Table 11-43 shows the supply-demand balance in our London and SWOX WRZs under this scenario. All other WRZs indicate significant surplus and so are not included here.

Zone/Scenario	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35
London	2.7	-2.7	-7.4	-13.7	-43.9	-38.3	-35.7	-87.3	-70.9	-68.7
SWOX DYAA	18.6	16.4	15.2	13.6	11.5	13.6	12.6	-2.2	2.8	5.0
SWOX DYCP	9.5	6.6	4.9	3.2	1.6	3.3	1.9	-10.5	-7.6	-7.9

Table 11-43: SDB impacts of a scenario in which only 50% of planned leakage reduction is achieved

11.376 The analysis suggests that there would be risks in the London WRZ from early in the planning period. These risks are small through the beginning of AMP8, but increase in magnitude by 2030 and beyond. Supply-demand balance risk in the SWOX WRZ is unlikely to materialise until after 2032, which gives us more time to respond. Risks escalate as we look to increase our level of service to a 1 in 200-year level. Other WRZs have a higher level of surplus and so are not as sensitive to the delivery of our demand management programme.

[20] Please note that, while the leakage reduction profile included in the rdWRMP24 is relatively smooth, factors in our WRMP forecasts mean that the supply-demand balance forecasts are not smooth. The significant changes in the supply-demand balance forecast are: 2029-30 (London only) sustainability reduction at NNRW sources, 25 Ml/d; 2032-33 move to 1 in 200-year resilience level.

11.377 Note that, in considering these risks, we have not considered risks in London beyond 2033, as our adaptive plan solution (Beckton Water Recycling) mitigates this risk (see Adaptive Plan: Teddington DRA).

11.378 Reflecting on these risks, alongside recent resilience issues experienced in the Guildford WRZ, we have identified additional adaptive plan measures which could be investigated and/or adopted to manage our supply demand risk. As is noted, there is uncertainty surrounding some of these options; some would not be needed in our preferred plan scenario and so are not "low regret", while others would result in negative environmental impacts. As such, these options are not adopted as part of our Best Value Plan.

11.379 These options are listed in a decreasing order of preference. Separate tables are included for the London, SWOX and Guildford WRZs, and options in these WRZs would be considered according to the supply-demand balance risk which materialises (or is forecast). Before we adopt any of these options, we will (as discussed elsewhere in the monitoring plan) consider the other factors which contribute to our supply-demand balance, for example population growth and any change in uncertainty levels.

11.380 This range of solutions demonstrates that, should risks materialise in the short-term, we will be able to respond to ensure supply-demand balance. However, our overriding priority is to achieve the demand reduction plan as set out in our preferred plan, as these alternative options involve some element of risk and are not considered low-regret.

Option	Estimated DO Benefit (Ml/d)	Lead Time	Reason Option Not Considered/Included in WRMP24 preferred programme
Delivery of Merton Groundwater Scheme	2	2 years	Lead time of 2 years, supply-demand balance position does not necessitate delivery in preferred plan scenario
Delivery of Honor Oak Groundwater Scheme(s)	1.7+1.4 = 3.1	3-8 years	Lead time of 3 and 5 years respectively, supply-demand balance position does not necessitate delivery in preferred plan scenario
Cancel Cockfosters and Perivale BSAs	15	3 months	Affinity Water resilience impacted
Mecana pre-treatment	TBC	Several years	DO Benefit uncertainty
Re-prioritisation of meter delivery to London WRZ	<20	<1 year	Would involve reducing metering delivery in other WRZs
Re-prioritisation of leakage reduction to London WRZ	<20	<1 year	Would involve reducing leakage delivery in other WRZs. Likely to incur additional cost.
Focus on outage resulting in a reduction in outage allowance	10-20	<1 year	Low level of confidence in delivery, and so high risk for customers
EA LTOA changes – enhanced maintenance of weirs	TBC	<1 year	Not within TW control

Option	Estimated DO Benefit (Ml/d)	Lead Time	Reason Option Not Considered/Included in WRMP24 preferred programme
and/or reduced navigation			
Media campaigns further enhanced	0-50	0	Low level of confidence in Ml/d benefits. Preferred plan already relies on demand reductions during drought events
Delay North Orpington GW source abstraction reduction	9	<1 year	Environmental and compliance impacts
Delay NNRW/New Gauge licence reductions	25	<1 year	Environmental and compliance impacts
Inclusion of Lower Thames drought permit options (TTF of 200/100/0 Ml/d) in supply-demand balance	50-100	<1 year	Environmental impacts. Low level of confidence in delivery.
Inclusion of "More before Level 4" demand-side restrictions	TBC	<1 year	Level of Service change
Temporarily lower level of service (1 in 50-year chance of L4 restrictions)	120	<1 year	Customers not protected from drought risk. Level of service change.

Table 11-44: Adaptive plan options for London WRZ to mitigate risks around demand management

Option	Estimated DO Benefit (Ml/d)	Lead time	Reason Option Not Considered/Included in WRMP24 preferred programme
Moulsford Groundwater Option – pull delivery timescale forward	2	3 years	Not needed until 2030s if preferred plan delivered.
Focus on outage resulting in a reduction in outage allowance	1-2	<1 year	Low level of confidence in delivery, and so high risk for customers
Re-prioritisation of meter delivery to SWOX WRZ	1-2	<1 year	Would involve reducing metering delivery in other WRZs
Re-prioritisation of leakage reduction to SWOX WRZ	<5	<1 year	Would involve reducing leakage delivery in other WRZs. Likely to incur additional cost.

Option	Estimated DO Benefit (Ml/d)	Lead time	Reason Option Not Considered/Included in WRMP24 preferred programme
Inclusion of Farmoor drought permit in supply-demand balance calculation	35	<1 year	Uncertain benefit, as granting of permit not certain, and operational issues may inhibit benefit
Inclusion of "More before Level 4" demand-side restrictions	TBC	<1 year	Level of Service change
Temporarily lower level of service (1 in 50-year chance of L4 restrictions)	10	<1 year	Customers not protected from drought risk. Level of service change.

Table 11-45: Adaptive plan options for SWOX WRZ to mitigate risks around demand

Option	Estimated DO Benefit (Ml/d)	Lead Time	Reason Option Not Considered/Included in WRMP24 preferred programme
Investigate agreement with Affinity Water to temporarily or permanently cease Ladymead export	2.3	< 1 year	Impacts Affinity Water resilience
Investigate new import from SES Water (Reigate to Guildford)	5	5 years	5-year lead time. Not needed in preferred plan scenario for supply-demand balance.
Focus on outage resulting in a reduction in outage allowance	<0.5	<1 year	Low level of confidence in delivery, and so high risk for customers
Re-prioritisation of meter delivery to Guildford WRZ	<0.5	<1 year	Would involve reducing metering delivery in other WRZs
Re-prioritisation of leakage reduction to Guildford WRZ	<0.5	<1 year	Would involve reducing leakage delivery in other WRZs. Likely to incur additional cost.
Investigate combination of Shalford WTW expansion alongside licence increase	>5	TBC	Long lead time. Unlikely that licence would be granted.

Table 11-46: Adaptive plan options for Guildford WRZ to mitigate risks around demand

11.381 In monitoring the success of our demand management programmes and other short-term risks in our plan, we will, in line with the WRSE Regional Group, adopt headroom (both reported and forecast) as the metric which will identify whether these additional measures are required. If our actual headroom falls below, or is forecast to fall below,

target headroom, then we will need to act. Combining reported and forecast headroom is important because, as highlighted above, some actions can take several years to implement.

11.382 Headroom is a good measure to use in our monitoring plan as it factors in all of the uncertain elements of our plan, both on the supply-side and demand-side. As an example, if PCC does not fall in line with expectations but population does not rise in line with forecasts, then we need to consider the balance of these two things to work out whether action is needed to ensure the security of supply. Our forecast of headroom takes into account uncertainty around future population growth and consumption and so factors both of these elements.

11.383 The Figures below demonstrate how reported and forecast headroom will be used to trigger action. These are taken from the WRSE Regional monitoring plan, and other WRSE companies will be adopting the same approach.

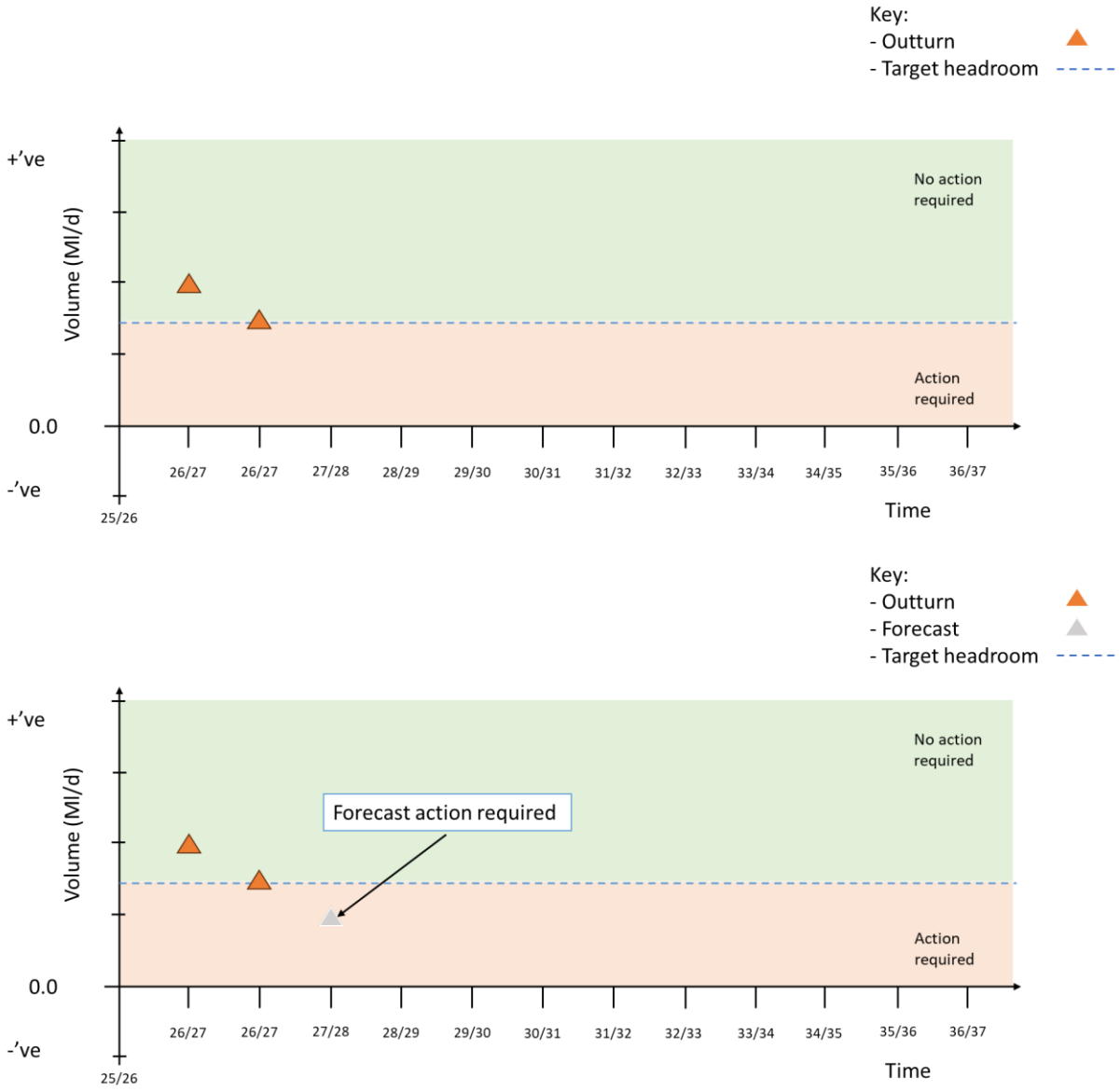

Figure 11-26: WRSE Monitoring Plan Thresholds

Adaptive plan: Lower Thames

11.384 This component of the adaptive plan involves learning and monitoring and covers the period from now until we can confidently determine whether a solution is needed to maintain our currently stated Deployable Output for the London WRZ, accounting both for issues identified in the 2022 drought (see Appendix CC) and any exacerbation of these issues caused by the River Thames Scheme, without resorting to emergency measures such as backpumping. This stage of the monitoring plan is required because, subject to the outcome of these investigations, Teddington DRA (our preferred solution) could be found not to be promotable. As such, this adaptive plan and the Teddington DRA adaptive plan are linked.

11.385 Our current schedule for the Teddington DRA scheme involves submission of a DCO application by mid-2026 for the scheme to be operational by Q1 2033. As such, our aim is to have this monitoring plan check completed in time to allow alignment with the consenting schedule. We anticipate that this will be around the time of our AR25 submission. The 2033 date is driven by the need to have new supplies to provide a 1 in 200-year level of resilience for our customers. The date of 2033 is a company target, not a statutory target. We have established through sensitivity testing that Teddington DRA remains our preferred solution, even if we delay this date up to 2035. As such, if this monitoring plan check is not complete by late 2025 we may delay our consent application and would accordingly delay our anticipated date for achievement of 1 in 200-year resilience, but would not alter our option selection.

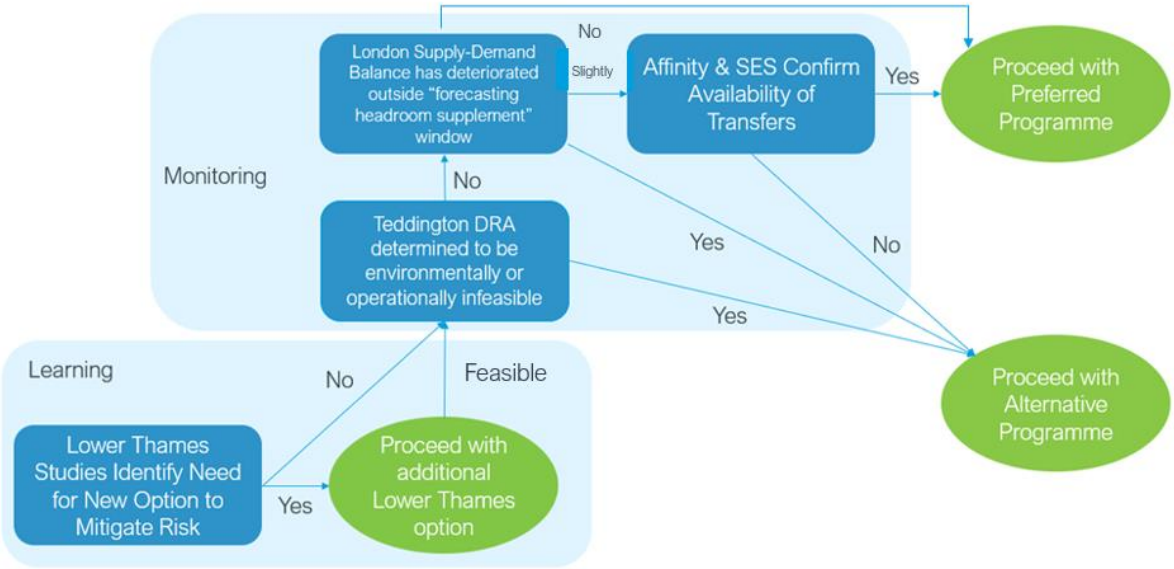

Figure 11-27: Monitoring Plan, Lower Thames and Teddington DRA Triggers

11.386 The learning involves investigation, research, and modelling to determine: whether there are constraints on our abstraction which we do not currently capture within our water resources modelling; whether the River Thames Scheme (a flood alleviation scheme being developed by the Environment Agency and Surrey County Council) will exacerbate these constraints; and whether these constraints can be mitigated by operational changes by Thames Water and/or the Environment Agency, or if engineering interventions are necessary to remove these constraints.

11.387 If engineering interventions are necessary, then an options appraisal process, which will run in parallel to the problem identification process, will determine the preferred option for mitigating the risks which are identified. We will proceed with the development of the preferred option(s) subject to feasibility assessment and appropriate funding being in place.

11.388 We have confirmed, through sensitivity testing, that the Teddington DRA scheme remains the best option to provide 1 in 200-year resilience if constraints on the River Thames do not exist or exist but are mitigable through operational changes (either of these would be our preferred plan), or are found to exist but are mitigable by an engineering solution. If, however, we identify that constraints on our Lower Thames abstractions exist or will be created by the River Thames Scheme, and that an engineering solution is infeasible, we will need to revisit the decision made regarding option selection for the early part of the WRMP24 planning period (up to 2033).

11.389 We have commissioned two studies to investigate issues on the Lower Thames, including the River Thames Scheme. These are known as the "Lower Thames Study" (better understanding the role that river levels play in abstraction management on the Lower Thames), and "Abstraction Options Development" (Finding and developing solutions to problems which are identified in the Lower Thames Study). The Abstraction Options Development project will identify and screen options. Options considered in this study include new pipelines/tunnels, new abstraction points, refurbishing or increasing the capacity of abstraction points, making changes at pumping stations (e.g., introducing new or smaller pumps, or introducing variable speed drives on existing pumps), improving connections with water treatment works, and new digital tools to optimise operational efficiency. We will report on the progress of these projects through our Annual Review and 6-monthly review processes, and ensure that our regulators are updated on both projects as they progress.

Adaptive plan: Teddington DRA

11.390 The outcome of the monitoring to inform the adaptive plan for the Lower Thames will identify whether a new option is needed to mitigate issues around our Lower Thames abstractions, and whether such an option would be feasible. At this point, we will consider the following three checks which will determine whether we will adopt our preferred or alternative programme for the short-term. We anticipate that this will be around the time of our AR25 submission.

11.391 Our alternative programme substitutes the Teddington DRA option with an alternative Water Recycling scheme (Beckton or Mogden). Both Beckton and Mogden Water Recycling options are significantly more expensive and create greater environmental impacts than Teddington DRA (relying on membrane treatment and involving the construction of long tunnels), but are modular and could, over time, be scaled up to a 300 or 150 Ml/d recycling plants respectively (the chosen Teddington DRA size is, by contrast, 75 Ml/d). The modularity of the other Water Recycling plants means that they could be scaled up should it be found that additional water is needed in the short to medium term. The 150 Mm3 SESRO option is our preferred option for delivering long-term security of supply, regardless of whether we adopt a Water Recycling option or the Teddington DRA, and so both our preferred and alternative plans for this monitoring phase include the SESRO 150 Mm3 scheme. We will continue to progress the development of the Beckton and Mogden Water Recycling Schemes as part of the Strategic Resource Options process overseen by RAPID. This gated assessment

process will ensure that all options remain available and are developed at a suitable pace should an alternative for the current preferred option (Teddington DRA) be required.

11.392 The first monitoring check is whether ongoing environmental and operational investigations (carried out by the SRO team as part of the EIA or other assessments) have determined that the Teddington DRA is not environmentally (or otherwise) promotable. If the Teddington DRA has been found not to be promotable, we will adopt our alternative plan and undertake monitoring checks two and three to determine the scale of the Recycling option required.

11.393 The second monitoring check is whether the central forecast of our supply-demand balance trajectory for the early- to mid-2030s indicates that we are outside the "forecasting headroom supplement" envelope in the London WRZ.

11.394 We undertake a Target Headroom forecast to ensure that we leave an appropriate buffer to account for future risks. Our Target Headroom allowance for the short- to medium-term future is larger than the 'base year' (the year in which we undertake the assessment) because forecasting forward is more uncertain than making assessments of the current situation. It is not the case that we would anticipate having a headroom allowance as large as the forecast target headroom in future years, and we would instead expect to have a headroom allowance approximately equal to the 'base year' allowance when we assess our security of supply at a point in the future.

11.395 We have split our Target Headroom forecast into a 'base year' allowance and a 'forecasting supplement' (Figure below). At the point at which we undertake our monitoring checks, we will adjust our WRMP24 final plan supply-demand balance trajectory to account for the major short-term uncertainties in our plan, which are: the overall distribution input at the point in the future when we undertake the monitoring checks; our forecast leakage, informed by the success of our leakage reduction plan for the rest of AMP7; our forecast household consumption, informed by the success of our PCC reduction plan which includes the need for Government interventions and updates to population forecasts; our forecast of the availability and capability of the gateway desalination plant, and; amendments made to our baseline supply capability following assessment of feasible abstraction in the Lower Thames.

11.396 If we find that the combination of these factors leads to a deterioration in our supply-demand balance of more than the "forecasting supplement" in the early- to mid-2030s, then we will appraise whether we should adopt additional small solutions alongside the Teddington DRA scheme, adopt our alternative plan (a different water recycling option), or develop an additional water recycling option alongside Teddington DRA. This approach is aligned with the WRSE regional monitoring plan, which uses available headroom and target headroom to judge whether additional interventions are needed.

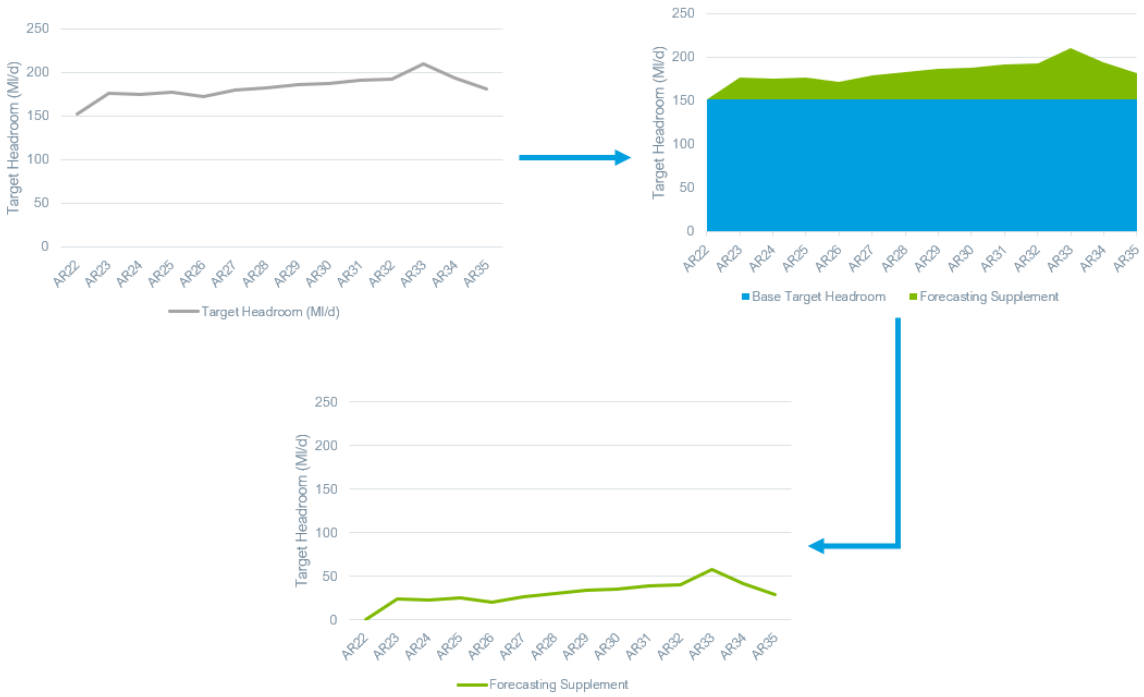

Figure 11-28: Forecasting Headroom Supplement Calculation

11.397 The third monitoring check to be undertaken will be that, if it is needed (according to the headroom check), the licence transfer option from Affinity Water (or an alternative transfer option, from SES Water) is needed and available according to the best current information. This transfer was included in our revised draft WRMP24, but has not been included in our final WRMP24 as it is dependent on Affinity achieving their demand reduction goals and gaining consent and successfully developing the Grand Union Canal SRO. We have retained the Affinity Water transfer as an adaptive solution which could be used subject to need and availability. If the supply-demand balance indicates it is needed, if the Affinity Water (or SES water) transfer has been identified as being unavailable or significantly delayed, we will appraise whether alternative/additional options are needed and available and adopt small solutions, an alternative recycling option or an additional recycling option as necessary.

11.398 If we find that all three monitoring checks are passed, then we will proceed with our preferred programme.

Adaptive Plan: SESRO

11.399 This adaptive plan concerns the SESRO development consent order. We have identified that the 150 Mm3 SESRO scheme is the best value option to provide long-term resilience for our customers' supplies and for improving the environment. The 150 Mm3 scheme, being the largest single-phase option which we can develop, also offers the greatest supply-demand balance benefit and so its selection as the best value option should proceed regardless of change in our forecast supply-demand balance resulting from the issues noted as short-term risks (e.g., achievement of demand management targets in the short term, Gateway desalination plant capability). Should the 150 Mm3 SESRO be found to be infeasible or be denied consent we should seek consent for and develop an alternative SESRO size (the largest feasible size), and if SESRO is denied

consent overall we will switch to our alternative plan and proceed with development and consenting of an alternative option, most likely the Severn Thames Transfer SRO.

Adaptive plan: Accelerated Licence Reductions

11.400 Our preferred plan includes the development of the 150 Mm3 SESRO scheme by 2040. A significant reason for adopting the larger SESRO option is that it ensures resilience against the range of risks which we may encounter in the future. However, an additional benefit of our preferred plan is that, should these risks not emerge, there would be surplus available in the 2040s which could enable the delivery of licence reductions ahead of the 2050 date.

11.401 We have phased the delivery of our Environmental Destination Scenario between 2030 and 2050 so that we can identify and programme a coherent overall solution when considering new water resources and new infrastructure, rather than applying a piecemeal approach where reductions are accelerated in certain locations. The process of investigation, design and solution implementation is important and will take time when considering the scale of infrastructure (both new water resources and new network infrastructure) which is necessary.

11.402 In Section 5 of our WRMP we have identified those licence reductions which are currently scheduled for delivery in 2050, but which could be accelerated if surplus is available, if investigations confirm that they are necessary and if network solutions can be developed to the required timescales.

11.403 We will adopt the following strategy to bring together the evidence which is gathered through our WINEP investigations, our forecast of the supply-demand balance (accounting for the success of, and remaining risks relating to PCC and leakage reduction, alongside other risks referenced in our Monitoring Plan), and our learning regarding network solutions which will be required to enable licence reductions. This strategy involves 5 phases: monitor; forecast; develop; review; and implement. Adopting this strategy may allow us to deliver environmental benefit earlier than is scheduled, while ensuring resilience and efficiency.

11.404 This strategy will be implemented over the continuous learning and development process of the next two WINEP and WRMP cycles. The strategy is shown as a flow chart below.

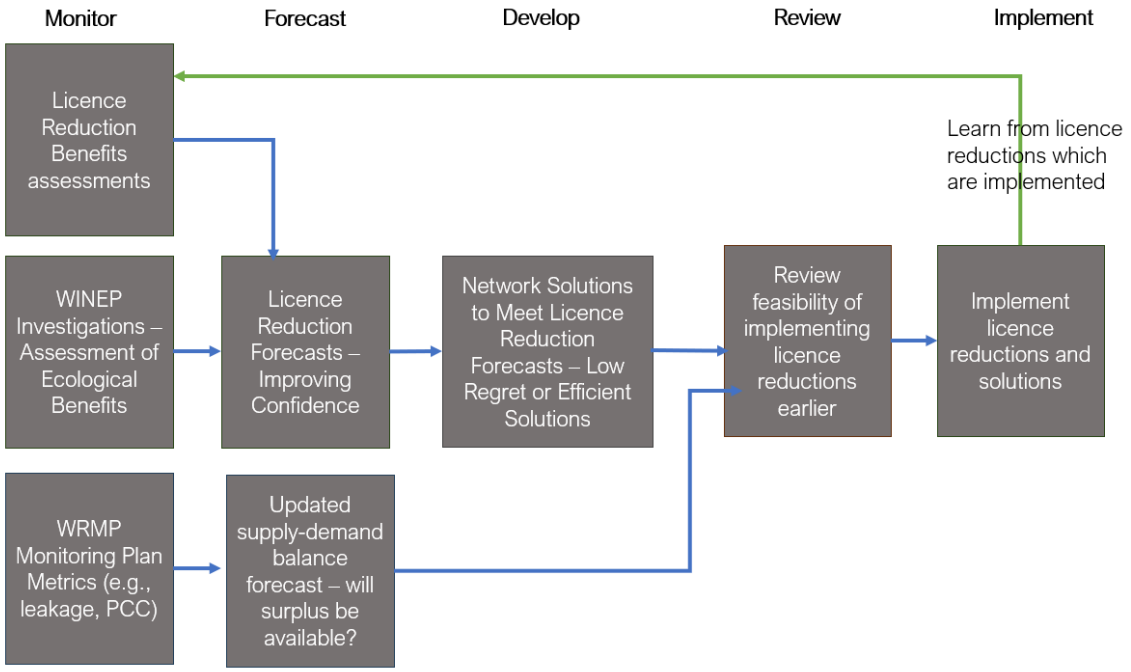

Figure 11-29: WINEP Monitoring Plan

11.405 As is described in Section 5 of the WRMP, we have identified that licence reductions could be accelerated ahead of 2050 at the following source groups, subject to the outcomes of this review process:

- London – Sundridge and Westerham
- London – New Gauge & NNRW
- SWOX – Cotswolds

11.406 Reviews would be undertaken following AMP8 and AMP9 WINEP investigations, and following monitoring and re-forecasting of our supply-demand balance as we move towards WRMP29 and WRMP34.

11.407 If the monitoring and investigations are complete and the sustainability reductions confirmed in AMP8 and if our forecasts show that, subject to continued success in demand management, surplus is likely to be available, then we would accelerate the design of network solutions required to enable these licence reductions (where relevant) and would look to deliver them between 2040 and 2045. The same process will be undertaken in AMP9, and if a positive outcome is found then these reductions would be made between 2045 and 2050.

Adaptive Planning – Longer term

11.408 In our long-term planning, decisions which we make will always necessarily be based on a combination of observations and forecasts (with these forecasts being informed by regulatory guidance). This is because the large supply-side interventions which we can implement will take of the order of at least 10 years to develop, and so we must forecast ahead to highlight when investment is needed. This is particularly important when considering climate change impacts, as the impacts of climate change on drought risk to date are only observable through detailed climate modelling (i.e., they are not directly

observable), and observable thresholds (e.g. total emissions or temperature rise) correlate poorly with drought risk outcomes (see WRMP24 Appendix U).

11.409 In addition, the overall supply-demand balance is clearly influenced by multiple factors. When determining whether investment is required, we must consider the cumulative impact of different factors. As such, we should consider risks in the round when making investment decisions.

11.410 In Table 11-47, we have identified the principal factors which we will monitor (aligned with the earlier "metrics" table). For each factor, we have identified representative scenarios of outcomes which could occur, a 2027-28 indicator value (2027-28 being five years from the submission of our rdWRMP24, and so being around the likely date for publication of our WRMP29), and the impact on our supply-demand balance in 2040 if this scenario were to be realised.

11.411 Table 11-47 demonstrates that combinations of different factors could lead to very similar outcomes for our overall supply-demand balance. For example, a future in which we follow our preferred plan, but the government does not implement policy beyond water labelling and West Berkshire groundwater scheme is forecast to be unavailable from 2040 (total 2040 SDB change = -173 Ml/d) gives approximately the same overall impact as a future in which we follow our preferred plan, but our leakage reduction plan is only 50% as effective as we would like and the Gateway desalination plant is decommissioned (total 2040 SDB change = -164 Ml/d).

11.412 Through our annual review process we will track and report on these indicators, and will track progress towards the stated 2027-28 indicator values to give an idea of the likely future scenario we are facing. Our tracking will indicate whether we need to make interventions in addition to the selected SROs.

11.413 It is notable that many of the future scenarios listed would result in supply-demand balance detriment, which reflects the ambitious, policy-driven targets for demand management (e.g., there is a larger chance of under-delivery than over-delivery of PCC reduction).

11.414 As can be seen in Table 11-47, the single largest supply-demand change that we could experience would be if the Environment Agency were to confirm sustainability reductions being required in accordance with the High scenario, with the delivery date accelerated to 2040. In this scenario, we would need to develop additional new resources.

11.415 A benefit of our preferred plan is that, in the 2040s, there exists a surplus of resource (note that this surplus does not exist from 2050 onwards), meaning that we could absorb some scenarios of adverse supply-demand balance impact without needing to resort to additional resource development in the medium-term. The surplus from the 150 Mm3 SESRO and 75 Ml/d Teddington DRA together would be around 190 Ml/d in 2040, 140 Ml/d in 2045, and 0 Ml/d in 2050. By 2050, resource from the 150 Mm3 SESRO and 75 Ml/d Teddington DRA would be fully utilised or very nearly fully utilised, meaning that no/little excess capacity would exist. The resilience to future medium-term risks but long-term efficiency is a clear benefit of our preferred programme and demonstrates that the schemes presented are an adaptable, efficient solution to the planning problem with which we are faced.

11.416 With the shorter-term elements of our monitoring plan ensuring delivery of the required supplies up to 2035, our long-term monitoring plan's main focus is the period 2035

onwards. Tracking of indicators will highlight whether, for example, additional intervention is needed to reduce leakage more quickly, whether tariffs should be introduced earlier, or whether additional supply options (small or large) may be required during this period. We will, however, of course ensure sufficiency of supply is forecast for 2040 and will respond if required.

Assessment Area	Monitoring Activity and metric	Range of scenarios	2027-28 indicator	2040 Supply-Demand Balance Impact, Compared to "Situation 4" (positive = SDB improvement), Ml/d
Leakage reduction	Leakage, Ml/d	50% success	531	-116
		75% success	493	-58
		100% success	456	0
		50% reduction by 2040	<430, and innovative solutions identified	+43.5
Company-led consumption reduction	DYAA PCC, l/h/d	50% effective	138	-85
		75% effective	137	-43
		100% effective	135	0
Government action on demand reduction	Policy Commitment	Apathy	Water labelling implemented, no further commitment	-96
		Moderate	Water labelling implemented, commitment to minimum standards on white goods in 2030	-73
		Preferred plan	Water labelling implemented, commitment to minimum standards on white goods in 2030 and indication that buildings regulations changes will be made	0
Population	Population (000's) and guidance	Low demand & guidance changes	Growth follows ONS trajectory, guidance changes to require ONS forecast use	+159
		Low demand	Growth follows ONS trajectory, guidance still requires forecast using local authority plan	+89
		Preferred plan	Growth follows Local Plan Trajectory	0
Environmental Destination	Investigation indications and policy	High, accelerated	Investigations confirm reductions necessary, policy changes to accelerate all reductions to 2040	-372
		High	Investigations indicate all reductions necessary	0
		Medium	Investigations indicate medium scenario likely	+56
		Low	Investigations indicate low scenario likely	+56
Climate Change	Latest forecasts and guidance	Low	Forecasts and guidance suggest low scenario appropriate	+87
		Medium	Forecasts and guidance suggest medium scenario appropriate	+40

Assessment Area	Monitoring Activity and metric	Range of scenarios	2027-28 indicator	2040 Supply-Demand Balance Impact, Compared to "Situation 4" (positive = SDB improvement), Ml/d
		High	Forecasts and guidance suggest high scenario appropriate	0
		X High	Forecasts and guidance suggest impacts higher than high scenario	-75
West Berkshire Groundwater Scheme	EA communication and policy	Available 2040	Scheme likely to be available in 2040	0
		Unavailable 2040	Scheme likely to be decommissioned by 2040	-77
Gateway desalination plant	Site capability and reliability	75 Ml/d reliable	50 Ml/d reliable. Good progress towards 75 Ml/d	0
		50 Ml/d reliable	50 Ml/d possibly reliable, but indication that 75 Ml/d unlikely	-8
		Decommission	Indication that plant will be decommissioned	-48
Supply-demand balance	Supply-demand balance, DI, and WAFU, in Ml/d	Better than forecast	Surpluses larger than forecast	Dependent on combination of factors above
		Preferred plan	Supply-demand balance	0
		Worse than forecast	Deficits in some zones	Dependent on combination of factors above

Table 11-47: Longer-term monitoring plan - metrics and impacts[21]

WRMP29: Reconciliation Exercise

11.417 The final step in our monitoring plan will be undertaken when we produce WRMP29. At this point we will undertake a reconciliation exercise of our supply-demand balance trajectories against those included in WRMP24. This exercise will exclude changes in guidance introduced in the interim but will include consideration of the direction of travel for key drivers, alongside whether actions have been completed and whether these actions have resulted in the outcomes which we anticipated. We will reconcile our forecast supply-demand balance position in order to indicate the supply-demand balance trajectory that we look most likely to follow in order to indicate, based on current (WRMP24) guidance, the decisions that our WRMP24 would trigger us to make, as well as making an estimate of the outstanding uncertainty, and so comparing the envelope of forecasts that we would consider according to WRMP24 guidance. This will allow us to explain the impact of changes in policy and guidance made between WRMP24 and WRMP29. The factors considered and key questions which will be answered are listed in the Table below.

Factor	Factors Considered	Metric(s)
Leakage	Have we achieved our leakage reduction targets?	Ml/d
Meter installations and water efficiency	Have we met our targets for water meter installations and water efficiency visits? Have we seen the usage reductions we anticipated?	000's l/h/d
Population growth	How does population and the number of properties compare with our forecasts?	000's

[21] Note: most values are taken from analysis of our rdWRMP24 supply-demand balance trajectory

Factor	Factors Considered	Metric(s)
Low-flow investigations	Do low-flow investigations carried out suggest that the "High", "Medium", or "Low" forecast is most likely?	Ml/d
Licence reductions – monitoring	Does our post-implementation of monitoring of licence reductions made suggest that they are effective in delivering ecological gain?	Qualitative/ quantitative discussion
Water labelling	Has water labelling been implemented? Has research shown that this introduction has been effective?	Yes/no l/h/d
White Goods – Minimum Standards	Have minimum standards on white goods been adopted?	Yes/no
Changes to buildings regulations	Will buildings regulations be updated to promote greater water efficiency?	Yes/no
Desalination plant availability	How well have we performed in our maintenance programme? What is our forecast for the plant's capability?	Update Ml/d
Climate change – demand	Have new climate change forecasts been released? Does observed and forecast warming indicate that we should alter our demand uplift approach?	Yes/no Ml/d
Climate change – supply	Have new climate change forecasts been released? If yes, do the revised forecasts alter our view of likely impacts?	Yes/no Ml/d
SRO	Have we obtained development consent for the SROs in our plan?	Yes/no

Table 11-48: WRMP29 Reconciliation – Factors Considered

Aligning our Monitoring Plan with the WRSE Regional Monitoring Plan

11.418 As described in the Adaptive Plan sections above (demand management and Teddington DRA), our monitoring plan makes use of target headroom, both reported and forecast. This is in line with the approach being taken by the WRSE Regional Group.

11.419 The WRSE Regional Group's monitoring plan will track the delivery of all companies' preferred plans. This includes the delivery of new water resource schemes, consumption reduction and leakage reduction. If adequate progress is not being made to address the projected deficit, then WRSE will be able to take a regional and coherent view regarding action which is needed.

11.420 In the revised WRSE Regional monitoring plan, WRSE has highlighted the metrics which will be monitored. These metrics align with those of our own monitoring plan, and so we will report our metrics into WRSE.

11.421 WRSE has included the Table below in the regional monitoring plan. As can be seen, this aligns well with the factors which we have described which could bring a change to our WRMP.

Factors which could change the regional plan	Key issues to be monitored and resolved where possible
Environmental ambition	WRSE has worked with the EA and Natural England to develop the existing environmental ambition profiles, and to incorporate licence capping. The profiles will need to be reviewed to ensure they meet policy expectations, particularly regarding licence capping and the results of ongoing WINEP and environmental investigations.
Quantifying environmental benefits	WRSE will continue to work with our member companies, regulators and catchment partners to better understand schemes and ecological benefits from environmental ambition.
Demand side options	TUBs and NEUBs have been included in the regional plan as one of the measures to meet the challenges ahead. The default regional position is that this will remain the case unless there is feedback to change this policy position. WRSE have tested several different Government water efficiency policies. Government Policy C+ brings the region to 110 l/p/d by 2050 in a dry year, but this puts a lot of onus on Government to deliver a significant component of the plan. This will require careful monitoring as the plan progresses to review Government commitments.
Supply side options	Uncertainties relating to supply side schemes will be monitored and resolved where possible. Key schemes to monitor include SESRO, GUC, Hampshire Water Transfer and Water Recycling, and Teddington DRA. Drought orders and permits continue to be selected in the regional plan until 2040, however WRSE will monitor regulatory positioning on the continued use of drought orders and permits and adjust our approach accordingly. WRSE has investigated accelerated cessation of the use of drought orders and permits (2035) as well as delayed cessation (2045 and 2050). WRSE will continue to work with the All Company Working Group (ACWG) and the National Advisory Unit (NAU) to look at emerging substances relating to reuse and water recycling schemes and compliance with the Water Framework Directive.
Carbon reduction	We will monitor the cost of carbon and mitigation options.
Future environmental policies	WRSE will continue to work with Government and regulators throughout the regional planning process to inform and support resolution of outstanding environmental policy uncertainties.
Regional reconciliation	There will need to be further regional reconciliation to ensure consistency is maintained between the regions in future.
Multi-sector options	WRSE will continue to engage with stakeholders and multi-sector groups to improve our understanding of non-public water supply demand forecasts, potential multi-sector options, and impacts on non-public water supply sources from droughts and licence capping.
Drought resilience	We have tested several different implementation timescales for 1:500 year drought resilience timing. Unless there is a strong consultation response or regulatory direction, the default WRSE position is 2040 for achieving 1:500 year drought resilience.

Table 11-49: WRSE Monitoring Plan

Summary – What is our plan, and why have we selected it?

11.422 In this section we have presented our preferred Best Value plan, and preferred programme. We now summarise the key parts of our plan and the decisions that we have made.

11.423 Our plan reflects the revised Regional Plan, with the only difference between our plan and the regional plan being that we have included seven small options in addition to the WRSE Regional Plan in AMP8 to mitigate risk, with several of these having been as a result of direction from our regulators.

Demand Management

11.424 Demand management is the most important component of our WRMP24. If we deliver our demand management programme during the rest of AMP7 and deliver the programme we have set out for AMP8, then we will achieve a supply-demand balance in all WRZs up to the year 2030.

11.425 Our company-led demand management programme is ambitious but achievable. It includes significant reductions in leakage, and a range of actions which encourage and help our customers to use less water. The demand reductions that we have set out in our company-led plan are based on evidence of achievable reduction and include a reasonable allowance for demand reductions from future innovations. In accordance with the Water Resources Planning Guideline and government policy, our preferred programme includes demand management measures which are predicted to reduce average PCC to 110 l/h/d by 2050. The constraints on measures over which we have control mean that, if the 110 l/h/d target is to be achieved, we must assume that the government will take decisive action to reduce household consumption. Our assumption is that the government will introduce measures which will, in aggregate, reduce average PCC by 24 l/h/d by 2050. We anticipate that these measures will include the introduction of water labelling of white goods, the introduction of minimum standards on white goods and changes to buildings regulations.

11.426 We have set out a leakage reduction programme which would see us achieve the target of 50% leakage reduction, compared to 2017-18 levels, by 2050. Our programme begins by focussing on the most cost-effective actions, such as using smart meter data to identify leaks, transitioning to a programme of mains rehabilitation in the longer-term in the expectation that developments in technology will mean that a major mains rehabilitation programme will become more affordable in the future. Focussing on cost-effective interventions early in the programme will minimise the bill impact of our programme in the near-term.

11.427 Our company-led house consumption reduction programme is centred on household metering and water efficiency programmes in the shorter-term, and includes the introduction of tariffs when a sufficiently large proportion of our customer population are metered to allow tariffs to be equitably introduced.

11.428 There is a risk that the government may not take the action required to allow the 110 l/h/d per capita consumption target to be achieved. If the target is missed then we may need to invest in additional supply-side solutions beyond those detailed in our preferred programme.

Teddington DRA

11.429 We have a need for new water resources to be developed for use from the early 2030s onwards, in order that we can increase the resilience of our customers' supplies to drought events to a level at which we would not need to impose emergency restrictions more often than once every two hundred years.

11.430 The Teddington DRA scheme is the best value option for us to move to 1 in 200-year resilience by the early 2030s, being an option which is deliverable in a short timescale, would deliver a sufficient volume of water to improve our London WRZ's drought resilience, and which is relatively inexpensive compared to other available options.

11.431 Our plan involves proceeding with obtaining consent for and constructing the Teddington DRA scheme for use in the early 2030s.

SESRO

11.432 In the medium and long-term, we have considered different pathways of future demand and supply capability to reflect the uncertainty that exists around population growth, the impacts of climate change on drought risk, and abstraction licence reductions that may be necessary to ensure environmental protection and improvement. We have used modelling to analyse the costs and benefits of different solutions to the supply-demand balance challenges that these pathways pose for the WRSE region, and have considered outputs from this modelling alongside other factors in order to build a best value adaptive plan.

11.433 From this analysis, we have established that we should start obtaining consent for SESRO as soon as possible, in order that it can be used by 2040. This is in order that we, and others in the region, can increase the drought resilience of our customers' supplies to a level at which we would not need to impose emergency restrictions more often than once every five hundred years, and so that we can plan for the level of environmental protection which guidance indicates will be required.

11.434 Our decision to promote construction of SESRO instead of STT is based on the assessment that plans in which the STT is used in place of SESRO are more expensive, result in more carbon emissions, and do not deliver the same environmental or resilience benefits, particularly under severe future scenarios. The SESRO scheme provides a resilient source of water with low operating costs that can facilitate transfers within the WRSE region, and so provides the ideal base of an adaptive plan for an uncertain future.

11.435 The SESRO option, would be used to provide supplies for our London WRZ, Affinity Water, and Southern Water, with supplies also provided to our SWOX, Kennet Valley, and SWA WRZs and elsewhere in the WRSE region under some scenarios.

11.436 We have examined a range of possible future scenarios and have considered the wide range of risks that we may encounter in the future. As set out in the draft plan, smaller reservoir sizes reduce local impacts while larger sizes offer increased regional resilience. Our consideration is that the 150 Mm^3 SESRO is the best value option as the marginal cost of building a reservoir of this size (rather than a smaller reservoir) is small in comparison to the benefits gained, and due to the fact that the larger reservoir provides a larger capacity to provide resilience against the many adverse future scenarios which could be encountered. With around 80% of our future supply-demand balance need planned to be delivered through currently uncertain demand management measures

(not all within our control), in order to protect the security of supply for the south east, the 150 Mm^3 reservoir is the right choice.

11.437 In the longer-term, if the 110 l/h/d target is achieved and additional risks do not materialise then we are not likely to require additional sources of water alongside selection of the 150 Mm^3 reservoir. If, however, PCC does not reduce to levels which the government are aiming for, or if other risks materialise, then we made need to invest in additional sources of water.

11.438 Overall, we consider that the major elements highlighted here, described in more detail throughout this document, present the BVP for our customers and as part of the solution for the WRSE region as a whole.

Annex: Changes Made Between Plan Iterations

In this Annex, we set out the main changes made to our plan that were made between the draft WRMP24 and the revised draft WRMP24, and between the revised draft WRMP24 and final WRMP24.

Main changes between our draft WRMP24 and revised draft WRMP24:

Per Capita Consumption and Risk Mitigation

- In our dWRMP24 we identified that we could not describe a resilient and deliverable plan which we could be confident would result in achievement of the 2050 target of 110 l/h/d per capita consumption (PCC). Between dWRMP and rdWRMP our regulators updated the Water Resources Planning Guideline (WRPG) such that it now states, "if you are a water company in England your preferred programme should deliver a PCC of 110 litres per person per day by 2050 under your dry year annual average scenario". Inclusion of this target in the WRPG is consistent with the national target set out in the Environmental Improvement Plan (HM Government, 2023). In accordance with this guidance, our preferred programme includes demand management measures to be taken by Thames Water and Government which are intended to reduce average PCC to 110 l/h/d by 2050. Decisive government action to deliver household consumption reduction is required to ensure the demand management targets are achieved and to ensure our plan's resilience.
- As described in the dWRMP, the actions which we as a company can take to help customers reduce their demand for water are limited to the installation of water meters, water efficiency interventions, including fixing wastage issues such as leaky loos, and (when sufficient meter penetration is achieved) introduction of tariffs which discourage the excessive use of water. The constraints on measures over which we have control have not changed and, as such, if the 110 l/h/d target is to be achieved, we must assume that the government will take decisive action to reduce household consumption. In our dWRMP, our assumption was that the government would introduce water labelling measures (as has already been committed to) and that this would reduce PCC by 6 l/h/d by 2050. In our revised draft plan, our assumption is that the government will introduce measures which will, in aggregate, reduce average PCC by 24 l/h/d by 2050. We anticipate that these measures will, in addition to introduction of water labelling of white goods, include the introduction of minimum standards on white goods and changes to buildings regulations.

- An average reduction of 24 l/h/d made by our 2050 forecast of over 12 million customers equates to around 300 million litres per day, or around 16% of our 2050 baseline forecast of water supply. This is clearly a very significant amount of water and we do not yet have confirmation from the government regarding the measures that they intend to implement, nor when such measures might be implemented. Placing such heavy reliance on measures outside our control clearly presents a risk to the security of supply in the future. To mitigate this risk, we have presented a comprehensive monitoring plan which looks to the longer-term and identifies when we may need to make additional interventions beyond those in our preferred plan, should the necessary actions not be taken by Government, and what those interventions would be.

Changes to Underlying Supply-Demand Balance

- Between our dWRMP and rdWRMP, we have revised our forecasts of supply and demand using the most up to date information available. Changes are in bringing forward some licence reductions (Farmoor and the River Lee) in our "Environmental Destination" scenarios in order to comply with our regulators' expectations that these will be in place by 2050 at the latest. This accelerates the pace at which new water sources are needed.

Management of Short-Term Risks

- As was highlighted in the Environment Agency's representation to our dWRMP24, there are a range of risks which we face in the short-term. These include the output from our Gateway desalination plant, issues around our ability to abstract from the Lower Thames during low-flow events which were highlighted in the 2022 drought and which may be exacerbated by the River Thames Flood Alleviation Scheme being developed by the Environment Agency and Surrey County Council, and confidence in our ability to sustainably reduce leakage and household consumption.
- To mitigate these short-term risks, we have identified a monitoring plan for the short-term, with trigger points to identify whether we need to make different investment decisions. We have also identified a series of small-scale interventions which we will proceed with in the short-term to further protect the security of our customers' supplies.

Scheme Selection

- As is described in Section 10 of our rdWRMP24, we have undertaken our programme appraisal process using revised information and acknowledging changes in the WRPG, and this has resulted in changes to our option selection decisions in our preferred programme. Our rdWRMP reflects the revised Regional Plan, with the only difference between our plan and the regional plan being that we have included three small options in addition to the WRSE Regional Plan in AMP8 to mitigate risk.

Date for Achievement of 1 in 200-year Resilience

In our draft WRMP24, we included a move to a 1 in 200-year Level of Resilience for severe (Level 4) restrictions by 2030-31. The achievement of this level of resilience relies upon the delivery of approximately 120 Ml/d improvement in the supply demand balance in London (in addition to approximately 180 Ml/d of supply-demand balance benefit needed to offset climate change impacts, sustainability reductions and growth). The bulk of this enhancement is planned to be delivered through an ambitious programme of demand management reduction. Even after delivering our demand programme in AMP8 there is still a significant supply demand imbalance to secure 1 in 200-year resilience for Level 4 restrictions and as such a strategic resource option is also required to improve security of supply. Between the draft WRMP24 and revised draft WRMP24 we reassessed the feasible delivery schedule for the London Water Recycling options accounting for the likely planning route (Development Consent Order rather than under the Town and Country Planning Act) and concluded that the earliest date for the delivery of these options would be 2032-33. As such, we have moved the target date for achievement of 1 in 200-year resilience to 2032-33. We have not assessed customer acceptability or consulted on this change, as a large option is still needed to secure this level of resilience, and so the change is driven by what is feasible rather than being influenced by acceptability.

Changes between our revised draft WRMP24 and Final WRMP24:

Additional Supply-Side Schemes for Delivery in AMP8

In the Draft Determination on our PR24 business plan, Ofwat allocated funding for the delivery of 18 Ml/d of new supply-side schemes in AMP8. We are supportive of delivery of additional resilience through new supplies. We intend to accept the additional allowance and associated commitments in our response to the Draft Determination, and have included proposed schemes to make up this 18 Ml/d in our final WRMP24.

The 18 Ml/d of new supply schemes proposed have been determined by bringing forward schemes already selected in the rdWRMP24 from later in the planning period, or in another branch of the adaptive plan. This ensures that each option will have had the necessary technical assessments and the proposed options will be consistent with options selected in the regional plan solution. We have reviewed our plan-level in-combination and cumulative environmental assessments, and these have not been impacted by the changes.

We will conduct further environmental assessments and more detailed design scoping for the proposed options in order to further increase the confidence in the environmental feasibility and costs of the proposed options. We will carry out a wider review of the potential feasible options in order to identify alternatives should the more detailed work for the proposed solutions identify that large cost uplifts or environmental feasibility issues exist. Note that these alternatives may not have been in our preferred plan, and so would themselves be the subject of the required environmental assessments.

We will keep in regular contact with the Environment Agency regarding the progress of investigations into preferred and alternative solutions. If necessary, we will substitute proposed options with alternative options in our delivery plan and report this in our WRMP Annual Reviews.

Having the resilience of these additional schemes, alongside other small changes to our supply-demand balance, means that we no longer need to rely on a licence trade with Affinity Water in the mid-2030s. This option was high-risk, being dependent on Affinity Water successfully delivering their demand management programme and the delivery of the Grand Union Canal. This option is retained as an adaptive solution, rather than being in our preferred plan.

Updates to our metering programme

Our revised draft WRMP24 assumed the delivery of our Green Economic Recovery metering programme. Funding for this scheme was made contingent on hitting our leakage targets. In light of Ofwat's decision not to adjust the funding conditions to reflect the impact of the summer 2022 drought and December 2022 freeze-thaw events on our leakage performance, we were left with no alternative but to stop the GER programme. We have updated our future metering and water efficiency programmes following the cancellation of this programme, and accounting for changes to PMP survey to fit ratios.

NHH PSUP installations have increased to align with PR24 and meet MOSLs expectation to meet smart meter all large meters within AMP8. An additional 3,837 NHH PSUP installations have also been added following updated analysis of reactive installations

Updates to utilisation of some schemes

There have been small changes to the utilisation of some schemes in our WRMP, resulting from minor changes to our baseline supply-demand balance (see Sections 3 and 6 for further details). Most changes are small changes in SESRO utilisation across different WRZs.


Thames
Water