Water Resources Management Plan

Annual Review 2022-23

June 2023

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Abbreviation	Definition
AA	Annual Average
ACWG	All Company Working Group
AFW	Affinity Water
AMP	Asset Management Plan
AR	Annual Review
ASR	Aquifer Storage and Recovery
CMOS	Central Market Operating System
CP	Critical Period
DCO	Development Consent Order
DI	Distribution Input
DO	Deployable Outputs
DPC	Direct Procurement for Customers
DRA	Direct River Abstraction
DWI	Drinking Water Inspectorate
DWUS	Domestic Water Use Study
DYAA	Dry Year Annual Average
DYCP	Dry Year Critical Period
EA	Environment Agency
EIA	Environmental Impact Assessment
FD	Final Determination
GER	Green Economic Recovery
GUI	Guildford WRZ
HEN	Henley WRZ
HH	Household
HNL	Herts and North London
HRA	Habitats Regulation Assessment
KSL	Kent, South London and East Sussex
KV	Kennet Valley WRZ
LON	London WRZ
LPP	Large Process Plants
MLE	Maximum Likelihood Estimation
MOSL	Market Operator Services Limited
ND	No Deterioration
NGO	Non-Governmental Organisation

Abbreviation	Definition
NHH	Non-household
NLARS	North London Artificial Recharge Scheme
NRW	Natural Resources Wales
ODI	Outcome Delivery Incentive
PCC	Per Capita Consumption
PMP	Progressive Metering Programme
PR	Price Review
RAPID	Regulators' Alliance for Progressing Infrastructure Development
SBV	Smarter Business Visits
SDB	Supply Demand Balance
SDO	Source Deployable Output
SEA	Strategic Environmental Assessment
SESRO	South East Strategic Resource Option
SHV	Smarter Home Visits
SOSI	Security of Supply index
SAP-ISU	Thames Water's customer database
SRO	Strategic Regional Option
STT	Severn Thames Transfer
STW	Sewage Treatment Works
SWA	Slough, Wycombe and Aylesbury WRZ
SWOX	Swindon and Oxfordshire WRZ
TLT	Thames Lee Tunnel
TW	Thames Water
UKCP	UK Climate Programme
UU	United Utilities
WAFU	Water Available for Use
WARMS	Thames Water's system simulation model
WBGWS	West Berkshire Groundwater Scheme
WFD	Water Framework Directive
WINEP	Water Industry Environment Programme
WRMP	Water Resources Management Plan
WRPG	Water Resources Planning Guidance
WRSE	Water Resources South East
WRZ	Water Resource Zone
WTW	Water Treatment Works

Executive Summary

Introduction and purpose of this report

1. Water companies are required to produce a Water Resources Management Plan (WRMP) every five years which sets out how the company intends to provide a secure and sustainable supply of water to their customers, whilst protecting the environment.

2. In April 2020, following approval from the government, we published our Water Resources Management Plan 2019 (WRMP19) which sets out how we plan to provide a secure and sustainable water supply for the 80-year period from 2020 to 2100.

3. We monitor our progress against the commitments in WRMP19 and provide an annual performance report. We do this for the first 5-year period of the plan, aligning with the 5-year business plan. The annual report is sent to Department for Environment, Food and Rural Affairs (Defra), the Environment Agency (EA) and Water Services Regulation Authority (Ofwat) and is published on our website www.thameswater.co.uk/wrmp for customers and stakeholders.

4. This document, called the Annual Review 2023 (AR23), presents our performance for the period from 1 April 2022 to 31 March 2023. It is the third annual review of our WRMP19 and has been prepared in accordance with regulators' guidance.

5. Since WRMP Annual Review 2022 our regulators have asked for more information on our Thames Gateway Desalination Plant, Per Capita Consumption (PCC) and our metering programme. We have included the additional information requested within this submission.

6. We have included information on the development of a regional plan for the South East covering 2025 to 2075. We are working with our neighbouring water companies, regulators, government and water users across the region, to confirm the supply demand challenge and investigate potential future solutions, a draft was published for consultation in November 2022. We have also included information on our draft WRMP24 which we published for consultation in December 2022.

7. We have also included an update on the programme to develop the Strategic Resource Options alongside the Water Resources South East regional group (WRSE) and the WRMPs.

Overview of our performance for 2022-2023

Our security of supply for our customers

8. The supply demand balance, and the associated regulatory metric called the Security of Supply Index (SoSI), are designed to show whether there are sufficient water supplies to meet demand and therefore if the water supply is secure. Whilst all of our zones are in surplus for the Dry Year Annual Average scenario, our SoSI score is 99 due to a deficit in the Swindon and Oxfordshire Water Resource Zone (SWOX WRZ) under the Dry Year Critical Period scenario. This is largely due to a higher level of demand being recorded than was planned for, and a reduction of Deployable Output (DO) at two of our sites in SWOX. All other zones are in surplus.

We have observed fluctuating levels of water demand

9. We continue to experience significant changes in the balance of household and business water use due to post-Covid hybrid working, although consumption levels have started to return to pre-Covid levels. The overall reductions in household usage are welcomed, but there are potentially a large number of influencing factors contributing to actual household usage outcomes. Whilst we have increased smart meter penetration and increased our targeted water efficiency engagement, meaning that some household demand reduction is attributable to our actions, we believe that some of the reduction in usage is due to the cost of living crisis as people reduce their hot water consumption to reduce energy bills. Most of the factors impacting consumption are external and outside of water company control or direct influence. These include, but are not limited to:

- Extreme summer events and record heatwaves
- A high and unknown proportion of people working-from-home post-Covid
- Changes to population commuting practices and working locations
- Cost of living crisis
- Media coverage of heatwave and drought

10. We have seen a drop in measured (metered) household consumption, and an increase in unmeasured household usage. The increase in smart meter penetration provides more granular consumption data across a greater proportion of the household customer base, which reduces uncertainty of overall consumption levels.

11. In-year actual PCC has fallen in each of our WRZs from AR22 to AR23, and is now much closer to the WRMP19 Final Plan forecast in all WRZs. Whilst actual measured and calculated Per Household Consumption (PHC) levels show reductions, the application of available population data (which is uncertain) introduces uncertainty into the calculation of PCC, detracting from the PCC metric's case as a meaningful indicator of customer usage. We are committed to reducing leakage and encouraging the efficient use of water. In 2021/22, we met our leakage target, delivering a 10.2% reduction against the 2019/20 baseline. This was the third successive year we achieved our target. However, in 2022/23 performance fell short of our 14.1% target.

12. Underperformance was driven by weather conditions in 2022. In particular, the prolonged hot and dry summer which created an unprecedented soil moisture deficit caused our pipes and our customers' pipes to move and crack leading to an increase in leakage. We estimate that this event increased our leakage position by at least 10%. In addition, the UK experienced a prolonged period of low temperatures between 8 and 17 December 2022. On 12 December, the UK average maximum temperature was zero degrees with the 12 and 13 December the UK's coldest days since 28 February and 1 March 2018 (the 'Beast from the East'). Daily minimum temperatures fell widely to between -5 degrees Celsius and -10 degrees across the UK on several nights. Temperatures then rose significantly, between 17 and 18 December, with increases of over 17 degrees Celsius within 24 hours

13. The rapid thaw that followed heavily impacted leakage performance and led to a significant visible leak outbreak. Notwithstanding this, having taken learning from the winter event of 2018, we redesigned how we respond to major incidents and, consequently, customers experienced less than 10% of the supply interruptions experienced in 2018.

14. We are making transformational changes to the way that we work. However, we are mindful that as annual leakage targets are based on a 3-year rolling average, the impact of this year will be felt, not just this year, but for the next two years' performance. Notwithstanding this, we remains committed to doing all that is reasonably practicable to achieve our regulatory AMP target to reduce three-year rolling average leakage by 20.5% compared to the 2019/20 baseline. In 2022/23 we fixed a total of 66,896 leaks (compared with 61,671 in 2021/22). This equates to one leak being fixed approximately every 7 mins 45 seconds. In addition, we are committed to reducing leakage by 50% (compared to 2017/18 levels) by 2050.

We have continued to roll out the smart metering programme.

15. This year we installed around 105,000 new smart water meters, slightly below the number originally forecast in WRMP19. The meters installed in AMP7 are shown in the table below, with the smart replacements row excluded from the total "new" installs.

Table 1: Yearly metering summary (non-cumulative)

Metering Installation	AR21	AR22	AR23
HH Progressive Metering	44137	94454	88709
HH Optant Metering	12352	21006	16584
HH Small Bulk Meters	955	2947	0
HH Large Bulk Meters	420	734	729
HH Smart Replacements	25850	49285	40204

16. Around 55% of our customers now have a household meter. Our revised forecast in AR22 included additional meters to be installed in the Green Economic Recovery (GER) programme in AR23. This programme has been delayed and will commence next year. We still plan to install an additional 200,000 smart meters by 2025 as part of the Government's GER. Meters are a key enabler to the efficient use of water, and we use the smart meter data to target our leakage reduction activity and work with customers to reduce demand.

We continue to support our customers and encourage efficient use of water

17. Average household water use continues to be close to the WRMP19 forecast. Consumption in London remains slightly above forecast whilst all other water resource zones fall below. We are continuing our award-winning programme to encourage the efficient use of water, increasing the amount of proactive direct customer communications during summer drought and year-round, continuing the focus on smarter home and business visits, new incentive schemes for developers, and using smart meter data to proactively engage with households, business and retailers to increase self-fixing of continuous flows (e.g. internal wastage).

We have sufficient water sources

18. We have progressed new water sources to maintain a resilient water supply, this includes:

- Preparatory work for three new groundwater schemes in London as set out in WRMP19.
- There has been good progress with the development of a new transfer main, the Shalford to Netley transfer main in Guildford WRZ, which will improve our ability to transfer water across the zone.
- In WRMP19 we proposed the development of Deephams water recycling; this scheme was key to achieving 1 in 200-year drought resilience by 2030. As noted in our Annual Review 2022, we have progressed studies on this option and, following discussion with the EA, we have withdrawn the option from WRMP19 and will not be progressing the development of this option in this Asset Management Plan (AMP). In our future water resources planning, WRMP24, we have considered the option as infeasible until 2060 due to the same environmental risks which resulted in the scheme being ruled out for development in the short-term. We are currently looking at alternative options for achieving a 1 in 200-year level of drought resilience by the early 2030s, a target to which we remain committed. Adopting an option other than Deephams will result in a delay in delivering this enhanced level of resilience.

We remain focused on protecting and improving the natural environment

19. Improving and protecting the environment is integral to managing and planning future water resources. The three core stands of activity are:

- We are undertaking environmental investigations at 10 sites including the Upper Kennet, Upper Lee and the Hogsmill River and reducing abstraction on the River Cray (North Orpington) and River Chess (Hawridge).
- We are seeking opportunities for improvements to the environment as part of the feasibility, design and appraisal of new resource options.
- We continue to work with WRSE and the Environment Agency to refine the likely requirements for sustainability reductions to meet environmental destination in relation to chalk streams and other sensitive rivers in the region, and how to prioritise this activity.

We delivered a secure supply to our customers during the 2022 Drought

20. We experienced an Exceptional Shortage of Rainfall in 2022, leading us to implement our Drought Plan. We followed our Drought Plan which included spring/summer media campaigns, using our strategic schemes to support our reservoir storage position, and introducing a Temporary Use Ban. We also applied for Drought Permits in our SWOX Water Resource Zone, however none of these permits were used.

WRMP19 – confirming our position

21. In April 2020 we published our WRMP19, which looks forward over the next 80 years to 2100. We developed the WRMP19 based on insights from customers and engaged extensively with stakeholders and regulators throughout the development of the plan. We have also worked collaboratively with other water companies from across the South East of England through WRSE to understand the challenges facing the whole region and to identify opportunities and shared solutions. We designed our plan to satisfy three main objectives:

- to provide a secure supply of water for our customers, addressing the supply demand deficits that we forecast in our region
- to improve resilience to a 1 in 200-year severe drought event by 2030/31
- to look beyond the needs and opportunities of our supply area alone and consider the growing needs of the wider South East of England

22. Our plan is a 'Best Value' plan, including ambitious leakage and demand reduction in combination with the development of new water resources to make sure we have a secure water supply and environmental resilience. We recognise that there are uncertainties in our plan, which is not unexpected with the long planning horizon; as such we have used an adaptive planning approach which provides flexibility to adapt to changes and new information across the long-term planning period.

23. In WRMP19 we proposed a monitoring plan to provide regulators and stakeholders visibility of our performance on a range of metrics, including performance on our programme to manage demand for water. We report on these metrics in this annual review and will also report on them in subsequent annual reports.

24. We have checked our actual position in April 2023 against a suite of key metrics and our forecast start position in WRMP19. We can confirm that the foundation of **WRMP19 is robust and remains valid** as a basis for future planning.

25. The supply demand position in the Swindon and Oxfordshire (SWOX) WRZ continues to be tighter than anticipated, with a deficit reported in this year in our critical period (CP) scenario. In response, we have put in place a recovery plan and have brought forward demand management activity. We have also identified a series of potential solutions to improve our leakage performance.

26. Over the longer-term we will need more water resources and are exploring a wide range of options as part of the regional planning process including catchment solutions, options proposed by third-parties, and solutions which can provide resilience for public water supply and other sectors. These are considered in the WRSE regional plan and our draft WRMP24, which was published for consultation between 13 December 2022 and 21 March 2023.

27. When it is finalised, our WRMP24 will supersede WRMP19. Broadly, however, the interventions set out in our WRMP24 are well aligned with those proposed in WRMP19, and as such WRMP19 continues to be robust and remains valid.

28. We are progressing work on strategic resource options (SROs), in collaboration with other water companies and regulators, which were funded by Ofwat as part of the Final Determination on our 2019 Business Plan. All the SROs we are involved with successfully passed Gate 1 and Gate 2 – feasibility, conceptual design and multi-solution decision making. We are now working towards Gate 3 which will include selecting preferred options, surveys to inform design development and environmental impact assessments, commercial strategy, a procurement plan and pre-planning engagement for consent applications. The five options we are involved with are:

- South East Strategic Reservoir Option (SESRO)
- River Severn to Thames Transfer (STT)
- London Water Recycling (LWR)

- Thames to Affinity Transfer (T2AT)
- Thames Water to Southern Water Transfer (T2ST)

Working across the South East region

29. In line with the National Framework for Water Resources[1] and focusing on regional planning, we are working closely with WRSE, and the other water companies located in the South East, to develop a regional resilience plan for the South East of England.

30. There are significant water resource challenges faced in the South East with a forecast shortfall of over 1 billion litres of water per day in the next 15 years, rising to 2.6 billion litres by 2060[2]. This is a significant challenge that needs careful forward planning to safeguard a secure and sustainable future water supply for society, the economy and the environment.

31. Over the past year, WRSE has continued to progress technical work to inform the development of a best value plan for the region. The draft WRSE Regional Plan was published on 14 November 2022, and a public consultation was carried out following the plan's publication. A number of stakeholder engagement events were carried out, including a parliamentary launch of the plan. Over 900 responses to the Regional Plan were received, from a wide range of stakeholder groups and individuals. WRSE will produce a consultation response document in which representations will be responded to and changes to the Regional Plan following the consultation will be discussed. A final Regional Plan will be published on a timescale which aligns with companies' Revised Draft WRMP24s. Our dWRMP24 reflects the WRSE Draft Regional Plan, and our rdWRMP will reflect the WRSE Final Regional Plan.

Forward Look

32. We have identified the following challenges, risks and opportunities for the coming year:

Challenges:

- Successful delivery of demand reduction – Maintaining our progress with leakage reduction and achieving sustained usage reduction.
- Environmental ambition – We are continuing to work with regulators and regional partners to investigate substantial future reductions in abstraction for environmental benefit. The scale and range of potential reductions included in our dWRMP24 far exceed those planned for in the past and this is one of the main investment drivers in regional plans and our WRMP24.
- Achieving a SoSI score of 100 – we are working towards achieving a supply demand balance across SWOX to facilitate an overall SoSI score of 100.

Risks:

- Drought resilience: As part of the development of our WRMP24, we are looking to determine how we should achieve a 1 in 200-year level of drought resilience, as part of determining the best value plan for our customers and the South East region. As described previously, we have ruled out the Deephams Water Recycling option after discussion with the Environment Agency, and our work is indicating that one of the

[1] https://www.gov.uk/government/publications/meeting-our-future-water-needs-a-national-framework-for-water-resources

[2] WRSE has produced a wide range of scenarios and will produce an adaptive plan recognising there are uncertainties in long-term planning

schemes being developed through the London Water Recycling Strategic Resource Option is likely to be the preferred option to help us achieve a 1 in 200-year level of resilience. Our draft WRMP24 includes the selection of the Teddington DRA scheme, and we are working to determine whether Teddington DRA or Beckton water recycling is the best option to include in our rdWRMP24. Teddington DRA and Beckton water recycling will take longer to develop than the Deephams water recycling scheme would have taken, and as such the length of time before we will improve our level of drought resilience to a 1 in 200-year standard will be increased. This raises the risk that a drought outside of our planned levels of resilience could occur.

Opportunities:

- WRSE Regional Plan – producing a fully adaptive, best value plan for the South East of England presents us with an opportunity to produce a plan which is efficient across a wide range of potential futures, and which delivers benefits to everyone in the South East.
- Understanding Future Patterns of Demand – With the relaxation of coronavirus restrictions the associated transition of working arrangements gives an opportunity for the water industry to understand potential future patterns of demand. Following the 2022 drought, we also have the opportunity to review our customers' responses to implementing intensive media campaigns and a Temporary Use Ban. Our adaptive planning approach means that our future plans should be robust against a range of future demand patterns.
- The continued development of multiple Strategic Resource Options for consideration in the WRSE regional plan and our WRMP24, affords the opportunity to improve resilience and flexibility for the longer term.
- The increased communication and dialogue that has been carried out through regional planning and WRMP24, with both regulators and government, has improved understanding of our planning, which may help in expediting approval of WRMP24.

Part A – Introduction

A.1 Background

33. Water companies are required[3] to produce a Water Resources Management Plan (WRMP) every five years which sets out how the company intends to provide a secure and sustainable supply of water to their customers, whilst protecting the environment.

34. In April 2020 we published our Water Resources Management Plan 2019, hereafter referred to as the plan or WRMP19. It is an adaptive plan and sets out a range of measures to so that we can continue to provide a secure supply of water to all our customers over the 80-year period from 2020 to 2100. The plan is available on our website www.thameswater.co.uk/wrmp.

35. Water companies are required[4] to produce an annual review of their plan which provides a report on progress, highlights any changes to the plan, reports on actions requested by regulators and presents an overall summary of the supply demand situation. The Environment Agency and Natural Resources Wales publish guidance[5] for companies to use as a framework in completing the review.

36. This document presents the annual review of progress and achievements for the period from 1 April 2022 to 31 March 2023 (2022/23), the third year of the five-year period. It is referred to as the Annual Review 2023 (AR23). We have prepared AR23 in accordance with the regulators' guidance.

37. The AR23 report builds on the six-month progress update report, shared with government and regulators in Autumn 2022, which covered the period to the end of September 2022.We have also included responses to letter received from our regulators since AR22.

38. As part of the annual progress report we have included an update on the programme of studies to inform the selection of strategic options that will be considered as part of the best value investment programme for the South East regional plan and WRMP24.

39. We will send the AR23 to the Secretary of State, the Environment Agency and Ofwat. We will also publish it on our website for interested customers and stakeholders www.thameswater.co.uk/wrmp.

A.2 Purpose of this document

40. This document is the third annual review of our WRMP19 for the period from 1 April 2022 to 31 March 2023, noted as 2022/23. It provides an assessment of actual events and performance in the past year and compares these against the forecasts in the plan. It also sets out the further work that is planned and on-going engagement as we deliver on committed activities and continue to develop our future plans.

41. This document is structured in four main parts, Part A to Part D.

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[3] Water Industry Act 1991, Sections 37A to 37D (as amended by the Water Act 2003)
[4] Water Industry Act 1991 Section 37A (5)
5 EA and NRW (March 2021) Water resource management plan annual review and annual data return: Guidance for water companies in England and Wales

42. The remainder of Part A provides contextual information. It describes:

- Our supply area, divided into Water Resource Zones (WRZs) for planning purposes
- The Levels of Service we provide to our customers
- Comments and actions from AR22

43. Part B looks at conditions, performance and progress in the past year. It presents:

- An overview of the weather
- The 2022/23 water balance and movements from the previous year
- Progress with delivery of demand management, resource development schemes, environmental investigations, and sustainability reductions
- Source availability during the year
- Actual outage

44. Part C covers the WRMP19 Monitoring Plan. It details:

- Updates on the key components of the supply demand balance against the WRMP19 forecast position
- Updates on strategic resource options
- Updates on the ongoing collaborative work with the South East regional plan
- Updates on environmental activities
- WRMP19 validity statement

45. Part D takes a look ahead. It considers:

- The key challenges, risks and opportunities for the coming year
- Our forward plans for engagement

46. We have also included Appendices to provide supporting information or extra detail where necessary.

A.3 Water Resource Zone boundaries

47. Our water supply area consists of six Water Resource Zones (WRZs); London, Swindon and Oxfordshire (SWOX), Henley, Kennet Valley (KV), Slough/Wycombe/Aylesbury (SWA) and Guildford. These are illustrated in Figure 1. The WRZs outside London are collectively referred to as the Thames Valley WRZs.

48. We plan water resources based on these six WRZs. There have been no changes to the WRZ boundaries between AR22 and AR23.

Figure 1: Our Water Resource Zones

A.4 Drought Planning and Levels of Service

49. Our Water Resources Management Plan is aligned with our Drought Plan. Linking both plans are our levels of service, which set out the frequency with which we expect to act to restrict our customers' use of water during prolonged periods of dry weather.

50. We updated our Drought Plan in 2021 and published our updated Drought Plan in 2022. We updated our plan to address the requirements of revised regulatory guidance and to better align with neighbouring water companies in relation to levels of service and implementation of demand side measures. We have also improved our assessment of the risk of more severe droughts and the measures we would need to address them.

51. We included the following changes to our Levels of Service in our 2022 Drought Plan:

- To implement a full Temporary Use Ban, formerly known as a Hosepipe Ban, at Level 2 with a level of service of 1 in 10-years. This is consistent with other water companies who operate in the South East
- To apply additional measures for the most serious droughts, referred to as "More Before Level 4 measures", these include significant reductions in water use and the use of additional emergency water sources

52. We have four escalating levels of service, with a sub level at 'More Before Level 4 measures'. These levels and the actions that we'll take at each level, are presented in Figure 2.

53. During 2022 we experienced a period of exceptionally low rainfall and implemented our Drought Plan, this is discussed further in Section B.

Figure 2: Levels of Service Drought Plan (April 2022)

54. Following the Drought in 2022 we carried out a Lessons Learnt review and as a result we are making some changes to our Drought Plan. These changes include an update to the scenarios we run to include a 50% and a 40% scenario to address the potential for more severe and quick developing droughts in the future. We are also updating the communications section of our Drought Plan to better address the range of media outlets that we use such as increased use of social media. We are also updating the Section on 'More Before Level 4 measures' to better reflect the viability of the schemes identified as potentially available in a severe drought.

A.5 Comments and Actions from WRMP19 and AR22

We received two Tripartite Group responses[6,7] to our AR22 WRMP review. The first in October 2022 and the second in June 2023.

October 2022 Tripartite letter

55. The first letter received in October 2022 raised concerns about our management of, and communications associated with, our Thames Gateway Desalination Plant. This response also raised concerns about our per capita consumption (PCC) which remained higher than our WRMP19 forecast commitment. The Tripartite letter included the following requirements.

Tripartite Group response - Comment on our Annual Review 2022
Take all actions to ensure the desalination plant is operational. You have committed to the plant being available by the end of February, but as set out in the letter from the Secretary of State, we believe you should make efforts to bring forward this completion.
Set out which months the desalination plant was not operational during the 2021/22 reporting year and which months it could be 'operated at 100 Ml/d with 50 days notice'. In addition, identify the date at which you were unable to achieve 100 Ml/d with 50 days notice. If the outage is longer than 6 months during this reporting period, you should update the annual review 2022 accordingly and set out your revised supply-demand balance. Where an outage duration is longer than 6 months and crosses into the 2022/23 reporting year then the annual review 2023 should include a supply demand balance which reflects the ongoing situation.
Provide us with a PCC action plan to show how you intend to meet your PCC targets by the end of November 2022.
For the remainder of this AMP, over the 2022-25 period, significantly step up your efforts to reduce demand to ensure you deliver on both your leakage and PCC WRMP19 forecast commitments and PR19 performance commitment targets annually.
Consult on glidepaths for PCC and leakage reductions as part of your draft WRMP24 submissions in line with WRMP and PR24 guidance.

[6] Tripartite letter (EA, Ofwat, Defra), Thames Water Annual Review 2022, 21st October 2022

[7] Tripartite letter (EA, Ofwat, Defra), Thames Water Annual Review 2022, 5th June 2023

The full tripartite letter and our response can be found in Appendix K: WRMP19 and AR22 Comments and Actions

Summary of our response November 2022

56. The Thames Gateway Desalination plant has experienced a number of outage incidents since commissioning in 2010. The plant, when operational, can provide deployable output that amounts to up to 5% of the daily supply demand and drought resilience for London.

57. The plant has been not operated since November 2021 when a fire occurred leading to health and safety concerns and resulting in essential maintenance work. We could have operated the plant at a lower capacity of 50 Ml/d with 50 days' notice between November 2021 and June 2022 but chose not to do due to health and safety issues and raw water storage levels. The essential maintenance plan was approved in June 2022, resulting in full outage of the plant from July 2022.

58. Further details on the Deployable Output of the Thames Gateway desalination plant for this annual return, our work completed to date, and our ongoing programme can be found in section B.3.1.

59. We have provided regular updates to government and our regulators on our Thames Gateway desalination plant, and have provided fortnightly progress reports to the Environment Agency. We have also provided formal written updates on both the recommissioning process and the steps that we are taking to secure the carbon dioxide that is needed to operate the plant. In addition:

60. We have engaged with government and regulators by hosting the following:

- hosted Defra colleagues on 20th October 2022 at Thames Gateway desalination plant to cover the latest developments at the plant and our wider response to the drought.
- held a further meeting on 24th October with the Environment Agency at which we provided similar content on the Thames Gateway desalination plant, with a follow-on meeting with a smaller EA and Thames Water team on 9th November.
- we also hosted a technical workshop on 20th January 2023 for Ofwat, detailing history of the plant, operation & network constraints, current work programme, implications on our WRMP and next steps.

Inconsistent treatment of the Thames Gateway Desalination Plant

61. There was an inconsistency between our representation of the plant's operational capacity correspondence and the dWRMP that we submitted to Defra on 3rd October 2022. We resolved this inconsistency and resubmitted our dWRMP24 to Defra on 28th November 2022 by assuming a capability of 50Ml/d up to 2030, and a capability of 75 Ml/d thereon.

Reporting of the Thames Gateway Desalination Plant in the 2022 Annual Review

62. During the 12 month period to March 2022, the plant was not operating for 11 out of 12 months (all months apart from June). We recorded this period when the site was not operating as an outage, rather than reducing the DO. We did this to present a conservative view of our supply-demand balance because the projected storage in London and relatively low demand in early to mid-2021 meant that we were unlikely to need the plant to be operational in the Annual Review reporting period.

63. The plant could have been available at 100 Ml/d, with 50 days' notice, up to the point that the fire occurred in November 2021.

64. If we had written down the DO instead of reporting it as an outage London WRZ would have been in surplus when calculated in both Supply Demand Balance Index (SDBI) and SoSI.

65. Given the recent outage we have accordingly reduced the DO for the Plant, for AR23 it is 0 Ml/d.

Our PCC action plan

66. Our WRMP19 PCC commitment is challenging. Both Covid and the 2022 Summer drought have increased demand beyond that predicted in our WRMP19. Our pre-Covid PCC values need to be used with caution when applied as performance comparatives. Ofwat has already recognised this issue and, during 2021, changed the PCC performance commitment assessment timings from in-year to end-AMP, following consultation with the water companies and other regulators.

67. We missed both our Final Determination (FD) and Environment Agency (WRMP) PCC targets for AR22. While we have plans in place to improve our performance, it is appropriate to highlight that, we now believe that our FD target for the AMP will be very challenging to achieve. As a result, we are investigating ways of enhancing our range of household demand reduction programmes. Our current AMP7 programme includes:

- Installing 631k smart meters on households through our Progressive Metering (PMP), Optant Metering and Meter Replacement programmes
- Before the end of AMP7, installing 200k additional smart meter installations as part of our Green Economic Recovery (GER) programme
- Using data to target water efficiency activities
- Communication campaigns, including our every drop counts campaign.

Our Leakage action plan

68. The company met its leakage performance target of a 10.2% reduction against the baseline for the 2021/22 reporting year. However, as set out above in 2022/23, the exceptionally hot and dry summer alongside the soil moisture deficit and the increase in demand from our customers, followed by the December freeze-thaw event have all contributed to significant increases in burst water mains and associated leakage. As a result, we fell short of our 2022/23 leakage target.

69. Notwithstanding this, we remain committed to doing all that is reasonably practicable to achieve our regulatory AMP target to reduce leakage by 20.5%

June 2023 Tripartite letter

Tripartite Group response - June 2023
Gateway desalination plant outage: You should provide an indication of the timescales needed to bring the desalination plant back into service should the resource position change and this asset be required.

Tripartite Group response - June 2023
We expect that any period of outage for the Gateway desalination plant of more than 6 months in duration should be documented as a reduction in deployable output when reporting for your Annual Review submissions.
Leakage: In your WRMP19 Annual Review submission for 2022/23 we expect you to report the actions you have taken across the year to deliver your leakage targets within each water resource zone, as well as at a company level. This should include the additional resourcing you have put in place, the leakage activities you have delivered, and the resulting reduction in leakage volumes. You should also provide a leakage recovery plan programme of work for the remainder of the AMP; with clear actions and associated targets you have in place to deliver your end of AMP leakage target. You should provide a 6 monthly update on progress with delivering your programme of work as part of your ongoing communication with regulators.
Metering: In your WRMP19 Annual Review submission for 2022/23 we expect you to report the progress that has been made on delivering your metering target and set out your programme of work to deliver your end of AMP target for metering. Updates on progress should be included in your 6-monthly reporting.
PCC: In your WRMP19 Annual Review submission for 2022/23 we expect you to report the progress that has been made on delivering your PCC target, setting out the activities that have taken place and how you have assessed the success of those activities. We would like to see a clear programme of work setting out how you plan to deliver your end of AMP target for PCC. Updates on progress should also be included in your 6-monthly reporting.

Our response June 2023

70. **Thames Gateway desalination plant outage:** Our Thames Gateway Desalination Plant has been out of supply for AR23 and therefore we have reduced the Deployable Output to zero. This is in line with Environment Agency outage guidelines. Please see section B3.1 for full details. On 29 June 2023 and following a period of significant and safety critical engineering work, commissioning of the remineralisation process commenced and subject to the successful completion of the activities needed to bring the plant back online, we expect the plant to begin putting water into supply in late July. As at the date of this submission our water resources position remains healthy, and we will be running the plant at a low level to provide data that will support its future use. It should also be noted that continued operation of the plant is entirely dependent on securing an ongoing regular and secure supply of the carbon dioxide that is essential to its operation.

71. We will include updates on our Thames Gateway desalination plant, metering, leakage and PCC in our 6 monthly WRMP updates for AR23 and will keep stakeholders informed on developments at the plant.

72. **Leakage:** We have set out the actions we have taken across this year in section B.2.7. We have also discussed our programme to recover our leakage position in section D1. A detailed breakdown by water resource zone and our leakage programme for the rest of the AMP will be discussed at the meeting with our regulators requested in July 2023.

73. **Metering:** We have set out the progress we have taken across this year in section B2.8. Our detailed programme for delivery in the rest of the AMP will be discussed at the meeting with our regulators requested in July 2023.

74. **PCC:** We have set out the progress we have taken across this year in section B2.4. Our detailed programme for delivery in the rest of the AMP will be discussed at the meeting with our regulators requested in July 2023.

Environment Agency Response to AR22

75. Additionally, the Environment Agency has raised a number of points in relation to our Annual Review in 2022. The full Environment Agency comments and our response can be found in Appendix K: WRMP19 and AR22 Comments and Actions.

76. The main concerns that were raised by the Environment Agency were linked to our Thames Gateway desalination plant and associated outage report in AR22, the changes in demand across our region, our PCC, metering and leakage performance. We have provided a summary of Gateway, leakage and PCC in our response to the tripartite letter above.

Part B – The out-turn year 2022-23

77. In Part B we report on the weather conditions experienced in the reporting year and how it has impacted our annual water balance.

78. We particularly look for whether there has been a cold winter, which typically would cause an increase in the volume of water lost through leakage, and also whether the summer has been dry and hot, which typically results in higher consumption.

79. Importantly the annual water balance enables us to compare the out-turn year with the normalised dry year and peak week forecasts used within the WRMP.

B.1 Overview of the weather

- Summer (and its impact on usage):

  The summer of 2022 was extremely dry, and was hotter than average. July 2022 had much warmer than average temperatures8. Notably a heatwave occurred in in mid-July, with the monthly average of the daily maximum temperature exceeding 27°C and a maximum of just above 40°C recorded at Heathrow, West London9. Ahead of this period the Met Office had issued its first ever Red Extreme Heat Warning10. This exceptionally warm weather resulted in high summer demand for water. The exceptionally dry conditions also impacted our summer leakage levels, as the ground dried out, pipes moved causing an increased level of leakage compared to last year.

- Winter (and its impact on leakage):

  The winter of 2022/23 was cold, leading to a substantial freeze thaw event11. This resulted in increased leakage compared to the previous year. In December 2022, the average daily temperature remained below 0ºC from the 7th December until 18th December 2022 in London and the Thames Valley12 (Figure 3). On the 15th December 2022, temperatures reached -9 ºC in Oxford.

[8] London Heathrow Airport | Weather History & Climate | Meteostat
[9] 2022_03_july_heatwave_v1 (metoffice.gov.uk)
[10] https://www.metoffice.gov.uk/about-us/press-office/news/weather-and-climate/2021/extreme-heat-warning-issued-for-western-areas
[11] https://blog.metoffice.gov.uk/2022/01/04/december2021weather/
[12] https://meteostat.net/en/station/03772?t=2022-01-01/2022-12-31

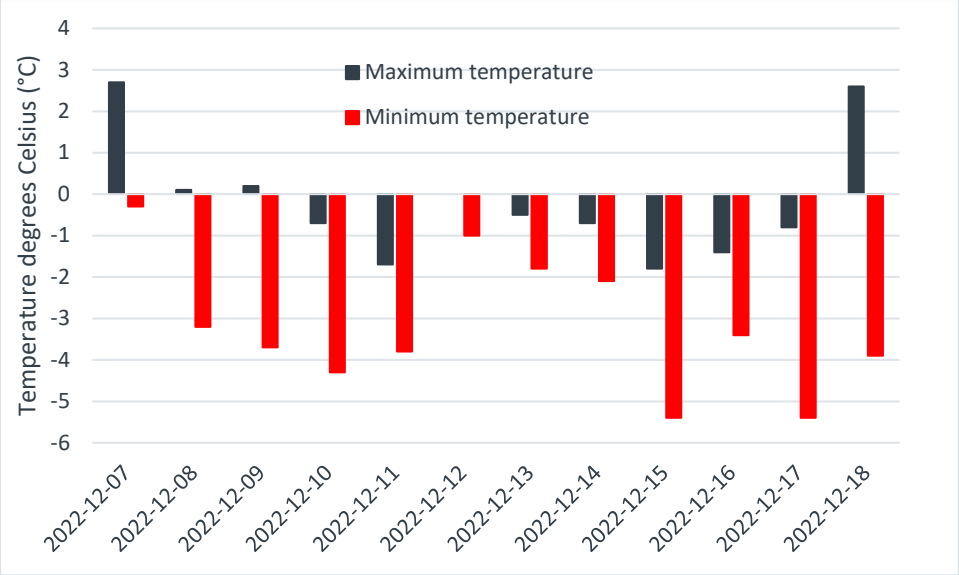

Figure 3: Heathrow Greater London temperature, December 2022

80. Figure 4 illustrates the increase in demand (as distribution input (DI), purple line) in the London WRZ during the hot, dry summer peaks in June, July and August. It also shows the winter demand peak after the freeze thaw event in December.

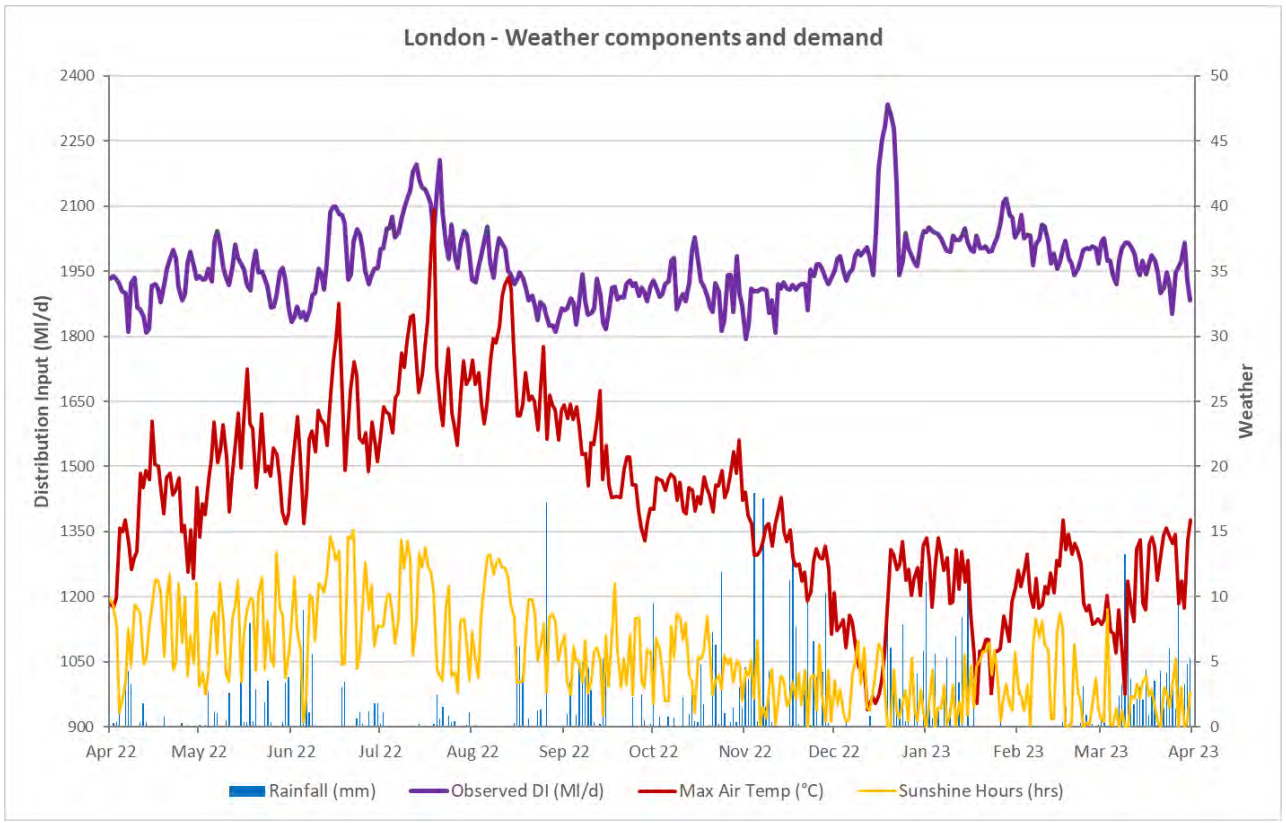

Figure 4: Weather components and demand – London WRZ

Drought in 2022

Overview

81. The drought in 2022 exemplified the perception that 'all droughts are different'. The drought developed quickly from a situation early in the year which was not signalled from our Drought Event Risk monitoring to be clearly high risk and across the industry was not a year generally perceived to be at high risk of severe drought.

82. Groundwater recovery in the previous winter was moderate meaning that groundwater levels were generally close to normal for the time of year. The end of the recharge period in March followed above average rainfall in February. November and January had significantly below average rainfall.

83. The drought started with below average rainfall from the start of March and accelerated in June with rainfall during the six months to August all being below average. July was extremely dry and also very hot. This resulted in increased demand across the company and accelerated reservoir storage decline, particularly at Farmoor, but also in London, notably in the west London reservoirs. This was because of the incoming flows from the upper reaches of the Lower Thames being suppressed, whilst in the lower reaches, flows were supported by tributaries such as the River Wey and the Mole. Further investigation is needed to understand whether this pattern has occurred in the past and if it could reoccur in future droughts. For instance, the naturalised flows at Teddington weir (on River Thames) and Feildes weir (on River Lee), for the month of July, ranged from 1391.04 Ml/d to 2246.40 Ml/d and 164.16 Ml/d to 269.681 Ml/d respectively.

84. In contrast to previous droughts, the impact to the Lee Valley was not as great due to baseflow from groundwater levels supporting flows in the River Lee. We also took the decision to deploy North London Artificial Recharge Scheme (NLARS) as soon as it was beneficial to help suppress storage decline. We were also able to support the Lee Valley through lower River Thames abstraction at Hampton into the Thames-Lee tunnel.

85. The drought risk became severe in the late summer necessitating the application for Drought Permits for the first time in over 30 years for SWOX and requiring Thames Water to request operation of West Berkshire Groundwater Scheme (WBGWS) with the aim of arresting the decline in storage in west London. Note that the scheme commenced operation in late October and ran for a total of 30 days, coinciding with a period of heavy rainfall.

    This intense and quickly developing drought situation highlighted the need for us to be able to move quickly to deploy drought measures such as Temporary Use Bans (TUBs) and to manage communications with customers to clearly communicate the rapidly changing drought position.

Climatic Conditions

86. The summer of 2022 saw an intense heatwave in the UK, with temperatures at some locations exceeding 40°C in July and southern England experiencing the driest July on record. The Environment Agency confirmed drought status in our area on the 12 of August 2022.

87. Rainfall in the River Thames catchment over the reporting year was slightly higher than average at 104% of the long-term average. Rainfall was significantly below average during the spring/summer period (April to September) at 63% of the long-term average, with July receiving only 12% of the monthly LTA. This preceded a very wet winter during which there was above average rainfall, 121%. Monthly rainfall totals relative to the long-term average are shown in Figure 5.

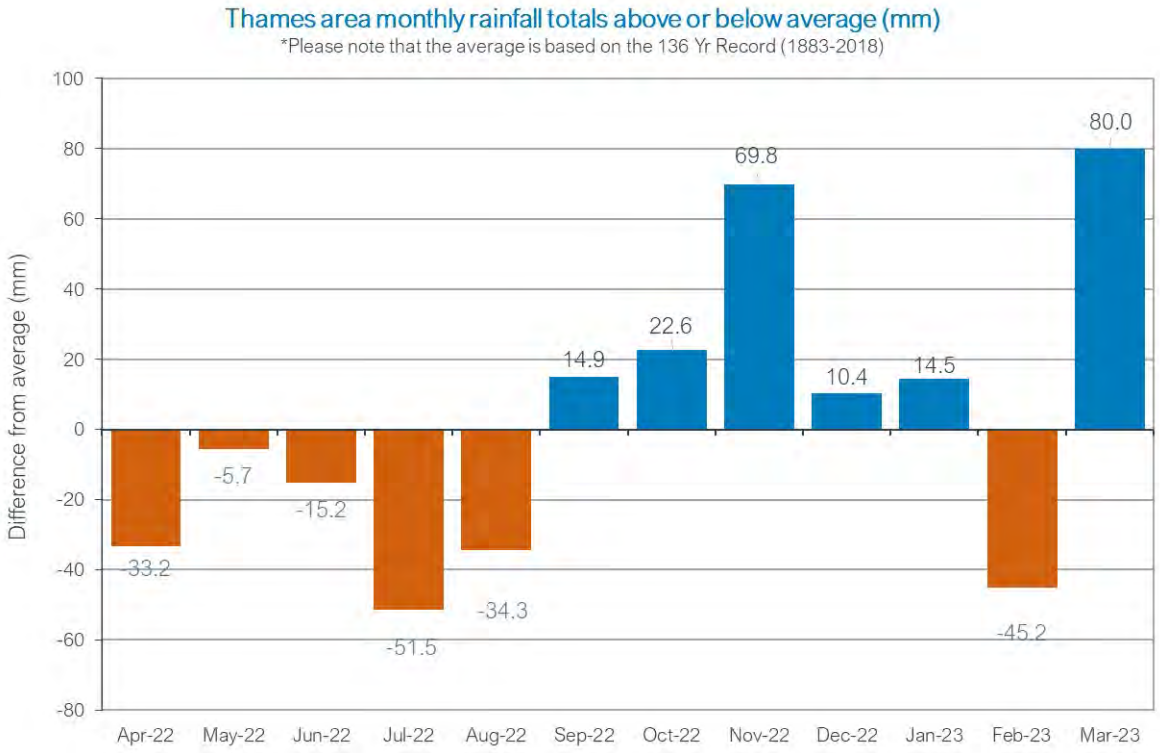

Figure 5: Difference in total monthly rainfall to long-term average rainfall

88. The drought continued to develop with exceptional shortage of rainfall occurring between November 2021 and August 2022. The following findings were calculated and documented as part of our drought permit application for SWOX.

89. The Standard Precipitation Index (SPI) for the period November 2021 to August 2022 indicated extremely dry conditions. The SPI for this period is the fourth lowest out of the 131 other 10-month periods ending in August in the historical record. The only other drier periods being the significant historical droughts of 1976, 1921 and 1934. The return period was calculated as 1 in 36 years. The 10-month rainfall accumulation ending August 2022 is classified as Exceptionally Low (using the EA's rainfall probability ranking), being only 62% of the long-term average (LTA 1891-2021).

River flows and groundwater levels

90. River flows and groundwater levels were exceptionally low in some areas. In the Thames Area Water Situation Report for August, the EA reported that "River flows at 80% of indicator sites were Below Normal or lower, and over half were exceptionally low. At the end of August, the EA Thames Catchment Situation Report noted levels at 13 of 16

groundwater observation sites were between Exceptionally Low and Below Normal. We also experienced extremely high demand for water during the heatwave.

Demand

91. Demand varies widely between years and is difficult to forecast and analyse as it is dependent upon numerous factors. In 2022 there were record breaking temperatures in the UK with a heatwave occurring in mid-July. In the Swindon and Oxford Water Resource Zone we experienced the highest demands seen over the last 20 years between the 9th to 20th July, putting significant pressure on our reservoir storage. In the London Water resource Zone demand reached highest in mid-July since 2003.

Reservoir storage

92. Overall London reservoir storage was lower than at any point since 1989 during August, Figure 6. Total reservoir storage reached its minimum in October 2022 despite some limited recovery in September. It was noted that throughout the drought, storage in the Lee reservoirs remained above or near average, whilst storage in West London had drawn down to significantly low levels in some reservoirs. The drought situation in the Lee Valley was less severe for a number of reasons:

- The groundwater levels in the chalk did not decline as significantly as groundwater levels in other parts of the catchment
- The Thames Lee Tunnel and NLARs also supported storage within the area

93. The West London reservoirs were impacted by the low flows in the River Thames, particularly upstream of tributaries to the lower Thames. Our abstractions which feed the upstream West Thames reservoirs were more heavily constrained by river levels and subsequently reservoir levels were lower compared to the downstream West Thames reservoirs.

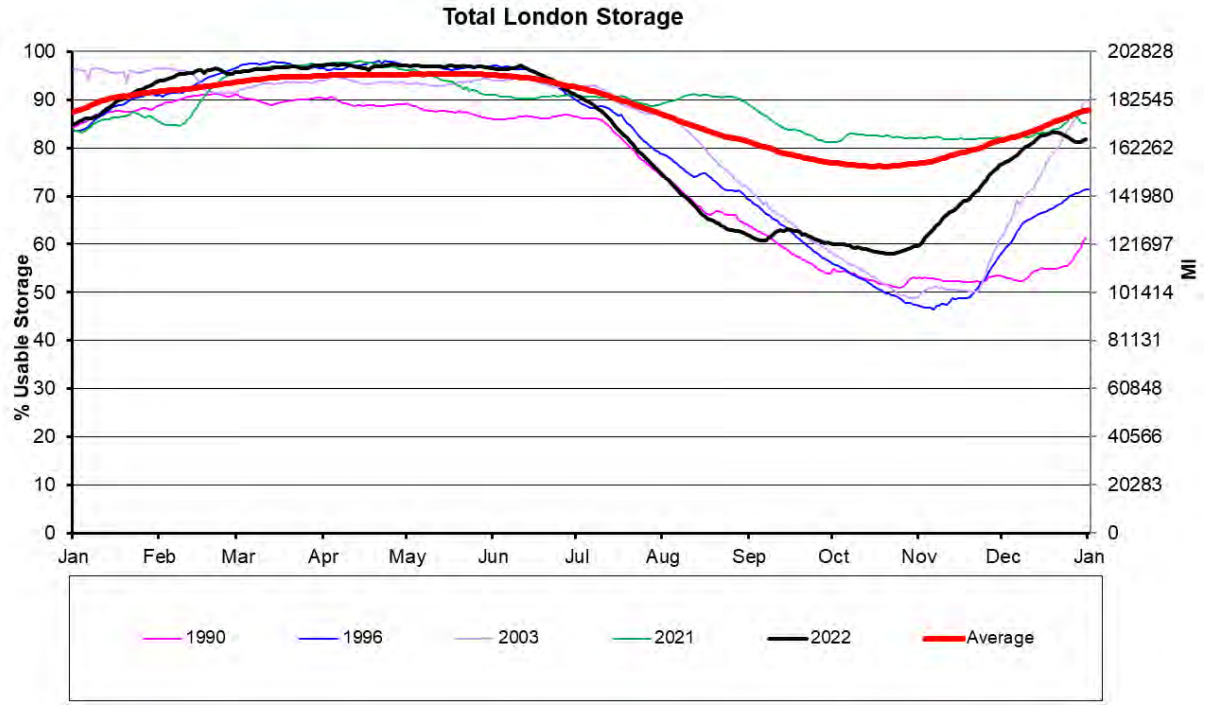

Figure 6: Total London Storage in 2022, 2021 and key dry years. Note record starts at 1989.

94. Reservoir storage in SWOX (Farmoor reservoir) declined rapidly during July and was the lowest since 2003 through August and into autumn. Farmoor storage reached its minimum in late October, with limited recovery in early September an early October.

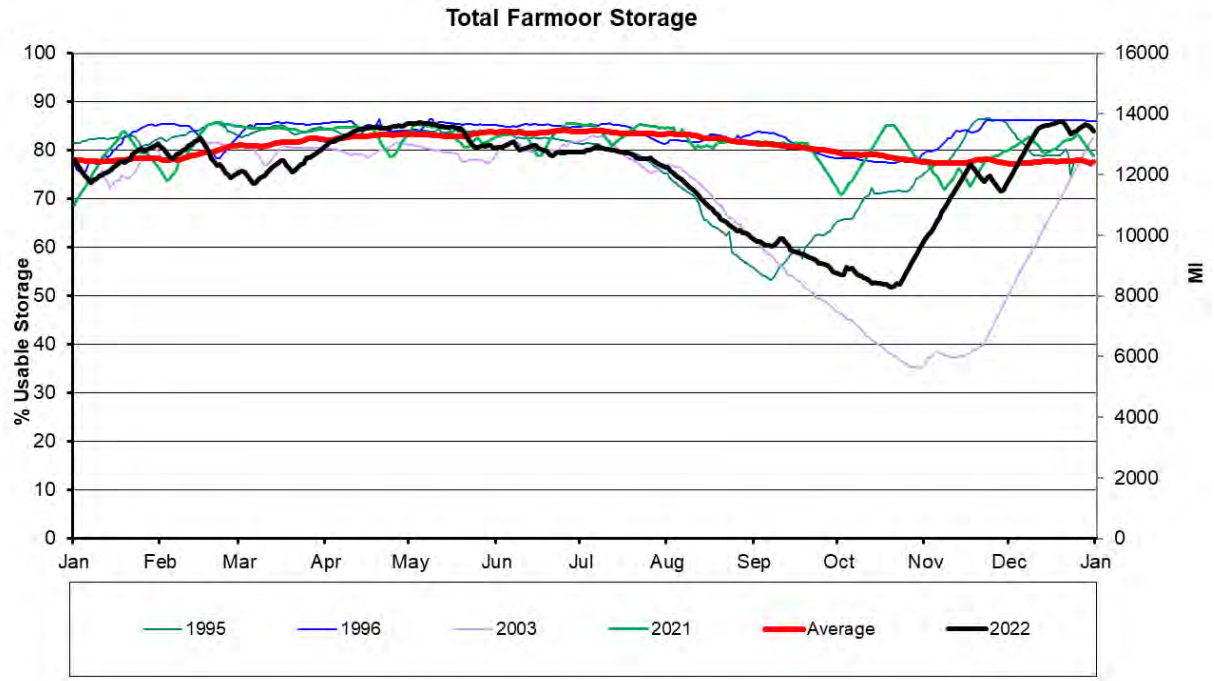

Figure 7 Total Farmoor storage in 2022, 2021 and key dry years. Note record starts at 1994.

Drought measures: Demand restrictions

95. Following our Drought Plan 2022, we began intensive media campaigns in May 2022 and after crossing Level 2 on the Lower Thames Control Diagram, introduced a Temporary Use Ban (TUB) on 24 August. The TUB remained in place until the 22 November 2022. This is the first TUB we have implemented since 2012. These activities followed the strategy set out in our Drought Plan 2022, in line with our levels of service and complying with the legislation and guidance. The media campaign resulted in 26,400 clicks to the TWUL water saving calculator. This has resulted in a 13% increase in the number of people making a deliberate effort to reduce water usage.

Drought mitigation measures: Strategic Schemes

96. In line with the Lower Thames Control Diagram, we deployed our North London Artificial Recharge Scheme (NLARS) scheme. The scheme ran from the 6 July until the 31 November with an average abstraction rate of 88 Ml/d and a peak of 126.7 Ml/d.

97. We also applied to the Environment Agency to request use of the West Berks Groundwater Scheme (WBGWS) to support West London reservoir storage levels. The scheme commenced in October and ran for a total of 30 days. With coincident heavy rain and limited operation time, it has been difficult to quantify the benefit that the scheme provided in October/November 2022.

Drought mitigation measures: Drought permit applications

98. In response to the increasing severity of the drought during the summer of 2022 in SWOX, we applied for Drought Permits to take more water at Farmoor, and increase groundwater abstraction from Baunton, Meysey Hampton and Axford to help secure supplies in our Swindon and Oxford area and to arrest the decline in Farmoor reservoir storage. The Farmoor Drought Permit was issued and was in force until the end of March 2023. Due to the significant rainfall in September and October we did not use the Farmoor drought permit. We withdrew our applications for the Drought Permits at Baunton, Meysey Hampton and Axford. Therefore, we have not used any Drought Permits this year.

Summary

99. Following the drought event of 2022, we have reviewed our drought plan and focussed on lessons learned. There are no material changes required to our Drought Plan. We will be including a new appendix to our dWRMP24 covering the 2022 drought and actions that were taken.

B.2 The Water Balance

100. To understand how water is used across our supply area in a reporting year, we use a water balance.

101. The water balance is split into the following components:

- Distribution input – the amount of water put into our supply network
- Household use – water used in the home and garden (including the per capita consumption (PCC) measure)
- Non-household use – water used by businesses and institutions
- Minor components – including operational water we use to maintain the network, water used without charge either legally (e.g. fire hydrant use), or illegally (e.g. usage in a property declared as void (empty))
- Leakage – water lost from the distribution system, trunk mains, service reservoirs and customer side leakage

102. In the following sub-sections we will explore each of these components and how they have changed compared to last year at company-level. The full breakdown of the out-turn water balance for 2022/23 by WRZ is provided in Appendix A: Out-turn Tables – Annual Average and Appendix B: Out-turn Tables – Critical Period.

103. The water balance for this reporting year continues to be impacted by changes in water use behaviours as a result of Covid-19 lockdowns, however less so than in the previous years. We see a continuing trend of reduction in household water use and increase in non-household water use as people continue to return to places of work.

B.2.1 Methodology

104. The methods used to produce the water balances undertaken for this review have been reviewed and endorsed by an independent external auditor.

B.2.2 Summary of changes in key components of the water balance

105. The main changes from last year at company-level (actuals) are:

- A increase in distribution input of 26.16 Ml/d
- An increase in measured household consumption of 4.48 Ml/d and a decrease in measured PCC of 10.50 litres per person per day
- A decrease in unmeasured household consumption of 41.87 Ml/d and an increase in unmeasured PCC of 8.12 litre per person per day
- An increase in the measured non-household consumption of 35.89 Ml/d
- An increase in leakage of 25.82 Ml/d

106. Overall the water balance discrepancy at company-level (the difference between distribution input and the independent calculation of its components) has decreased from -3.52% last year to -1.39% this year. This is within good practice reporting limits (of +/- 2%).

107. The water balance discrepancy is apportioned across the components of demand using the Maximum Likelihood Estimation (MLE) technique. The confidence intervals applied remain the same as last year.

B.2.3 Distribution Input

108. Distribution Input (DI) refers to the volume of water put into our supply network to meet demand. DI is calculated from the sum of our treatment works output, the net balance between bulk imports and exports and the removal of demand from insets. Adjustments are made for meter error where the discrepancy with the test meter is greater than 5% and for on-site operational use where the off take is downstream of the distribution input meter.

109. Distribution Input this year has increased by around 26 Ml/d (Table 2). This is due to the prevailing weather conditions and can be related to the increase in leakage during the extreme summer and winter periods.

Table 2: Summary of AR22 and AR23 Distribution Input

	AR22	AR23	Variance
Distribution Input (Ml/d)	2,547.59	2,573.74	26.16

B.2.4 Household Use

Measured Properties

110. Water delivered to measured properties is reported from our customer information systems. Properties are billed in the SAP ISU billing system. PCC is the water used (water delivered minus supply pipe leakage) per person.

111. The reported volume delivered to measured households increased by 4.48 Ml/d with the PCC decreasing by 10.50 l/h/d compared at AR22 (Table 3).

112. The increase in water delivered is due to the following: the progressive metering programme (PMP) where more homes have been moved to the measured household category; further optant metering where customers have opted for a metered bill; additional new build properties; and further de-registration of household properties from the non-household market.

113. The decrease in PCC can be attributed to impacts of Covid-19 lessening, the impact of reduced consumption driven by “cost of living crisis”, the volume of company-led customer

engagement and external media coverage, and the temporary use ban in the latter part of the year.

Table 3: Summary of AR22 and AR23 Household Use Measured

Household Use - Measured	AR22	AR23	Variance
Water delivered billed measured households (Ml/d)	719.79	724.27	4.48
Measured household PCC (l/h/d)	126.56	116.05	-10.50

Unmeasured Properties

114. The Domestic Water Use Study (DWUS) is used as a base to determine water consumption for unmeasured household accounts. The DWUS comprises a panel of households and examines the water use in these households that have a meter fitted, but who are billed on the unmeasured tariff. This means they behave more like an unmeasured customer, but their water use is captured by the DWUS meter.

115. This panel has been shrinking over the AMP6 period with the roll out of the progressive metering programme (PMP). As a result, two other data sources have been introduced to supplement the DWUS panel: the unmeasured period from the properties metered under the PMP prior to the household paying on a metered tariff (the metering journey for these properties meaning that there is a period of recorded consumption billed as unmeasured, before they are switched to metered billing), and; a panel of bulk metered areas (BMAs) to capture use in blocks of flats.

116. The DWUS, BMA panel and PMP results are weighted by property type, occupancy and ethnicity to determine the overall value for unmeasured household consumption.

117. The reported volume of water delivered to unmeasured households has decreased by 41.87 Ml/d this year, whilst PCC has increased by 8.12 l/h/d (Table 4).

118. A decrease in water delivered is to be expected as properties move to measured billing via the progressive and optant metering programmes.

Table 4: Summary of AR22 and AR23 unmeasured household use

Household Use - Unmeasured	AR22	AR23	Variance
Water delivered billed unmeasured households (Ml/d)	919.33	877.46	-41.87
Unmeasured household PCC (l/h/d)	164.17	172.29	8.12

119. The increase in unmeasured household PCC is due to the movement in population between unmeasured and measured households. There may have also been a slight impact due to the population data used. This year the first phase of the new Census 2021 results were partially released. We have undertaken a review of the data available and have consulted with industry experts and the Office for National Statistics (ONS). Following this review we have taken the decision not to use the new Census datasets, due to the following concerns:

- The 2021 Census was conducted in online form only
- The 2021 Census was undertaken during a Covid-19 lockdown and the majority of people were restricted in their movement
- A large proportion of the population were working from home and in March 2021, at the time of the Census, London had a significant drop in pay rolled employees

- Commuting was restricted to 'key' and critical services workers only
- Students residing in large cities moved back to their original home or changed rental accommodation due to the financial impact of the pandemic
- Schools and universities students attended courses remotely
- The pandemic and lock down would have temporarily impacted overseas and local tourists

120. ONS confirmed the potential for miscalculation of the population due to the above factors, particularly in London, and warned to use Census results with caution. Several Local Authorities have also questioned the Census 2021 results and have used alternative models to calculate population, for example the London Borough of Hackney is using the Mayhew study model.

121. More detailed information is reflected in reports published by ONS. In addition, further information on the population moves during the pandemics, immigration statistics, including. the impact of Ukrainian refugees, etc. is yet to be processed and will be released at a later stage.

122. Therefore the decision was made to use MYE 2020 as the base population until further Census data and MYE 2022 are released later this year.

B.2.5 Non-household Use

123. Billing for non-household properties was migrated to the non-household Retail Market in 2017. Billed consumption is now provided by the Central Market Operator System (CMOS), including estimates of consumption for unmeasured and assessed non-household properties.

124. We have no direct control over the estimation of consumption of non-household properties, nor meter reading, but liaise with the Retailers if we have concerns.

125. Measured non-household water delivered is higher than last year, by 35.89 Ml/d. Unmeasured non-household water delivered is also lower by 0.40 Ml/d (Table 5).

126. The increase in usage in non-households can be attributed to people gradually going back to workplaces.

Table 5: Summary of AR22 and AR23 non-household use

Non-Household Water Use (Ml/d)	AR22	AR23	Variance
Water delivered billed - measured	379.78	415.67	35.89
Water delivered billed - unmeasured	15.55	15.15	-0.40

B.2.6 Minor components

127. Minor components include operational water we use to maintain the network, water used without charge either legally (e.g. fire hydrant use), or illegally (e.g. usage in a property declared as void (empty)). A summary is provided in Table 6.

128. The movements this year are primarily related the MLE balancing process rather than an underlying change in assumptions or volumes.

Table 6: Summary of AR22 and AR23 minor components water use

Minor components Water Use (Ml/d)	AR22	AR23	Variance
Distribution system operation use	17.15	18.02	0.87
Water taken legally	27.65	29.45	1.80
Water taken illegally	41.95	48.21	6.26

B.2.7 Leakage

129. Leakage reduction is an extremely important part of our plans to manage the balance between supply and demand. Consequently, we have challenging targets to deliver a 20.5% reduction in our base level of leakage (as a 3-year rolling average) by 2024/25 and a goal to reduce leakage by 50% (of 2017/18 levels) by 2050.

130. During 2021/22 we created a Leakage Reporting and Insight Improvement Programme (LRIIP) which was designed to improve confidence in our data and processes, improve resilience, provide greater accuracy and consistency of reporting through assurance and demonstrate how we will use insight to effectively deliver improved leakage performance expected by our customers and stakeholders. The LRIIP consisted of five themes and 21 critical deliverables with due dates through to March 2023. All deliverables have been completed, assured, and signed off by our Internal Audit team. Ofwat has been kept up to date with our progress through quarterly meetings.

131. In January 2023, a new Assurance and Continuous Improvement team was established to transition the LRIIP deliverables into "business as usual" and to continuously improve against the objectives set out in the LRIIP.

132. Our reported leakage for 2022/23 is 619.7 Ml/d, an increase of 25.9 Ml/d, as shown in Table 7. Our final year end leakage outturn will be reported in our Annual Performance Report ('APR') which we will publish in July.

Table 7: Summary of AR22 and AR23 out-turn year total leakage

Out-turn year Total Leakage (Ml/d)	AR22	AR23	Change
Total leakage	593.8	619.7	+25.9

133. Further information on performance against the WRMP19 forecast and at WRZ-level is provided in Part C.

134. To get back on track with our AMP commitment we have evolved our recovery plan into a 'Leakage Transformation Plan'. The Transformation Programme will focus on enhancing current strong performance and key identified initiatives to help in driving further improvement in our operation. This transformation approach is underpinned by the industry-wide PALM initiative - Prevent, Aware, Locate and Mend. We will achieve this by focusing on the below key pillars:

- A data driven approach where we will drive a more focused approach to enhancing and driving further improvement on DMA Operability, further investing in insight to allow us to account for water consumption and leakage on a day-to-day basis.

- Driving our 'Love Your DMA' transformation initiative by further developing insight and targets on a DMA level. Building upon the success of our leakage reduction programmatic activity and rolling out improved ways of working into the business-as-usual teams.
- Fixing the right leaks, faster by continuing to grow and enhance technology in the 'Aware & Locate' space. Utilising various 'point of interest' tools (such as acoustic loggers, self-correlating loggers, satellite technology.
- Continuing to be at the forefront of innovation to enhance and inform future ways of working. We are just about to embark on a long- term strategic partnership with FiDO and Microsoft, where we will enhance the partnership built up over the previous two years to utilise the artificial intelligence software as a service package to drive leakage reduction in troublesome areas.
- Launch Water Networks Transformation 3.0 focusing on transforming our field performance and improving productivity further in the insourced teams.
- Implement our Smart System proof of concept trial in North East London. Initially we are looking to roll this out on a small scale in five DMA's, to make sure that learning is in place and understood before scaling. The plan is to then roll this out across an entire hydraulic system (nine flow monitoring zones, 140,000 properties).

135. Under our Green Economic Recovery programme, we will be installing 200,000 household meters, 3,000 non-household meters and 1,700 bulk meters across the Thames Valley region. This programme of activity will be delivered in years 4 and 5 of AMP7 (2023-2024, 2024-2025), with the leakage reduction benefits of and demand reduction of 14.8 Ml/d to be realised at the beginning of AMP8.

B.2.8 Metering

136. The metering programme includes two main workstreams for new household installations, optants and the progressive metering programme (PMP). The optant programme installs meters at the request of the customer. The PMP involves the installation of meters on a compulsory basis as part of our ongoing programme of activity to make the most efficient use of water. These customers have a meter installed at their property and are moved to a metered tariff after a year.

137. There are two additional programmes relating to household metering, meter replacement and bulk metering. The meter replacement programme exchanges household meters at the end of their life with a new ‘smart’ meter. The bulk metering programme installs meters on our connections to blocks of flats.

138. The metering programme is a key enabler to help to identify leakage.

139. Our current strategy is to install only smart meters in our optant, selective and replacement programmes. However, there will be instances when a customer may request a ‘basic’ meter.

140. Smart metering allows meter reads to be collected remotely through our wide area network. We can receive daily a profile of either 15-minute or hourly read data. This rich source of data allows us to better understand water usage in our supply area and identify leakage and wastage, enabling us to work with customers to help reduce demand and leakage. Outside of our wide area network coverage (London WRZ only), the same meter is installed but operates in a ‘walk-by or ‘drive-by’ reading mode.

141. The total number of meters installed under each of these programmes in 2022-23 is provided in Table 8 compared to the WRMP19 forecast where applicable.

Table 8: Meter installations in 2022-23

Meter Installations	Water Resource Zone						Total	WRMP19 Forecast	Variance
	LON	SWOX	SWA	KV	GUI	HEN			
Progressive Metering	71,976	12,466	3	2	4,262	0	88,709	89,006	-297
Optant Metering	10,429	2,914	1258	1531	452	0	16,584	17,297	+713
Smart Replacements – HH	32,570	4,142	1235	1455	802	0	40,204	34,772	+5,432
Small Bulk Meters	0	0	0	0	0	0	0		
Large Bulk Meters	728	0	0	1	0	0	729	134	+595
Total	115,703	19,522	2,496	2,989	5,516	0	146,226	145,605	+621

142. Overall, we have installed and replaced 621 more meters in 2022-23 than we forecast in the WRMP19.

143. We continue to monitor the benefits of smart meter installations across our network, with regular reviews of our work-mix installation plans so that the profile meets the needs of both programmes.

144. Deliveries for our smart meters and their associated components continue to be impacted by the global microchip shortage restricting manufacturing in the supply chain.

145. Our forecast for meter installations and replacement are totals over the 5-year period of our Business Plan and we expect to achieve our targets over the 5 years. See section C2.3.

Progressive Metering

146. In WRMP19, we forecast to install 89,006 domestic water meters across London and the Thames Valley this year as part of the PMP.

147. We slightly underdelivered against our target, installing 88,709 meters across our network. This was due to the reprofiling of our programme to prioritise the delivery of our M01 and M02 performance commitment. We anticipate delivering all missing installs in April & May of 2023-24 to recover our position.

148. Whilst the majority of our meters were installed in the London area, we successfully delivered above our WRMP19 target in the SWOX and Kennett Valley WRZ's. We plan to focus our programme on internal installs in the Thames Valley and Home Counties area over the remainder of the AMP7 period.

Optant Metering

149. In WRMP19 we forecast we would install 17,280 meters through our optant metering programme each year, based on historic take-up rates.

150. We installed 16,584 meters, significantly less than our 2021-22 output of 21,006.

Meter Replacement

151. In WRMP19 we forecast that we would replace 35,755 meters in household properties through our meter replacement programme. These are meters identified for replacement are those more than 14 years old (proactive replacements), or those identified as inaccurate, defective, or stopped by customers or company/contractor personnel (reactive replacements).

152. We exceeded our target, replacing a total of 40,204 meters across the financial year, the benefits of which are captured in our value for total leakage.

Bulk Metering

153. We have installed 729 large bulk meters in 2022/23.

B.2.9 Water efficiency

154. Reducing water use across our region is a core priority for our business, which is why we've continued to deliver a large water efficiency programme. The cumulative Ml/d demand reduction achieved to date over AMP7, is slightly ahead of forecast, with some demand reduction variation seen across all individual activities. The Water Efficiency programme will continue to evolve, using smart meter data and regular monitoring of each activity, with a focus on the total AMP7 demand reduction objective.

155. This year:

- Our Smarter Home Visits (SHV) activity was reduced due to re-profiling of demand reduction programmes in line with smart meter rollout activities and the increasing focus on targeted digital engagement. The Ml/d demand reductions achieved through SHVs was only slightly short of forecast. The total AMP7 cumulative Ml/d demand reductions are below the original AMP7 forecast, due to long-standing impacts of Covid restrictions impacting on-ground delivery capability, plus a shift to increase target digital engagement with customers to drive self-fix activity. Our use of smart meter data to assist targeting high usage households to maximise the demand reductions achieved per SHV, plus continuous flow data to initiate targeted engagement for both wastage self-fixes and Customer Supply Pipe Leakage (CSL) action. This insight has been shared with Government, regulators and other water companies to help inform PR24 programme development.
- Our Smarter Business Visit (SBV) activity continues to be a very effective demand reduction activity. The Ml/d demand reduction benefits delivered in 22/23 exceeded the annual forecast, due to partnership working with the Department for Education enabling increased school visits, which provide enhanced water saving opportunities and help public sector organisations secure financial savings benefits. During and since the 2022 Drought, we have used smart meter data to help target continuous flows on business properties and increase joint-working with business Retailers. Our insight on business water use/loss was shared with Defra to aid the development of new National Water Targets for business demand, plus shared with Ofwat and the Retailer-Wholesaler Group to aid the development of PR24 performance commitment approaches. Our water savings evidence from SBVs also assisted in MOSL's development of their Interim Metering Strategy. Our SBVs were also being used in specific Water Resource Zones in response to the 2022 heatwave and official Drought.
- Our wastage fixes are continuing to deliver consistent and useful water savings per visit, but the cumulative demand reduction process is behind the original WRMP projection due

to the long-standing impacts of Government Covid restrictions in year 1, which resulted in months of no delivery. The insight from our wastage fix initiative was supplied to Defra and Ofwat to inform National Water Target and PR24 demand reduction approaches. Our wastage evidence continues to be shared with regulators, industry and trade bodies, the manufacturing industry and product certification bodies to help inform activities aiming to address the UK's 'leaky-loo' issue.

- We have been exploring how best to engage with NHH Retailers and business customers whose smart meters are recording continuous flow. Around 30% of flow through our NHH smart meters is registering as continuous flow (flow of one litre per hour, every hour for 14 consecutive days or more). Continuous flow is evident across every business category and we are working with retailers to test various engagement methods and offer options on identifying and fixing wastage. These include communications directly from retailers with their own solution methods; dual branded Thames Water/retailer branded letters; and Thames Water only branded letters.

  The data for meters with continuous flow is now shared directly with the retailers via our Digital Data Dashboard, so they can access live information and communicate this with their customers to reduce water loss.

  We have now analysed the results from our first trial of sending letters out to ~4,000 businesses with continuous flows greater than 240 l/day to encourage a self-fix on the property. These letters were a mixture of co-branded with the retailer and Thames Water only branding. We will share our insight with the NHH retail market, regulators and MOSL to help enhance demand reduction successes and benefit retail market viability.

- We launched an industry-first Environmental Incentive for Developers, aimed at enabling and accelerating levels of water efficiency performance in all new development in our supply regions. Our three-tiered discount scheme that encourages developers to better guarantee that water efficiency fittings/appliances are installed, financially incentivises the inclusion of water reuse technologies (rainwater and greywater), plus achieve water neutrality through saving water in existing homes and businesses in the same water resource zone.

  We teamed up with Berkeley Group/St. George to pilot the concept of water neutrality on the Royal Exchange development in South West London. The objectives of this pilot were to:

  i. Quantify how much water new homes actually use, compared to water performance levels of 125 and 110 litres/person/day as outlined in Part G of Building Regulations.
  ii. Quantify the water use and PCC benefits of using the 'fittings approach' from Part G.
  iii. Quantify the water savings volumes that can be made from retrofitting existing homes and businesses in the surrounding area.
  iv. Prove that achieving water neutrality by offsetting the forecast water demand of a new development, can be done by improving the water performance of existing surrounding buildings.

The results of this water neutrality project will be disseminated through the water utility and developer sectors, as proof that offsetting future new water demand can be achieved with relatively simple water device retrofits and wastage/leak fixes in existing homes and businesses.

- We continue to offer non-financial incentives to smart metered households registered with our partner Greenredeem. These customers benefit from rewards and prizes for their efficient use of water. Our ability to expand our Greenredeem water efficiency incentive in line with WRMP projections, was impacted by reduced SHV activity and the restricted ability to digitally/electronically engage with customers to promote water efficiency incentives due to the updated Privacy and Electronic Communications Regulation (PCR) ruling under data protection laws, requiring greater levels of customer consent. The demand reduction volumes per customer registered with Greenredeem continue to be very favourable. We have expanded the partnership with Greenredeem to include sewer abuse/blockage education and customer engagement. We will continue our use of incentives to enable greater demand reduction benefits to smart meters customers.
- Our free online calculator has continued to help thousands of households work out how much water they're using. This interactive tool also links this to water and energy costs, displaying the most appropriate water-saving devices and pop-up tips that customers can use to save water, energy and money. Customers can even test settings for the top five actions (like showering or washing the dishes) to see how much water and energy they could save in the future. This is also the first calculator of its kind to identify how much water a customer typically uses outside of their home, such as when they're showering at the gym. This means our customers can see exactly what impact they'rehaving on water demand, and for the first time see their water use presented in PCC metrics. https://www.thameswater.co.uk/help/water-saving/water-saving-calculator
- We have not delivered any non-potable water reduction in AMP7. Our efforts have focused on working with Defra and the Future Homes Hub to inform the development and consultation of Building Regulations changes. We have also introduced the water sector's first Environmental Incentive for Developers that financially incentivises the take-up of water reuse technology such as rainwater harvesting and greywater recycling. The aim of this developer incentive is to accelerate the adoption of non-potable technologies within new housing development and work towards a 'water neutral' outcome. We are also working with a large golf course to scope and implement an innovative use of final wastewater effluent within irrigation practices.
- We migrated all separate housing association home visits into our larger SHV programme in 21/22. From 22/23 onwards, all water efficiency visits conducted in housing association properties will fall into the SHV delivery and reporting space.
- We have continued with our Water Efficiency Incentive for Business Retailers. Insight from this offering is shared with Ofwat, MOSL and Retailers to inform future retail market regulation and engagement bilateral arrangements. We continue to engage with external suppliers of new technology and customer engagement opportunities. These engagements can lead to small pilots and trials to inform future water efficiency programmes. In parallel to sharing these results with other water companies through the Water Efficiency Network, we will use these trials to expand our innovation activity into later AMPs.
- We continued to engage with multiple government, regulator and industry groups that influence water policy, regulations and national projects. We contributed demand

reduction insight and data, plus advice based on experience delivering large-scale smart metering and water efficiency programmes across household and business customers. These groups include; UK Water Efficiency Strategy steering group, UK Water Neutrality sub-group, Defra's Water Labelling steering group, Future Homes Hub, and the Retailer-Wholesaler Group's Water Efficiency Sub-Group.

156. As a lead supporter of Waterwise, we are a long-term active member of the UK Water Efficiency Strategy Steering Group and Water Efficiency Network steering group. We have played key roles in the working groups on water neutrality and water reuse, resulting in guidance publications to advance both agendas.

157. We have been a key active member of the Retailer-Wholesaler Group's Water Efficiency sub-group, developing evidence and recommendations for future improvement on demand reduction within the non-household market.

158. We've also collaborated with key stakeholders and neighbouring water companies to set ambitious water-saving targets for the next business plan period. We have also presented results from our smart metering data analytics and water efficiency initiatives at national conference events.

159. Two of our water efficiency programmes have been shortlisted for the Water Industry Awards 2023 - Water Efficiency Project of the Year

- Water Efficiency innovation from rolling out smart meters in businesses: Non-Household Smart Meter Data Services and Continuous Flow Live Dashboard
- Water Neutrality Pilot

160. We continue to champion water efficiency across the entire business, including in our boardroom, with regulators, at stakeholder partnership meetings, at the UK Water Efficiency Strategy Steering Group and at customer care contact centres. We have delivered large-scale programmes to save water on both household and business sites, while continuing to inspire the next generation through exciting educational activities, customer engagement and community partnerships.

B.3 Supply performance

161. In this section we discuss source availability throughout the year, actual outage (when we are not able to use a source), and progress with new resource delivery.

B.3.1 Source Availability during the Year

162. While we were able to meet demand through 2022-23, there were some extended periods of very high demand during the drought. This resulted in the rapid draw down of storage in some of our raw water reservoirs. We also deployed some of our strategic schemes to support reservoir storage, in line with our Drought Plan. Key sites/areas to note when considering source availability over the past year are detailed below.

NLARS

163. The crossing of Level 1 on the Lower Thames Control Diagram (LTCD) led to the use of the NLARs (and Chingford Artificial Recharge Scheme (CHARS)) schemes from the 6th July. The CHARS boreholes began supply from 13th July, with NLARS boreholes commencing supply from 25th July. Ramp up of the schemes continued through the summer supporting reservoir storage and ability to meet demand in the Lee Valley.

Thames Gateway Desalination Plant

164. For the whole of the AR23 period the Thames Gateway desalination plant has been not available and therefore the DO has been written down to 0 Ml/d and not included in the outage allowance calculation. This was due to an electrical fire in the late autumn of 2021, and then a planned outage in May 2022 to carry a second phase of AMP7 investment. At this time the risk was assessed of a planned outage of the plant and was seen as low risk assuming no extreme dry weather event. As it is now known, an 'exceptional drought' started in the summer of 2022, with the Thames Gateway desalination plant then not available. Due to weather patterns the north London reservoirs were at good levels throughout the drought leaving a limited need for the Thames Gateway desalination plant.

165. Following the onset of the drought, key elements of the 'Phase 2' work, targeting health and safety improvements, were fast tracked to aim for a February 2023 return to supply at up to 50 Ml/d. Following the identification of a failure in one of the joints on newly installed air pipework (that led to the air main pipework and fittings needing to be being replaced) this work was completed in May 2023, in line with the revised timescales that were shared with stakeholders in January.

166. On 18 May we wrote to stakeholders to inform them that we were ready to commission the plant but we were unable to do so as we were unable to secure the carbon dioxide that was needed to start the remineralisation process.

167. Since 18 May letter, we have continued to engage with carbon dioxide suppliers from across Europe to secure the carbon dioxide that is needed to start the remineralisation process and put the Thames Gateway plant back into supply. On 29 June we informed stakeholders that we now have sufficient carbon dioxide on site to run the plant for the next 30 days and that commissioning of the remineralisation process has started. Subject to the successful completion of the activities needed to bring the plant back online, we anticipate putting water into supply in late July. However, it should also be noted that continued operation of the plant is entirely dependent of securing an ongoing regular and secure supply of the carbon dioxide that is essential to its operation.

168. We will continue to keep stakeholder and regulators informed of developments.

169. With the completion of this 'fast track' phase, a further 'non fast track' stage of phase 2 will continue during the AMP7 so that the plant is able to operate at a reliable 50 Ml/d. This work includes improved Reverse Osmosis (RO) racks leak collection and drainage, improved undercroft drainage and floor surface upgrades, and design and procurement activities for chemical improvement works.

170. It has also been noted that we are awaiting DWI accreditation of new Reverse Osmosis membranes to enable the site to produce more than 50 Ml/d. The sole laboratory used by DWI for Reg 31 testing is moving premises, which will delay their previously advised June 2023 Reg 31 approval date for the new RO membranes. Enquiries have concluded that it will be 6-12 months before the new lab will be able to start re-testing for Reg 31 purposes. The new RO membranes, which can only be manufactured post Reg 31 approval, are estimated to arrive 3-6 months post Reg 31 sanction. These timelines indicate that the site could be limited to 50 Ml/d until after summer 2024. Discussions with DWI, the lab and the membrane supplier are ongoing.

171. During 2022 we reviewed and revised the deployable output of the plant. It became apparent that the plant itself would not be able to achieve a deployable output of 100 Ml/d.

Meetings were held with the EA, Defra and Ofwat to review this decision to reduce the deployable output to 50 Ml/d in our water resources modelling. This has also been taken into account in our WRMP24 planning, with further funding included in our PR24 business plan to improve the capability and resilience of the plant to provide a deployable output of 75 Ml/d by 2030.

West Berkshire Groundwater Scheme (WBGWS)

172. Due to the Drought and subsequent pressure on water resources in 2022, we requested the use of WBGWS. The scheme commenced operation in late October. The scheme provides a benefit to River Kennet which then flows into the River Thames, allowing for increased abstraction in the Lower Thames. The scheme ran for a total of 30 days in October/November 2022. With coincident heavy rain and the relatively short period of operation, there is currently limited understanding of the benefit that the scheme provided.

Gatehampton and Chinnor

173. There have been reductions in deployable output at Gatehampton and Chinnor in the SWOX WRZs. These reductions are discussed in relation to the Security of Supply Index below.

B.3.2 Actual Outage

174. In this section we present "Actual Outage" that has occurred in the past year and also provide an update to our "Outage Allowance" for WRMP19, which is based on an outage risk assessment.

175. The total Actual Outage across London and the Thames Valley this year is 31.8 Ml/d, compared with 184.8 Ml/d reported in 2021/22 as presented in Table 9. This reduction is related to the write-down of Thames Gateway desalination plant deployable output. The DO is 0 Ml/d as the contribution to outage is removed. Previously, the Thames Gateway desalination plant was the main contributor to London's outage.

Table 9: Actual Outage by WRZ

WRZ	2021/22 (Ml/d)	2022/23 (Ml/d)	Variance (Ml/d)
London	170.8	22.9	-147.9
SWOX	4.3	1.3	-3.0
SWA	6.1	4.6	-1.5
Kennet Valley	2.4	1.5	-0.9
Guildford	0.4	0.9	+0.5
Henley	0.8	0.6	-0.2
Total	**184.8**	31.8	**-153.0**

176. Further details are available in Appendix E: Outage.

B.3.3 New resource development

177. No new resource developments were due to be delivered in 2022/23.

178. Further details and updates regarding the AMP7 resource development programme and the ongoing studies into Strategic Regional Options can be found in C.2.4 and C.2.5a.

B.4 Security of Supply Index

179. The Security of Supply Index (SoSI) describes a company's ability to meet its planned levels of service for average demand in a dry year (DYAA) and during the dry year critical period (DYCP). An index of 100 indicates surplus in all WRZs.

180. This year, we have achieved supply-demand surplus in all WRZs for the DYAA scenario. However, for the DYCP scenario, there is a deficit of 4.4 Ml/d in SWOX WRZ, which resulted in a final SoSI score of 99. The deficit in SWOX has been driven by a reduction in DO at our Gatehampton and Chinnor sources, as well as a much higher level of demand than had been planned for in our WRMP19 forecast. The reason for the DO reductions and plans to recover the loss of DO are explained below.

181. Details of the components of the SoSI calculation are provided in Part C.

Table 10: Summary of AR22 and AR23 SoSI score

SoSI		2021/22	2022/23
DYAA	Forecast	100	100
	Actual	100	100
DYCP	Forecast	100	100
	Actual	100	99

Recovery of SWOX deployable output

Gatehampton

182. Gatehampton source DO has been reduced due to control issues resulting from a mismatch between the booster pumps at Cleeve WTW and the borehole pumps at Gatehampton, meaning that peak licensed output can't be realised. The water quality challenges that arise when Gatehampton boreholes trip, caused by turbidity on start-up, is being addressed by a new permanent run to waste (RTW). The design is being progressed, and the Environment Agency is being consulted to make sure that the proposal is acceptable. The expectation is that the RTW will be fully operational prior to summer 2024. The Gatehampton RTW will improve site resilience, however the booster pumps at Cleeve WTW need to be upgraded in order to fully recover the source DO. This work is linked to the provision of a RTW at Cleeve WTW. The solution is challenging due to the location of the WTW, and various options have been investigated. A preferred solution has almost been identified, however due to long delivery times on key items, it is not expected that the DO will be recovered until early in AMP8.

Chinnor

183. Chinnor suffers with high iron and associated high turbidity, and it has been necessary to restrict use to times of high demand to minimise the risk of water quality impacts on the network. The AR23 source DO reflects the operational use during this 12 month period. Chinnor WTW was issued with a DWI Notice in November relating to iron and turbidity. Work is currently being carried out to enable continuation of the short-term mode of operation, whilst a treatment upgrade is being designed to provide a permanent solution. An outline design has been proposed, with an expected completion and associated recovery of source DO in Year 2 of AMP8.

B.5 Supply Demand Balance Index

184. The Supply Demand Balance index (SDBI) metric measures how the actual supply demand balance has performed compared with what is set out in Thames Water's WRMP.

185. The EA expects the target headroom used in the SDBI calculation to match the WRMP target headroom for each WRZ, unless (by exception) an adjustment has been made. Thames Water has discussed this with the EA and we have chosen to use our reporting year target headroom.

186. SDBI is an index first introduced in 2020/21, where we achieved a score of 100. Overall, SDBI for 2022/23 is 100 (Table 11 below).

Table 11: SDBI using reporting year target headroom

DI Scenario	Planning scenario	SDBI Score
WRMP19 Planned DI	DYAA	100
	DYCP	100
Reporting Year Actual DI	DYAA	100
	DYCP	100

Part C – WRMP19 Review

187. In this section we present how activity in the out-turn year compares to our WRMP19 forecasts. We have structured this section in line with our WRMP19 Monitoring Plan, which we use to track progress with key elements of the plan.

188. We published our dWRMP24 in December 2022 for a 14-week public consultation period. This included a re-forecast of activity in the final three years of this AMP. This re-forecast was necessary as it included additional demand management activity under the Green Economic Recovery programme and the network enhancement programmes, which were previously highlighted as potential 'opportunities'.

189. In Section 6 of our reviseddWRMP24, we will compare our forecast supply-demand balance position with that projected in WRMP19.

C.1 WRMP19

190. We published our final WRMP19 in April 2020 following approval to publish from the Secretary of State for the Environment, Food and Rural Affairs.

191. We developed WRMP19 with extensive engagement with regulators, stakeholders and customers. The plan covers the 80-year period from 2020 to 2100 and sets out the range of measures that are required to manage demand and maintain sufficient resources to continue to provide a resilient supply of water to our customers. This is available on our website www.thameswater.co.uk/wrmp.

192. We worked collaboratively with water companies from across the South East of England, through the WRSE group, to understand the challenges facing the whole region and to identify opportunities for shared solutions and to make sure that we plan to secure water supplies for the whole region.

193. We took a long-term view in recognition of the scale and complexity of the challenges that we face. We designed our plan to satisfy three main objectives:

- To provide a secure supply of water for our customers addressing the supply demand deficits that we forecast in our region
- To improve resilience to a 1 in 200-year drought
- To look beyond the needs and opportunities of our supply area alone and consider the growing needs of the wider South East of England

194. We have proposed a twin track approach in our WRMP19, aiming to make the most effective use of the water resources that we have available, with a focus on leakage reduction and supporting our customers to use water efficiently through smart metering and innovative engagement, in combination with the development of new resources to maintain a secure water supply and environmental resilience.

195. We have built our plan following adaptive planning principles. This provides flexibility to adapt to changes and new information as they emerge across the long-term planning period. Taking an adaptive approach means we can be confident that we can continue to provide a secure and sustainable supply of water despite the challenges of an ever-changing world.

196. We've committed to an ongoing programme of studies to inform the selection of strategic options that will be promoted as part of the best value investment programme for the South East regional plan and WRMP24.

197. We have included in this part of the report, the Monitoring Plan we will use to track progress against the commitments set out in the WRMP19. Alongside this, we are also continuing our engagement programme to provide the opportunity for stakeholder involvement in the ongoing work to shape our future plans.

C.2 WRMP19 Monitoring Plan

198. Our WRMP19 Monitoring Plan is incorporated into this Annual Report to give regulators and stakeholders' visibility of our progress delivering our AMP7 programme. This will help to facilitate stakeholder input and engagement and includes:

- Progress against our demand management programme (reduction in leakage, PCC and progressive metering)
- Actual population growth compared to forecast growth
- Progress on industry workstreams, coordinated through Water UK and Waterwise, to facilitate mandatory water labelling on water using products, changes to fitting standards and building regulations
- Delivery of water supply schemes, including several groundwater schemes against the investment programme (scheme milestones, associated yield and quality against expectations)
- Progress with resource development studies underway as part of the Strategic Resource Option development programme. This work is being undertaken in collaboration with other water companies, engagement with regulators and interested stakeholder organisations. The findings will be considered in the regional plan for the South East and in development of WRMP24

199. We will continue to report progress through our Water Resources Forum and the associated technical stakeholder meetings. The forums will be held jointly with both Affinity Water and WRSE, where appropriate.

200. Our Monitoring Plan elements are summarised in Table 12. Each Assessment Area is then discussed separately in the sub-sections below.

Table 12: Monitoring Plan elements

Assessment Area	Monitoring Activity	Metric	Purpose and relationship with decision point
Supply demand balance summary	SDBI/SOSI	Ml/d	Actual vs predicted – Confirm if movement is within Headroom expectations
	DI		
	WAFU		
Growth	Population	000s	Actual vs predicted and updates to projections
	Properties		
	PCC	l/h/d	
AMP7 Delivery - Demand options	Leakage	Ml/d	Actual vs predicted – assumptions and impact assessment
	Metering	Activity	Meters installed – assumptions and impact assessment
	Water Efficiency		Activity now replaced as a measure by PCC
AMP7 Delivery – Supply options	New River Head	Delivery progress update	Delivery vs WRMP19
	Horton Kirby		
	Southfleet & Greenhithe		
	RWE Didcot		
	Ladymead		
Option Studies*	Effluent Reuse (Deephams)	Progress updates	Readiness for 2022/23 decision point (2030 scheme delivery)
Strategic Regional Option studies	South East Strategic Reservoir Option (SESRO)	Progress update	Readiness for 2022/23 decision point (2037 scheme delivery)
	Severn-Thames Transfer (STT)		
	London Water Recycling (LWR)		
	Thames to Affinity Transfer (T2AT)		
	Thames to Southern Transfer (T2ST)		
Regional need	WRSE	Progress Update	Regional modelling update
Environmental need	Water Industry National Environment Programme (WINEP)	Update	• Progress with current investigations / delivery • Likelihood and magnitude of further sustainability reductions in the future • West Berkshire Groundwater Scheme
Resilience required	Regulators	Design drought	Update return period and DO

* Options not part of the Strategic Regional Options studies but important to WRMP19 preferred plan

C.2.1 Supply demand balance summary

201. The supply demand balance differs from the out-turn year water balance (as presented in Part B) because it is normalised to reflect a dry year annual average (DYAA) or a dry year critical period (DYCP) scenario. This allows us to compare directly with WRMP19. In practice this means that total demand for water, distribution input, is factored up or down to a level of demand that would be experienced 1 in 10-years.

202. Having uplifted DI[13], this is compared to water available for use (WAFU) from our sources (net of imports and exports, outage and climate change) and an allowance for uncertainty (Headroom), to form the supply demand balance.

Supply Demand Position

Supply demand balances compared to WRMP19 forecasts are presented in Table 13 and Table 14 below for DYAA and DYCP conditions, respectively. Please note that London data for DYCP is not shown as we do not report a peak week for this WRZ, the DYAA planning scenario is more significant for London.

Table 13: DYAA Supply Demand Balance compared to WRMP19 forecast. Green: higher than WRMP19 forecast. Red: Lower than WRMP19 forecast

Surplus/Deficit (Ml/d) - DYAA		20/21	21/22	22/23	23/24	24/25
London	WRMP19 Forecast	2.38	13.65	15.33	42.86	61.44
	Actual	64.59	90.62	43.72		
SWOX	WRMP19 Forecast	17.11	18.93	20.96	25.53	27.04
	Actual	12.55	23.16	20.13		
SWA	WRMP19 Forecast	27.88	26.88	26.45	26.27	19.65
	Actual	13.86	12.75	8.63		
Kennet Valley	WRMP19 Forecast	31.61	30.08	29.27	29.24	28.76
	Actual	33.24	34.43	32.31		
Guildford	WRMP19 Forecast	14.19	14.49	14.63	15.08	15.27
	Actual	13.37	12.61	13.15		
Henley	WRMP19 Forecast	11.72	11.69	11.70	11.67	11.63
	Actual	4.35	6.39	6.65		

[13] If the reporting year was exceptionally dry or with high peak demands, beyond the 1 in 10 return period, the numbers would actually be deflated.

Table 14: DYCP Supply Demand Balance compared to WRMP19 forecast. Green: higher than WRMP19 forecast. Red: Lower than WRMP19 forecast

Surplus/Deficit (Ml/d) - DYCP		20/21	21/22	22/23	23/24	24/25
London	WRMP19 Forecast					
	Actual					
SWOX	WRMP19 Forecast	10.41	10.71	12.69	16.01	18.67
	Actual	2.92	1.18	-4.40		
SWA	WRMP19 Forecast	12.99	10.88	10.03	9.73	3.64
	Actual	9.78	6.44	2.92		
Kennet Valley	WRMP19 Forecast	21.84	20.39	19.44	18.99	17.90
	Actual	17.80	17.90	16.99		
Guildford	WRMP19 Forecast	2.81	3.11	3.10	3.18	7.76
	Actual	2.18	2.47	5.44		
Henley	WRMP19 Forecast	5.42	5.34	5.30	5.32	5.31
	Actual	4.71	2.39	2.80		

203. The supply demand position in London is better than predicted in the WRMP19. This is due to:

- Reducing uncertainty as we move through the planning period. i.e. we do not require as much of the buffer for uncertainties allowed for in the WRMP19 forecast when we reflect back on previous years
- The long-term working from home measures moving demand away from London

204. This puts us in a good position for AMP7. We remain fully committed to our demand management commitments in London, which, if the impacts are as expected, should leave us in a better position at the end of the AMP. The surplus has allowed us to defer some small resource developments, whilst keeping them available for delivery at short notice (see Section C2.4).

205. The supply demand position in Thames Valley is worse than predicted in the WRMP19. This is due to:

- Higher than predicted demand in all zones, despite lower population growth
- The impact on demand exacerbated by people working from home meaning people are using more water at home in the commuter belt rather than at work in London
- Unforeseen reductions in source performance and the need for some lengthy recommissioning works, including at Gatehampton and Chinnor sources

206. A breakdown of the supply demand balance into its components (WAFU, DI and Target Headroom) can be found in Appendix J: Supply Demand Balance.

Security of Supply Index

207. We forecast in WRMP19 to maintain a SoSI position of 100 throughout the rest of AMP7.

208. The supply demand balance tables above show that we are in surplus in all WRZs in 2022/23 for the DYAA scenario, which gives a SoSI score of 100. However, for the DYCP scenario, the supply demand balance tables above show that we are in deficit in the SWOX

WRZ for 2022/23, which gives a SoSI score of 99. The lower of the two values is the final number being reported. Therefore, our SoSI is 99, which is below our WRMP19 forecast.

Table 15: SoSI compared to forecast

SoSI		20/21	21/22	22/23	23/24	24/25
DYAA	Target	100	100	100	100	100
	Actual	100	100	100		
DYCP	Target	100	100	100	100	100
	Actual	100	100	99		

Supply Demand Balance Index

209. The Supply Demand Balance index (SDBI) metric measures how the actual supply demand balance has performed compared with what is set out in Thames Water's Water Resources Management Plan (WRMP).

210. The EA expects the target headroom used in the SDBI calculation to match the WRMP target headroom for each WRZ, unless (by exception) an adjustment has been made. Thames Water has discussed this with the EA and we have chosen to use our reporting year target headroom.

211. SDBI is a new index first introduced in 2020/21, where we achieved a score of 100. Overall, SDBI for 2022/23 is 100.

Table 16: SDBI for reporting year 2022-23

DI Scenario	Planning scenario	SDBI Score
WRMP19 Planned DI	DYAA	100
	DYCP	100
Reporting Year Actual DI	DYAA	100
	DYCP	100

Water Available for Use (WAFU)

212. Water available for use in 2022/2023, uplifted (or reduced) to the dry year and critical period scenarios suitable for comparison to WRMP19 are presented in Table 17 and Table 18 below:

213. WAFU is calculated from assessments of:

- Deployable Output (DO) – water available to be abstracted and treated
- Reductions to DO – the impact of climate change, sustainability reductions etc.
- Outage – reductions in the amount of water available due to planned and unplanned events
- Raw and treated (potable) water is also transferred to and from our supply area as bulk imports and exports

214. Each component of WAFU is updated on an annual basis.

215. The variance in Annual Average WAFU, particularly in London which is the only WRZ with an annual average supply demand driver, is not seen as material to the WRMP19 forecast.

AR23 London WAFU decreased by 2.67% resulting from large reduction in DO even though the outage allowance also decreased sizeably.

216. The variance in Critical Period WAFU in Thames Valley compared to WRMP19 forecast is also not seen as material to the WRMP19 forecast. There have been movements in DO and outage allowance calculations following annual source review.

217. Although DYCP numbers are the primary focus for all the WRZs excluding London, as seen in Table 18, it is worth mentioning that the DYAA numbers for SWOX, SWA and Kennet Valley were quite different from their DYCP counterparts, which is due to the difference in DO and outrage allowance numbers for the scenarios

218. Further details on changes to components of WAFU are provided in Appendix F: WAFU.

Table 17: DYAA WAFU compared to WRMP19 forecast

WAFU (Ml/d) - DYAA		20/21	21/22	22/23	23/24	24/25
London	WRMP19 Forecast	2151.73	2144.81	2137.88	2130.96	2130.03
	Actual	2127.41	2139.40	2081.57		
SWOX	WRMP19 Forecast	297.87	297.61	297.34	297.08	296.82
	Actual	308.87	317.30	314.86		
SWA	WRMP19 Forecast	170.52	170.43	170.34	170.25	163.38
	Actual	161.50	159.79	158.81		
Kennet Valley	WRMP19 Forecast	138.68	138.36	138.05	137.73	137.42
	Actual	139.53	140.44	140.10		
Guildford	WRMP19 Forecast	62.07	62.06	62.04	62.03	62.02
	Actual	63.79	63.16	63.17		
Henley	WRMP19 Forecast	25.29	25.29	25.29	25.29	25.29
	Actual	18.50	20.75	20.75		

Table 18: DYCP WAFU compared to WRMP19 forecast

WAFU (Ml/d) - DYCP		20/21	21/22	22/23	23/24	24/25
London	WRMP19 Forecast					
	Actual					
SWOX	WRMP19 Forecast	354.54	354.25	353.94	353.63	353.31
	Actual	358.71	361.66	355.05		
SWA	WRMP19 Forecast	189.83	189.77	189.71	189.65	182.69
	Actual	187.81	186.79	185.98		
Kennet Valley	WRMP19 Forecast	150.82	150.58	150.35	150.11	149.88
	Actual	144.19	143.81	144.09		
Guildford	WRMP19 Forecast	67.95	67.94	67.92	67.91	72.50
	Actual	70.50	69.77	69.63		
Henley	WRMP19 Forecast	25.54	25.54	25.54	25.54	25.54
	Actual	23.32	23.31	22.59		

Distribution Input

219. The dry year DI is estimated as the 1 in 10-year demand, with the uplift factor being made up of two components, 'customer use' and 'leakage'. The 1 in 10-year estimate is taken as the joint impact of a coincident 1 in 5-year return periods for usage and leakage.

220. For details of the Dry Year uplift process, refer to Appendix G: Estimation of Dry Year Demand.

221. A summary of the Dry Year DI for each WRZ for annual average and critical period conditions is provided in Table 19 and Table 20.

222. This year we have seen continued reductions in DI in London compared to forecast. In the Thames Valley WRZs, DI has remained broadly similar to last year, so remains notably higher in SWOX than originally forecast. This increase in peak demand in SWOX is a driver for the reduction in our supply demand balance position compared to WRMP19.

223. This regional movement is likely to have been influenced by the Covid-19 lockdown.

Table 19: DYAA Distribution Input compared to WRMP19 forecast

Distribution Input (Ml/d) - DYAA		20/21	21/22	22/23	23/24	24/25
London	WRMP19 Forecast	2018.22	1998.77	1973.62	1947.65	1927.10
	Actual	1997.10	1975.50	1962.68		
SWOX	WRMP19 Forecast	267.41	264.44	261.20	258.07	254.97
	Actual	289.92	289.12	287.996		
SWA	WRMP19 Forecast	137.82	138.11	138.24	138.39	138.57
	Actual	144.46	144.20	147.38		
Kennet Valley	WRMP19 Forecast	102.46	102.84	103.12	103.32	103.48
	Actual	102.34	101.87	103.56		
Guildford	WRMP19 Forecast	45.57	45.28	44.93	44.68	44.48
	Actual	49.24	49.40	48.83		
Henley	WRMP19 Forecast	12.93	12.93	12.93	12.93	12.93
	Actual	13.82	14.04	13.77		

Table 20: DYCP Distribution Input compared to WRMP19 forecast

Distribution Input (Ml/d) - DYCP		20/21	21/22	22/23	23/24	24/25
London	WRMP19 Forecast					
	Actual					
SWOX	WRMP19 Forecast	326.92	323.97	320.62	317.38	314.16
	Actual	340.93	345.33	344.14		
SWA	WRMP19 Forecast	170.33	170.85	171.16	171.48	171.85
	Actual	169.16	171.70	174.17		
Kennet Valley	WRMP19 Forecast	123.11	123.68	124.14	124.49	124.79
	Actual	119.76	119.02	120.21		
Guildford	WRMP19 Forecast	62.11	61.83	61.48	61.24	61.08
	Actual	64.55	63.48	60.58		
Henley	WRMP19 Forecast	19.28	19.29	19.31	19.32	19.33
	Actual	17.62	19.78	18.50		

224. This year we have seen continued reductions in DI in London compared to forecast. In the Thames Valley WRZs, DI has remained broadly similar to last year, so remains notably higher in SWOX than originally forecast. There has also been a small increase in DI in the SWA WRZ. Note there is no DYCP calculation for London.

225. This regional movement is likely to have been influenced by the COVID-19 lockdown.

C.2.2 Growth

Population

226. Population numbers remain based on MYE2020 as noted in section B2.4 due to concerns over 2021 Census results.

227. Table 21 presents the total population in our supply area broken down by WRZ, compared with the WRMP19 forecast.

Table 21: Population compared with WRMP19 forecast

Total Population (000s)		20/21	21/22	22/23	23/24	24/25
London	WRMP19 Forecast	7,977.100	8,049.740	8,110.772	8,163.623	8,213.322
	Actual	8,045.127	8,104.579	**8,103.001**		
SWOX	WRMP19 Forecast	1,135.968	1,151.527	1,165.446	1,178.508	1,190.732
	Actual	1,089.714	1,090.338	**1,090.099**		
SWA	WRMP19 Forecast	581.564	586.513	590.207	593.817	597.559
	Actual	550.239	549.827	**548.522**		
Kennet Valley	WRMP19 Forecast	431.287	435.818	439.933	443.550	446.670
	Actual	416.931	419.115	**417.551**		
Guildford	WRMP19 Forecast	174.506	176.229	177.888	180.030	182.316
	Actual	168.430	169.920	**169.947**		
Henley	WRMP19 Forecast	53.912	54.265	54.577	54.830	55.028
	Actual	50.115	50.605	**50.607**		
Total	**WRMP19 Forecast**	**10,354.337**	**10,454.092**	**10,538.822**	**10,614.359**	**10,685.626**
	Actual	**10,320.556**	**10,384.384**	10,379.727		

228. Total population reported is marginally lower than last year due to the baseline population remaining unchanged and a larger population being subtracted for NAV appointments. Population is also slightly lower than forecast in WRMP19.

Properties

229. Table 22 and Table 23 present the number of billed household properties and billed non-household properties, respectively, by WRZ, compared with WRMP19 forecasts.

230. As observed with population, the number of billed household and non-household properties is also lower than forecast in the WRMP19.

231. Our household property forecasts are Local Authority Plan-based. Many of these plans anticipated a rebound in property building that has been depressed in recent years by the financial crisis and Covid-19 lockdown. The market has not yet recovered and thus house building remains lower than planned by the Local Authorities.

232. Our billed non-household properties are also lower than anticipated. This is likely to reflect movements in and out of voids and also deregistration of domestic properties from the non-household market.

Table 22: Billed Household Properties compared with WRMP19 forecast

Billed HH Properties (000s)		20/21	21/22	22/23	23/24	24/25
London	WRMP19 Forecast	2,907.192	2,950.577	2,989.769	3,026.022	3,061.809
	Actual	2,870.965	2,908.261	2,938.169		
SWOX	WRMP19 Forecast	469.028	478.979	485.445	491.696	497.702
	Actual	416.250	423.962	428.347		
SWA	WRMP19 Forecast	234.397	239.274	242.886	246.413	250.063
	Actual	205.051	206.995	206.639		
Kennet Valley	WRMP19 Forecast	166.296	168.375	169.898	171.071	172.147
	Actual	156.868	159.881	162.680		
Guildford	WRMP19 Forecast	66.408	67.717	68.400	69.269	70.229
	Actual	60.844	61.680	62.071		
Henley	WRMP19 Forecast	22.004	22.051	22.114	22.208	22.305
	Actual	20,241	20.630	20.687		
Total	**WRMP19 Forecast**	**3,865.324**	**3,926.973**	**3,978.511**	**4,026.679**	**4,074.255**
	Actual	**3,730.219**	**3,781.409**	**3,818.593**		

Table 23: Billed Non-Household Properties compared with WRMP19 forecast

Billed NHH Properties (000s)		20/21	21/22	22/23	23/24	24/25
London	WRMP19 Forecast	156.044	157.468	158.892	160.316	161.740
	Actual	138.903	141.396	138.354		
SWOX	WRMP19 Forecast	25.474	25.706	25.938	26.170	26.402
	Actual	22.970	19.214	19.111		
SWA	WRMP19 Forecast	10.920	11.032	11.145	11.257	11.370
	Actual	8.058	9.422	9.809		
Kennet Valley	WRMP19 Forecast	7.969	8.052	8.135	8.219	8.302
	Actual	6.791	6.235	5.929		
Guildford	WRMP19 Forecast	3.869	3.906	3.942	3.978	4.015
	Actual	2.794	3.078	2.946		
Henley	WRMP19 Forecast	1.158	1.170	1.182	1.194	1.206
	Actual	0.763	0.780	0.762		
Total	**WRMP19 Forecast**	**205.435**	**207.335**	**209.235**	**211.135**	**213.035**
	Actual	**180.279**	**180.125**	**176.911**		

Per Capita Consumption

233. Per Capita Consumption refers to the volume of water used per person per day. It reflects population demographics, the type of property occupied and whether customers have been billed on a metered tariff (i.e. they are more likely to save water) or undertaken any water efficiency activity.

234. Our three-year rolling average PCC performance is 146.8 l/h/d, a small improvement on 2021/22. The demand management activities and resulting Ml/d reductions funded through the PR19 Final Determination, such as smart meter installations and water efficiency programmes, were provided by our WRMP19 plan to deliver a PCC reduction of 4.2%. We are currently on-track to deliver these demand reduction levels. The volume of Ml/d demand reduction embedded in WRMP19 activities, as per the Final Determination, was always less than half of the Ml/d volumes that would be actually required to achieve the PCC performance commitment of 6.3%, because of the PCC 3-year rolling average methodology. There is a fundamental difference in Ml/d volumes between the WRMP19 target and the PCC performance commitment target, and our internal planning has aligned with the WRMP19 target of 4.2%.

235. We have met our WRMP19 PCC target in all zones apart from London this year, despite experiencing a peak in water demand across the summer due to record heatwave temperatures and the official nationwide drought.

236. We continue to experience significant post-Covid hybrid working changes in the balance of household versus business water use, but consumption levels have started to return to pre-Covid levels. The overall reductions in household usage are welcomed, but there are potentially multiple influencing factors contributing to actual household usage outcomes. Whilst we increase smart meter penetration and increase our targeted water efficiency engagement, we believe that some of the reduction in usage may be due to the cost of living crisis as people reduce their hot water consumption to reduce energy bills. Most of the factors impacting consumption are external and outside of water company control or direct influence. These include, but are not limited to:

- Extreme summer events and record heatwaves
- High and unknown proportion of people working-from-home post-Covid
- Changes to population commuting practices and working locations
- Cost of living crisis
- Media coverage of heatwave and drought

237. We have seen a drop in consumption by measured households, and an increase in consumption from unmeasured households. The increase in smart meter penetration provides more granular consumption data across a greater proportion of the household customer base, which reduces uncertainty of overall consumption levels.

238. In-year actual PCC has fallen in each of our WRZs from AR22 to AR23 and is now much closer to the WRMP19 Final Plan forecast for PCC in all WRZs. Whilst actual measured and calculated Per Household Consumption (PHC) levels show reductions, the application of available population data to convert to PCC metrics, amplifies these percentage reduction amounts, introducing uncertainty of using the PCC metric as a meaningful indicator of customer usage.

239. Table 24 shows the average per capita consumption by WRZ compared with WRMP19 forecasts. Both the actual and WRMP19 forecast reflect "dry year" demand.

Table 24: Per Capita Consumption (Average) compared with WRMP19 forecasts

Average PCC (l/hd/d)		20/21	21/22	22/23	23/24	24/25
London	WRMP19 Forecast	141.23	140.03	138.69	137.38	136.18
	Actual	150.96	145.97	140.71		
SWOX	WRMP19 Forecast	134.62	132.77	130.82	129.00	127.24
	Actual	155.23	146.78	129.85		
SWA	WRMP19 Forecast	137.61	137.24	136.90	136.58	136.27
	Actual	154.35	150.15	136.10		
Kennet Valley	WRMP19 Forecast	132.12	131.74	131.29	130.84	130.45
	Actual	149.25	142.96	130.61		
Guildford	WRMP19 Forecast	144.86	143.36	141.66	139.97	138.40
	Actual	157.94	148.30	130.43		
Henley	WRMP19 Forecast	140.08	139.50	139.02	138.71	138.47
	Actual	160.20	155.49	130.57		
Combined Company PCC	Actual	153.25	146.23	138.73		

240. AR23 average PCC (uplifted to dry year conditions) is lower than reported at AR22, and lower than that forecast in the WRMP19 in all WRZs apart from London.

241. This is likely to be due to customers spending more time at home during Covid-19 and since with changes to working-from-home practices. The region has also experienced several record heatwave events and water stress periods, including UK's hottest recorded temperatures and official nation-wide drought in 2022.

242. Our smart metering and water efficiency programmes continue to deliver water savings volumes in-line with the WRMP19 demand reduction.

C.2.3 AMP7 Demand Management

Leakage

243. Table 25 presents out-turn year leakage (from Section B2.7) uplifted to dry year for comparison with the WRMP19 forecast, by WRZ.

Table 25: AMP7 Leakage tracker (vs WRMP19)

Total Leakage (Ml/d) (uplifted to Dry Year)		AR21	AR22	AR23	AR24	AR25
London	Actual	460.23	439.34	452.55		
	Forecast	483.56	465.80	445.03	424.27	408.20
	Variance	-23.33	-26.46	7.52		
SWOX	Actual	63.64	70.44	79.57		
	Forecast	59.74	58.19	56.64	55.08	53.56
	Variance	3.9	12.25	22.93		
SWA	Actual	39.73	44.72	47.02		
	Forecast	37.4	37.40	37.40	37.40	37.40
	Variance	2.33	7.32	9.62		
Kennet Valley	Actual	23.78	28.02	27.67		
	Forecast	26.2	26.20	26.20	26.20	26.20
	Variance	-2.42	1.82	1.47		
Guildford	Actual	16.11	18.73	18.38		
	Forecast	12.63	12.30	11.98	11.65	11.32
	Variance	3.48	6.43	6.40		
Henley	Actual	3.76	4.61	5.17		
	Forecast	3.58	3.58	3.58	3.58	3.58
	Variance	0.18	1.03	1.59		
Company	Actual	607.23	605.86	629.86		
	Forecast	623.11	603.47	580.83	558.18	540.26
	Variance	-15.88	2.39	49.03		

244. Leakage, at company level, is above the WRMP19 forecast position by 49 Ml/d.

245. Leakage has increased above forecasted levels in AR23 due to a combination of factors including dry summer leakage breakouts and freeze thaw events during the winter months. The steps we are taking to get leakage back on target are outlined in Section B above.

Metering

246. In Part B2.8 we set out progress with the metering programme in 2022/23. In this section we will track the total number of progressive and optant meters to be installed during AMP7 and how this compares with the WRMP19 forecast.

247. In the WRMP19 we included for progressive meter installation in London, SWOX and Guildford WRZs. We have focussed initially on installation in London, helping to target leakage reduction. The programme will be rolled out into the Thames Valley WRZs over the AMP7 period and has been reprofiled and expanded, through the Green Economic Recovery (GER) programme, which we highlighted as a potential 'opportunity' in AR21.

248. The GER programme will be a continuation of the Progressive Metering Programme, converting unmeasured households to metered account customers.

249. Our GER programme will install 200,000 smart water meters in our Thames Valley WRZs, by the end of AMP7, significantly more than planned in WRMP19.

250. There has been no delivery of the GER programme in 2022/23, with all activity on target for delivery in year 4 and 5 of AMP7.

251. Our GER installations have been re-profiled to years 4-5 of AMP7, to better align with the smart meter communications capability timings and to enable a more effective delivery programme with our external partners. We re-profiled some meter installation activity in response to the 2023 drought impacts, focusing on areas experiencing supply-demand challenges.

Table 26: AMP7 Metering tracker

Metering (No.)		AR21	AR22	AR23	AR24	AR25
Progressive	Actual	44,137	94,454	**88,709**		
	WRMP19 Forecast	64,741	88,974	89,006	89,048	88,973
	AR22 Re-forecast incl. GER			133,705	153,999	143,784
	Variance	-20,604	5,480	-44,996		
Optant	Actual	12,353	21,006	**16,584**		
	Forecast	17,297	17,297	17,297	17,297	17,297
	Variance	-4,944	3,709	-713		
Total	Actual	56,490	115,460	**105,293**		
	WRMP19 Forecast	82,021	106,271	106,286	106,328	106,253
	AR22 Re-forecast incl. GER			150,985	171,279	161,064

252.

253. Table 27 splits the progressive metering programme to WRZ level.

Table 27: AMP7 Progressive metering tracker (by WEZ)

Progressive Metering (No.)		AR21	AR22	AR23	AR24	AR25
London	Actual	44,120	94,067	71,976		
	WRMP19 Forecast	56,253	77,159	77,202	77,228	77,165
	AR 22Re-forecast			109,705	85,940	11,843
	Variance	-12,133	+16,908	-37,729		
SWOX	Actual	0	0	12,466		
	WRMP19 Forecast	7,077	9,853	9,840	9,855	9,851
	AR22 Re-forecast incl. GER			14,957	28,905	56,036
	Variance	-7,077	-9,853	-2,491		
SWA	Actual	0	0	3		
	WRMP19 Forecast	0	0	0	0	0
	AR22 Re-forecast incl. GER			0	15,673	30,384
	Variance	0	0	3		
Kennet Valley	Actual	0	0	2		
	WRMP19 Forecast	0	0	0	0	0
	AR22 Re-forecast incl. GER			0	16,777	32,524
	Variance	0	0	2		
Guildford	Actual	17	387	4,262		
	WRMP19 Forecast	1,411	1,962	1,964	1,965	1,957
	AR22 Re-forecast incl. GER			9,043	5,034	9,759
	Variance	-1,394	-1,575	-7,078		
Henley	Actual	0	0	0		
	WRMP19 Forecast	0	0	0	0	0
	AR22 Re-forecast incl. GER			0	1,670	3,238
	Variance	0	0	0		

254. The water efficiency element of GER will run in parallel with the smart meter installation programme and will primarily involve the delivery of Smarter Home Visits (SHV) on newly smart metered household customers. These SHVs will target households with higher than average water use and/or continuous flows (e.g. internal wastage, leaky-loos), aiming to maximise the water savings benefit per visit and resolve high use and wastage, and enable these customers to convert to metered bills.

255. Overall, we expect the GER programme to deliver an additional c.15.71 Ml/d of demand reduction (leakage and usage) to the Thames Valley WRZs.

Water efficiency

256. There are no water efficiency activity-based performance commitments in AMP7. They have been replaced with a more general commitment to reduce demand as measured by

PCC. See section C2.2 for the tracking of PCC against WRMP19 forecasts. Further information on water efficiency is provided in Appendix I: Water Efficiency.

C.2.4 AMP7 Supply enhancement

257. Our supply enhancement programme for AMP7 comprises five schemes in two WRZs and is summarised in Table 28.

Table 28: AMP7 Supply enhancement schedule

Scheme	WRZ	Resource Type	WRMP19 Target (Ml/d)	AMP7 Forecast (Ml/d)	AMP7 Delivery				
					20/21	21/22	22/23	23/24	24/25
RWE Didcot	LON	Licence Trade	18	24	24				
New River Head	LON	Groundwater	3	0	X				
ASR Horton Kirby	LON	Aquifer Recharge	5	0					X
Southfleet & Greenhithe	LON	Groundwater	8	0					X
Ladymead WTW	GUI	Groundwater / Constraint release	4.6	0.0					X
AMP7 Totals			38.6	24					
Cumulative AMP7 Delivery Profile					24	24	24	24	24

258. No schemes were planned or delivered in 2020/21-22 or this year (2022/23), consistent with our WRMP19 programme for AMP7.

259. The new temporary licence trade agreement with RWE Npower at Didcot was signed and came into force from 1st April 2020 as planned. The increase in output from the trade is based on a reassessment of the benefits, rather than reflective of a material change to the agreement itself.

260. With the supply demand balance in the London WRZ remaining in surplus, the delivery of the New River Head scheme continues to be deferred and similarly, the delivery of the ASR Horton Kirby and Southfleet & Greenhithe Groundwater schemes are also now deferred beyond the end of AMP7. Despite delivery being deferred, development work has progressed on all three of these schemes in case they are required.

261. In the Guildford WRZ upgrade works have commenced at Ladymead WTW, which is the first phase in removing constraints that limit the site deployable output. The second phase, which is required to release the DO, will not deliver until after 2024-25. The zone remains in surplus and therefore the delay is not material. The optimised delivery with a new interconnector, the Shalford to Netley internal transfer main, is due to be delivered in 2026. This main will improve our ability to transfer water across Guildford WRZ, improving resilience in supporting our Albury/Netley WTW as well as providing additional supply to address growth in East Guildford.

C.2.5a Option Studies

262. In this section we provide an update on progress with options that are important to the WRMP19 preferred plan but are not part of the scope of the Strategic Regional Options Studies (see C.2.5.b).

Effluent Reuse – Deephams

263. The Deephams STW Reuse option was included as a preferred option in the adaptive pathway of our adopted WRMP19, subject to further investigations. It had a potential benefit to the supply demand balance of 46.5 Ml/d and was scheduled to deliver by 2030/31 in order to provide 1 in 200-year drought resilience for the London WRZ.

264. Treated effluent from the Deephams STW would be pumped to a discharge location on the River Lee Diversion and subsequently abstracted to supplement the raw water supply in the Lee Valley reservoirs.

265. The Environment Agency's representation on our revised draft plan included the recommendation to "Ensure that the Deephams option is feasible and does not pose a risk to the environment", due to concerns over environmental impacts on downstream habitats from reduced flows from Deephams STW; and in the estuarine Thames Tideway.

266. In response, we set out a programme of further research to make sure that the option is compliant with the Water Framework Directive (WFD) Regulations before being progressed.

267. This further research has been carried out with extensive collaborative working with the Environment Agency throughout, including 10 meetings with Hertfordshire and North London Area Environment Agency staff. This has led to the adoption of a Methodology Report for the assessment which included scope development, assessment criteria and assessment methods.

268. Following completion of our further studies and review of the findings with the Environment Agency a position has been agreed with common understanding of the potential environmental effects of the option. It establishes that Deephams STW Reuse option does have potential environmental risks.

269. At times of operation, it was considered that a Deephams STW Reuse option would reduce flow in reaches of the River Lee downstream of Deephams STW. For the stretch of the Lower Lee impacted by the scheme, the WFD classification for hydrological regime is 'Does not support Good'. In the Water Resources National Framework, the Environment Agency utilised a bespoke spreadsheet tool (Waterbody Abstraction Tool) to estimate water balance deficits in 2050; and some of the reaches downstream of Deephams STW Reuse option have been identified to have a water balance deficit. For the Lower Lee, the calculated deficit is substantial and ranges between 425-521 Ml/d under a range of scenarios for the reach impacted by this scheme. The WRSE Regional Group is working with water companies and the Environment Agency to develop the most appropriate environmental ambition scenarios for the South East to redress these deficits.

270. The flow reduction associated with a Deephams STW Reuse Option is therefore contrary to the environmental ambition for these waterbodies as laid out by the Environment Agency Waterbody Assessment Tool (2021) and adopted by WRSE, if the scheme were implemented before 2060, after which schemes such as Beckton Reuse will be able to provide compensatory flows. No further work on the environmental risks of a Deephams STW Reuse option before this point, or work to identify bespoke mitigation of the risks, will satisfactorily resolve the risk in the absence of a compensatory scheme.

271. As such, after detailed discussion of the findings with the Environment Agency, we have withdrawn the option as the preferred WRMP19 option and also as a feasible option from future WRMPs in the medium-term period to 2060.

272. Our WRMP19 proposed alternatives to the Deephams option, should it not be available. These are currently being progressed as part of the Strategic Regional Options Studies (see below).

C.2.5b Strategic Regional Option Studies

273. The Water Regulators' Alliance for Progressing Infrastructure Development, or RAPID[14], has been established to oversee progress of the strategic resource solutions. RAPID was formed post-WRMP19 to provide a regulatory interface to support the industry in promoting the development of national water resources infrastructure in the interests of water users and the environment.

274. RAPID has representation from Ofwat, the EA and the DWI. It will be the primary reviewer and will provide recommendations to the boards of the constituent regulators. The development work involves nine water companies and 18 potential solutions (see Figure 5 below), each providing over 50 Ml/d. These specific studies will inform WRMP24 and the regional plans (e.g. WRSE).

[14] https://www.ofwat.gov.uk/regulated-companies/rapid

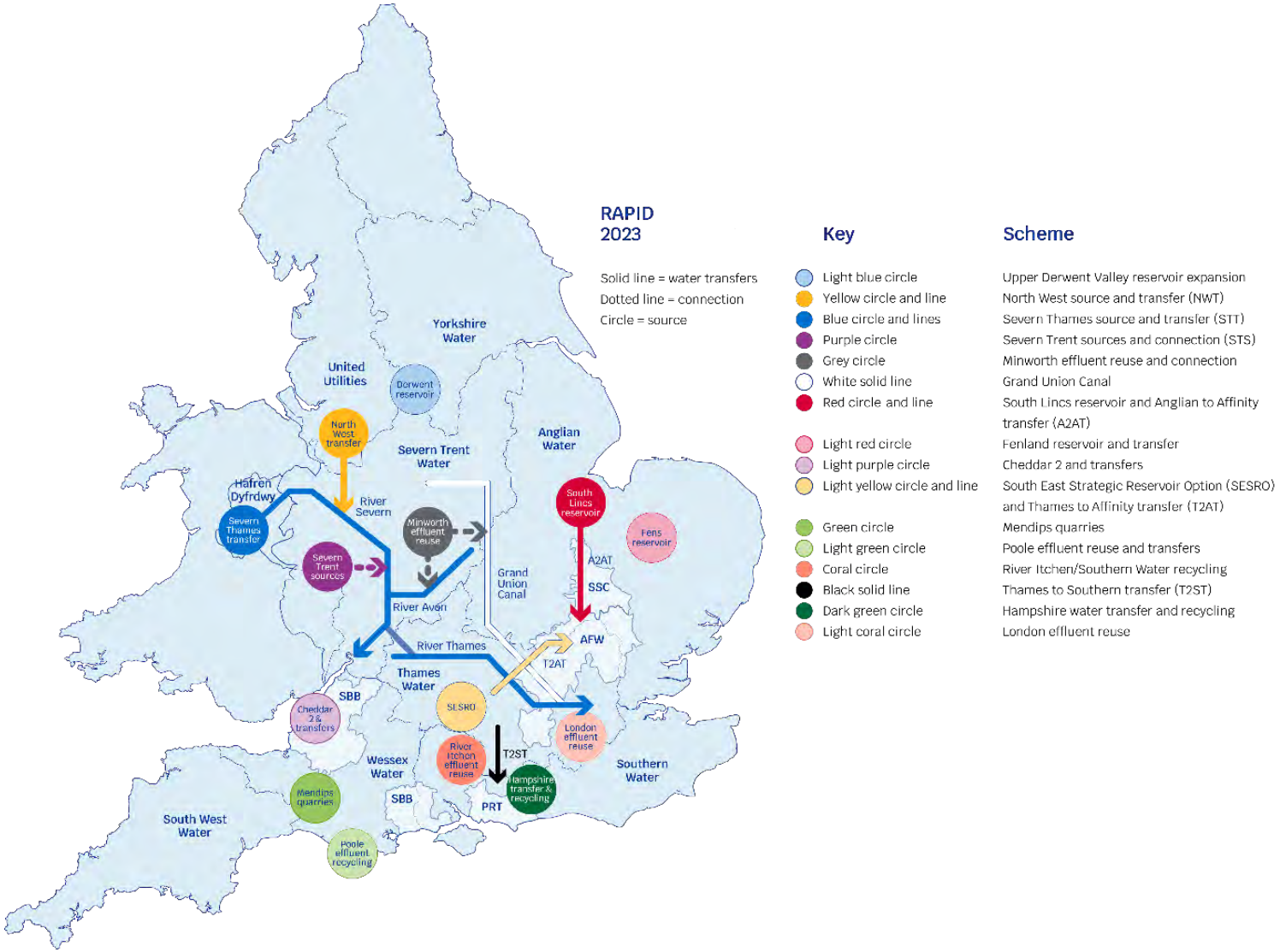

Figure 5: Strategic water resources solutions map

275. All strategic resource solutions are following a gated regulatory process as set out in the PR19 final determination[15]. It aims to provide a clear and transparent process and timely decisions, as well as protecting customers from unnecessary spend. The gates are review points to track and formally assess the progress to examine the solutions. For each gate, the activities and deliverables will be agreed in advance and, based on this information, a decision will be made whether a solution is viable and should be progressed to the next stage of activity with confirmation of further funding, or not viable and the work should be concluded.

276. During AMP7 we are undertaking joint technical studies into five potentially regionally significant resource developments. The SROs that Thames Water have been involved in the investigation and development of are:

- South East Strategic Reservoir Option, SESRO – a large reservoir near Abingdon that could provide water to Thames Water (London, SWOX, SWA, Kennet Valley WRZs), Affinity Water (via Thames to Affinity Transfer), and/or Southern Water (via Thames to Southern Transfer).
- Severn-Thames Transfer, STT – a transfer of water from the River Severn to the River Thames, potentially supported by transfers from United Utilities and Severn Trent Water, used to provide water to Thames Water (London, SWOX, SWA, Kennet Valley WRZs), Affinity Water (via Thames to Affinity Transfer), and/or Southern Water (via Thames to Southern Transfer).
- London Water Recycling, LWR – an SRO project which is investigating several water recycling schemes in London, including the Teddington Direct River Abstraction scheme, Beckton Reuse, and Mogden Reuse. Water would be for the London WRZ, and could potentially be transferred to Affinity Water, via the Thames to Affinity Transfer scheme.
- Thames to Affinity Transfer, T2AT – to facilitate the transfer of water from SROs to Affinity, a scheme involving transfer of water from the River Thames to Affinity Water.
- Thames to Southern Transfer, T2ST – to facilitate the transfer of water from SROs to Southern Water, a scheme involving transfer of water from either SESRO or STT to Southern Water's Western Area.

For the SRO solutions in Gate 2:

277. Programme Management Boards (PMB) with executive oversight from Programme Steering Groups (PSG) were responsible for delivering the RAPID gate requirements.

278. Independent Project Managers were appointed by the PMB to manage the development work and secure third-party assurance.

279. An All Company Working Group (ACWG) was in place to provide consistent methods, which were reviewed by RAPID.

280. The Environment Agency and Natural England established a National Appraisal Unit (NAU) to provide guidance during development and environmental endorsement in a consistent fashion across all options, and throughout the gated process.

281. Quarterly progress reports were submitted to RAPID and there was regular engagement on the technical and engagement work to inform the development of the schemes.

[15] https://www.ofwat.gov.uk/publication/pr19-final-determinations-strategic-regional-water-resource-solutions-appendix/

282. We submitted updated SRO solutions costs and benefits to the WRSE best value regional planning process in February 2022. Our draft WRMP24 is cascaded from and fully aligned with the WRSE regional plan and so the same best value metrics have been considered in both plans.

283. We submitted our Gate 2 reports to RAPID in November 2022. RAPID published its draft decision on each of the solutions on 30 March 2023. All Thames Water sponsored solutions have been classified as "*Good (meets expectations)*" and have passed through to Gate 3[16]. The Gate 2 draft decision and dates for Gates 3 and 4 are summarised in Table 29.

Table 29: Summary of Thames Water sponsored SRO and future gates

Gate 2 Solution	Gate 2 draft decision	Solution owners	Gate 3 date	Gate 4 date	Solution schematic
South East Strategic Reservoir Option (SESRO)	"Good (meets expectations)"	Thames Water Affinity Water	January 2025	November 2026	
River Severn to River Thames Transfer (STT)	"Good (meets expectations)" but does fall short in some important areas	Thames Water Severn Trent United Utilities	January 2025	October 2026	
London Water Recycling (LWR) Strategic Resources Option	"Good (meets expectations)"	Thames Water	November 2023	May 2024	
Thames to Affinity Transfer (T2AT)	"Good (meets expectations)"	Thames Water Affinity Water	December 2029	2031	
Thames Water to Southern Water Transfer (T2ST)	"Good (meets expectations)"	Thames Water Southern Water	November 2027	January 2029	

284. The RAPID Gate 2 assessments provided feedback on where solutions might have remediation issues which needed to be assessed as priority actions or actions and recommendations that should be addressed in the Gate 3 submissions. The LWR and STT solutions had priority actions to be addressed during 2023.

285. The LWR priority actions require further engineering, environmental and water quality investigations to identify mitigation measures for the environmental impacts of the Teddington DRA and Beckton water recycling options on the Rivers Thames and Lee.

286. The STT priority actions require further investigations into the mitigations required to reduce the environmental risks from Minworth and Netheridge wastewater treatment works' discharges on the Severn Estuary Habitats Regulation site, the need for a more detailed plan for stakeholder and customer engagement explaining how their views have informed

[16] https://www.ofwat.gov.uk/publication/letter-to-thames-water-on-draft-decisions-for-gate-two/

key decisions and alignment of the solution in each of the solution owners WRMPs. RAPID also illustrated that a conditional review point may be required to assess the ongoing requirements for progression of the solution after the regular checkpoint planned for December 2023.

287. In November 2022 we 'stood-up' a Portfolio Management Office or Client team to support the delivery of all of our SROs through Gate 3 in a consistent manner for programme controls including governance, risk, cost management, change, assurance and performance reporting and to provide support to the other core functions including Regulation, Commercial Strategy, Scheme Development, Consents & Stakeholder Engagement and Legal. Gate 3 will include selecting preferred options, surveys to inform design development and environmental impact assessments, commercial strategy and procurement plan and pre-planning engagement for consent applications.

288. In February 2023 we submitted updated SRO solutions cost and benefits into the WRSE regional planning process for preparation of the revised draft WRMP best value plan. The SRO Gate 3 solutions development will be informed by the selection of the options in the final WRMP during 2023-24. The preferred solutions and selected alternatives will be promoted for funding in AMP8 via our PR24 submission in October 2023.

C.2.6 Regional Need – WRSE

Regional Planning

289. A regional dimension to water resources planning in the South East of England has been in place for well over a decade. However, ahead of WRMP24, regional planning will take centre stage.

290. The Environment Agency's National Framework for Water Resources[17] (2020) makes it clear that in order that the required investment can be made to reduce demand, increase supplies, increase resilience to drought and to make sure that the nation's water supplies and environment are able to cope with an uncertain future, planning will need to be done at a regional level and include all sectors of water users.

291. The National Framework focuses on the regional plans that will be developed over the coming years by the five regional water resources groups that are now in place. The strategic direction of these plans has been shaped by a senior steering group representing government, regulators, the water industry, bodies representing other major water users, environmental non-governmental organisations (NGOs) and academia. It is considered that this shift to collaborative regional planning, within an agreed framework, will allow a step change in water resources.

292. The WRSE group, one of the five regional groups, is developing a regional water resources plan (which is not statutory) to integrate with water company WRMPs (which are statutory).

293. Ongoing progress with the development of the WRSE regional strategy is discussed below.

[17] https://www.gov.uk/government/publications/meeting-our-future-water-needs-a-national-framework-for-water-resources

WRSE Progress

294. WRSE has developed a water resources system simulation model of the South East region together with an enhanced investment model and visualisation tool to facilitate more robust water resources analysis and programme appraisal at a regional level.

295. As well as the assessment of deployable output, the close collaboration between WRSE companies has resulted in methodological consistency for other key components of the supply-demand balance. For example, WRSE companies have aligned approaches to demand forecasting, outage allowance calculation, weather datasets, and climate change impact calculation.

296. WRSE has developed a model which can conduct multi-objective optimisation, using adaptive planning methods. The outputs from this model will be used to derive the TW best value plan. The use of a single investment modelling platform has required the development of consistent input datasets.

297. Through the Regional Planning process, WRSE companies have reviewed one another's option lists in order to ascertain whether options deemed unnecessary/unsuitable for one company may be useful for another.

298. WRSE has developed options involving transfers between WRSE companies which had not previously been considered.

299. Some environmental assessments are being undertaken through WRSE, including the consideration of cumulative and in-combination effects of options across company boundaries. The WRSE Environmental sub-group has also worked to align the scoping and level of detail in option-level and cumulative/in-combination company-level environmental assessments, which will again drive alignment.

300. This work is being undertaken in parallel to the Strategic Regional Options development work (see C.2.5b). This ongoing programme of studies will inform the selection of strategic options as part of the best value WRSE regional investment programme.

301. In November 2022, WRSE published its Draft Water Resources Regional Plan for a period of public consultation. Over 900 responses to the Regional Plan were received, from a wide range of stakeholder groups and individuals. WRSE will produce a consultation response document in which representations will be responded to and changes to the Regional Plan following the consultation will be discussed. A final Regional Plan will be published on a timescale which aligns with companies' Revised Draft WRMP24s. Our dWRMP24 reflects the WRSE Draft Regional Plan, and our rdWRMP will reflect the WRSE Final Regional Plan.

C.2.7 Environmental Need – WINEP

AMP7 Environment Programme

302. Our AMP7 Environment Programme comprises 10 investigations. We completed two in the last year, Marlborough & Clatford in the upper Kennet and Hogsmill in South London.

303. Our AMP7 programme also includes two planned sustainability reductions, to improve the fluvial environment of the River Cray (North Orpington) and River Chess (Hawridge). These are discussed below, with further information on the investigations that have also included options appraisals, in Appendix D: Environment Programme Investigations and Options Appraisals.

304. The licence reduction proposed at Hawridge is from the current licence of 9.1 Ml/d to zero (a loss of 6.9 Ml/d of DO). Outline design has been progressed and highlighted greater complexity of the solution than previously envisaged and so an enlarged scope of detailed design with further network system modelling is being progressed and any EIA needs being identified. Delivery is planned to follow design and resolution of environmental issues related to the pipeline route and delivery will be completed after the target date of March 2025 with the provisional revised date set at March 2028.

305. The reduction on the River Cray followed investigation at Bexley and the options appraisal identified a reduction further upstream at North Orpington as the preferred option. The reduction at North Orpington replaces the original solution of reduction at Bexley as it provides benefit to a greater length of the River Cray. The reduction would be from the current licence of 9.07 Ml/d to zero, a loss of 9 Ml/d of DO.

306. The North Orpington scheme has also undergone design development and outline design, which has identified that a more complex solution is required, and detailed design is being progressed. Delivery is planned to follow design. The outline design phase and strategic considerations for the optimum solution have resulted in changes from the originally identified solution with the required solution of greater complexity. This means delivery will be completed after the target date of March 2025 with the provisional revised date set at March 2028.

Likelihood and magnitude of further sustainability reductions in the future.

307. Our draft WRMP24 includes scenarios looking at meeting the requirements for environmental destination to protect vulnerable chalk and other streams as set out in the guidance from the Environment Agency. Our draft WRMP24 also includes measures to address the impact of further sustainability reductions to confirm 'no deterioration' under the Water Framework Directive.

308. These scenarios highlighted that, despite the requirement set out in the guidance, future sustainability reductions remain a very significant uncertainty in our medium to long-term plan, which could result in material change to the forecasts. When compared to WRMP19, the volume of licence reductions that we anticipate may be required in the future has significantly increased, driven by the "Environmental Destination" guidance and National Framework scenarios.

309. We have been working with the WRSE and the Environment Agency to identify the likely requirements for sustainability reductions to meet the Environmental Ambition in relation to chalk streams and other sensitive rivers in the region and this has been taken forward into our dWRMP.

310. We have worked with the Environment Agency and agreed low, medium and high scenarios to be used for the regional modelling and our WRMP24. Our plan includes allowance to meet the high scenario as required by the guidance.

311. The Environment Agency has also issued guidance covering the requirement for licence capping to recent levels of abstraction to protect water bodies from potential risk of deterioration, based on an interpretation of the Water Framework Directive. This guidance has been used to inform our approach to potential reductions in DO and licence for inclusion in our WRMP. A key issue for the outcome of this consideration was whether licences should be capped at recent actual average level of abstraction or can be capped at recent actual peak annual abstraction. Our analysis has shown that there is a significant

impact on the DO for London due to the capping of the Northern New River Wells at RA and this amounts to 25 Ml/d in our draft plan. We have also allowed for licence caps required in the SWOX WRZ at Netley Mill, Chilterns Scarp sources, Swells and plan to close our Bradfield sources to address the requirement for no deterioration on the River Pang. This presents significant challenges for supply/demand balance solutions in the next AMP due to the strategic nature of solutions required for even a small amount of DO.

312. In summary, with reference back to WRMP19, we are working towards enabling sustainability reductions which were highlighted as being necessary in the short-term in WRMP19 (though these have been slightly delayed). In the longer-term, the supply-demand balance challenge associated with licence reductions has materially increased between WRMP19 and WRMP24. The longer-term licence reductions are not required until further into the future and so do not invalidate our current plan for implementing WRMP19.

West Berkshire Groundwater Scheme (WBGWS)

313. The WBGWS is an important augmentation scheme which is managed by the Environment Agency. In the WRMP19 we included 'What-if' scenarios to demonstrate what the impact would be of losing or reducing benefit of the WBGWS from 2031, in line with communication with the Environment Agency.

314. This analysis showed a significant impact on our DO in London and Kennet Valley WRZs and so any loss or reduction of the WBGWS would be a significant adverse impact on the supply demand balance going forward.

315. The Environment Agency is making significant investment in the WBGWS abstraction assets with a programme of work continuing during AMP7. This investment should extend the assumed asset life of the scheme well beyond 2031, reducing the likelihood of future losses in benefit in the future.

316. We have continued to discuss testing the WBGWS with the Environment Agency after planned testing in 2022 was deferred. The scheme was partially operated at the end of 2022 in response to drought (See section B.1). We are working with the Environment Agency to assess the benefits of the short-term use of the scheme. Further joint testing of some elements of the scheme may still be required, aiming to assess more rigorously the WBGWS drought yield and benefits. The timing of the testing will, in part, be dependent on weather and resourcing, but it is likely to continue into AMP8.

C.2.8 Resilience Need

317. Our WRMP19 included an allowance for increased drought resilience from 1 in 100-year to 1 in 200-year in 2030/31. We also included scenarios to explore what additional investment would be needed to deliver 1 in 500-year drought resilience.

318. Since publication, there has been clear guidance from government, as incorporated into the WRPG for WRMP24, that greater drought resilience is necessary and that all future planning should demonstrate resilience to extreme 1:500 drought.

319. The increased level of public water supply drought resilience translates into an annual chance of no more than 0.2% that Emergency Drought Orders would need to be imposed.

320. This planning assumption is in line with the recommendation from the National Infrastructure Commission.

321. The National Framework states that this level of drought resilience should be achieved during the 2030s and regional groups should determine a date within that range by considering the costs and benefits of alternative approaches to find an optimum.

322. Increased resilience should not rely on the increased use of drought measures to boost supplies by, for example, allowing additional abstraction during drought, where this is environmentally damaging. Also, the planned implementation of non-essential use bans should not become more frequent to achieve the reduction in the use of more extreme restrictions such as standpipes and rota cuts.

323. As we develop our WRMP24, we will continue to examine alternative drought resilience thresholds and timings. The proposed timing of 1 in 500-year resilience is not so immediate that we need to alter our WRMP19.

C.3 WRMP19 Validity Statement

324. On the basis of the updates described above we consider the status of our WRMP19 is as follows:

Table 30: WRMP19 Validity Statement

Status	WRMP19 Validity
✔	The WRMP19 remains valid as a basis for future planning.

325. At WRZ level, the following changes and mitigating actions have been made as a result of variances identified via the Monitoring Plan.

Table 31: WRZ-Level Status

WRZ	Status	AMP7 Programme
London		Due to the favourable position in the supply demand balance, we have deferred three groundwater options in London.
SWOX		As reported at AR22, the peak supply demand balance in SWOX is tighter than anticipated in the WRMP19. We have taken steps to bring forward demand management in this zone (and across the Thames Valley WRZs). We are confident that we can maintain a secure water supply. We have a programme in place to recover DO in SWOX
SWA		No changes
Kennet Valley		No changes
Guildford		No changes
Henley		No changes

Part D – Forward Look

D.1 Challenges, risks and opportunities

326. WRMPs involve long-term forecasts, subject to significant uncertainty. We have identified below the key risks and challenges that focus on the period 2020-25.

Challenge 1 – Maintaining and Improving Performance on Leakage and Consumption Reduction

Leakage

327. Our WRMP19 includes measures to deliver significant reductions in per capita consumption (PCC) and leakage over the planning period, including ambitious targets for AMP7. It is important that we deliver measures that we set out in WRMP19 to maintain current security of supply, and to set us on the path to delivering 50% leakage reduction by 2050. Our customers see measures to reduce leakage and measures to enable consumption reduction as good options.

328. The most effective way of reducing leakage is asset replacement. While in the short-term this method is an expensive option compared to alternatives such as 'find and fix' and household metering (identifying customer-side leakage), 'find and fix' measures do not improve the state of the assets, and to reduce leakage sustainably will require asset replacement in addition to household metering. A challenge will be how we transition between 'find and fix' measures and asset replacement.

329. We have a strong reputational and financial incentive to achieve our leakage reduction targets. In our PR19 business plan we have included a performance measure, with an associated financial penalty/reward, called an Outcome Delivery Incentive (ODI) for leakage in AMP7. This is a significant incentive for the company to continue to focus and sustain its efforts to achieve its leakage reduction targets.

330. To further enhance our focus on leakage for year 4, at the start of April 2023 a new Head of Leakage joined the business to oversee all elements of leakage and our long-term reduction strategy, and we continuing with our Leakage Transformation Programme to shift future performance.

331. The Leakage Transformation Programme was launched in April with the following objectives:

- Minimise under-performance vs. AMP7 targets
- Enter AMP8 at or below the planned year 5 leakage level
- Improve capacity and capability to reduce Leakage sustainably at 20% per AMP.

332. Execution of the Programme is in three Tranches of initiatives with immediate focus on Tranche A 'Near Term Wins' and Tranche B 'Incubate New Ways of Working' in FY 24. 'Tranche C 'Build Sustainable Foundations'

A - Near Term Wins

333. Find & Fix the right leaks faster – Work has commenced to improve dashboards, processes, and governance structures to find the jobs with higher leakage earlier and fix them faster. Repair times will be reduced.

334. Enhanced Leakage Reports and Consumption Reporting – Alongside the enhanced reporting against Find and Fix activities, a runway of opportunities have been identified to improve estimates of actual leakage from the company Water Balance and improve consumption reporting.

335. Customer Side Leakage (CSL) – it is estimated that CSL could be as high 30% of total leakage and as such represents a priority area. A series of new initiatives are in the process of being rolled out in Year 4 to harmonise meter information, technology and day to day interaction, improve policies to maximise self-fix rates, educate customers to address CSL, consumption and wastage and address shared supply.

B - New Ways of Working

336. The business is changing its ways of working to deliver successful and sustained leakage management. A new Leakage Operating Model will result in coordinated decision-making, improve Network Awareness and be more effective in the way leakage is identified and fixed.

C – Build Sustainable Foundations

337. Under-pinning capabilities and critical transformation activities will be required for long-term success. The immediate focus will be on reframing the leakage strategy end to end from an organisational and data perspective, clarifying the strategy for Prevention and Trunk Mains and examining Safety Management and Quality Assurance matters arising. The programme shall revisit our approach to attracting, retaining, and maximising the potential of Leakage colleagues with focus on training. As the programme progresses significant IT / technology requirements are also anticipated to be captured which will require coordination with wider Digital initiatives. More information on our detailed programme for the rest of the AMP will be discussed with our regulators are requested in the Tripartite letter received in June 2023.

Consumption

338. In-year actual PCC has fallen in each of our WRZs from AR22 to AR23, and is now much closer to the WRMP19 Final Plan forecast for PCC in all WRZs. Contributing further reductions in PCC through continued metering and water efficiency programmes is a key activity for us in AMP7. We will increase our utilisation of smart meter data to target high usage and continuous flows, and continue our increased levels of proactive customer engagement through direct communications and wider campaigns.

339. We have commenced smart meter installations in the Thames Valley region, through our Green Economic Recovery (GER) programme. This initiative is in addition to our PR19 smart metering programme and, includes the installation of 200,000 smart meters on previously unmeasured homes in all Thames Valley WRZs. The data will enable accelerated demand reduction benefits to critical chalk stream catchments and enable improvements in customer behaviour change, leakage and continuous flow management.

340. We continue to experience significant post-Covid hybrid working changes in the balance of household versus business water use, but consumption levels have started to return to pre-Covid levels. The overall reductions in household usage are welcomed, but there are potentially a large number of influencing factors contributing to actual household usage outcomes. Whilst we increase smart meter penetration and increase our targeted water

efficiency engagement, we believe that some of the reduction in usage is due to the cost of living crisis as people reduce their hot water consumption to reduce energy bills. Most of the factors impacting consumption are external and outside of water company control or direct influence. Whilst the principle of a low PCC target has many positives, how a target value is delivered, and responsibilities and accountabilities are transferred to all relevant stakeholders will be critical. We will continue working closely with government on key demand reduction workstreams such as; national water target, mandatory water labelling, building regulations/Future Homes, WC performance standards, water neutrality planning and on-ground initiatives, and data/insight sharing.

341. We will continue our sector-leading business demand reduction initiatives. These programmes are delivering water savings within the NHH retail market in advance of the introduction of a Business Demand performance commitment and in-line with Defra's new Business Demand target agenda. We are sharing our smart meter data and insight with government, regulators and all water wholesalers and retailers, to advance the smart metering and water efficiency delivery across the sector.

342. A key challenge for our future planning in WRMP24 is how to incorporate risk associated with the potential for under-delivery of demand reduction. Our current plan is heavily reliant on demand reduction, through leakage and consumption reduction, to maintain a supply-demand balance. Should measures introduced not be as effective as is anticipated, we may be in a position of need for new supply sources. Our adaptive approach and constant monitoring of the effectiveness of new measures will help us manage this risk.

Challenge 2 – Environmental Ambition

343. Our WRMP19 included sustainability reductions which were deemed necessary to meet WFD requirements, as well as future sustainability reductions (focussed on chalk stream catchments) considered likely.

344. The Environment Agency has brought in significant new guidance for WRMP24, outlining the need to consider 'Environmental Destination' within water resource planning. This guidance sets out the need to consider long-term profiles of licence reductions at existing sources.

345. We have, in collaboration with regulators, developed scenarios of potential future sustainability reductions which may be required up to 2050. The largest scenario of reductions aligns with the EA's 'Enhanced' scenario, which results in around 500 Ml/d of Deployable Output reduction; the smallest scenario of reductions results in around 100 Ml/d of Deployable Output reduction.

346. Reductions in supply capability set out in our environmental destination scenarios represent the largest future impact to our supply-demand balance within our WRMP24, and the largest uncertainty that must be considered in the medium to long-term.

347. Incorporating Environmental Destination scenarios into our WRMP24 involves an extensive application of adaptive planning techniques, due to the scale of uncertainty present.

348. Determining our future profile of abstraction reductions will also involve significant challenges. Firstly, there is a need to determine the appropriate pace and scale of reductions, balancing potential ecological benefit with robustness of evidence; this will involve detailed investigations throughout AMP8 and AMP9 as we must be sure that sustainability reductions will deliver ecological benefit before committing to reductions,

given the scale of investment required to offset reductions in supply capability (up several billion pounds). Secondly, there will be a need to better understand the supply system resilience impacts that reductions will bring (i.e., beyond drought periods) in order to determine the cost associated with more local infrastructure requirements to make sure that customers' supplies remain resilient. With such potentially large scenarios of future abstraction reduction, the risks posed to customers' supplies are significant, and different magnitudes of licence reduction will result in very different infrastructure solutions (e.g., removal of a single source may be mitigated by a local infrastructure solution, while removal of the bulk of the supply to a portion of a WRZ may need a wholesale redesign of that WRZ's network).

349. The challenge of planning for future sustainability reductions has been extended by the late-stage introduction of a new policy of capping abstraction licences to quantities that have been used in the recent past. This guidance, confirmed in April 2022, sets out licence reductions that would be implemented on a significantly shorter timescale (2025-30) than those set out in Environmental Destination profiles (2050).

Risk 1 – Resilience to drought

350. Supply systems in the UK are not designed to be resilient to all potential droughts as the cost to do so would be prohibitive. As such, each year there is the inherent risk that any year could have extreme drought conditions that are outside our planned levels of service.

351. WRMPs are developed to meet levels of service for supply restrictions that are agreed with customers and stakeholders. WRMP19 sets out that until 2030/31 our system is resilient (i.e. avoidance of the most serious supply restrictions) to the worst historic drought on record (~1 in 100-year return period).

352. We are delivering a programme of investment to increase resilience to a severe drought (1 in 200-year return period). A key component of our WRMP19 plan to deliver an effluent reuse scheme at Deephams. Following further investigation, in agreement with the EA, we have withdrawn this option from our WRMP19 and have ruled it out for selection in our dWRMP24 until 2060 due to environmental risk to downstream habitats.

353. We are currently considering alternative solutions to enable our 1 in 200-year resilience and will set out our plan for achieving this in our dWRMP24 and the WRSE Regional Plan.

354. In forthcoming plans, we are now required to plan to be resilient to extreme drought (1 in 500-year return period), so it is essential that projects can progress in a timely manner and that environmental risks are established as early as feasible.

Opportunity 1 – WRSE Regional Plan

355. We have, in collaboration with five other companies, developed a fully adaptive, Best Value Plan for the water resources in the South East of England. The development of this plan gives an opportunity for us to deliver a plan which is efficient across a range of potential future supply-demand balance scenarios, and which delivers value to customers across the South East, rather than giving siloed views of the 'best' plan for each company's customer base.

356. Having the WRSE Regional Plan as the overarching plan from which our plan is taken gives us confidence in the alignment of our plan with the plans of other companies in the region, and has presented us with the opportunity of fully considering the potential of shared water resources options.

357. Being part of the WRSE regional group has allowed us to consider more advanced planning methods, and so this will also be the first time that our WRMP uses an 'adaptive-first' approach. Our WRMP19 incorporated adaptive planning methods, but relied on non-adaptive methods in some key steps. The bulk of our investment modelling for WRMP24 applies adaptive planning methods, and this will result in a plan which is robust across uncertain futures.

Opportunity 2 – Understanding Future Patterns of Demand

358. The coronavirus pandemic had a marked impact on our customers' demand for water, and the distribution of demand across our supply area. The changes we have seen in consumption and the balance between household versus business water use, following Covid and the changes to hybrid working continue, but consumption levels have started to return to pre-Covid levels. The overall reductions in household usage are welcomed, but there are potentially a large number of influencing factors contributing to actual household usage outcomes.

359. Determining the isolated impact that coronavirus restrictions had on demand has, however, not been possible to date. Given the continued uncertainty over future working patterns and changing population movement, we have also not been able to confidently assess the future patterns of demand that we may see across our supply area.

360. We have undertaken research into potential new impacts on demand, such as Data Centres, which can introduce daily and peak demand spikes through their need for water-based cooling. We are working with local authorities and developers to better understand and manage this potential water demand risk.

361. We are also working with leading authorities and sector groups which rely on irrigation and other season discretionary water sources. These include golf course, leisure facilities, sporting fields, garden centres and horticultural nurseries. We are investigating alternative water sources and increase water efficiency opportunities.

362. Our adaptive planning approach means that our future plans should be robust against a range of future demand patterns, despite not explicitly accounting for coronavirus impacts.

D.2 Stakeholder engagement

Introduction

363. There is wide interest in water resources from a diverse range of stakeholders, from those organisations who are interested in a specific geographical area, watercourse or single option, to organisations that have a broad interest in the sustainable management of resources for the long-term.

364. We engaged with stakeholders throughout the development of WRMP19 sharing information in a timely, open and transparent manner and providing opportunity for challenge and input to inform the plan. Overall, the approach was positively received by regulators and stakeholders.

365. In WRMP19 we committed to undertake monitoring and reporting to give regulators and stakeholders visibility of our progress delivering the programme of studies for WRMP24 and facilitate stakeholder input and engagement to the overall work programme. This included a six-monthly progress update to government and regulators. This year we provided a report in autumn 2022, which covered the period to the end of September 2022, and this report, the Annual Review of the water resources programme, covers the twelve months to April 2023.

366. Our engagement programme comprises three main components:

    i. To share information and seek input to inform the development of the draft South East regional plan, and in turn our draft WRMP24, including consultations on the draft plans.
    ii. To share information and seek input to the work to examine the Strategic Resource Options we are involved with.
    iii. To engage with all stakeholders as we progress work to deliver the commitments made in WRMP19 including the delivery of the demand management activities and development of new resource schemes.

367. In addition, there has been stakeholder engagement as part of work to progress the environmental investigations, catchment-based schemes and the Smarter Water Catchment initiative, the Drainage and Wastewater Management Plan and the Drought Plan.

368. We continue to host stakeholder meetings, both in conjunction with WRSE and also the Water Resources Forum jointly with Affinity Water, reflecting our close working alliance and common stakeholders. The meetings continue to be well attended with a diverse stakeholder audience.

369. In addition, it is important that we engage with customers to seek, and take account of, their views and preferences as we continue work to develop our long-term water resources plan. This year we have completed collaborative research through WRSE to inform the strategic planning process, to understand preferences for solutions and the reasons for customers' preferences and also the best value criteria and metrics. The findings have been used in the work to develop the best value plan. We have also undertaken research with Thames Water customers as part of the consultation on the draft plan to make sure that we heard feedback from a representative sample of our customers alongside stakeholders, and we did a further phase of research as part of WRSE, which has focused on the trade-off decisions as part of the determination of the best value plan. This work continues to be

guided and challenged by a regional Customer Challenge Group and the Consumer Council for Water.

370. We continued to engage with multiple government, regulator and industry groups that influence water policy, regulations and national projects. We contributed demand reduction insight and data, plus advice based on experience delivering large-scale smart metering and water efficiency programmes across household and business customers. These groups include; UK Water Efficiency Strategy steering group, UK Water Neutrality sub-group, Defra's Water Labelling steering group, Future Homes Hub, and the Retailer-Wholesaler Group's Water Efficiency Sub-Group.

Our engagement programme to support the development of the draft SE regional plan

371. Water Resources South East (WRSE) is working closely with the six water companies in the South East region, and the other water using sectors, to develop a multi-sector resilience plan for the region. The regional plan will be reflected in the South East companies' WRMP24s which in turn will set out the "need" for new strategic infrastructure development.

372. Working closely with WRSE, we have continued to work collaboratively and provide opportunities for the wider stakeholder community to get involved and help shape the regional plan such as eNGOs, water retailers, developers, and local authorities. The activity comprises both WRSE-led and company-led activity, and has been delivered through forums and meetings, and we have also continued to use an interactive web-based platform for all the engagement activity.

373. In January 2022 WRSE published its emerging Water Resources Regional Plan for public consultation. The emerging plan gave early sight of the big issues and emerging solutions to gain initial feedback from stakeholders. WRSE and the water companies undertook direct and indirect publicity and awareness raising ahead of the consultation, including direct emails to stakeholder organisations, media briefings and print and social media activity.

374. WRSE used a dedicated consultation website to host information about the regional plan including the documents, short videos and other information, and an online survey where responses to a series of consultation questions could be submitted. WRSE also hosted virtual webinars and an online interactive Q&A session. A summary of the consultation activity is shown in Figure 8. WRSE received over 1,150 responses to the consultation. In May 2022 WRSE published a response to the consultation which highlighted the main themes and issues raised in the responses received and provided WRSE's position in response to them.

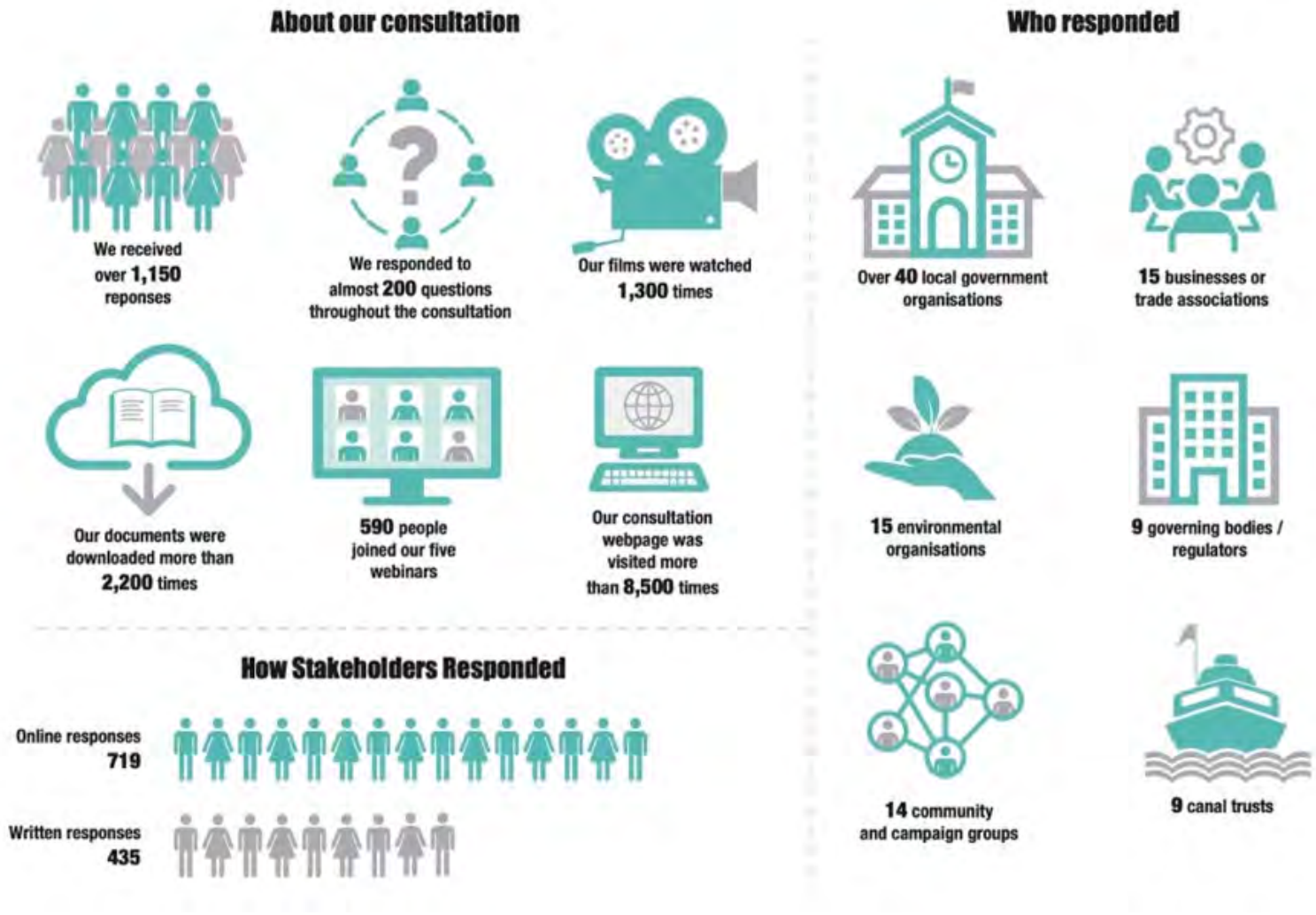

Figure 8: Overview of the consultation on the WRSE emerging plan

375. WRSE continued work to transition from the emerging (least cost) plan to the best value plan and in autumn 2022 held a 12-week public consultation on the draft regional plan. There was a programme of events to share the draft plan with stakeholders and encourage feedback.

376. The draft regional plan was the foundation of our draft WRMP24, and we have used the regional technical methods and assessments to inform our WRMP24 thereby ensuring alignment between the regional plan and our WRMP24, and across the South East more widely.

377. We submitted our draft WRMP24 to Defra in October 2022. In November 2022 we received a letter from Defra requesting additional information in relation to the Thames Gateway desalination plant and Teddington DRA. We worked with the Environment Agency to address the points and resubmitted our draft plan to Defra. On 13th December 2022, following approval from Defra, we published out draft plan for public consultation. The public consultation ran for 14 weeks starting on 13th December 2022 and closing on 21st March 2023. We promoted the consultation widely through direct communications, media and paid for advertising, held events across our supply area including in areas that could potentially be affected by a scheme in our draft plan and held meetings with regulators, MP's, Councillors, local government, parish councils, organisations and individuals.

378. We have continued to engage with regulators including monthly meetings with the Environment Agency to share information, discuss issues and points of concern at an early stage and make sure that there are "no surprises".

379. In total we received 1,688 responses to the public consultation and will publish our Statement of Response and revised draft plan in the summer 2023 taking account of the representations as well as new information and regulatory guidance which has been published since we prepared and published our draft WRMP24.

Our engagement programme to support the work on the Strategic Resource Options

380. We are involved in five Strategic Resource Options (SROs)[18], these options are considered in the South East regional plan alongside other options. The SROs are following a parallel gated regulatory process defined by Ofwat and overseen by the Regulators' Alliance for Progressing Infrastructure Development (RAPID). Engagement is an important part of the development of these options, and a requirement set out by Ofwat.

381. The SRO activity through the first two stages, Gate 1 (July 2021) and Gate 2 (November 2022) has involved feasibility studies and conceptual design and accordingly the focus of engagement has been with regulators and strategic stakeholders, as well as two collaborative customer research studies. Prior to the dWRMP24 public consultation we extended the engagement on the schemes to include local planning authorities and specific stakeholders who have an interest or relationship with the potential schemes. The engagement activity is reported in the SRO Gate 2 submissions published on our website www.thameswater.co.uk/sro.

382. As part of the public consultation on the draft WRMP24 we held community information events in the vicinity of proposed new water infrastructure development, in west London,

[18] London Reuse, Severn to Thames Transfer, South East Strategic Reservoir option, Thames to Affinity Transfer, Thames to Southern Transfer.

Oxfordshire and the Cotswolds to explain the draft WRMP24 and discuss the proposed schemes. We have received a large number of representations to the public consultation in relation to the proposed new water infrastructure from the local communities and interest groups.

Our engagement programme to shape, and take forward, commitments set out in WRMP19

383. We included a monitoring and reporting programme as part of WRMP19 to give regulators and stakeholders visibility of our progress delivering the commitments made in WRMP19 and the programme of studies for WRMP24 to enable a decision to be made by 2022/23 on the strategic resource options that need to be progressed. Progress against each of the outputs is presented in a 6-monthly report and the Annual Review, this report, then details the progress for the full year from April to end March.

384. We have targeted engagement on specific deliverables in our plan. For example, we have continued close working with the Environment Agency on technical studies to ascertain the feasibility of the Deephams reuse option and the Thames Gateway desalination plant; and have an established engagement programme with catchment partnerships as we deliver our Smarter Water catchments work.

Part E – Summary

We have checked our actual position in April 2023 against a suite of key metrics and our forecast start position in WRMP19.

We can confirm that the foundation of WRMP19 is robust and remains valid as a basis for future planning.

Overview of our performance for 2022-2023

Our security of supply for our customers. Whilst all of our zones are in surplus for the Dry Year Annual Average scenario, our SoSI score is 99 due to a deficit in the SWOX WRZ under the Dry Year Critical Period scenario.

We have observed fluctuating levels of water demand. We continue to experience significant changes in the balance of household and business water use due to post-Covid hybrid working, although consumption levels have started to return to pre-Covid levels. In-year actual PCC has fallen in each of our WRZs from AR22 to AR23 and is now much closer to the WRMP19 Final Plan forecast for PCC in all WRZs.

We are committed to reduce leakage and encourage the efficient use of water. After achieving our regulatory leakage targets in years 1 and 2 of AMP7, we have not achieved our regulatory performance commitment in year 3 with respect to reducing the amount of water lost through leaks on our pipe network and on our customers' pipes. Despite the challenges experienced this year, we remain committed to halve leakage (compared to 2017/18 levels) by 2050.

We have continued to roll out the smart metering programme. This year we installed a further 105,000 smart water meters, slightly below the number originally forecast in WRMP19. Our revised forecast in AR22 included additional meters to be installed in the Green Economic Recovery programme in AR23. This programme has been delayed and will commence next year. We still plan to install an additional 200,000 smart meters by 2025 as part of the Government's GER.

We continue to support our customers and encourage efficient use of water. Average household water use continues to be close to the WRMP19 forecast. We are continuing our award-winning programme to encourage the efficient use of water.

We have sufficient water sources. We have progressed new water sources to maintain a resilient water supply. This includes preparatory work for three new groundwater schemes in London as set out in WRMP19, progressing the development of the Shalford to Netley transfer main in Guildford WRZ, and exploring alternative options to Deephams to achieving a 1 in 200-year level of drought resilience by the early 2030s, a target to which we remain committed.

We remain focused on protecting and improving the natural environment. Improving and protecting the environment is integral to managing and planning future water resources. The three core stands of activity are undertaking environmental investigations at ten sites, seeking opportunities for improvements to the environment as part of the feasibility, design and appraisal of new resource options, continuing to work with WRSE and the Environment Agency to refine the likely requirements for sustainability reductions to meet environmental destination in relation to chalk streams and other sensitive rivers in the region, and how to prioritise this activity.

We delivered a secure supply to our customers during the 2022 Drought. We followed our Drought Plan which included spring/summer media campaigns, using our strategic schemes to support our reservoir storage position, and introducing a Temporary Use Ban.

385. **WRMP19 – confirming our position.** In April 2020 we published our WRMP19, which looks forward over the next 80 years to 2100. We designed our plan to provide a secure supply of water for our customers, to improve resilience to a 1 in 200-year severe drought event by 2030/31, and to look beyond the needs and opportunities of our supply area alone and consider the growing needs of the wider South East of England. We have checked our actual position in April 2023 against a suite of key metrics and our forecast start position in WRMP19. We can confirm that the foundation of **WRMP19 is robust and remains valid** as a basis for future planning.

386. The supply demand position in SWOX WRZ continues to be tighter than anticipated, with a deficit reported in this year in our critical period scenario. We are progressing work on strategic resource options, in collaboration with other water companies and regulators, which were funded by Ofwat as part of the Final Determination on our 2019 Business Plan. We are now working towards Gate 3 for five solutions which will include selecting preferred options, surveys to inform design development and environmental impact assessments, commercial strategy, a procurement plan and pre-planning engagement for consent applications.

Working across the South East region

387. We are working closely with WRSE, and the other water companies located in the South East, to develop a regional resilience plan for the South East of England. Over the past year, WRSE has continued to progress technical work to inform the development of a best value plan for the region. The Draft WRSE Regional Plan was published on 14 November 2022, and a public consultation was carried out following the plan's publication. Our dWRMP24 reflects the WRSE Draft Regional Plan, and our rdWRMP will reflect the WRSE Final Regional Plan.

Forward Look – Challenges, Risks, and Opportunities

Challenges:

- Successful delivery of demand reduction - Maintaining our progress with leakage reduction and achieving sustained usage reduction.
- Environmental ambition – We are continuing to work with regulators and regional partners to investigate substantial future reductions in abstraction for environmental benefit. The scale and range of potential reductions included in our dWRMP24 far exceed those planned for in the past and this is one of the main investment drivers in regional plans and our WRMP24.

- Achieving a SoSI score of 100– we are working towards achieving a supply demand balance across SWOX to facilitate an overall SoSI score of 100.

Risks:

- Drought resilience: As part of the development of our WRMP24, we are looking to determine how we should achieve a 1 in 200-year level of drought resilience, as part of determining the best value plan for our customers and the South East region. Our draft WRMP24 includes the selection of the Teddington DRA scheme, and we are working to determine whether Teddington DRA or Beckton water recycling is the best option to include in our rdWRMP24.

Opportunities:

- WRSE Regional Plan – producing a fully adaptive, best value plan for the South East of England presents us with an opportunity to produce a plan which is efficient across a wide range of potential futures, and which delivers benefits to everyone in the South East.
- Understanding Future Patterns of Demand – With the relaxation of coronavirus restrictions the associated transition of working arrangements gives an opportunity for the water industry to understand potential future patterns of demand. Following the 2022 drought, we also have the opportunity to review our customers' responses to implementing intensive media campaigns and a Temporary Use Ban. Our adaptive planning approach means that our future plans should be robust against a range of future demand patterns.
- The continued development of multiple Strategic Resource Options for consideration in the WRSE regional plan and our WRMP24, affords the opportunity to improve resilience and flexibility for the longer-term.
- The increased communication and dialogue that has been carried out through regional planning and WRMP24, with both regulators and government, has improved understanding of our planning, which may help in expediting approval of WRMP24.

Appendices

Appendix A: Out-turn Tables – Annual Average

388. See accompanying file.

Appendix B: Out-turn Tables – Critical Period

389. See accompanying file.

Appendix C: Deployable Output

Introduction

390. An update of Deployable Output (DO) for AR23 Q4 (April 2022 to March 2023) has been calculated by the Water Resources Modelling Team. This update reflects the latest information available from a variety of sources across the Company, with this report providing a summary of the changes and new DOs calculated.

391. Source Deployable Outputs (SDOs) have been subject to an annual internal review. This includes groundwater sources as well as the run-of-river surface water sources that do not pump into raw water reservoirs. To continually improve the SDO assessments, the regulatory, hydrogeological/hydrological and infrastructure constraints on water source outputs, water treatment works (WTW) capabilities and process losses derived from mass balance models have been reviewed where available information indicates this is appropriate. The changes resulting from this review are summarised in Appendix 1.

392. The conjunctive use DO for the London, and Swindon and Oxfordshire (SWOX) Water Resource Zones (WRZ) are calculated using Aquator XV and Aquator XM water resources modelling packages. The model simulates the Thames water resources system and is used to calculate the Deployable Output (DO) from the conjunctive use areas across the region supplied by Thames Water. The model simulates water resources by finding optimal solutions to the problem of meeting the demand for water in different demand zones, which are known as Demand Centres (DCs). Updates to SDOs in both London and the Thames Valley, as well as updates to the water treatment works capability of the Large Process Plant (LPPs) and process loss assumptions are contained within this update. Additional updates include implementation of new assumptions on demand savings for London that align with those being used in current regional water resource management planning, i.e. Water Resources South East (WRSE) planning for WRMP24.

London WRZ

393. The review and update of the London WRZ DO, as shown below in Table 32, has included implementing all of the updates including the updated groundwater SDOs, changes to LPP capability (including Process losses), and the write-down of the Gateway Desalination Plant's DO due to long-term outage. This has resulted in the London WRZ DO decreasing from 2311 Ml/d to 2206 Ml/d. It is important to note that any step change in WRZ DO will not necessarily correspond exactly with changes in DO derived from individual schemes or assumptions. This is because the analysis is dependent upon several factors, e.g., the level of demand, the balance of treatment capability and process losses, where the losses are returned to the environment, assumptions within the Lower Thames Operating Agreement and trigger levels for demand savings and strategic schemes within the Lower Thames Control Diagram (LTCD).

Table 32 London DO - Changes from AR21 to AR22

Scenario	Steps	DYAA DO (Ml/d)	Description
1	AR22 Q4	2311	Implementation of updated groundwater SDOs, changes to LPP capability (including Process losses).

Scenario	Steps	DYAA DO (Ml/d)	Description
2	AR23 Q4	2206	Implementation of updated groundwater SDOs, changes to LPP capability (including Process losses), gateway outage for the year 2022-2023.

394. In the subsequent year end update, groundwater SDOs, water treatment works capabilities and process losses have been reviewed and updated. A decrease in groundwater SDO (3 Ml/d) resulted from the year end review. There was also decrease of over 15 Ml/d in the London LPP treatment capability, mainly at Kempton WTW as well as an associated slight change in treatment process losses at Kempton where process losses increased from 1.13% to 1.24%. The write-down of the Thames Gateway desalination plant's Deployable Output contribution, as a result of long-term outage, resulted in a significant decrease of London WRZ DO (in AR22, the Thames Gateway desalination plant had a stated capacity of 100 Ml/d during drought periods). The total change in DO, including groundwater SDO, water treatment works capabilities and process loss changes has resulted in a decrease in the London WRZ DO from 2311 Ml/d to 2206 Ml/d, a decrease of 105 Ml/d.

395. Overall, therefore, the combined impact of the above changes is that London's WRZ DO of 2206 Ml/d for AR23 is 105 Ml/d lower than the AR22 DO of 2311 Ml/d. Thames Valley WRZs.

SWOX WRZ

396. The SWOX WRZ DO is calculated using the Aquator (XV and XM) model of the Upper Thames part of the WRZ combined with the sum of the groundwater SDOs in the South Oxfordshire part of the WRZ. The AR23 update included a review and update of groundwater SDOs, water treatment works capabilities and process losses. The impact of changes on SWOX WRZ DO can be seen in Table 33, together with the changes in the Upper Thames DO.

397. Upper Thames DO decreased from 255 Ml/d to 254 Ml/d between the AR22 and AR23, as a result of changes in Groundwater SDOs, and WTW capabilities and process losses.

Table 33: SWOX DO - Changes from AR21 to AR22

Scenario	Steps	DYAA DO (Ml/d)	DYCP DO (Ml/d)	Description
1	AR22 Q4	326.67	365.46	Impact of model changes from Aquator 4.2 to Aquator XV and reassessment of WRZ DO, including updated groundwater SDOs, treatment capability and process losses.
2	AR23 Q4	323.62	359.17	Impact of updated groundwater SDOs, treatment capability and process losses
1	Upper Thames AR22 DO	255.00	-	SDO, LPP capability & process loss updates
2	Upper Thames AR23 DO	254.00	-	SDO, LPP capability & process loss updates

398. In the year end update, groundwater SDOs, water treatment works capabilities and process losses have been reviewed and updated for the SWOX supply sources. While there was only a small (0.1 Ml/d) decrease in the average groundwater SDOs, there has been a larger

(2.05 Ml/d) decrease in the average WRZ DO for SWOX WRZ and a (6.29 Ml/d) decrease in peak DO for SWOX, largely as a result of decreases in Chinnor and Gatehampton Peak groundwater SDOs. No significant changes were made in Kennet Valley and Henley WRZs. In SWA there was a small (0.25 Ml/d) decrease in DO.

399. Groundwater SDOs, water treatment works capabilities and process losses have also been reviewed and updated for the remaining four Thames Valley WRZs, Kennet Valley, Henley, Slough Wycombe Aylesbury (SWA) and Guildford. As summarised in Table 34 and Table 35 below, there are decrease in average and peak DO of SWOX, a small decrease in the average WRZ DO of Kennet Valley and SWA, a significant decrease in peak WRZ DO at SWOX but a small decrease at in Henley and SWA, no changes in the peak WRZ DO at Guildford and Kennet WRZs.

400. A comparison of all the AR22 and updated AR23 Dry Year Annual Average (DYAA) WRZ DO is presented in Table 36 and the Dry Year Critical Period (DYCP) WRZ DO presented in Table 37.

Table 34: Comparison of DYAA DO – All WRZs

DYAA DO (Ml/d)	London	SWOX	SWA	Kennet Valley	Guildford	Henley
AR22	2311	326.67	143.99	21.55	182.68	66.98
AR23	2206	323.62	143.92	21.55	182.43	66.98
Variance	-105	-2.05	-0.07	0.00	-0.25	0.00

Table 35: Comparison of DYCP DO – All WRZs

DYCP DO (Ml/d)	London	SWOX	SWA	Kennet Valley	Guildford	Henley
AR22	N/A	365.46	149.71	21.70	199.18	72.42
AR23	N/A	359.17	149.71	21.59	198.93	72.42
Variance	N/A	-6.29	0.00	-0.11	-0.25	0.00

Table 36: Groundwater SDO Review – London WRZ – May 2023

Resource Zone	Site	Average (Ml/d)			Peak (Ml/d)			Comments
		AR22 SDO	AR23 SDO Update	Difference	AR22 SDO	AR23 SDO Update	Difference	
Thames Valley	No SDO Changes	No SDO Changes			No SDO Changes			N/A
			Total	0.00		Total	0.00	
Lee Valley	No SDO Changes	No SDO Changes			No SDO Changes			N/A
			Total	0.00		Total	0.00	
New River	No SDO Changes	No SDO Changes			No SDO Changes			N/A
			Total	0.00		Total	0.00	
South East	Nonsuch borehole	1.00	0.00	-1.00	1.00	0.00	-1.00	Turbidity concerns has resulted in a long term outage. No solution in place to resolve, therefore DO reduced to zero
	Deptford	21.10	22.00	+0.90	21.10	22.00	+0.90	Correction in inflow for 12 month average, however average and peak constrained by turbidity at higher flows. Operations limit output to 22 Ml/d
			Total	-0.10		Total	-0.10	
Total London				-0.10			-0.10	

Table 37: Groundwater SDO Review – Thames Valley WRZs – May 2023

Thames Valley								
North Oxon	Farmoor & Swinford	147.79	147.79	0.00	174.00	172.87	-1.13	Revised due to balances on SDOs
			Total	0.00		Total	-1.13	
Swindon								N/A
			Total	0.00		Total	0.00	
South Oxon	Chinnor	2.13	0.08	-2.05	2.16	1.30	-0.86	Subject to a DWI Notice, looking at iron and turbidity. Only to be used in exceptional circumstances. Needed to meet peak demands. Average and peak have been calculated from observed 2022-23 usage
	Gatehampton	94.90	94.90	0.00	101.40	97.10	-4.30	Control challenges due to the mis-match in the large fixed speed booster pumps with the smaller VSD borehole pumps, means that it's not possible to reach peak licence. Solution scoped, but requires RTW at Cleeve WTW before the control can be changed. Detailed assessment has also highlighted metering uncertainity.
			Total	-2.05		Total	-5.16	
Total SWOX				-2.05			-6.29	
Kennet Valley	Playhatch	7.23	7.16	-0.07	7.78	7.78	0.00	Reassessment of process losses using MB model, and update to booster pump capability
			Total	-0.07		Total	0.00	
Henley	Greys Road	3.85	3.85	0.00	4.00	3.89	-0.11	Booster pump capacity updated in MB model, as per SOM
			Total	0.00		Total	-0.11	
Slough, Wycombe & Aylesbury	Hampden	2.00	1.75	-0.25	2.00	1.75	-0.25	Reduction in borehole pump capacity as per SOM, and observed output
			Total	-0.25		Total	-0.25	
Guildford								NA
			Total	0.00		Total	0.00	
Total Thames Valley				-2.37			-6.65	

Appendix D: Environment Programme Investigations and Options Appraisals

Investigations

401. We have undertaken investigations in AMP7 for the Upper Kennet and the River Hogsmill and are continuing investigations on the Upper Lee and Bedford Ouse groundwater body and for a number of locations to address the requirement for 'no deterioration' (ND) assessment under WFD; these are shown in Table 38 below.

Table 38: AMP7 Environmental Investigations

Investigation name	Waterbody	WRZ	EA Area	Completion Date
Thames at Reading ND	Thames	KV	Thames	complete
Colne ND	Colne and Chess	SWA	HNL	complete
Upper Kennet	River Kennet	KV	Thames	complete 31/03/2023
Hogsmill	River Hogsmill	London	KSL	complete 31/05/2023
Ampney Brook and Lower Churn ND	Ampney Brook and Lower Churn	SWOX	Thames	30/09/2023
River Coln and Dikler ND	Coln and Dikler	SWOX	Thames	30/09/2023
Tillingbourne ND	Tillingbourne	Guildford	Thames	30/09/2023
Chiltern Chalk scarp ND	Scarp streams	SWOX	Thames	30/09/2023
Pang ND	Pang	KV	Thames	30/09/2023
Upper Lee U Bedford Ouse Chalk INV and ND	River Lee	London	HNL	31/03/25

402. The River Thames at Reading ND investigation into the impact of increase of Pangbourne abstraction up to full licence was concluded at the end of Phase 1. It was concluded that an increase in abstraction up to full licence at Pangbourne did not pose a risk of deterioration to the River Thames at Reading.

403. We have also agreed with the Environment Agency that the Colne ND investigation (in conjunction with Affinity Water) does not require any further investigation by us. This is because our only source under investigation is Hawridge and we already plan to close the source.

404. The other investigations were originally due to be completed by the end of March 2022 in order to provide a view to inform WRMP24. However, it was recognised that this was a very tight timescale in which to deliver these investigations which in some cases will involve a significant degree of complexity. Therefore, extensions were agreed to these investigations with the Environment Agency so that we could deliver a comprehensive investigation in each case. The revised dates are shown in the table above. In each case the investigations

have been used to provide an interim view of the sustainability reductions that are required for WRMP24.

405. It should be noted that we have agreed in principle to vary the dates for completion of the remaining no deterioration investigations because it is more sensible to stagger them rather than to deliver them all in September 2023. These changes will be formalised with the EA through the NEP alteration procedure in the coming weeks.

Options Appraisals

406. The AMP7 investigations at Upper Kennet and Hogsmill progressed into options appraisals which were completed to the same timescales as the investigations. We have also identified the need for options appraisals for the Upper Lee investigation. We are also likely to complete options appraisals on a number of the no deterioration investigations.

Beyond 2025

407. The investigations and options appraisals in AMP7 have provided evidence to inform the requirement for chalk streams abstraction reduction in some cases. However, further work will be required to address the future programme of WRSE environmental destination scenarios.

408. In view of this requirement, we have developed plans for further WINEP investigations in AMP8 to inform the need to make further sustainability reductions to address the impact of abstraction on chalk streams. We will also deliver a wider, prioritised review of all our abstractions that have the potential to adversely affect any chalk or other sensitive stream through our Vulnerable Catchments programme, and this will also help to inform future planning and environmental destination scenarios.

Appendix E: Outage

409. In this Appendix we provide further details on "Actual outage" that has occurred in the past year and also an update to our "Outage allowance", which is based on an outage risk assessment and is comparable to values in the WRMP19.

410. The outage analysis and calculation for each Water Resources Zone (WRZ) has been carried out in AR22 using the same outage model and methods used in AR21. This model was developed for the Water Resources South East (WRSE) companies to enable improved consistency between the companies.

411. The difference between the average "Outage Allowance" and the "Actual Outage" that has occurred over the period 2007-08 to 2022-23 across the Company area is shown in Figure 9. The total Actual Outage for the Thames Water area for the reporting year 2022-23 is 24.7 Ml/d (184.8 Ml/d during AR22). An update of the Outage Allowance assessment is also presented in Table 43, which for the Thames Water area shows that Outage Allowance for AR23 at 84.5 Ml/d has changed significantly mainly due to Thames Gateway desalination plant (long-term outage) since AR22 when an Outage Allowance of 134.3 Ml/d was reported.

Actual Outage 2022-23

London

412. The outage data collated for London over the twelve month period until the end of March 2023 is summarised in Table 39, showing the four main contributions to actual outage. The impact of the outages of the major water treatment works (WTW; collectively LPPs - Large Process Plants) on the London WRZ DO is assessed using WARMS2 and input as an impact across the year. The total London actual outage figure for AR23 is 22.9 Ml/d, which is 147.9 Ml/d lower than AR22 reporting year outage of 170.8 Ml/d.

Table 39: Actual Outage – London WRZ

WRZ	Site	Cause	Outage (Ml/d)
London	LPPs	Planned refurbishment of treatment components.	12.00
	ELReD	Multiple, including process issues, site trip and power failures.	4.29
	Waltham Abbey	Asset trips and process issues	1.98
	Brixton	Asset trips and process issues	1.72
		Total	22.90

413. The LPPs outages included outages at Hampton, Ashford, Hornsey and Walton WTW, which were a combination of planned and unplanned outages. The impact of these outages was limited as a result of low customer demand in London. During 2022/23 period, Thames Gateway Desalination Plant was unavailable due to an electrical fire in late autumn of 2021 and a planned outage from May 2022 to carry out the second phase of AMP7 investment. This has led to the write down of Gateway DO to 0 Ml/d for AR23 and as such the outage

contribution from the plant is removed and has significantly reduced the total outage allowance for London. The LPPs and reservoirs outages also significantly reduced during AR23. Overall, total company and London outage decreased in AR23.

Thames Valley

414. The outage data collated for Thames Valley over the twelve month period until the end of March 2023 is summarised in the following Table 40 to Table 42 with commentary as appropriate. As an explicit DYCP Outage Allowance is now being calculated, the reporting of Peak Actual Outage needs to align with this. As a result, the Peak Actual Outage has been calculated as the product of Outage Magnitude and Outage Duration in the July-August peak period, averaged over the duration of July-August peak period, i.e. 62 days.

415. The main outages recorded in Guildford were at Sturt Road and Brook, which occurred due to water quality issues, comms failures or potentially related to storm events (Table 40). It is notable that most of the recorded outages during the peak supply period of July and August were resolved within the 24 hours.

Table 40: Actual Outage – Thames Valley WRZs

WRZ	Site	Cause	Average Outage (Ml/d)	Peak Outage (Ml/d)
SWOX	Witheridge Hill	Power failure, and water quality issues	0.21	0.05
	Watlington	Various	0.31	0.02
	Bibury	Various	0.06	0.00
		Total	**1.27**	**5.34**
SWA	Hampden	Planned site refurbishment	1.18	0.74
	Hawridge	Process issues and other site trips	1.19	0.47
	Pann Mill	Minor system trips	1.07	0.00
	Eton	Minor system trips	0.29	0.19
		Total	**4.56**	**2.13**
Kennet Valley	Pangbourne	Various	0.58	0.35
	Fobney	Water quality	0.85	1.21
	Ufton Nervet	System failure or planned	0.05	0.00
		Total	**1.48**	**1.56**
Guildford	Sturt Road	Various	0.40	0.10
	Brook	Various	0.26	0.00
		Total	**0.88**	**0.53**
Henley	Harpsden	Communications	0.63	0.07
		Total	**0.63**	**0.07**

416. Actual outage has reduced in Thames Valley and comprises ongoing planned site maintenance work and generally minor system trips for a variety of reasons.

Outage allowance 2022-23

417. Outage allowance is based on an outage risk assessment looking at the actual outage that has occurred since 2007-08.

418. It is the outage allowance that is used for water resources planning and can be compared to WRMP19.

419. The total average Outage Allowance for AR23 has been calculated as 83.0 Ml/d, a decrease of 51.3 Ml/d from the 134.3 Ml/d reported in AR22.

Outage summary

420. Outage values reported over recent previous submissions are shown in the tables below (noting the peak outage method change for AR21). The accompanying graph shows the difference between Actual Outage and Outage Allowance for the London WRZ over recent returns.

Table 41: Annual Average Outage Allowance and Actual Outage by WRZ

Report	London	SWOX	SWA	Kennet Valley	Guildford	Henley
AA OUTAGE ALLOWANCE (Ml/d)						
AR16	81.72	16.73	10.75	2.8	1.25	0.44
AR17	84.55	17.5	9.99	2.59	1.33	0.4
AR18	93.03	17.73	10.35	2.53	1.4	0.36
AR19	111.49	17.32	10.65	2.65	1.6	0.33
AR20	97.15	17.14	14.45	2.69	1.54	0.8
AR21	105.8	6.52	13.8	1.93	1.63	1.24
AR22	107.4	6.69	15.49	1.95	1.55	1.15
AR23	55.36	6.44	16.44	2.11	1.54	1.15
Variance	-52.04	-0.25	0.95	0.16	-0.01	0.00
WRMP19	99.76	17.23	9.46	2.49	1.40	0.36
Variance	44.40	10.79	-6.98	0.38	-0.14	-0.79
AA ACTUAL OUTAGE (Ml/d)						
AR16	77.56	3.77	1.68	0	4.14	0.05
AR17	80.53	4.72	4.84	0.01	2.07	0
AR18	222.31	4.97	14.18	0.32	2.08	0.04
AR19	218.77	9.48	18.66	0.35	1.57	0.01
AR20	157.42	13.82	14.91	3.11	0.97	6.42
AR21	146.4	5.61	10.22	2.31	0.22	2.6
AR22	170.8	4.34	6.1	2.42	0.38	0.79
AR23	17.97	1.27	2.60	1.48	0.81	0.61
Variance	-147.90	-3.07	-1.54	-0.94	0.54	-0.16

Table 42: Peak Outage Allowance and Actual Outage by WRZ

Report	London	SWOX	SWA	Kennet Valley	Guildford	Henley
CP OUTAGE ALLOWANCE (Ml/d)						
AR20		17.14	14.45	2.69	1.54	0.8
AR21		3.6	3.04	0.72	0.37	0.16
AR22		3.06	3.26	0.99	0.38	0.17
AR23		3.09	3.74	0.98	0.52	0.27
Variance		0.03	0.38	-0.01	0.14	0.05
WRMP19		17.23	9.46	2.49	1.4	0.36
Variance		14.14	5.82	1.51	0.88	0.14
CP ACTUAL OUTAGE (Ml/d)						
AR20		13.82	14.91	3.11	0.97	6.42
AR21		2.53	16.08	2.41	0.44	0.13
AR22		1.51	2.81	3.42	0.00	0.33
AR23		5.34	2.82	1.56	0.27	0.07
Variance		3.83	0.01	-1.86	0.27	-0.26

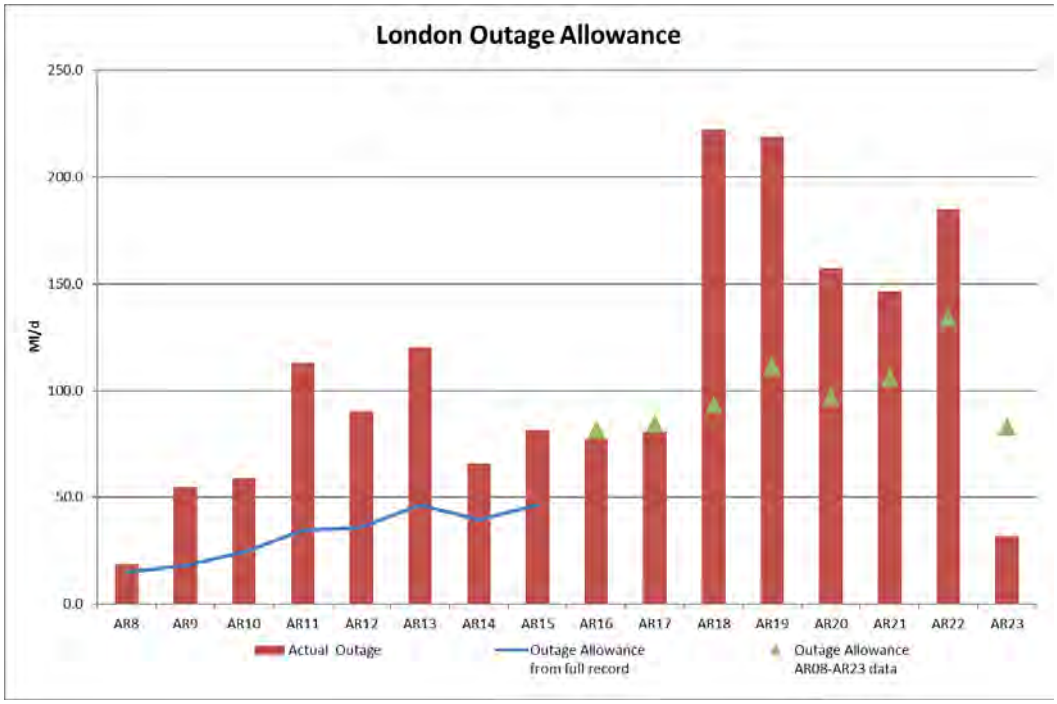

Figure 9: London annual average outage allowance

Table 43 AR23 Outage Allowance results

WRZ	Outage Allowance (Ml/d)	
	Annual Average	*Peak*
Henley	1.15	0.22
Guildford	1.54	0.52
Kennet Valley	2.11	0.98
Slough, Wycombe, Aylesbury	16.44	3.64
SWOX	6.44	3.09
London	55.36	No DYCP
Total	**84.04**	**8.45**

Appendix F: WAFU

421. This appendix summarises the components of water available for use (WAFU) by WRZ compared to forecast values from WRMP19.

WAFU = Deployable Output (DO)
– Changes to DO (New resources, Climate change, Constraints)
– Outage Allowance
[+/- Transfers (Imports and Exports)]

Table 44: DO to WAFU AR22 vs WRMP19

DO to WAFU (Ml/d)	DYAA	DYCP				
	London	SWOX	SWA	Kennet Valley	Guildford	Henley
AR23						
Deployable output	2206.00	359.17	198.93	149.67	72.42	21.59
New resource development	0.00	0.00	0.00	0.00	0.00	0.00
Sustainability Reductions	In DO	In DO	In DO	0.00	0.00	0.00
Climate Change Impacts	49.44	3.19	0.31	3.04	0.00	0.00
Network Constraints	0.00	0.17	2.00	0.00	0.00	0.00
Outage Allowance	55.36	3.09	3.64	0.98	0.52	0.22
Other reductions	In DO	0.00	0.00	0.00	0.00	0.00
WAFU (own sources)	2101.20	352.72	192.88	145.65	71.90	21.37
Total Exports	19.63*	2.64	7.00	1.56	2.27	0.00

DO to WAFU (Ml/d)	DYAA	DYCP				
	London	SWOX	SWA	Kennet Valley	Guildford	Henley
Total Imports	In DO	4.97	0.00	0.00	0.00	1.22
Total WAFU	2081.57	355.05	185.98	144.09	69.63	22.59
WRMP19						
Deployable output	2302.00	385.38	214.40	155.40	71.70	25.90
New resource development	3.00	0.00	0.00	0.00	0.00	0.00
Sustainability Reductions	4.00	14.43	7.30	0.00	0.00	0.00
Climate Change Impacts	49.25	3.19	0.61	2.36	0.11	0.00
Network Constraints	0.00	0.40	2.00	0.00	0.00	0.00
Outage Allowance	99.76	17.23	9.46	2.49	1.40	0.36
Other reductions	23.00	0.00	0.00	0.00	0.00	0.00
WAFU (own sources)	2136.99	350.12	195.03	150.55	70.19	25.54
Total Exports	17.11	1.18	5.32	0.20	2.27	0.00
Total Imports	18.00	5.00	0.00	0.00	0.00	0.00
Total WAFU	2137.88	353.94	189.71	150.35	67.92	25.54
Variance						
Deployable output	-96.00	-26.21	-15.47	-5.73	+0.72	-4.31
New resource development	-3.00	0.00	0.00	0.00	0.00	0.00
Sustainability Reductions				0.00	0.00	0.00
Climate Change Impacts	+0.19	-0.00	-0.30	+0.68	-0.11	0.00
Network Constraints	0.00	-0.23	0.00	0.00	0.00	0.00
Outage Allowance	-44.40	-14.14	-5.82	-1.51	-0.88	-0.14
Other reductions		0.00	0.00	0.00	0.00	0.00
WAFU (own sources)	-35.79	+2.60	-2.05	-4.90	+1.71	-4.17
Total Exports	+2.52	+1.46	+1.68	+1.36	0.00	0.00
Total Imports		-0.03	0.00	0.00	0.00	+1.22
Total WAFU	-56.31	+1.11	-3.73	-6.26	+1.71	-2.95

*The Essex and Suffolk transfer is captured within DO.

London DYAA

422. Total WAFU is 56.31 Ml/d lower (2.63%) than the WRMP19 forecast for the AR23 reporting year. This is due to a reduction in DO and WAFU, even though Outage Allowance also decreased. Although the delivery of the proposed new resource development at New River Head has been deferred, the Didcot import agreement incorporated in the London WRZ DO, which was renewed in AMP7, delivers an increased benefit.

SWOX DYCP

423. Total WAFU has increased by 1.11 Ml/d (0.31%) compared with the WRMP19 forecast for AR23. This is the result of changes in a number of the WAFU components.

424. DO has reduced by 26.21 Ml/d (6.80%) relative to the WRMP19 forecast, primarily because of sustainability reductions at Axford, Ogbourne and Childrey Warren. These previously forecast reductions are now part of our 'current' DO and combine with other reductions at Woods Farm, Leckhampstead and Farmoor/Swinford that were not forecast in the WRMP19. These reductions in total WRZ DO are balanced in part by an increase in the Latton groundwater source DO. There are also additional unforeseen reductions at Gatehampton and Chinnor.

425. Increases in exports have also reduced total WAFU, but this and the reduction in DO are counterbalanced by a significant reduction in peak outage allowance. This reduction occurred in AR21 following the adoption of a new outage methodology by the companies in the South East, which enabled calculation of a specific DYCP outage allowance. This change continues to be reflected in the decrease in AR23 outage compared with the WRMP19 forecast.

SWA DYCP

426. Total WAFU is around 3.73 Ml/d (1.97%) lower than forecast in the WRMP19.

427. DO reductions relative to the WRMP19 forecast of around 15.47 Ml/d (7.21%) make up the largest component of this change. A sustainability reduction at Pann Mill was completed in AMP6 as forecast in WRMP19 and is now included in our 'current' DO. In addition, several sources, most notably Taplow but also Dancers End, Datchet and Hampden, have had source DO reductions to reflect performance capabilities at these sites.

428. The reduction in DO is balanced by a significant reduction in peak outage allowance. This reduction occurred in AR21 following the adoption of a new outage methodology by the companies in the South East. This change continues to be reflected in the decrease in AR23 outage compared with the WRMP19 forecast.

Kennet Valley DYCP

429. Total WAFU is 6.26 Ml/d (4.16%) lower than forecast in the WRMP19 for the AR23 reporting year.

430. The most notable change to WAFU in Kennet Valley is the 5.73 Ml/d (3.69%) reduction in DO. This is largely associated with a DO reduction at Bishops Green reflecting a DO reduction taken at AR20 as a result of raw groundwater turbidity issues. Other smaller DO reductions have also occurred at the Playhatch and Bradfield groundwater sources.

431. The reduction in DO is balanced in part by the peak outage allowance decrease in AR21 following the adoption of a new outage methodology across the companies in the South East. This change continues to reflect the decrease in AR23 outage compared to the WRMP19 forecast. However, an increase in exports from Kennet Valley WRZ in AR21 has continued for AR23 reporting as a result of the inclusion of a treated water transfer to Henley WRZ. This was not forecast in WRMP19 and contributes to the reduction in WAFU.

Guildford DYCP

432. Total WAFU is 1.71 Ml/d (2.51%) higher than forecast in the WRMP19 for the AR23 reporting year. This reflects a 0.72 Ml/d increase in DO, as a result of an increase in source

DO at Shalford, with other small movements at other groundwater sources, together with a reduction of 0.88 Ml/d in outage allowance.

Henley DYCP

433. Total WAFU is 2.95 Ml/d (11.55%) lower than forecast in the WRMP19 for this reporting year. This is due to a reduction in DO at Sheeplands in AR20, which account for asset constraints not forecast in WRMP19, but partially counterbalanced by an increase in treated water imports from Kennet Valley WRZ.

Appendix G: Estimation of Dry Year Demand

Method

434. As in previous years, Dry Year demand (both annual average and critical period peak) has been derived from analysis of the impact of a range of weather scenarios on demand using a long time-series of weather data. This analysis is coupled with models of how demand varies as a function of weather, with the models explaining the weather dependent variability of both usage and leakage.

435. Consistent with previous estimation of dry year demand, the models have been "levelled", producing a de-seasonalised base DI that is matched to the measured distribution input (DI) for the reporting year from 01/04/2022 to 31/03/2023. Using this "levelled" DI, the models have then been used to estimate the amount of demand attributable to the prevailing weather conditions in 2022/23. Using a reference year, in which DI represents the sum of 1 in 5-year usage and 1 in 5-year leakage, the difference between the 2022/23 modelled demand and that of the reference year is reported as the annual average dry-year uplift. Similarly, the uplift factors for the peak demand are calculated using the maximum 7 day rolling average demands for July and August.

436. The methodology of using the relative severity of the annual reporting year to estimate dry year demand again remains unaltered in AR23 for annual average. For AR21, owing to the impact of the Covid-19 lockdown on demand the methodology for estimating peak dry weather demand had been adapted. This involved uplifting the observed peak DI in July and August 2020, so embedding the actual impact of lockdown. For AR22, the effect of Covid-19 restrictions on demand appeared to be less significant and so we reverted to approaches used prior to AR21 for estimating peak dry weather demand; the Dry Year Critical Period (DYCP) demand figures are estimated by uplifting observed annual averages using an uplift calculated from the weather dependent models, implementing a consistent approach across the Thames Valley WRZs. This approach remains the same for AR23.

437. To provide further context, the following points are of note:

- Assessing the impact of Covid-19 on customer demand as well as potential long-term impacts on demand patterns requires a period of time post-pandemic on which to base analysis. At AR23, there is some evidence for small long-term changes in demand however this is not yet significant enough for inclusion within the model.
- Demand during the first year of the pandemic (from mid-March 2020) showed evidence of being more sensitive to weather, particularly peak demand in warmer, drier weather. Following 2020 demand response to weather in London appears to have largely returned to the pre-pandemic response relationships. In the non-London zones the data suggests there may be a small long-term change in the relationship between demand and weather compared to the pre-pandemic response.
- After excluding AR21 as an anomalous year, with only two years, AR22 and AR23, showing potentially different demand-weather relationships there is currently insufficient data to develop a new relationship.
- It is possible that the pattern of demand and its sensitivity to weather may continue with the shift to increased home-working and, as a result, may require several additional years of demand and weather data to confirm the correlations and responses that are appropriate to use.

Risk Curves

438. Figure 10 shows the risk curves for the overall effect of usage, leakage and combined weather on London DI. The curves show the relative position of usage, leakage and combined weather component of demand based on the last 74 years. Figure 10 shows that, in London, the weather impact on demand over the whole reporting year has been higher than normal, consistent with the hot weather experienced. This is apparent from the increased modelled usage, which is at the 91st centile. The modelled leakage impact appears below normal at the 41st centile, despite the increase in leakage last winter. It is noted in the section below that modelled winter demand is not well matched to the observed, which may have some impact on how the modelled leakage is ranked in the risk curves.

Figure 10: London annual average risk curve for weather dependent demand

439. The equivalent annual average risk curve for the whole of the Thames Valley water supply area is shown in Figure 11. As with London, the weather impact on demand over the whole reporting year for Thames Valley has also been higher than normal, ranked at the 89th percentile. The Thames Valley annual average for this reporting year shows that the modelled leakage is significantly higher than normal as a result of this year's weather, being at the 93rd centile reflecting a colder than normal winter.

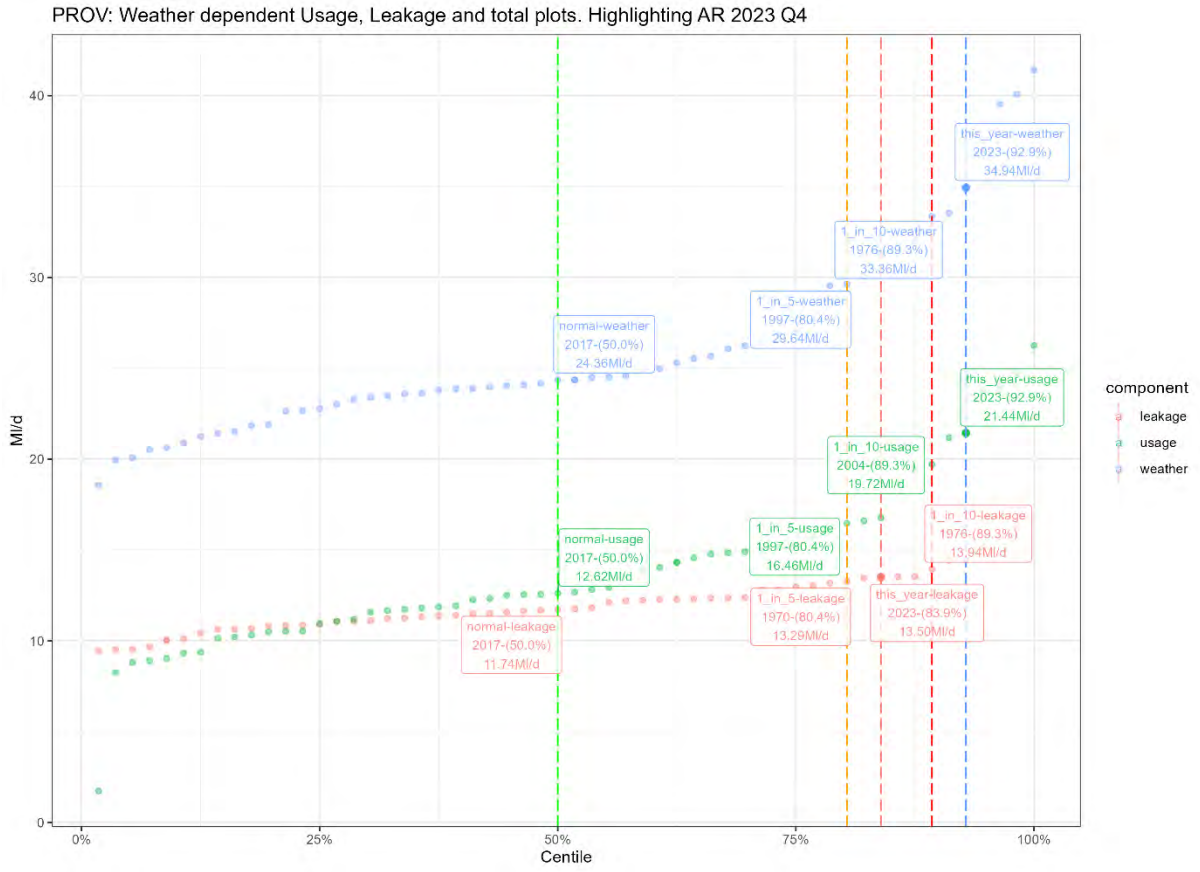

Figure 11: Thames Valley annual average risk curve for weather dependent demand

Table 45: London and Thames Valley modelled demand components for annual average and critical period

		London	SWOX	SWA	Kennet Valley	Guildford	Henley	Thames Valley
DYAA	Weather	89%	93%	91%	91%	95%	93%	93%
	Leakage	41%	63%	91%	89%	98%	98%	84%
	Usage	91%	93%	91%	89%	93%	91%	93%
DYCP	Demand		91%	89%	95%	96%	89%	95%
		Normal = 50%		1 in 5 = 80%		1 in 10 = 90%		

440. The relative position on the risk curves enables us to calculate what uplift factors (or reductions) are required in order to estimate a normal year, dry year annual average and dry year critical period condition, for water resources planning purposes.

Peaking factors

441. Below is a tabulated summary of the peaking factors applied in AR23. The peaking factors are applied to annual average out-turn DI to generate dry year (DY) and normal year (NY)

uplifted DI for both annual average (AA) and critical period (CP). We do not apply the uplift to the observed critical period, although it is shown for information below.

442. The DI is exclusive of usage by inset appointments. These are removed, uplifted separately then counted as Bulk Exports in the supply demand balance.

443. Note that the uplifted DI in the tables below will not reflect the final DI used in the supply/demand balance calculation. This is because action as further adjustments are included for the final supply/demand balance adjustments e.g. MLE (Mean Likelihood Estimate).

Table 46: AR23 Normal Year uplifts by WRZ

2022-23		Observed DI	Uplift to Normal Year	Normal Year DI
London	AA	1957.20	-17.46	1939.74
	CP			
SWOX	AA	292.89	-5.02	287.87
	CP	343.21	27.91	371.12
Kennet Valley	AA	104.40	-1.41	102.98
	CP	120.34	8.91	129.25
Henley	AA	14.12	-0.49	13.63
	CP	19.76	2.74	22.51
SWA	AA	148.77	-2.13	146.64
	CP	172.29	15.27	187.56
Guildford	AA	50.36	-1.55	48.81
	CP	64.22	6.06	70.28

Table 47: AR23 Dry Year uplifts by WRZ

2022-23		Observed DI	Uplift to dry Year	Dry Year DI
London	AA	1957.20	-4.15	1953.05
	CP			
SWOX	AA	292.89	-2.26	290.62
	CP	343.21	54.31	347.20
Kennet Valley	AA	104.40	-0.65	103.75
	CP	120.34	16.06	120.46
Henley	AA	14.12	-0.32	13.80
	CP	19.76	4.42	18.54
SWA	AA	148.77	-1.00	147.77
	CP	172.29	26.11	174.87
Guildford	AA	50.36	-1.02	49.34
	CP	64.22	10.73	61.09

444. Critical Period is not calculated for the London WRZ.

Appendix H: Target Headroom

445. Target Headroom is the minimum buffer that water companies are required to maintain between supply and demand in order to account for the current and future uncertainty in supply and demand.

446. We reassess and rebase our Target Headroom in each annual review of our WRMP. This tends to reduce headroom compared to WRMP19 forecasts as many of the key components are now known and reported as actuals, as opposed to a forecast made several years before.

447. As such, comparing Target Headroom reported in each annual return is more useful than comparison with WRMP forecasts, to understand the underlying uncertainty.

448. The components of uncertainty are:

- Accuracy of supply side data
- Climate change
- Demand uncertainty

449. We routinely review and update our supply and demand-side assumptions in light of data gathered in the reporting year.

450. For AR23, there are two runs of the target headroom models, one used to produce a Target Headroom for calculating the Supply Demand Balance Index (SDBI) and one for calculating the Security of Supply Index (SoSI). This is because there are different metrics for outage used in each and, more importantly, differences in demand used in these indices which need to be reflected in Target Headroom. The difference in demand relates to the use of actual DI in SDBI versus DI adjusted to account for hot, dry weather impacts used in WRMP, which will result in differences in uncertainty and therefore the Target Headroom calculated.

451. The DYAA and DYCP Target Headroom allowances for both SDBI and SoSI are presented below.

Table 48: AR23 Target Headroom: DYAA output for SoSI & SDBI

DYAA (Ml/d)	London	SWOX	SWA	Kennet Valley	Guildford	Henley
SoSI	75.17	6.73	2.80	4.23	1.19	0.34
SDBI	74.36	6.40	2.73	4.21	1.16	0.33

Table 49: AR23 Target Headroom: DYCP output for SoSI & SDBI

DYCP (Ml/d)	London	SWOX	SWA	Kennet Valley	Guildford	Henley
SoSI		15.31	8.89	6.89	3.61	1.29
SDBI		8.44	8.86	7.11	3.67	1.23

Appendix I: Water Efficiency

452. The cumulative Ml/d demand reduction achieved to date over AMP7 is slightly ahead of forecast, with some demand reduction variation seen across all individual activities. The Water Efficiency programme will continue to evolve, using smart meter data and regular monitoring of each activity, with a focus on the total AMP7 demand reduction objective.

Smarter Home Visits

453. Our Smarter Home Visits (SHV) activity was reduced during 2022/23 due to re-profiling of demand reduction programmes in line with smart meter rollout activities and the increasing focus on targeted digital engagement. The Ml/d demand reduction achieved through SHVs was only slightly short of our forecast. The total AMP7 cumulative Ml/d demand reductions are below the original AMP7 forecast, due to long-standing impacts of Covid restrictions impacting on-ground delivery capability and a shift to increase targeted digital engagement with customers to drive self-fix activity. Our use of smart meter data to assist targeting high usage households, in order to maximise the demand reductions achieved per SHV, alongside using continuous flow data to initiate targeted engagement for both wastage self-fixes and Customer Supply Pipe Leakage (CSL) action. This insight has been shared with Government, regulators and other water companies to help inform PR24 programme development.

Smarter Business Visits

454. Our Smarter Business Visits (SBV) activity continues to be a very effective demand reduction activity. The Ml/d demand reduction benefits delivered in 2022/23 exceeded the annual forecast, due to partnership working with the Department for Education enabling increased school visits, which provide enhanced water saving opportunities and help public sector organisations secure financial savings benefits. During and since the 2022 Drought, we have used smart meter data to help target continuous flows on business properties and increase joint-working with business Retailers. Our insight on business water use/loss was shared with Defra to aid the development of new National Water Targets for business demand, plus shared with Ofwat and the Retailer-Wholesaler Group to aide the development of PR24 performance commitment approaches. Our water savings evidence from SBVs also assisted in Market Operator Services Limited (MOSL's) development of their Interim Metering Strategy. Our SBVs were also being used in specific Water Resource Zones in response to the 2023 heatwave and official Drought.

Wastage Fixes – Households

455. Our wastage fixes are continuing to deliver consistent and useful water savings per visit, but the cumulative demand reduction process is behind the original WRMP projection due to the long-standing impacts of Government Covid restrictions in year 1, which resulted in months of no delivery. The insight from our wastage fix initiative was supplied to Defra and Ofwat to inform National Water Target and PR24 demand reduction approaches. Our wastage evidence continues to be shared with regulators, industry and trade bodies, the manufacturing industry and product certification bodies to help inform activities aiming to address the UK's 'leaky-loo' issue.

Non-Household 'Continuous Flow'

456. We have been exploring how best to engage with NHH Retailers and business customers whose smart meters are recording continuous flow. Around 30% of flow through our NHH

smart meters is registering as continuous flow (flow of one litre per hour, every hour for 14 consecutive days or more). Continuous flow is evident across every business category and we are working with retailers to test various engagement methods and offer options on identifying and fixing wastage. These include communications directly from retailers with their own solution methods; dual branded Thames Water/retailer branded letters; and Thames Water only branded letters.

457. The data for meters with continuous flow is now shared directly with the retailers via our Digital Data Dashboard, so they can access live information and communicate this with their customers to reduce water loss.

458. We have now analysed the results from our first trial of sending letters out to ~4,000 businesses with continuous flows greater than 240l/day to encourage a self-fix on the property. These letters were a mixture of co-branded with the retailer and Thames Water only branding. We will share our insight with the NHH retail market, regulators and MOSL to help enhance demand reduction successes and benefit retail market viability.

Water Efficiency Incentive for Developers

459. Thames Water launched an industry-first Environmental Incentive for Developers, aimed at enabling and accelerating levels of water efficiency performance in all new development in our supply region. Our three-tiered discount scheme that encourages developers to better guarantee that water efficiency fittings/appliances are installed financially incentivises the inclusion of water reuse technologies (rainwater and greywater), plus achieve water neutrality through undertaking water efficiency its and wastage fixes in existing homes and businesses with, in the same water resource zone, which then offset the forecasted water demand from the new development.

Water Neutrality Pilot

460. Thames Water teamed up with Berkeley Group/St. George to pilot the concept of water neutrality on the Royal Exchange development in South West London. The objectives of this pilot were to:

- Quantify how much water new homes actually use, compared to water performance levels of 125 and 110 litres/person/day as outlined in Part G of Building Regulations
- Quantify the water use and PCC benefits of using the 'fittings approach' from Part G
- Quantify the water savings volumes that can be made from retrofitting existing homes and businesses in the surrounding area
- Prove that achieving water neutrality by offsetting the forecasted water demand of a new development, can be done by improving the water performance of existing surrounding buildings

461. The results of this water neutrality project will be disseminated through the water utility and developer sectors, as proof that offsetting future new water demand can be achieved with relatively simple water device retrofits and wastage/leak fixes in existing homes and businesses.

Greenredeem/household incentive scheme

462. To expand our ability to deliver water efficiency benefits from our smart metering programme, we work with Greenredeem to provide smart metered customers with non-

financial incentives and rewards for reducing their average daily consumption. This initiative is successfully enhancing measurable demand reduction by an additional 2-5%, on top of the demand reductions delivered by smart meter installations, wastage fixes and separate water efficiency visits. Our ability to expand our Greenredeem water efficiency incentive in line with WRMP projections, was impacted by reduced SHV activity and the restricted ability to digitally/ electronically engage with customers to promote water efficiency incentives due to the updated Privacy and Electronic Communications Regulation (PCR) ruling under data protection laws, requiring greater levels of customer consent. The demand reduction volumes per customer registered with Greenredeem continue to be very favourable. We have expanded the partnership with Greenredeem to include sewer abuse/blockage education and customer engagement. We will continue our use of incentives to enable greater demand reduction benefits to smart meters customers.

Campaigns and communications

Online Water Calculator tool

463. Our free online calculator has continued to help thousands of households work out how much water they're using. This interactive tool also links this to water and energy costs, displaying the most appropriate water-saving devices and pop-up tips that customers can use to save water, energy and money. Customers can even test settings for the top five actions (like showering or washing the dishes) to see how much water and energy they could save in the future. This is also the first calculator of its kind to identify how much water a customer typically uses outside of their home, such as when they're showering at the gym. This means our customers can see exactly what impact they're having on water demand, and for the first time see their water use presented in PCC metrics. https://www.thameswater.co.uk/help/water-saving/water-saving-calculator

Non-Potable

464. We have not delivered any non-potable water reduction in AMP7. Our efforts have focused on working with Defra and the Future Homes Hub to inform the development and consultation of Building Regulations changes. We have also introduced the water sector's first Environmental Incentive for Developers that financially incentivises the take-up of water reuse technology such as rainwater harvesting and greywater recycling. The aim of this developer incentive is to accelerate the adoption of non-potable technologies within new housing development and work towards a 'water neutral' outcome. We are also working with a large golf course to scope and implement an innovative use of final wastewater effluent within irrigation practices.

Housing Association

465. We migrated all separate housing association home visits into our larger SHV programme in 2021/22. From 2022/23 onwards, all water efficiency visits conducted in housing association properties will fall into the SHV delivery and reporting space.

Innovation savings

466. We have continued with our Water Efficiency Incentive for Business Retailers. Insight from this offering is shared with Ofwat, MOSL and Retailers to inform future retail market regulation and engagement bilateral arrangements. We continue to engage with external suppliers of new technology and customer engagement opportunities. These engagements can lead to small pilots and trials to inform future water efficiency programmes. In parallel

to sharing these results with other water companies through the Water Efficiency Network, we will use these trials to expand our innovation activity into later AMPs.

Stakeholder and External

467. We continued to engage with multiple government, regulator and industry groups that influence water policy, regulations and national projects. We contributed demand reduction insight and data, plus advice based on experience delivering large-scale smart metering and water efficiency programmes across household and business customers. These groups include; UK Water Efficiency Strategy steering group, UK Water Neutrality sub-group, Defra's Water Labelling steering group, Future Homes Hub, and the Retailer-Wholesaler Group's Water Efficiency Sub-Group.

468. As a lead supporter of Waterwise, we are a long-term active member of the UK Water Efficiency Strategy Steering Group and Water Efficiency Network steering group. We have played key roles in the working groups on water neutrality and water reuse, resulting in guidance publications to advance both agendas.

469. We have been a key active member of the Retailer-Wholesaler Group's Water Efficiency sub-group, developing evidence and recommendations for future improvement on demand reduction within the non-household market.

470. We've also collaborated with key stakeholders and neighbouring water companies to set ambitious water-saving targets for the next business plan period. We have also presented results from our smart metering data analytics and water efficiency initiatives at national conference events.

471. Two of our water efficiency programmes have been shortlisted for the Water Industry Awards 2023 - Water Efficiency Project of the Year:

- Water Efficiency innovation from rolling out smart meters in businesses: Non-Household Smart Meter Data Services and Continuous Flow Live Dashboard
- Water Neutrality Pilot: Working with a large housing developer to install water efficient fittings and appliances, then offsetting the remaining forecasted water demand through retrofitting and wastage fix activities in surrounding existing homes and businesses

Appendix J: Supply Demand Balance

472. This appendix summarises the main components of the SDB by planning scenario (DYAA and DYCP) and by WRZ, and compares them with the WRMP19 forecasts.

473. The SDB is calculated as SDB = WAFU – (DI + Target Headroom).

Table 50: Comparison of SDB Components – AR23 vs WRMP19 Forecast (DYAA)

DYAA (All figures in Ml/d)	London	SWOX	SWA	Kennet Valley	Guildford	Henley
Annual Return 2023						
WAFU	2081.57	314.86	158.81	140.10	63.17	20.75
Distribution Input	1962.68	288.00	147.38	103.56	48.83	13.76
Target Headroom	75.17	6.73	2.80	4.23	1.19	0.34
SDB	**43.72**	**20.13**	**8.63**	**32.31**	**13.15**	**6.65**
WRMP19 Forecast						
WAFU	2137.88	297.34	170.34	138.05	62.04	25.29
Distribution Input	1973.62	261.20	138.24	103.12	44.93	12.93
Target Headroom	148.93	15.17	5.65	5.66	2.48	0.66
SDB	**15.33**	**20.96**	**26.45**	**29.27**	**14.63**	**11.70**
Variance						
WAFU	-57.18	17.52	-11.53	2.05	-25.93	-4.54
Distribution Input	-10.94	26.80	9.14	0.44	3.9	0.83
Target Headroom	-73.76	-8.44	-2.85	-1.43	-1.29	-0.32
SDB	**27.52**	**-0.83**	**-17.82**	**3.04**	**-1.54**	**-5.05**

Table 51: Comparison of SDB Components – AR23 vs WRMP19 Forecast (DYCP)

DYCP (All figures in Ml/d)	London	SWOX	SWA	Kennet Valley	Guildford	Henley
Annual Return 2023						
WAFU		355.05	185.98	144.09	69.63	22.59
Distribution Input		344.14	174.17	120.21	60.58	18.50
Target Headroom		15.31	8.89	6.89	3.61	1.29
SDB		**-4.40**	**2.92**	**16.99**	**5.44**	**2.80**
WRMP19 Forecast						
WAFU		353.94	189.71	150.35	67.92	25.54
Distribution Input		320.62	171.16	124.14	61.48	19.31
Target Headroom		20.64	8.52	6.77	3.35	0.9
SDB		**12.69**	**10.03**	**19.44**	**3.10**	**5.30**

DYCP (All figures in Ml/d)	London	SWOX	SWA	Kennet Valley	Guildford	Henley
Variance						
WAFU		1.11	-3.73	-6.26	1.71	-2.95
Distribution Input		23.52	3.01	-3.93	-0.9	-0.81
Target Headroom		-5.33	0.37	0.12	0.26	0.39
SDB		-17.09	-7.11	-2.45	2.34	-2.50

Appendix K: WRMP19 and AR22 Comments and Actions

474. Defra, in its WRMP19 permission to publish letter[19], set out its expectations for further work ahead of WRMP24. These work areas are summarised in Table 52.

Table 52: Defra-defined areas of further work ahead of WRMP24

WRMP24 work area	Our update
Expectations for regional planning You should continue to actively participate in Water Resources South East regional group and neighbouring regional groups and respond positively to the expectations set out as part of the national framework.	We are a core member of the Water Resources South East Group and also active participants in neighbouring groups that link to our region. As well as providing data we have provided considerable technical support to the WRSE team, and embedded key resources to assist in the technical development of this plan. We remain committed to ensuring a Regional Plan is developed that is adaptive and delivers best value. Further information on WRSE and the development of strategic regional options can be found in Part C.
Consider further environmental benefit In line with the expectations of regional planning, we expect your WRMP to be ambitious in protecting and improving the environment and demonstrate how you plan to do this. You should ensure that opportunities for improvements to the environment in the development of resource options has been considered in the feasibility, design and appraisal of these schemes.	We continue to work closely with the Environment Agency and our regional partners to improve the natural environment in our region. We have established a number of environmental objectives for use in regional planning and our own WRMP that will keep environmental considerations centre-stage in developing a best value plan. We will continue to examine the environmental and social impacts and opportunities of all potential water resource and demand management options. Further information on the environment programme can be found in Part C.
Continue to work and engage with your stakeholders You received a significant number of responses on the strategic options in your plan [WRMP19] from a number of local interest groups. Given the significant public interest in these options, maintaining dialogue is key and we welcome the commitment to continue your stakeholder engagement forums. You should also ensure that decisions made in your plan are clear and accessible to all stakeholders.	Our WRMP24 and the regional plan received a considerable customer and stakeholder interest, with our consultation receiving over 1,600 responses. Our overall approach for WRMP19 was positively received by regulators and stakeholders and we have built on this for WRMP24, noting the links with regional planning. We have engaged with stakeholders throughout the development of the draft regional plan and

[19] Letter from Defra 31 March 2020

WRMP24 work area	Our update
	WRMP24, sharing information in a timely, open manner and providing opportunity for challenge and input to inform the plan. We have also committed to undertake monitoring and reporting to give regulators and stakeholders visibility of our progress delivering the programme of studies for WRMP24 and facilitate stakeholder input and engagement to the overall work programme. We are fully engaged with stakeholders and are working collaboratively with the relevant water companies in the development of the Strategic Resource Options. Further information on the stakeholder engagement programme can be found in Part D.2.

Table 53: TMS Tripartite Response 30 November 2022

Tripartite Group
Defra, Environment Agency, Ofwat

cc: DWI

Clearwater Court
Vastern Road
Reading
RG1 8DB

cathryn.ross@thameswater.co.uk

30 November 2022

By email

Dear Tripartite Group

Thames Water Annual Review 2022 – Feedback

Thank you for your joint feedback on our 2022 Annual Review of our Water Resources Management Plan 2019, requesting further actions be undertaken relating to the status of the Thames Gateway Desalination Plant (hereafter referred to as "the plant") and our PCC commitments. Please find our response below:

Thames Gateway Desalination Plant outage

We welcome the opportunity to clarify our position on the plant. The plant has experienced a number of outage incidents since commissioning in 2010, which has understandably raised concerns and uncertainty about the reliability of the source, and its potential impact on our security of supply.

The plant, when operational, can provide deployable output that amounts to up to 5% of the daily supply demand and drought resilience for London. However, to do this, the plant needs to be operating (at 100Ml/d) all day every day during a drought event before any outage allowance. In our view, running the plant to produce this level of output for a prolonged period would cause some of the elements of the plant (such as the membranes used to treat the water) to require maintenance and replacement that would require outages in order to keep the plant operational.

It should also be noted that to operate the plant at more than 50Ml/d would require us to reduce supply into the London system from our slow sand filter-based treatment works at Coppermills, Hampton, and Walton. Given the lack of resilience that comes from the design of the plant, and its high dependency on power and chemicals, with fragile supply chains, full utilisation of the output from the plant could require us to displace more reliable supplies from our large process plants with supply from the Gateway desalination plant, such that we could reduce the resilience of London's water system

overall, and the resilience of supplies to those customers served from our Woodford reservoir in particular.

The plant has been not operated since November 2021 when a fire occurred leading to health and safety concerns and resulting in essential maintenance work. We could have operated the plant at a lower capacity of 50 Ml/d with 50 days' notice between November 2021 and June 2022 but chose not to do due to health and safety issues and raw water storage levels. The essential maintenance plan was approved in June 22, resulting in full outage of the plant from July 2022.

Phase 1 of this work was completed by the end of 2021 at a cost of £22m. The decision to proceed with the phase 2 works was made late last year when, having experienced two wet winters and completed the QE2 reservoir maintenance work, our water resource position was healthy.

In Phase 2, there are five critical items covering safety and resilience that need to be rectified prior to getting the plant back into supply. This rectification will cost £2m and we have a contractor in place to complete the work by the end of February 2023. This is three months sooner than the original pre-drought plan of the end of May 2023. All work is currently going to plan. On completion of the work, the plant will be able to run at 25Ml/d initially and we expect it then to ramp up to a consistent 50Ml/d by February 2023, with 50-days' notice.

This is consistent with our dWRMP, which we submitted to Defra on 28 November 2022, where we plan that the plant will deliver a reliable 50 Ml/d capability by February 2023 with the aim of demonstrating a higher capability than this by March 2023. Investment of £12m is being made in the remainder of AMP7 (the period up to 2025) and our current plans for AMP8 – which are subject to further refinement internally and ultimately Ofwat's PR24 process – envisage additional investment of up to £38m being available in AMP8 (2025-2030) to ensure 75 Ml/d minimum output of the plant. This is consistent with our dWRMP.

We are commissioning engineering assurance of our plans for the plant, in order to evidence that the funding and activities planned could reasonably be expected to deliver the outputs that are required.

We hosted Defra colleagues on 20 October at Gateway WTW to cover the latest developments at the plant and our wider response to the drought. From Thames Water, this was attended by Nevil Muncaster, Martin Padley, Paul Wetton, Mick Clarke, Peter Kendall and me. A further meeting held on 24 October with Environment Agency colleagues provided similar content on the Gateway WTW, with a follow-on meeting with a smaller EA and Thames Water team on 9 November.

We are formalising lines of communication with our Regulators. We are arranging a deep dive for Ofwat colleagues to cover the design and operation of the plant and the current work to bring it into operation while on 26 November we provided an update on Gateway restart to the Environment Agency. Going forward, we will do this on a

fortnightly basis, and follow that up with a Teams meeting. We will work with the EA to agree a common approach for communicating significant go/no go decisions.

Inconsistent treatment of the Thames Gateway Desalination Plant

We have been inconsistent in our representation of the plant's operational capacity in recent correspondence and the dWRMP that we submitted to Defra on 3 October 2023. We apologise for this and will learn lessons so this does not happen in the future.

We have resolved this inconsistency in our revised dWRMP submission (sent to Defra on 28 November) by assuming a capability of 50 Ml/d up to 2030, and a capability of 75 Ml/d thereon.

We are aware that this could have a knock-on impact on the WRSE. However, we do not consider this to be a material issue and have demonstrated this through a sensitivity run of the WRSE investment model.

Reporting of the Thames Gateway Desalination Plant in the 2022 Annual Review

During the period to March 2022, the plant was not operating for 11 out of 12 months (all months apart from June). We recorded this period when the site was not operating as an outage, rather than reducing the Deployable Output (DO). We did this to present a conservative view of our supply-demand balance because the projected storage in London and relatively low demand in early to mid-2021 meant that we were unlikely to need the plant to be operational in the Annual Review reporting period.

The plant could have been available at 100Ml/d, with 50 days' notice, up to the point that the fire occurred in November 2021. We apologise for not informing you of the fire on a more timely basis. On reflection, we should have done so and, and discussed how to report it with you.

We recognise that, due to the period of outage during the ongoing drought event, we will need to write the source's deployable output down for the Annual Review 2023 reporting period.

In the table below we detail amendments that would have been made to the Annual Review SDBI and SoSI submissions if we had written down the DO instead of reporting it as an outage. These calculations demonstrate that the London WRZ would have been in surplus with a complete write-down of the source's DO using both methods of calculation.

	Supply-Demand Balance Index (SDBI)	Security of Supply Index (SoSI)
Reported London WRZ Surplus, Annual Review 22	77.94	90.62
London WRZ DO Amendment, Assuming Full Gateway Write-down of DO	-100	-100
London WRZ Outage Allowance/Actual Outage Amendment, Assuming Full Gateway Write-down of DO	-91.5	-(107.4 - 54.1) = -53.3
Resultant WAFU Amendment	-8.5	-46.7
Revised London WRZ Supply-demand Balance	+69.44	+43.92

Source: Thames Water

Our PCC commitments action plan

We acknowledge that our WRMP19 PCC commitment is challenging. Both Covid and this Summer's drought have increased demand beyond that predicted in our WRMP19. Our pre-Covid PCC values need to be used with caution when applied as performance comparatives. Ofwat have already recognised this issue and, during 2021, changed the PCC performance commitment assessment timings from in-year to end-AMP, following consultation with the water companies and other regulators. We are keen to be included in industry wide discussions with the Government to resolve this issue.

We missed both our FD and EA PCC targets for AR22. While we have plans in place to improve our performance, there is a risk that we might miss our FD target for the AMP. It is also unlikely that we will be able to meet the WRMP19 PCC target. Our dWRMP24 forecast is to reach 137.3 l/h//d by 2024/25 (against a DYAA target of 135 l/h/d in WRMP19).

As part of the "extraordinary effort" that you understandably require from us, we are investigating ways of enhancing our range of household demand reduction programmes. Our current programme includes:

- Install 631k smart meters on households through our Progressive Metering (PMP), Optant Metering and Meter Replacement programmes.
- As set out in the AR22 submission, commencing 200k additional smart meter installations as part of our Green Economic Recovery (GER) programme. These smart meter installations will fast-track demand reduction benefits in AMP7, particularly in Thames Valley WRZs, where the supply demand balance is tighter than anticipated.

- Smart meter installations on unmeasured and existing metered household to meet our PR19 performance commitments. We are on-track to meet our (M01) 399k new installations, and (M02) 130k replacement upgrades.
- Use smart meter data to target water efficiency interventions on high-usage households and businesses with continuous flow.
- Using smart meter data to target customer-side leakage (CSL) and engage households to enable self-fixing of internal wastage and external supply-pipe leaks.
- Large-scale 'Every Drop Counts' communications campaign, reaching every WRZ through omni-channel engagement approach (TV, radio, website, social media etc). Campaign started in May 2022, reaching 34.7m individuals over a 6-week period.
- Steering all household customers to our new online Water Calculator tool, which provide bespoke water and energy savings quantification following improvements in water use devices and behaviours.
- Actively work with policy makers and regulators on the following groups; UK Water Efficiency Strategy Steering Group, Retailer-Wholesaler Water Efficiency Steering Group, Water Neutrality steering group, Defra's water labelling steering group, Future Homes Hub.
- Area-wide customer education and behaviour change campaigns.
- Targeting 'hotspot' areas of high demand with campaigns and direct communications. This activity is still running and is on track to meet almost 10 million impressions with digital video and radio communications.
- Our water efficiency press releases in 2022 generated 42 pieces of coverage across national, regional and trade media. This coverage provided over 1.2 billion 'opportunities to see'.
- Working to introduce an enhanced digital engagement communication capability for smart metered households to drive behaviour change and wastage self-fixing.

We have recently partnered with the University of Southampton to share smart metering data and build new insights into how we can best influence consumption behaviour.

Our Leakage action plan

The company met its leakage performance target of a 10.2% reduction against the baseline for the 2021/22 reporting year. This year, the exceptionally hot and dry summer alongside the soil moisture deficit and the increase in demand from our customers have all contributed to significant increases in burst water mains and associated leakage.

We recognise that successful delivery of the leakage target is relevant to our compliance with our section 19 undertakings, and in particular undertaking 13 which requires us to maintain sufficient management control over the delivery of our

operational functions to ensure that we are able to meet our leakage performance commitment.

We have already signalled to Ofwat that we are behind on our 2022/23 leakage performance and our target this year will now be very challenging to achieve. Notwithstanding this, we remain committed to our target to reduce leakage by 20.4% over the course of this AMP and have implemented heightened governance around leakage management to oversee our ambitious and substantial recovery plan.

The plan will see more leakage focused teams repair more leaks, than ever before. We have already implemented some elements of our plan and, with an unprecedented increase in our repair teams and associated support, we have more than 260 gangs consisting of more than 500 people working night and day to get us back on track. This represents a 20% increase and further recruitment activity is ongoing.

A Gold Command event structure is in place for leakage recovery and will remain throughout the year in recognition of the considerable challenges we currently face.

We continue to report on delivery of our undertakings under Section 19, with the most recent report provided to Ofwat on 1 November 2022. We also update both Ofwat and our customers on the progress of our Leakage Reporting and Insight Improvement Programme (LRIIP) which confirms that 19 of the 21 deliverables are now complete. We are now transitioning these 'deliverables' into controls so they become embedded as a 'business as usual' activity.

We are looking forward to publishing for consultation our dWRMP24, which sets out our proposed glidepaths for demand management and resource development to 2075, developed alongside the draft WRSE Regional Plan for water resources. We are conscious of the need to make sure that our WRMP plan is consistent with the WRSE and other regional plans, particularly where we have mutual SROs and we will continue to work closely with other companies so that we remain aligned.

We confirm that have received, and will respond to, the Annual Review 2022 EA letter of 12th October. We will make sure that our response is consistent with what we have said in this letter.

Yours sincerely,

Cathryn Ross
Strategy and External Affairs Director

Table 54: Thames Water AR22 Environment Agency Feedback Response December 2022

Clearwater Court,
Vastern Road,
Reading
RG1 8DB
anthony.owen@thameswater.co.uk

Katya Manamsa Hall
Environment Agency

(By email only)

1st December 2022

Dear Katya,

Thank you for your letter of 12th October with feedback on our 2022 Annual Review of our Water Resources Management Plan 2019. We have also received a tripartite letter from Defra, Environment Agency and Ofwat on the same submission.

We are responding to both letters, and their content will overlap.

We have added below an additional column to your Appendix 1 (WRMP annual review 2022 actions and issues for Thames Water) with our responses as requested. These are summary responses because separate meetings have taken place to look at some of the issues in detail, particularly regarding the Thames Gateway Desalination Plant (hereafter referred to as 'the plant').

We are happy to discuss any of these issues in any of our regular meetings. Before our next formal review submission, AR23, you will also have seen our draft WRMP24, containing our latest forecasts.

Yours sincerely,

Tony Owen
Head of Water Resources

Appendix 1: WRMPAR22 Action and Issues

No.	Significant issue and action(s)	Recommended water company progress to be demonstrated at the next annual review	Thames Water Response
1	With regards to your annual review in the reporting year 2021/22 it is clear that the desalination plant was not operational for some of this time. You have included it as outage apportioning 91.5 Ml/d to the Gateway of the overall 184.8 Ml/d. The outturn value is an increase of 17.5 Ml/d on previous year and is 41% higher than the WRMP19 forecast at the company level and 71% higher than planned for London WRZ. The regulators are very concerned about the current and future operation of the Gateway Desalination plant and your communication around this outage.	Set out which months the desalination plant was not operational during the 2021/22 reporting year. If the outage is longer than 6 months during the reporting period, you should update your annual review accordingly and set out your revised supply-demand balance.	A full breakdown regarding the operational status of the plant is provided in response to the tripartite letter. In summary, the plant was not operating for over 6 months in 2021/22. It has also been unavailable for over 6 months in 2022/23 due to ongoing maintenance work. As such, we will recognise this as a reduction in DO in our forthcoming AR23 and have shown in the tripartite letter the impact on our AR22 supply demand balance.
		Commit to better communications around significant outages in the future. We expect to be notified of these especially in cases where outage is significant or would result in operations different to that as set out in your Drought Plan. Your communication around the Queen Elizabeth II reservoir outage has been helpful. Following this example, we expect you to set up regular engagement and planning to ensure measures are in place to mitigate any significant outage change. We would expect a go/no go decision to be made based on the climatic conditions and your resource position and in liaison with regulators.	We accept that better communications would have helped to clarify the situation at the plant ahead of the drought and agree that a QEII-type approach is preferable. We have regular meetings throughout the year and the status of the plant, or wider drought risk, can be a standing item. A QEII-style fortnightly progress update for the plant has been provided to the Environment Agency as an example (15/11/22), and have held our first technical meeting and will continue to do so as appropriate, based on these updates. We will work with the EA to agree a common approach for communicating significant 'go/no go' decisions. At the time the climatic conditions were not exceptionally dry, indeed 2021/22 was an average year. If we were to always anticipate onset of a period of very dry weather it would be difficult to take any of our large assets out of service for maintenance, and so a monitoring-based approach will be necessary. As stated by the EA, this year we have seen an

			'exceptional event' that led to drought conditions post the decision to carry out planned work.
	Environment Agency recommended issues for improvement	**Recommended water company progress to be demonstrated at the next annual review**	**Thames Water Response**
2	**Outage:** This is the highest level of outage recorded nationally equating to 7% of DI by any company for the reporting period and is nearly double the next highest reported. In your AR you state para 130 "To ensure that the Gateway WTW can be placed reliably into maintenance and standby modes, further refurbishment is continuing to enhance asset resilience." Yet fail to report that it is no longer able to provide the 100 Ml/d output at 50 days notice period which we were assured by email from TW dated October 2021. In I1 you state that Outage will reduce for 2023 and fail to recognise that the DO of the Gateway Desal plant will need to be written down in line with guidance.	We expect the company to engage with EA at all levels including through technical progress meetings on the scope, progress as well as key milestones and risks surrounding asset outage. We also expect the progress to become a standing Agenda item for strategic meetings.	The agenda items for strategic meetings are agreed in advance and any topic can be included by either party. As part of this pre-meet review we will ensure to promote the need for discussion on Gateway WTW. We will make outage a standing item, but noting in this circumstance the issue is specific to the plant rather than a wider concern about outage in general. In our AR22 submission we had anticipated the outage to reduce for AR23, following the completion of the maintenance work. However, with the outage now being over 6 months and the work still ongoing, the plant will be considered a DO reduction and outage should return to normal levels, in line with the industry. We discuss our reporting of the Thames Gateway WRW outage, and its impact on SDBI and SoSI in our response to the tripartite letter.
3	**DI:** The Distribution Input is close to the WRMP19 forecast even though this was an average rather than dry year. We requested in AR21 that company monitors impacts of changed working patterns and consider how this will impact on demand in the future. While the company states that there is insufficient evidence to suggest that these changes will be permanent and the company has taken steps to bring forward demand management activity in the Thames Valley WRZs in the period to 2025, we expect the company to collect evidence of the	The company needs to ensure that it has plans in place to manage the increased DI at SWOX and it also needs to consider actions to take in other WRZ that have seen DI above WRMP19 forecast such as GUI, SWA and Henley. The impacts of changes to demand following changed to the working patterns needs to be taken into account in the next WRMP for example by undertaking sensitivity testing to see impact of Covid uplift outside of London WRZ and impact of London DI rising.	We set out in our AR22 our response to the tighter supply demand balance in Thames Valley: 1) Bringing forward metering as part of the Green Economic Recovery (GER) programme – for which we provided new forecast numbers for the rest of the AMP. 2) Bringing the Thames Valley leakage planning operation back in-house. The adaptive planning approach and variety of sensitivity tests we have undertaken for dWRMP24 will enable a clear understanding of the potential impacts of movements in DI, for whatever reason.

	impacts due to changes in working patterns and consider the impact on Distribution Input and Demand. SWOX has seen DI input 7% higher than WRMP19 forecast and tightening SDB.		Our final WRMP24 will use a base year of AR22 for the demand forecast, and so will implicitly incorporate DI changes as a result of altered working patterns seen recently.
4	**Leakage:** While we welcome the progress the company has undertaken on leakage overall, and progress in London WRZ there are some interzonal differences that need to be addressed. The failure to deliver on leakage against WRMP forecast at WRZ levels ranges between 1 to 34 Ml/d. The ones to note are SWOX, SWA, and GUI WRZ. The impact on the SDB in these WRZs needs to be addressed.	The company is expected to take action to bring leakage down across all your Water Resource Zones Please share a plan to catch up and bring leakage back on track in SWOX, SWA and GUI and update us on your progress against this.	We have responded to the increase in leakage in the Thames Valley by bringing the Thames Valley leakage planning operation back in house. Unfortunately, the benefits of this are likely to be obfuscated in the coming reporting year due to the impact of the drought. We have already signalled to regulators that we are behind on our 2022/23 leakage performance and our company-level target this year will now be very challenging to achieve. Notwithstanding this, we remain committed to our target of reducing leakage by 20.4% over the course of this AMP and have implemented heightened governance around leakage management to oversee our ambitious and substantial recovery plan. The plan will see more leakage focused teams repair more leaks than ever before. We have already implemented some elements of our plan and, with an unprecedented increase in our repair teams and associated support, we have more than 260 gangs consisting of more than 500 people working night and day to get us back on track. This represents a 20% increase and further recruitment activity is ongoing.
5	**Metering:** In I4 it is stated that "Company-wide household meter penetration has increased to 52%."; however from data submission it appears that company has only achieved 50.5% meter penetration, which is 2.5% behind planned levels for metering at company level of 53%. While we welcome your progress last	The company should consider the impact of not achieving the planned metering on its plan. Please share the plan of actions you will take to make up for lag in delivery. Clarify what actions specifically you will undertake to catch up on progressive meter installation. We expect the company to increase metering in line with its plan and ensure	As per the installation rates set out in our AR22, we are not planning to deliver fewer meter installations than forecast over the AMP. Indeed, we are forecasting to install more meters than projected in WRMP19 due to the inclusion of the GER metering programme. We have stated that in the early years of the AMP we chose to change our delivery strategy to focus on installations in London WRZ, leading to increased delivery in that zone.

	year on metering London WRZ where you have installed greater number of meters than planned, we are disappointed that you have failed to meet your progressive planned meter installations for SWOX two years running and are behind in GUI also. Given the tightening of SDB in SWOX zone we expect the company to provide a plan to catch up on the planned metering for SWOX. With 4% of further metering planned for delivery over the next year at water company level we would like to understand how the company plans to achieve this, as it would represent double the rate of yearly progress attained over the past few years. We require assurance around strategy to change focus	that the strategy is adaptable should the demand recover in London.	As we knew we would need to, but additionally in response to the tightening of the SDB in Thames Valley zones, we are now re-prioritising to bring additional metering to the Thames Valley zones.
6	**Per Capita Consumption (pcc):** While demand has fallen post Covid average household pcc is 6 l/h/d higher than the WRMP19 forecast at the company level. There are trends of higher pcc within certain WRZ in particular SWOX, and SWA where the gap is largest between WRMP19 forecast and outturn data. SWOX and Henley WRZ are both over 12 l/h/d higher than forecast. We would like to understand the steps company is taking to bring down pcc across all its WRZs. How do you plan to address significantly higher pcc in a relatively normal year?	The company should provide details on the actions it will take to ensure that pcc is brought down further across all WRZs. There is a need for plans for SWOX and SWA to ensure you are back on track. This further underpins a need for metering to be increased for SWOX.	We acknowledge that meeting our WRMP19 PCC forecast is challenging. Both Covid and now drought have increased demand beyond that predicted in our WRMP19. As such, our pre-Covid PCC values need to be used with caution when applied as performance comparatives. Ultimately, we do not control the amount of water customers use and temporary fluctuations are to be expected. We are confident these fluctuations do not undermine our long-term goals or present an immediate risk to supplies. We have taken steps as set in our annual review to bring forward activity where possible, notably through the GER programme, which focusses on the Thames Valley WRZs. Further detail can be found in the tripartite letter response.

7	**SDB:** The company has reported a large SDB surplus at company-level. We note that you have reported a tightening of SDB for SWOX and in previous year for SWA and GUI WRZs. Tightening of SDB during a normal year highlights the need for all actions to be undertaken to ensure security of supply is not compromised.	Please share the plan for bringing demand down and increasing metering to ensure you can continue to provide secure supplies to your customers.	We have shared the additional steps we are taking to balance supply and demand in the Thames Valley in the AR22 submission and this is repeated above.
8	**Resource Development:** The postponement of the New River Head, ASR Horton Kirby, Southfleet and Greenhithe Groundwater supply schemes is explained by them not being needed as urgently as first thought.	Ensure the schemes are ready to be brought forward should the demand increase in the future making them needed. Please provide regular updates on the progress of their readiness next being the 6-month review point.	It should be noted that these are not temporary drought schemes. As such they are not held in readiness for operational drought management. Delivering them, if needed, would still take 3-5 years. These schemes are no longer being delivered in AMP7 due to: 1) An improved supply demand position in London 2) The potential local resilience issues in SE London have abated 3) Investigations raising doubts about the viability of the New River Head scheme. The ASR Horton Kirby and Southfleet schemes were brought forward in WRMP19 to meet an anticipated local resilience need in SE London. That need has not progressed/materialised, so the schemes have been deferred. Both have been re-entered into the programme appraisal process for the draft WRMP24 and are featuring in the Overall Best Value Plan in 2050 and 2031 respectively, when there is a supply demand need. The New River Head scheme has been stopped because investigations found the original scope was inadequate and due to technical difficulties (pumping sand). This scheme has not been returned to the options list for dWRMP24 pending confirmation of whether it remains a viable option.


Thames
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