Water Resource Management Plan Annual Review 2023-24

June 2024

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Table of Abbreviations

Abr.	Definition
AA	Annual Average
AMP	Asset Management Plan
AMI	Advanced Metering Infrastructure
AMR	Automated Meter Reading
APR	Annual Performance Report
AR	Annual Review
ASR	Aquifer Storage and Recovery
CIP	Clean in place
CP	Critical Period
CPIH	Consumer Price Index including housing
DCO	Development Consent Order
DI	Distribution Input
DO	Deployable Outputs
DRA	Direct River Abstraction
DWI	Drinking Water Inspectorate
DYAA	Dry Year Annual Average
DYCP	Dry Year Critical Period
EA	Environment Agency
GER	Green Economic Recovery
GUI	Guildford WRZ
HEN	Henley WRZ
HH	Household
KV	Kennet Valley WRZ
LON	London WRZ
LWR	London Water Reuse
MLE	Maximum Likelihood Estimation
ND	No Deterioration
NEP	National Environment Programme
NHH	Non-household
NAV	New Appointments and Variations
NLARS	North London Artificial Recharge Scheme

Abr.	Definition
Optant	Customer requested meter
PC	Performance Commitment
PCC	Per Capita Consumption
PHC	Per Household Consumption
PMP	Progressive Metering Programme
PR	Price Review
RAPID	Regulators' Alliance for Progressing Infrastructure Development
RO	Reverse Osmosis
SBV	Smarter Business Visits
SDB	Supply Demand Balance
SDBI	Supply Demand Balance Index
SDO	Source Deployable Output
SESRO	South East Strategic Resource Option
SHV	Smarter Home Visits
SOSI	Security of Supply index
SRO	Strategic Regional Option
STT	Severn Thames Transfer
SWA	Slough, Wycombe and Aylesbury WRZ
SWOX	Swindon and Oxfordshire WRZ
T2AT	Thames to Affinity Transfer
T2ST	Thames to Southern Water Transfer
TLT	Thames Lee Tunnel
TW	Thames Water
UKWIR	United Kingdom Water Industry Research
WAFU	Water Available for Use
WBGWS	West Berkshire Groundwater Scheme
WINEP	Water Industry Environment Programme
WRMP	Water Resources Management Plan
WRPG	Water Resources Planning Guidance
WRSE	Water Resources in the South East
WRZ	Water Resource Zone
WTW	Water Treatment Works

Executive summary

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 its customers, whilst protecting the environment.

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.

This WRMP Annual Review 2024 (AR24) and accompanying tables report our performance for the period from 1 April 2023 to 31 March 2024 against WRMP19. It is the fourth annual review of our WRMP19 and has been prepared in accordance with regulators' guidance.

Since WRMP Annual Review 2023 (AR23) our regulators have asked for more information on leakage, metering, per capita consumption, demand for water, supply schemes, the Gateway water treatment works and our supply demand balance. We have included updates on these topics within this submission.

Overview of our performance for 2023-2024

Maintaining security of supply for our customers.

We have maintained a Supply Demand Balance Index (SDBI) of 100 for 2023-24, reflecting the mild winter and a spring and summer without extended dry conditions or high temperatures.

When out-turn conditions are normalised to Dry Year Annual Average and Critical Peak scenarios for comparison with the WRMP19 (as in the Security of Supply Index, SOSI, calculation), our score is 99 due to a critical period deficit in the Swindon and Oxfordshire (SWOX) WRZ.

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

Per Capita Consumption (PCC) in households has reduced slightly (<2 l/person/d) to an average of 138 l/person/d against a WRMP19 forecast of 136. We continue to experience changes in the balance of household and business water use due to post-Covid hybrid working and behaviour change. We are continuing our award-winning programme to encourage the efficient use of water.

We have continued to roll out our smart metering programme.

This year we installed a further 128 thousand smart water meters and reached the milestone of having installed 1 million smart meters in total. This is slightly below the number originally forecast but we are on track to deliver the demand reductions associated with metering and water efficiency due to the success of our workstreams using smart meter data to identify high consumption and wastage, enabling us to work with customers to help reduce demand.

Following Ofwat's decision not to adjust funding conditions, we stopped delivery of the Green Economic Recovery programme and amended our delivery plan accordingly.

We are committed to reducing leakage.

Leakage reduction is a top priority within our company-wide Turnaround Plan. This year, leakage has reduced by 40 Ml/d to 590 Ml/d (dry year equivalent), its lowest level in AMP7, but remains above the WRMP19 forecast (558 Ml/d dry year equivalent). We remain committed to halving leakage (compared to 2017/18 levels) by 2050.

We have sufficient water sources.

We have progressed new water sources to maintain a resilient water supply. This includes progressing development of the Shalford to Netley transfer main in Guildford WRZ, preparatory work for the Horton Kirby ASR scheme and continuing development of Strategic Resource Options.

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 core strands of activity are completing the environmental investigations at ten sites (seven of which are complete, and the remaining three are to be completed in AMP7), seeking opportunities for improvements to the environment as part of the feasibility, design and appraisal of new resource options and continuing to work with WRSE and the Environment Agency to refine the likely requirements for future sustainability reductions to meet environmental destination, and how to prioritise this activity.

WRMP19 – confirming our position

We have checked our actual position in April 2024 against a suite of key metrics and our forecast position from WRMP19. We can confirm that the foundation of **WRMP19 is robust and remains valid** as a basis for future planning.

At WRZ level, the following changes and mitigating actions have been identified via the monitoring plan and other performance monitoring.

Table 1: WRZ level status

WRZ	Status	AMP7 programme
London		Due to the favourable supply demand balance position, we have deferred delivery of three groundwater options.
SWOX		The supply demand balance has improved this year; however, it remains tighter than forecast. We will continue to deliver demand management and our leakage turnaround plan across the Thames Valley WRZs. We also have a programme in place to recover deployable output.
SWA		The supply demand balance remains tight in the critical period scenario. We will continue to deliver demand management and our leakage turnaround plan across the Thames Valley WRZs.
Kennet Valley		No changes
Guildford		The peak supply demand balance is tighter than forecast. The Shalford to Netley internal transfer, which will improve resilience, is due to complete December 2025. Upgrade work at Ladymead WTW is scheduled to deliver by the end of AMP8.
Henley		No changes

WRMP24

We are in the final stages of approval for our next plan, WRMP24. We published our draft plan for consultation between 13 December 2022 and 21 March 2023. In August 2023, we published our statement of response which sets out our consideration of the feedback we received, and changes made to our draft plan in response. We included these changes within our revised draft plan. The revised draft plan is currently being reviewed by our regulators, and a decision on the next steps will be made by the Secretary of State.

1. Introduction

1.1. How to use this report

This report should be read in conjunction with the accompanying MS Excel file containing WRMP Annual Review Tables. These tables include information on our supply-demand balance and WRMP scheme delivery information.

We have sought to ensure alignment between this report, our Annual Performance Report and Discover Water and have carried out internal assurance checks.

1.2. Water Resource Zones and planning scenarios

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. The WRZs outside London are collectively referred to as the Thames Valley WRZs. We plan water resources based on these six WRZs. There have been no changes to the WRZ boundaries between AR23 and AR24. These are illustrated in the Figure 1 below:

Figure 1. Our Water Resource Zones (WRZs)

For each WRZ we report an out-turn supply-demand balance, linked to the weather conditions experienced during the year. For planning purposes, we also report this data factored up or down to equate to the conditions expected in a dry year, as an annual average and in critical period.

1.3. Drought Plans and Levels of Service

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. There have been no changes to our Levels of Service between AR23 and AR24.

During 2023/24 we published an addendum to our drought plan[1] implementing lessons learnt from the 2022 drought.

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

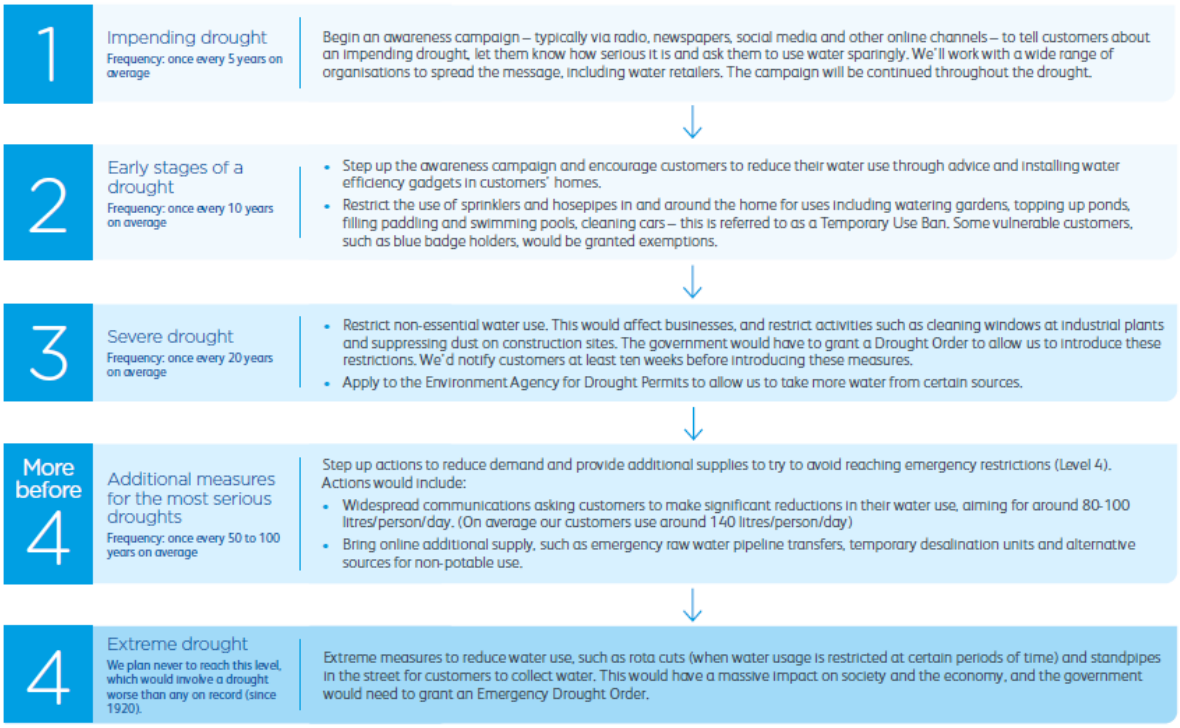

Figure 2: Levels of Service Drought Plan (April 2022)

[1] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drought-plan/drought-plan-2022/drought-plan-addendum.pdf

2. Review of the reporting year 2023/24

2.1. Weather summary

This year has been mild and wet with 141% of average rainfall falling in the Thames area from April 2023 to March 2024[2] and an average temperature of 16°C[3]. The summer of 2023 was also wet; the Met Office state that while June 2023 was the 4th sunniest on record, July was cooler and the 6th wettest on record, with mixed weather continuing into August[4]. The winter of 2023-24 was milder than average across the UK but variable with cold spells[5].

2.1.1. Impact of weather on supply

The wet weather experienced during the year meant that there were no issues with water scarcity. However, the exceptionally heavy rainfall resulted in some operational impact to available supplies, including increased turbidity and Cryptosporidum at surface water intakes (namely Thames at Farmoor, and some of the lower Thames intakes). This resulted in reservoir storage being drawn down for a period; however, storage quickly recovered and did not impact our ability to supply from WTWs at Farmoor and in West London. Heavy rain led to prolonged high groundwater levels and water quality challenges at some of our groundwater sources. With low customer demand we were able to adjust sourcing to ensure demands were still met.

We experienced an unusually high number of storms this year. Storm Ciarán caused power fluctuations and temporary shutdowns that affected five of our water treatment works (Haslemere, Netley, Ladymead, Millmead and Mousehill) in the Guildford WRZ. This led to declining storage in service reservoirs. Once power stabilised, our engineers were able to return the works to supply.

Due to the heavy rainfall, the storm also increased river turbidity which impacted treatment capability at our Shalford WTW (which can provide up to 40% of the water needed in the Guildford WRZ). With service reservoir storage levels already low due to the temporary shutdowns due to power fluctuations, customers started to progressively experience interruptions from the afternoon of Friday 3rd November. After stabilising the treatment process, our engineers returned Shalford WTW to supply and storage recovered over the following week. A total of 24,764 properties in the Guildford area experienced a disrupted water supply.

2.1.2. Impact of weather on demand

The weather particularly impacts demand in the spring and summer, with higher temperatures and sunshine hours driving increased usage, and in the winter with cold, freezing temperatures leading to increased leakage from the network.

The year 2023/24 was mild. There were notable but brief spikes of warmer-than-usual weather in June and September, but the year was otherwise unremarkable in terms of temperature and sunshine hours. It was a relatively wet year, with year-round spikes of rainfall and extended periods of rain in July, October/November, and February/March.

Figure 3 shows demand (as distribution input – DI) in SWOX had suppressed peaks over the summer, with temperatures remaining below 30°C for most of the summer.

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[2] EA rainfall data for the Thames Catchment, long term average over 1883 to 2018

[3] Temperature data from Reading University Weather Station

[4] Met Office, Summer 2023 Climate Summary Microsoft Word - Seasonal Assessment summer2023.docx (metoffice.gov.uk)

[5] Met Office, Winter 2024 Climate Summary Microsoft Word - Seasonal Assessment - Winter24.docx (metoffice.gov.uk)

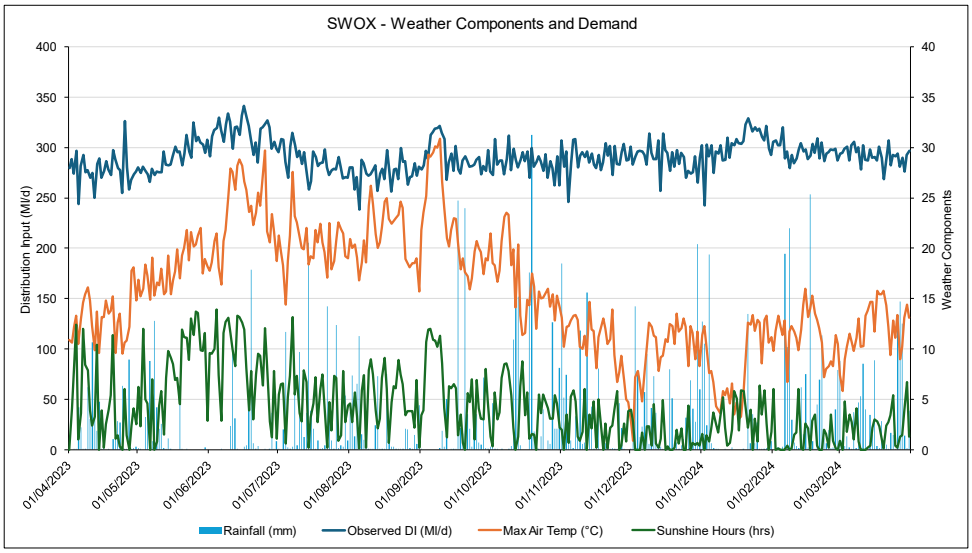

Figure 3. Distribution Input compared with weather components for AR24 – SWOX WRZ.

To compare the current year demand more directly to previous years, we produce normal and dry year demand estimates. These estimates are calculated using a demand uplift model, based on demand and weather data collected over time.

Weather-dependent usage components were estimated at the 70th percentile for London WRZ and 61st percentile for WRZs in the Thames Valley. Weather-dependent leakage components were estimated at the 16th percentile for London and 2nd percentile for Thames Valley when compared to impacts from previous years. This combination resulted in a roughly average impact on total demand for dry year and normal year uplifts, for both London and the Thames Valley.

2.2. Overall summary of supply demand situation

We submitted a High Confidence Supply Demand Balance Index (SDBI) of 100 for AR24, reflecting a surplus in all zones following a mild and wet year.

Supply demand balances uplifted to DYAA and DYCP conditions for comparison with WRMP19 forecasts are presented in Table 2 and Table 3 below. Values in green are higher than forecast, those in red, lower than forecast. All zones are in surplus.

Table 2: DYAA Supply Demand Balance compared to the 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	66.68	
SWOX	WRMP19 Forecast	17.11	18.93	20.96	25.53	27.04
	Actual	12.55	23.16	20.13	21.34	
SWA	WRMP19 Forecast	27.88	26.88	26.45	26.27	19.65
	Actual	13.86	12.75	8.63	15.99	
Kennet Valley	WRMP19 Forecast	31.61	30.08	29.27	29.24	28.76
	Actual	33.24	34.43	32.31	30.48	
Guildford	WRMP19 Forecast	14.19	14.49	14.63	15.08	15.27
	Actual	13.37	12.61	13.15	11.59	
Henley	WRMP19 Forecast	11.72	11.69	11.70	11.67	11.63
	Actual	4.35	6.39	6.65	4.13	

Table 3: DYCP Supply Demand Balance compared to 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	2.19	
SWA	WRMP19 Forecast	12.99	10.88	10.03	9.73	3.64
	Actual	9.78	6.44	2.92	3.59	
Kennet Valley	WRMP19 Forecast	21.84	20.39	19.44	18.99	17.90
	Actual	17.80	17.90	16.99	14.26	
Guildford	WRMP19 Forecast	2.81	3.11	3.10	3.18	7.76
	Actual	2.18	2.47	5.44	1.83	
Henley	WRMP19 Forecast	5.42	5.34	5.30	5.32	5.31
	Actual	4.71	2.39	2.80	2.86	

*We do not report critical period (peak week) in London WRZ

The supply demand position in London is better than predicted in WRMP19. The surplus has allowed us to defer some small resource developments, whilst keeping them available for delivery at short notice. The improved supply-demand balance 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
- The long-term working from home measures moving demand away from London

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

- Higher than predicted demand in all zones
- 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

2.3. Supply-side update

This section provides an update on our supply-side position for 2023/34 against our forecast position in WRMP19. Overall, changes to our supply forecast during the 2023-24 reporting year are minor and do not have significant implications for WRMP19 delivery or our WRMP24.

2.3.1. Changes to Deployable Output (DO)

Our current DO is lower than forecast at WRMP19. This is largely due to write-down in DO at Gateway desalination plant reported in previous returns. Further detail of the DO reductions made in the 2023-24 reporting year are presented in Appendix 1 – Source Deployable Output Review, April 2024 of this document.

2.3.2. Outage (planned and unplanned)

The mild weather has enabled us to undertake planned outages. The Thames Lee Tunnel (TLT) was temporarily isolated from January to April 2024 to enable relining of the tunnel. Sourcing in North London was adjusted and some NLARS boreholes deployed to ensure demands were met. TLT returned to service in early May. We undertook a planned reservoir outage at Wraysbury to inspect and clean the inlet tunnels. The reservoir was maintained at a reduced level from late

September to December 2023 and began to refill once the outage was completed. We adjusted the sourcing strategy to ensure demands were still met in London.

We are undertaking a programme of maintenance and capital improvements at Gateway Desalination Plant. This is to ensure that by 2030 the scheme is reliably available at 75 Ml/d during drought periods. Our current Capital Delivery AMP7 project is on track and will provide additional resilience at the plant. Our focus for the remainder of this AMP period is to ensure a reliable 50 Ml/d output from the plant is achievable. Significant maintenance upgrades will be delivered which will improve the reliability and output of the existing plant. The main components include:

- Improvements to the chemical dosing systems. Whilst we expect the bulk of this work to be completed during AMP7 there may be some aspects that may run into the initial part of AMP8.
- A new chiller. A new standby chiller unit is being installed to support the existing chiller during periods of high ambient temperature, and/or if the other unit breaks down. We will continue using a hired unit as a back-up until the new one is installed during winter 2024.
- A new chemical 'clean in place' (CIP) system. Allowing for outages, we expect this work to be completed during the initial period of AMP8.

The Regulation 31 approved reverse osmosis (RO) membranes that are needed to meet the legal DWI requirement are not currently available to purchase. We have the funding available to procure these membranes as soon as they become available. Without the approved RO membranes we are unable to operate the plant at 75 Ml/d. We intend to restart the plant, run it at 25 Ml/d and to subsequently beginning testing it up to 50 Ml/d out of supply.

In our PR24 business plan we have included funding of £50m for AMP8 to enable us to continue our programme of planned improvements at Gateway which will replace life-expired components and deliver the upgrades required to reliably achieve the 75 Ml/d output by 2030. We have also commissioned a peer review to validate our proposed scope of renewals. Our Capital Delivery team are currently developing the scope and programme for this, and we will share our milestone project plan with our Regulators when it is available, likely be towards the end of 2024 as it will be informed by the work which is currently being delivered, together with the peer review.

For AR24, the DO of the Gateway desalination plant used in our supply demand balance calculation is 25 Ml/d, following successful use at this rate over the summer of 2023.

2.3.3. Sustainability changes

There was no change to DO as a result in sustainability reductions in AR24. An update on progress with planned AMP7 reductions at Hawridge (SWA) and North Orpington (London) and our AMP7 investigations programme can be found in Section 4.1.9.

2.3.4. Changes to bulk supply agreements

A new bulk supply (export) agreement with Affinity Water known as the "Perivale bulk supply agreement" was signed on 12th March 2024. The agreement is for the export of 10 Ml/d of treated water. Because the agreement was signed towards the end of AR24 and therefore not in place for most of the reporting year, it will be included in our SDB calculations from AR25 but has not been included for AR24. We anticipate that a similar agreement with Affinity Water, known as the "Cockfosters bulk supply agreement" will be signed in the near future.

2.3.5. Delivery of new schemes

No new schemes were due to be delivered this year. Section 3.5 provides details of changes to planned scheme delivery in this AMP period.

2.3.6. Water Available for Use (WAFU)

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 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

Each component of WAFU is updated on an annual basis. The WAFU trackers for comparison with WRMP19 are presented in Table 4 (DYAA) and Table 5 (DYCP) below:

Table 4: 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	2080.79	
SWOX	WRMP19 Forecast	297.87	297.61	297.34	297.08	296.82
	Actual	308.87	317.30	314.86	318.32	
SWA	WRMP19 Forecast	170.52	170.43	170.34	170.25	163.38
	Actual	161.50	159.79	158.81	169.50	
Kennet Valley	WRMP19 Forecast	138.68	138.36	138.05	137.73	137.42
	Actual	139.53	140.44	140.10	140.87	
Guildford	WRMP19 Forecast	62.07	62.06	62.04	62.03	62.02
	Actual	63.79	63.16	63.17	62.52	
Henley	WRMP19 Forecast	25.29	25.29	25.29	25.29	25.29
	Actual	18.50	20.75	20.75	18.49	

Table 5: 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	352.90	
SWA	WRMP19 Forecast	189.83	189.77	189.71	189.65	182.69
	Actual	187.81	186.79	185.98	180.33	
Kennet Valley	WRMP19 Forecast	150.82	150.58	150.35	150.11	149.88
	Actual	144.19	143.81	144.09	140.14	
Guildford	WRMP19 Forecast	67.95	67.94	67.92	67.91	72.50
	Actual	70.50	69.77	69.63	64.45	
Henley	WRMP19 Forecast	25.54	25.54	25.54	25.54	25.54
	Actual	23.32	23.31	22.59	21.92	

2.4. Demand-side update

This section provides an update on our reported water balance position for 2023/24 and an uplifted distribution input tracker (DYAA) against our WRMP19 forecast position.

2.4.1. Out-turn Water balance

To understand how water is used across our supply area in a reporting year, we use a water balance. The water balance is a mechanism to account for all water that leaves our water treatment works as either 'accounted for water' or 'leakage'.

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

The main changes from last year at company-level (outturn) are[6]:

- A decrease in distribution input of 49 Ml/d
- An increase in measured household consumption of 69 Ml/d and an increase in measured PCC of 5 litres per person per day
- A decrease in unmeasured household consumption of 70 Ml/d and a decrease in unmeasured PCC of 10 litres per person per day
- A slight decrease in combined household consumption of 0.6 Ml/d and a decrease in average household PCC of 2.3 Ml/d
- A slight decrease in measured non-household consumption of -0.9 Ml/d
- A decrease in leakage of 50 Ml/d

The methods used to produce the water balance undertaken for this review have been reviewed and endorsed by an independent external auditor to Unqualified ISAE 3000 standard. This year we have incorporated some minor improvements to our leakage reporting methodology to increase our compliance with Ofwat common guidance. Our calculations have utilised smart meter insight to more accurately reflect water use in unmeasured blocks of flats and how we account for the way water is pumped both unmeasured and measured blocks of flats at night.

Overall, the water balance discrepancy at company-level (the difference between distribution input and the independent calculation of its components) is -1.64% this year. This is within good practice reporting limits (of +/- 2%).

2.4.2. Distribution Input

[6] Please note that these figures present a comparison between outturn figures reported in our WRMP Annual Reviews for AR23 and AR24. Between AR23 and AR24, updates to our water balance calculation have been made which, when backcast, to AR23 alter the differences. As such, comparison figures between AR23 and AR24 reported in the APR present a more accurate view of the underlying change in DI and leakage, though the differences are minor

Outturn distribution input (DI) decreased 49 Ml/d in 2023/24 compared to the previous year. This is primarily due to the reduction in leakage in London WRZ.

We provide the EA monthly submissions of daily pre-MLE distribution input at a WRZ level.

The changes in uplifted DI (DYAA) over the AMP period are provided in Table 6.

Table 6: 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	1,936.07	
SWOX	WRMP19 Forecast	267.41	264.44	261.20	258.07	254.97
	Actual	289.92	289.12	288.00	290.33	
SWA	WRMP19 Forecast	137.82	138.11	138.24	138.39	138.57
	Actual	144.46	144.20	147.38	150.62	
Kennet Valley	WRMP19 Forecast	102.46	102.84	103.12	103.32	103.48
	Actual	102.34	101.87	103.56	105.70	
Guildford	WRMP19 Forecast	45.57	45.28	44.93	44.68	44.48
	Actual	49.24	49.40	48.83	49.82	
Henley	WRMP19 Forecast	12.93	12.93	12.93	12.93	12.93
	Actual	13.82	14.04	13.77	13.99	

2.5. SDBI Calculation

We used reporting year target headroom in the SDBI calculation and the AR24 supply demand balance calculation. This is an adjustment to target headroom to reflect an appropriate level of uncertainty for the reporting year, which results in target headroom being smaller than WRMP19 forecast target headroom. The most significant change to our target headroom from the WRMP19 forecast to the reporting year is that, in the reporting year, there is no need to account for uncertainty around population growth and forecast demand. We also use actual transfers to NAVs, which are lower than the contractual maximum NAV transfers. This reflects that NAVs are driven entirely by customer demand, and some of the housing developments associated with the contracts are yet to have been built. Using actual transfers to NAVs produces a realistic view of our supply demand balance for this year.

These adjustments are consistent with our AR23 SDBI submission and have been discussed with the EA in excess of one month prior to our submission. A formal justification document was sent to the EA in the recommended timeline in advance of our high confidence SDBI submission. The adjustments template was also shared for discussion in advance of our high confidence SDBI submission on 10th May 2024.

We also note that within our WRMP AR24 tables submission, line 9AR (raw water losses, treatment works losses and operational use) has been stated as 0. This is to avoid double counting since we capture process losses within the Deployable Output calculation.

We have included a description of the differences in supply demand balance calculations in Appendix 4.

3. Progress with WRMP19 Delivery

WRMP19 is an adaptive plan. This provides flexibility to adapt to changes and new information across the 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. Table 7 outlines our monitoring plan and our AR24 position on each assessment area, with further details on key deliverables in the sub-sections below it.

Table 7: Monitoring Plan elements

Assessment Area	Monitoring Activity	Metric	Purpose and relationship with decision point	AR24 update
Supply demand balance summary	SDBI/SOSI DI WAFU	Ml/d	Actual vs predicted – Confirm if movement is within Headroom expectations	Our supply-demand balance position continues to be better than forecast in London WRZ and tighter than forecast in the Thames Valley WRZs, particularly at peak periods.
Growth	Population Properties PCC	000s l/h/d	Actual vs predicted and updates to projections	Population growth is well aligned to our WRMP19 projections. Population in our supply area has grown from 9.88m in 16-17 to 10.55m in 23-24. We have improved the source data for subsidiary properties which has replaced previous assumptions on metered subsidiary properties resulting in a reduction in metered properties and therefore a reduction in meter penetration in some WRZs.
AMP7 Delivery - Demand options	Leakage Metering Water Efficiency	Ml/d Activity	Actual vs predicted – assumptions and impact assessment Meters installed – assumptions and impact assessment Activity now replaced as a measure by PCC	Leakage is higher than was forecast in WRMP19, although good progress is being made in London. Our metering delivery is slightly behind plan. However, more benefit has been delivered through water efficiency than was anticipated in WRMP19, meaning that combined metering and water efficiency demand reduction exceeds that planned in WRMP19.
AMP7 Delivery – Supply options	New River Head Horton Kirby Southfleet & Greenhithe RWE Didcot Ladymead	Delivery progress update	Delivery vs WRMP19	The RWE Npower Didcot scheme is in place. New River Head, Horton Kirby and Southfleet and Greenhithe schemes are deferred and Ladymead scheme is in development. See Section 3.5 for further details.
Option Studies*	Effluent Reuse (Deephams)	Progress updates	Readiness for 2022/23 decision point (2030 scheme delivery)	Deephams Scheme withdrawn as preferred option following discussion with the EA. Replaced in WRMP24

				with Teddington DRA for delivery by 2033. See Section 3.9 for details.
Strategic Regional Option studies	SRO studies	Progress update	Readiness for 2022/23 decision point (2037 scheme delivery)	SROs are being developed within the RAPID gated progress, with progress on track. Teddington DRA and SESRO selected within preferred plan and due for delivery by 2033 and 2040 respectively.
Regional need	WRSE	Progress Update	Regional modelling update	WRSE revised draft Regional Plan published. Scheme selection well aligned with WRMP19.
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 (WBGWS)	Licence reductions planned for AMP7 deferred to AMP8. Licence reductions required in AMP8 identified following AMP7 investigations. Environmental Destination has highlighted licence reductions for the further future, included in WRMP24. No cessation of WBGWS planned in near future. WRMP24 includes sensitivity runs to investigate implication of closure in longer-term.
Resilience required	Regulators	Design drought	Update return period and DO	Requirement to meet 1 in 500-year resilience standard by 2040.

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

3.1. Reducing leakage

We have a long-term goal to reduce leakage by more than 50% (compared to 2017/18 levels) by 2050. AMP7 progress towards that goal is shown in Table 8:

Table 8: AMP7 leakage tracker (comparison to WRMP19 forecasts)

Total Leakage (Ml/d) (DYAA)		AR21	AR22	AR23	AR24	AR25
London	Actual	460.23	439.34	452.55	412.84	
	Forecast	483.56	465.80	445.03	424.27	408.20
	Variance	-23.33	-26.46	7.52	-11.43	
SWOX	Actual	63.64	70.44	79.57	78.51	
	Forecast	59.74	58.19	56.64	55.08	53.56
	Variance	3.9	12.25	22.93	23.43	
SWA	Actual	39.73	44.72	47.02	47.88	
	Forecast	37.4	37.40	37.40	37.40	37.40
	Variance	2.33	7.32	9.62	10.48	
Kennet Valley	Actual	23.78	28.02	27.67	26.80	
	Forecast	26.2	26.20	26.20	26.20	26.20
	Variance	-2.42	1.82	1.47	0.60	

Total Leakage (Ml/d) (DYAA)		AR21	AR22	AR23	AR24	AR25
Guildford	Actual	16.11	18.73	18.38	19.21	
	Forecast	12.63	12.30	11.98	11.65	11.32
	Variance	3.48	6.43	6.40	7.56	
Henley	Actual	3.76	4.61	5.17	5.05	
	Forecast	3.58	3.58	3.58	3.58	3.58
	Variance	0.18	1.03	1.59	1.47	
Company	Actual	607.23	605.86	629.86	590.28	
	Forecast	623.11	603.47	580.83	558.18	540.26
	Variance	-15.88	2.39	49.03	32.10	

Causes of variance from forecast

In AR23 our leakage was much higher than forecast due to the impacts of a cold winter and dry summer. In 2023/24 the weather was not as extreme as previous years, but we still saw seasonal leakage impacts, with cold snaps in December and January causing spikes in bursts and leakage.

During 2023-24 we have implemented our leakage turnaround plan and leakage has reduced significantly to the lowest annual average we have achieved. Although leakage has reduced significantly at company level from AR23 levels it remains above the levels forecast by WRMP19. Due to a focus on leakage in London leakage in this WRZ has reduced below forecast.

Leakage reduced slightly in SWOX, Kennet Valley and Henley WRZs but remains above WRMP19 forecast levels. Leakage increased slightly in SWA and Guildford WRZs and remains above WRMP19 forecasts due to the impact of asset health and a lag in implementation of our leakage turnaround plan in Thames Valley WRZs.

Action plan

We have plans in place to reduce leakage from current levels to the levels forecast for each WRZ at the beginning of rdWRMP24. Our actions on leakage have already reduced company leakage levels significantly to the lowest annual average we have achieved during AMP7.

To reduce company-wide leakage to the levels forecast in rdWRMP24, we need to consider the amount of leak repairs which will be necessary just to stop leakage increasing, alongside the reduction required. In total, we forecast that we will need to deliver 359 Ml/d of leak repairs to maintain our current leakage position. We forecast that we will need to deliver 500 Ml/d of leakage activities in total to achieve our forecasts. The leakage reductions needed to meet the levels forecast in rdWRMP24 for 2024/25 will require the largest in year reduction delivered in AMP7 to the lowest level achieved to date. Our year 5 leakage delivery plan includes the activities as set out in Table 9; this will be reviewed as we deliver our plan to maximise efficiency.

Table 9: Planned leakage activities for year 5

Activity in 2024/25	Leakage offset/reduction (Ml/d)
Find and fix	444
Calm Systems	4
Pressure Management	8
Metering customer side leakage	26
New Bulk meter installations	3
Bulk meter recurrence	4

Activity in 2024/25	Leakage offset/reduction (Ml/d)
Trunk Mains	10
Lead Pipe Replacement	1
Total	500

Leakage is one of the top priority initiatives within our company-wide Turnaround Plan. Our leakage turnaround plan aims to drive sustainable leakage reduction through understanding of consumption, targeting of detection activities, prioritisation of repairs and more efficient field options. It includes the following activities which enable and enhance the delivery of the workstreams in Table 9;

- Leak grading and new repair service level agreements prioritising leak repair by volume
- Availability and operability process improvements
- New detection contract based on volumetric leakage reduction
- No dig repairs for customer side leakage (Aquapea)
- No dig repairs for communications pipes (Origin trial)
- Dynamic demand
- Campaign management and associated analytical tools deployed
- Smart metering customer alarm process improvements

We will continue delivery in line with the PALM framework;

- Prevent – Asset Health improvements: continue with our capital delivery programme to replace mains & pressure optimisation to reduce leaks occurring
- Awareness – Maximise the intelligence from our smart meter data to understand customer usage & therefore improve the targeting and prioritisation of high leakage areas
- Locate – Use sensors where available to improve detection efficiency; up-skill detection teams to be more effective; innovate – use of fibreoptic network to pinpoint leakage issues on our trunk mains systems
- Mend – Continue to prioritise the repairs that matter most and reduce the run time of leaks

Our leakage turnaround plan is backed by our Board with external support to provide challenge and assist with pace of delivery. It has already delivered significant improvements in leak cycle times, reducing the average cycle time of active leaks from 67 to 16 days and reducing visible leaks from 16 to 6 days. Our total outstanding leaks have reduced by 52%.

We track leakage performance on a weekly basis, feeding into operational meetings, including daily and weekly area performance meetings, weekly regional performance meetings as well as weekly senior and Executive director-led oversight meetings. The oversight meetings are attended by key workstream leads and include the fortnightly leakage task force focusing on strategic medium to long term issues. We track performance against delivery plans and target leakage levels through the year, with quarterly Water Balance calculations providing calibration of our weekly tracking and opportunities to reforecast and review delivery plans.

Forecasts and impact on security of supply

Leakage levels and reduced deployable output had an impact on security of supply in SWOX in the critical period scenario resulting in a provisional SOSI score of 99, with a deficit in SWOX WRZ in the DYCP scenario. We have an action plan in place to reduce leakage from current levels to the levels forecast for each WRZ at the beginning of rdWRMP24.

3.2. Reducing Per Capita Consumption

We have a long-term goal to reduce PCC to 110 litres per person per day by 2050. AMP7 progress towards that goal is shown in Table 10:

Table 10: Per capita consumption tracker (comparison to WRMP19 forecasts)

Average PCC (l/hd/d) DYAA		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	139.55	
SWOX	WRMP19 Forecast	134.62	132.77	130.82	129.00	127.24
	Actual	155.23	146.78	129.85	134.23	
SWA	WRMP19 Forecast	137.61	137.24	136.90	136.58	136.27
	Actual	154.35	150.15	136.10	137.00	
Kennet Valley	WRMP19 Forecast	132.12	131.74	131.29	130.84	130.45
	Actual	149.25	142.96	130.61	133.64	
Guildford	WRMP19 Forecast	144.86	143.36	141.66	139.97	138.40
	Actual	157.94	148.30	130.43	131.81	
Henley	WRMP19 Forecast	140.08	139.50	139.02	138.71	138.47
	Actual	160.20	155.49	130.57	136.95	
Company	WRMP19 Forecast	139.99	138.79	137.48	136.20	135.02
	Actual	153.25	146.23	138.73	138.47	

Causes of variance from forecast

At company level PCC has reduced slightly compared to AR23 and significantly from the peak in AR21 associated with covid but remains above WRMP19 forecast. PCC remains above forecast in London, SWOX, SWA and Kennet Valley WRZs.

PCC is not a metric that water companies can fully influence or control. This year we have benefited from low seasonal demand which was predominantly driven by mild weather. In hotter, drier years seasonal demand will increase, increasing our PCC. Actions such as our demand reduction programmes as well as on-going customer engagement and demand restrictions can reduce consumption but our PCC trend remains highly linked to the weather seen in the year.

During 2023/24 we worked with Artesia, the Environment Agency and other water companies on a study into 'Water use shock events effects and regulatory treatment', taking forward earlier work to consider the impact of Covid and the cost of living on PCC. This has resulted in improvements in understanding the impacts of external factors on PCC. These are discussed in Appendix 3.

Action plan

We will continue our roll-out of smart metering which will contribute to reducing household water consumption, including wastage, as well as providing better data for more accurate customer billing and network management. We will also continue to deliver innovations in data utilisation to identify and target water efficiency communications and interventions on households with high usage and continuous flows. We are on track to deliver the household consumption demand reduction forecasts (Ml/d) for metering and water efficiency in WRMP19.

3.3. Increasing meter penetration

Metering is a key enabler for leakage and usage reduction. Progress with our metering programme is shown for 2023/34 (Table 11) and over the AMP period (Table 12).

Table 11: Household Meter installations in 2023-24

Installation Type	Water Resource Zone						Total	WRMP19 Forecast	Variance
	LON	SWOX	SWA	KV	GUI	HEN			
Progressive Metering	59,608	7,073	19	37	1,072	0	67,809	89,048	-21,239
Optant Metering	15,488	3,640	2,232	2,326	642	44	24,372	17,297	7,075
Smart Replacements	26,457	3,848	1,819	1,920	629	63	34,736	28,599	6,137
Small Bulk Meters	889	0	0	3	0	0	892	-	-
Large Bulk Meters	324	0	0	0	0	0	324	-	-
Total	102,766	14,561	4,070	4,286	2,343	107	128,133		

Table 12: AMP7 cumulative household meter installations, years 1-4

Installation Type	Total AMP7 to date (2020/21 – 2023/24)	WRMP19 Forecast (2020/21 – 2023/24)	Variance
Progressive Metering	295,109	331,769	-36,660
Optant Metering	74,314	69,188	+5,126
Smart Replacements	150,075	139,087	+10,988
Small Bulk Meters	4,794	-	-
Large Bulk Meters	2,207	-	-
Total	526,499		

Causes of variance from forecast

The roll out of smart metering has delivered lower installation volumes than forecast for AR24, due to high proportion of internal meter installation fits and the challenges associated with property appointments and access. Total AMP installation volumes remain lower than forecast due to carryover of historic external factors such as Covid and global microprocessor shortages.

Action plan

Our original meter installation volumes outlined in WRMP19 pre-date the PR19 Final Determination which did not allocate the funding requested to deliver the WRMP19 volumes. We have endeavoured to deliver the demand reductions outlined in WRMP19, through targeting meter installations in key areas, targeting water efficiency interventions and new innovative engagement approaches that enhance measurable demand reduction to cover the meter installation difference between WRMP19 and actual. Due to this funding shortfall, alongside the impacts of Covid-19 and the global microprocessor shortage, our progressive meter installations are behind the original WRMP19 and rdWRMP24 forecast. We will not be able to catch up the shortfall by the end of AMP7 and expect to be around 57,000 meters behind forecast at AR25.

Mid-AMP, we sought to increase meter installations through a Green Economic Recovery (GER) programme. The GER metering programme would have brought forward installation and

increased penetration compared to original forecasts in the Thames Valley WRZs, which was proposed as we saw a tightened supply-demand balance in that part of our supply area.

Following Ofwat's decision not to adjust funding conditions we stopped delivery of the Green Economic Recovery (GER) programme and requested an amendment to an existing performance commitment (MO1) associated with delivery of meters in London, to prioritise meter delivery in Thames Valley WRZs. Ofwat wrote to us on 17th April rejecting the requested amendment.

However, Ofwat's decision to reject this amendment has not altered the fact that the Thames Valley portion of our supply area is where meter delivery should be prioritised, due to supply-demand balance risk. As such, we continue to plan to install 45,000 meters in Thames Valley WRZs in 2024-25, prioritising supply-demand balance risk over performance commitments. We do not anticipate meeting the M01 performance commitment in 2024/25 as a result.

In our final WRMP24 and PR24 tables, we will re-profile our AMP8 and AMP9 meter installations to incorporate the forecast meter installations not delivered in AMP7 and the meter installs originally in the Green Economic Recovery, including insight gained from installation surveys.

Regarding consumption reduction overall, our under delivery of meter installations is offset by our above forecast benefit delivered by our combined metering and water efficiency reduction programme. Specifically, our 'Smart customer side leakage' projects which alerts customers to internal leaks and helps them to repair them - and Smarter Business Visits programmes which are delivering more savings than originally forecast.

Forecasts and impact on security of supply

There is no impact on security of supply as a result of the under delivery of meter installations, the demand reduction being offset by over delivery of water efficiency demand reductions.

In our final WRMP24 and PR24 tables, we will re-profile our AMP8 and AMP9 meter installations to incorporate the forecast meter installations not delivered in AMP7 and the meter installs originally in the GER scope, including insight gained from meter installation surveys.

3.4. Reducing Non-household (NHH) demand

NHH demand has stay stable in comparison to AR23, decreasing by 0.96 Ml/d. NHH demand had been gradually increasing since AR21 attributed to people gradually returning to workplaces following covid restrictions and behaviour change. We have continued our programme of NHH meter upgrades, upgrading around 11,000 to AMR or AMI meters in 2023-24.

3.5. Supply option delivery

There are two schemes in the Guildford WRZ that were due for delivery during AMP7; Ladymead WTW and Shalford (Pewley) to Netley internal transfer.

Upgrade work at Ladymead WTW is being delivered in two phases. The first phase was expected to deliver in 2023-24 and improves resilience, including replacing borehole pumps and drives, and upgrading the disinfection. There have been some upgrades to the contact tank and sampling facilities, with these aspects due to be completed during 2024-25. The upgrade to liquid disinfection programme has been delayed pending final agreement on a new location for an EA depot. The upgrade of borehole pumps at Ladymead and Dapdune groundwater sources has also been impacted by the delay from the disinfection programme, with testing and design work being progressed during 2024-25. The second phase, which is required to release the DO following the removal of constraints in the first phase, is upgrading the booster pumps. Due to the

design complexity and delivery timescale, it is expected this will take until the end of AMP8 to deliver, and so the DO benefit from this scheme will not be seen until 2029-30.

The route of the Shalford to Netley internal transfer has been revised to now go from Pewley Reservoir, which is fed from both Shalford WTW and Ladymead WTW. This main will improve our ability to transfer water across Guildford WRZ, improving resilience in supporting our Netley WTW as well as providing additional supply to address growth in East Guildford. The scheme is due to complete December 2025.

There are three supply schemes in the London WRZ that were in the WRMP19 programme for delivery by the end of AMP7. New River Head requires further ground investigation work, which has been scoped, before the availability of the scheme can be confirmed and the solution can be fully defined. Horton Kirby ASR is being progressed, but due to the length of time that the aquifer conditioning stage requires, the scheme will now deliver by the end of AMP8. The delivery of Southfleet and Greenhithe has been deferred beyond 2050, in part due to one of the key drivers for the scheme, the London Resort, being indefinitely delayed.

The status of these schemes in the Guildford and London WRZs has been reflected in our revised draft WRMP24 baseline supply-demand balance forecast according to the current delivery schedules. New River Head has been excluded from our baseline supply-demand balance and has not been considered as a feasible option in WRMP24. Southfleet and Greenhithe has been excluded from our baseline supply-demand balance and has been considered as a feasible option which could be delivered according to supply-demand balance need. Horton Kirby has been included as an option to be delivered within AMP8 under Base expenditure.

Our WRMP24 demonstrates that the London WRZ is forecast to remain in surplus throughout AMP8. To help mitigate the risk of a changing supply demand position, we have brought forward the Addington groundwater supply scheme. This is a new borehole that would feed into the existing Addington WTW in south London, increasing the site yield up to licence, delivering at the end of year 3 in AMP8. We have also proposed to extend the existing RWE Didcot licence trading agreement into AMP8, which delivers a larger benefit than the three deferred/cancelled schemes put together at a lower cost.

3.6. Implications for WRMP24 forecasts

Our AMP7 demand management programme consists of activities related to leakage reduction, metering, and the promotion of water efficiency. Regarding consumption reduction overall, our over-delivery on water efficiency exceeds the under-delivery on metering putting our metering and water efficiency demand reduction programme in a strong position.

We have a leakage turnaround plan in place which is improving leakage performance and expect to be close to forecast levels by AR25.

In our final WRMP24 we will re-profile our AMP8 and AMP9 meter installations to incorporate the forecast meter installations not delivered in AMP7 and the meter installs originally in the GER scope, including insight gained from meter installation surveys.

Our WRMP24 supply forecast included an updated delivery schedule for the deferred supply-side schemes from WRMP19, and so accounts for this deferral.

3.7. Options studies and Strategic Regional Option development

Funding was provided in AMP7 for investigations into several “Strategic Resource Options”. All strategic resource solutions are following a gated regulatory process as set out in the PR19 final determination. During AMP7 we are undertaking joint technical studies into five potentially

regionally significant resource developments. All of our Gate 2 submissions were considered "Good", and we are currently preparing submissions for Gate 3.

Projects from all five of the SROs feature in our WRMP24 in some respect. The Teddington DRA (one of the schemes investigated in the London Water Reuse (LWR) SRO project), SESRO, the T2AT and T2ST are in our preferred plan, while Beckton Water Recycling, Mogden Water Recycling (both also in the LWR SRO project) and the STT feature as alternative options.

3.8. Environmental need

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.

3.9. Resilience need

In our WRMP19, we stated that we would improve our level of resilience to a "1 in 200-year" standard by 2030. Achieving this was dependent on delivery of the Deephams reuse scheme. Following the completion of further studies and discussion with the Environment Agency, it has been established that the Deephams reuse scheme has potential environmental risk. As such, we have withdrawn the option as the preferred WRMP19 option.

In our rdWRMP24 we set out that Teddington DRA is our preferred option for achievement of a 1 in 200-year level of resilience but that the feasible delivery timescale for this option means delaying 1 in 200-year resilience until 2033. The date by which 1 in 200-year resilience should be achieved is a company-led decision, and as such the minor delay to the delivery of this level of resilience does not mean that we should alter our WRMP19. As per the requirements of the Water Resources Planning Guideline (WRPG), our rdWRMP24 sets out how we will achieve a 1 in 500-year level of resilience by 2040.

4. Progress against Performance Commitments and AR23 company specific actions

4.1. Business Plan customer outcomes and performance commitments

In this sub-section we describe progress against our customer outcomes and performance commitments that are relevant to WRMP19. Please see our Annual Performance Report for further commentary on our performance commitments.

4.1.1. Security of Supply Index (SoSI) (DW02) - Our ability to maintain a water supply, particularly during a drought

Last year, our SoSI score fell to 99 due to a deficit in the SWOX area and this remains the same, so we have missed our target. Demand and leakage continue to be higher than expected in that area, although the wetter, milder weather this year has reduced the impact.

Work is underway to recover the loss of deployable output at our Gatehampton and Chinnor sources in the SWOX area, with some of this likely to be resolved in Summer 2024. However, there is more than one site requiring investment work and ongoing challenges with elevated demand and leakage, so our SoSI may not be back at 100 until AMP8. Increased communications between our Water resources and Operations teams are in place to monitor progress. Maintenance and refurbishment of Thames Gateway WTW in London is also ongoing with the aim of improving reliability.

4.1.2. Per Capita Consumption (PCC) (BW05) - Three year average % reduction in the average water usage of household customers

Our three year average reduction in our PCC has improved by 3.4% year on year, the biggest improvement in the AMP. However, we've missed our target this year.

PCC is not a metric that water companies can fully influence or control. We've benefited from a cooler, wetter summer – in contrast to the drought 2022 – so we experienced a much smaller seasonal increase in demand. The continued installation of smart meters and associated water efficiency interventions and customer engagement will contribute to demand reductions benefiting PCC. Whilst these factors will have reduced the annual household usage averages, the three-year average assessment of PCC will still carry impacts of Covid and post-Covid hybrid working changes, as outlined and quantified in the recent Artesia-Frontier Economics study 'Water use shock event effects and regulatory treatment' which is discussed in Appendix 3 – Impact of Covid and cost of living on PCC.

The continued roll out of smart metering will play a role in reducing household water consumption and wastage, as well as providing more accurate customer insight and enabling better network management. It will also support further innovations in data utilisation to identify and target water efficiency communications and interventions on household with high usage and continuous flow. We are engaging with policy makers and regulation leads about the suitability of the PCC metric to measure water company performance going forward. This is a performance commitment where our performance is assessed at the end of the AMP.

4.1.3. Installing new smart meters in London (M01) - Cumulative number of new, smart meters that we have installed in London since 1 April 2020

This performance commitment is assessed at the end of the AMP. We have met out target this year despite several operation challenges. We successfully managed changing to a new workforce management system and disruption from the mobilisation and subsequent cancellation of the Green Economic Recovery programme. This year customer applications for smart meters

(optant meter requests) have been at an all-time high, likely due to the cost-of-living crisis and increased media focus on the performance of the water industry.

Following the cancellation of our GER programme, we submitted a request (corrigenda) to Ofwat to amend this performance commitment, shifting installations from London to Thames Valley, to address areas with greatest risk to security of supply. Ofwat rejected our request. We have continued our meter installation plans, prioritising supply demand balance risk over meeting PC targets and ODI repercussions. We therefore do not anticipate passing this performance commitment in 2024/25.

4.1.4. Replacing existing meters with smart meters in London (M02) - Cumulative number of basic meters replaced with smart meters in London since 1 April 2020

We have outperformed against our target despite similar operational challenges to our M01 performance commitment. Performance will be maintained though collaborative working relationships with our delivery partners and regular communications with suppliers to ensure consistent availability of metering components. This performance commitment is assessed at the end of the AMP.

4.1.5. Leakage (BW04) -% reduction in leakage using a 3-year average from the 2019/20 baseline

This year, we reduced annual average leakage on our network by 7% and leakage is now at its lowest level ever. Despite this, the ever more challenging requirements over the AMP means we've missed our target this year. This 3-year average metric is influenced by extreme weather in the previous years. Leakage is a key priority in our company turnaround plan. Please see Section 3.1 for more information on our leakage turnaround plan.

4.1.6. Abstraction incentive mechanism ("AIM") -Abstraction from environmentally sensitive sites when levels are low (Ml/d)

We've met our target this year. The predominantly wet and mild weather has had a major impact on this PC and the change in our performance from last year; AIM was not switched on at four out of five sites as flows were not low enough to reach the trigger values. Where AIM was switched on at Axford, we complied with the constraint until it was turned as the flows increased.

The target score for AIM is 0 or below; we have gone beyond our target this year, achieving an overall score of -156. AIM remained at 0 throughout the year for London as the flows were not low enough for it to be implemented. In the Thames Valley region we achieved a score of -156. As usual the weather has determined the AIM performance this year.

We will continue to maintain good communications with site operatives to allow us to continue to comply with AIM. However, our customers' security of supply will always be our priority.

4.1.7. Mains repairs (BW01) - Number of repairs we have made to the network per 1,000 kms of mains

We recorded a dramatic drop in the number of burst mains reported this year and met our target, with 185.3 repairs per 1000km against a target of 254.8. This is a reduction in repairs compared to the previous year, due to a change in leakage strategy which has shifted focus from the number of leaks fixed to the volume of leakage reduction achieved which has resulted in fewer mains repairs being carried out as well as favourable weather conditions. The more repairs we make, the worse we perform against this target.

4.1.8. Risk of severe restrictions in drought (DW01) - % of customers in our region at risk of severe water restrictions during a 1-in-200 year drought

This measure has been adversely affected by our performance in leakage and PCC, along with changes to supply-side schemes. Unfortunately, we've missed our target for this year. The level of demand seen in the SWOX and SWA WRZs has exceeded what was forecast and this has led to a supply demand deficit under 1:200 year drought conditions. We expect our performance for this measure to be improved by the leakage and resilience activities in our Turnaround Plan.

4.1.9. WINEP delivery (NEP01)

We are facing challenges in delivering our WINEP programme in this five-year period (known as AMP7). This means that the completion of some schemes will be later than the deadlines we previously agreed with the Environment Agency. The forecast late completion of these schemes is due to a range of pressures, including changes in scope, increased complexity of the schemes and macroeconomic conditions. Macroeconomic events have meant that the cost inflation we have experienced has far outstripped the CPIH uplift on the revenues we are able to recover from our customers in AMP7. The principal water related schemes that will not complete until after AMP7 include the sustainability reductions at Hawridge and North Orpington, as well as our river restoration and fish passage schemes. Our two large fish passage schemes rolling over from AMP6 (Oxford Watercourses and Goatbridge) are expected to be completed this summer.

The closure of Hawridge (SWA WRZ, near Aylesbury) is planned for AMP8, having been delayed from AMP7. However, access issues related to HS2 are preventing enabling works from taking place. The proposed route corridor is being determined, and a site secured, for the water booster station needed to feed the Hawridge zone post-closure. We are working towards concluding these aspects towards the end of March 2025. Progress on the design of the new pipeline to enable the source closure has been halted whilst the enabling works cannot take place and will be picked back up again from April 2025. This scheme will be completed in year 4 or 5 of AMP8.

The preferred option for the North Orpington sustainability reduction (London WRZ) has been confirmed as a strategic trunk main solution rather than development of a new source. This will be taken through the design process, with the source reduction planned for year 4 or 5 of AMP8.

Our AMP7 Environment programme comprises 10 investigations. Two were completed in 2022-23 and conclusions stated in AR23. A further 5 were completed in 2023-24, as per Table 13, and the remainder will be completed in 2024-25. Of those completed this year, the Upper Kennet and Hogsmill investigations progressed to Options Appraisal, with work planned for AMP8 to determine the most effective solutions. The three No Deterioration investigations (River Coln and Dikler, Tillingbourne, and Chiltern Chalk Scarp) do not require further investigation by us as the sources affected will be reduced to 'recent actual' in AMP8. The Ampney Brook and Lower Churn No Deterioration investigation was due to be completed by the end of May 2024. However, there is now a requirement for an options appraisal to be undertaken. The Environment Agency have rejected our NEP alteration form and so we have missed the regulatory deadline for this. The deadline to complete the options appraisal is 31 March 2025, and we are progressing this.

Table 13: 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

Investigation name	Waterbody	WRZ	EA Area	Completion Date
Hogsmill	River Hogsmill	London	KSL	Complete 31/05/2023
Ampney Brook and Lower Churn ND	Ampney Brook and Lower Churn	SWOX	Thames	31/05/2024
River Coln and Dikler ND	Coln and Dikler	SWOX	Thames	Complete 30/11/2023
Tillingbourne ND	Tillingbourne	Guildford	Thames	Complete 29/02/2024
Chiltern Chalk scarp ND	Scarp streams	SWOX	Thames	Complete 30/04/2024
Pang ND	Pang	KV	Thames	30/09/2024
Upper Lee U Bedford Ouse Chalk INV and ND	River Lee	London	HNL	31/03/2025

4.2. WRMP company specific actions during 2023/24

This section provides updates against outstanding actions from WRMP19, the Environment Agency's review of AR23 and the October 2023 AR23 tripartite regulator review letter.

4.2.1. Outstanding WRMP19 action updates

Table 14: Update on outstanding WRMP19 actions

Outstanding issue	2023/24 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 (WRSE) 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.
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.

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 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 WRMP24, sharing information in a timely, open manner and providing opportunity for challenge and input to inform the plans. We have also committed to undertake monitoring and reporting to give regulators and stakeholders visibility of our progress delivering the programme of work for WRMP24 and facilitate stakeholder input to the overall work programme through regular engagement. We are fully engaged with stakeholders and are working collaboratively with the relevant water companies in the development of the Strategic Resource Options.

4.2.2. EA AR23 review updates

Table 15: Update on EA AR23 review issues

Outstanding issue	2023/24 update
Supply demand balance – *'ensure secure supplies are maintained across all WRZs, especially in Henley and Guilford…. Provide detail on the recovery plan for the critical period deficit in the SWOX WRZ to ensure a surplus is restored for Annual Review 2024.'*	An extensive programme of asset refurbishment and upgrade work is continuing at Sheeplands WTW in the Henley WRZ, with resilience already being increased. This work will continue during the rest of AMP7 and into early AMP8, with the expectation that DO can be fully recovered when all of the work has been delivered. In SWOX, the Gatehampton run to waste has progressed well and is due to complete prior to this summer. The upgrade to the Cleeve booster pumps has also progressed, with two due to be available by the end of AMP7, and the remaining available for Summer 2025. See Section 5.1.2 for update on Chinnor WTW. See Section 3.5 for update on delivery of supply schemes in Guildford WRZ. Outturn DI reduced 49.29 Ml/d at company level in comparison to AR23. Outturn DI reduced in our London, SWOX, Guildford and Henley WRZs. However, DYAA DI increased in all our Thames Valley WRZs in comparison to AR23. We are prioritising delivery of demand management in our Thames Valley WRZs and leakage remains a key priority in our company turnaround plan.

4.2.3. Joint regulator review of AR23 updates

Table 16 Update on issues in joint regulator review of AR23

Outstanding issue	2023/24 update
Leakage performance – *'Reported leakage is above forecast and has increased annually since 2020-21'*	Our leakage levels in 2020-21 and 2021-22 were closely aligned with WRMP19 forecasts. Our leakage level in 2022-23 exceeded our WRMP19 forecasts. We have a leakage turnaround plan in place which is improving leakage performance and expect to be close to forecast levels by the end of 2024/25. Please see Section 3.1 for more information about our leakage performance and action plan.
Metering installations – *'Meter penetration remains below forecast'*	Metering installations have been impacted by the effects of COVID-19, the global shortage in microprocessors and budget pressures following a challenging PR19 final determination. These factors have led to fewer new meters being installed compared to WRMP19 forecasts. Please see section 3.3 for more information about our meter installations and impact on demand reduction.
PCC - *'PCC remains over forecast for the third consecutive year in AMP7'*	Due to external influences such as covid, hybrid working and the cost of living, we do not expect to be able to achieve the PCC targets as set out in WRMP19. Please see section 3.2 and Appendix 3 for more information on our AR24 PCC and the impact of exceptional events.
Demand for water - *'DI is over the WRMP19 reporting year forecast and has increased since 2021-22'*	Distribution input decreased compared to the previous year. This is primarily due to the reduction in leakage compared to the previous year. DI remains above our WRMP19 forecast primarily due to the impact of our leakage performance. Please see Section 3.1 for more information about our leakage performance and action plan.
WRMP19 supply schemes - *'scheme delivery is off track and you have deferred your schemes until beyond AMP7'*	Due to the favourable position in the supply demand balance, we have deferred three groundwater options in London. Please see Section 3.5 for more information on delivery of these schemes.
Gateway desalination - *'your write-down of the Gateway desalination plant's Deployable Output has resulted in a significant decrease in London WRZ DO'*	We are undertaking a programme of maintenance and capital improvements to ensure that, by 2031, the scheme is reliably available at 75 Ml/d during drought periods. Our current Capital Delivery AMP7 project is on track and will provide additional resilience at the plant. Our focus for the remainder of this AMP period is to ensure a reliable 50 Ml/d output from the plant is achievable. Please see Section 2.3.2 for more information on our Gateway WTW action plan.

5. Forward look

This section contains updates on the risks and opportunities for the period 2020-2025.

5.1. Risks

5.1.1. Ongoing and upcoming outage issues

We undertake planned outages for inspections, maintenance, cleaning, or repairs. The risk for outages is assessed carefully, with enablers and key go/no-go decision points. We communicate larger outages with the EA as part of regular water resources and operational discussions.

A planned outage at Wraysbury and Queen Mother Outlet Tunnels to Ashford is scheduled for August to December 2024 driven by Statutory tunnel inspections and statutory valve replacement work. We have an adjusted sourcing strategy in place to ensure demands will still be met. The water resources risk will be assessed as part of our BAU Water Situation Report, results of which will be communicated the EA during our regular meetings.

5.1.2. Treatment works with DWI notices (and any impact on supply)

Chinnor WTW in SWOX WRZ had a DO reduction at AR23 and is further reduced at AR24. It is subject to a DWI Notice that prohibits supply of water unless a treatment solution is installed, or accurate turbidity and iron monitors are available (the existing monitors are prone to fouling). Due to concerns regarding the water quality a trial has not yet taken place, and the site remains unavailable. A treatment solution has been designed and has a delivery date of April 2027.

5.1.3. 2022 Drought event review

The 2022 drought event reported in AR23 highlighted several risks, as described in Appendix CC of our rdWRMP24[7]. The most significant issues highlighted were with our abstractions on the Lower Thames and so we have placed most importance on investigating these issues, including two commissioned studies:

- Lower Thames Study: Better understanding the role that river levels play in abstraction management on the Lower Thames
- Abstraction Options Development: Finding and developing solutions to problems which are identified in the Lower Thames Study.

Initial findings from the Lower Thames Study have highlighted that the issues in 2022 were driven by extremely low flows in the River Thames at Windsor, with a greater proportion of flow entering the Thames from tributaries downstream of Windsor than previous events. The issues were likely exacerbated by several operational factors, including:

- Lack of flexibility in TW pumping arrangements
- Poor condition of some weirs (managed and maintained by the EA)
- Lack of use of Surbiton abstraction point.

The abstraction options development study is also underway and is making use of conclusions from the Lower Thames Study as they are drawn. Generic and unconstrained option development phases have been completed, and further option development and screening is underway, with a focus on options which will enhance our raw water abstraction and transfer capabilities.

[7] https://dn9cxogfaqr3n.cloudfront.net/revised-draft/Technical+Appendices/rdWRMP24+-+Appendix+CC+-+Lessons+Learnt+from+the+2022+Drought.pdf

5.1.4. Leakage reduction

Our WRMP19 forecast significant reductions in leakage delivered by a combination of find and fix, mains replacement and pressure management. It is important that we deliver measures 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 as good options.

Our leakage turnaround plan aims to reduce leakage levels to WRMP24 start positions in 2024/25. To deliver this reduction in leakage is a challenge and will require more reduction in leakage in a year than has ever been achieved. Our leakage turnaround plan is described in Section 3.1.

5.1.5. Changes in consumption

PCC has reduced slightly at company level in comparison to AR23. It increased in Thames Valley and is above WRMP19 forecast in SWOX, SWA, Kennet Valley and London. We have continued to deliver our metering and water efficiency programmes and, despite an under delivery of new meter installation, are on track to deliver the demand reductions attributed to them in WRMP19.

PCC is not a metric that water companies can fully influence or control. During 2023/24 we have worked with Artesia, Frontier Economics and other water companies on a study investigating and quantifying 'Water use shock events effects and regulatory treatment', discussed in Appendix 3.

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 assess and manage this risk.

5.1.6. Environmental ambition

Our WRMP19 included sustainability reductions which were included in the WINEP, as well as future sustainability reductions (focussed on chalk catchments) considered likely for the longer term. Since this point, the Environment Agency have brought in significant new guidance for WRMP24, triggering the inclusion of far more sustainability reductions in our WRMP24 than were included in our WRMP19. We have been able to manage this risk by profiling licence reductions through the planning horizon, leaving time for us to adapt. An emergent risk from the 2023-24 year is, however, that the Environment Agency have recently released a revised version of the "Licence Capping" guidance which could trigger more licence reductions to be made in AMP8 than are included in our WRMP24. We are managing this risk by screening all of our licences according to the criteria set out in the guidance, but we would urge the Environment Agency to consider the timing of the release of new guidance.

5.1.7. Resilience to drought

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. 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 serious supply restrictions) to the worst drought on record (~1 in 100-year return period).

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.

5.2. Opportunities

5.2.1. 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.

5.2.2. Understanding future patterns of demand

This year we have worked with Artesia, Frontier Economics and other water companies on a 'Water use shock events effects and regulatory treatment' study with the aim of quantifying the impacts of covid, its residual impacts and other shock events. This is covered in Appendix 3.

We have also reviewed our customers' responses to implementing intensive media campaigns and a temporary use ban in 2022. An UKWIR review of the 2022 drought demand management measures found that both the TUBs and communications campaigns implemented in 2022 did impact demand. The absolute savings from TUBs could not be accurately quantified due to the lack of data, but they were found to be significant in driving down household consumption and reducing DI consistently in areas where applied and were also found to be more effective than other campaign activities. However, the scale of savings from a TUB will depend in part on the weather during restrictions. The absolute savings are still to be determined.

The impact of communication/media campaigns is harder to quantify as there is no standard process for collating the data and so the data available are very varied. Additionally, it is difficult to discern between exceptional and routine activities, and random variations in consumption, for example due to weather variations, coupled with poor data, made the effect difficult to determine. However, in instances of good quality data it was clear that campaign activities reduced household consumption. Research indicates that the effects of campaigns are cumulative both within and across media over time and so there is an argument for starting campaigns focussed on demand management in early summer, however this must be tempered by the need to avoid doing so too early in situations where it may rain and mean there was no need for such action.

Our adaptive planning approach means that our future plans should be robust against a range of future demand patterns.

5.2.3. Strategic Resource Options (SROs)

Continued development of SROs for consideration in the WRSE regional plan and our WRMP24, give the opportunity to improve resilience and flexibility for the longer term.

5.3. WRMP24

Having been published in August 2023 and being (as far as practicable) aligned with our PR24 business plan, our rdWRMP24 has been informed by progress that has been made in the delivery of our WRMP19. As examples, rdWRMP24 includes an up-to-date view of scheme delivery, many of the changes to our supply forecast (e.g., Gateway desalination plant), updated population and property forecast, and updated leakage reduction forecasts. This gives us confidence that the transition from WRMP19 to WRMP24 will be smooth. Our delivery plans indicate that we are on track to meet the WRMP24 start position, but we will continue to monitor progress towards this.

Appendices

Appendix 1 – Source Deployable Output Review, April 2024

Table 17: Deployable Output Changes in 2023-24 Reporting Year

Resource Zone	Site	Average (Ml/d)			Peak (Ml/d)			Comment
		AR23 SDO	AR24 SDO update	Difference	AR23 SDO	AR24 SDO update	Difference	
Thames Valley	Battersea	6.89	6.90	+ 0.01	6.89	6.90	+ 0.01	Update to the mass balance model
	Brixton	8.54	8.59	+ 0.05	8.54	8.59	+ 0.05	Update to the mass balance model
Total Thames Valley				+ 0.06			+ 0.06	
Lee Valley	ELRED	13.20	7.39	- 5.81	13.20	7.39	- 5.81	Three boreholes out of service
Total Lee Valley				-5.81			- 5.81	
New River	N/A	No SDO changes			NO SDO changes			N/A
Total New River				0.00			0.00	
South East	Crayford	13.50	13.60	+0.10	13.50	13.60	+ 0.10	Update to the mass balance model
	Eynsford	2.09	0.00	- 2.09	3.51	0.00	- 3.51	OOS due to treatment capability
	Horton Kirby	4.69	6.78	+2.09	7.85	11.00	+ 3.15	Average DO is increased to individual site licence, peak is constrained by capacity
	Lullingstone	4.49	4.49	0.00	6.14	6.12	- 0.02	Updated WQ in mass balance model
	Shortlands	16.80	11.00	-5.80	18.10	11.00	- 7.10	Vibration issue, complaints from neighbours
	Southfleet	2.22	0.0	-2.22	2.66	0.00	- 2.66	OOS due to treatment capability
	Westerham	0.87	0.88	+0.01	1.34	1.34	0.00	Update to the mass balance model
	Wansunt	13.60	13.60	0.00	15.00	14.90	-0.10	Update to the mass balance model
Total South-East				-7.91			-10.14	
Total London				**-13.66**			**-15.89**	
North Oxon	N/A	No SDO changes			No SDO changes			N/A
Total North Oxon				0.00			0.00	
Swindon	Swells	2.92	2.32	-0.60	2.92	2.32	-0.60	Corrected to 1976 flow
Total Swindon				-0.60			-0.60	
South Oxon	Chinnor	0.08	0.00	-0.08	1.30	0.00	-1.30	Out of service due to water

Resource Zone	Site	Average (Ml/d)			Peak (Ml/d)			Comment
		AR23 SDO	AR24 SDO update	Difference	AR23 SDO	AR24 SDO update	Difference	
								quality challenges
Total SWOX				**-0.68**			**-1.90**	
Kennet valley	N/A	No SDO changes			No SDO changes			N/A
Total Kennet Valley				0.00			0.00	
Henley	Harpsden	6.50	3.90	-2.60	6.50	6.50	0.00	Greater transfer from Harpsden to Sheeplands
	Sheeplands	11.20	11.10	-0.10	11.20	11.20	0.00	No change in peak DO
Total Henley				-2.70			0.00	
SWA*	Hampden	1.75	0.00	-1.75	1.75	0.00	-1.75	Problems returning to supply after upgrade
Total SWA				-1.75			-1.75	
Guildford	Mousehill & Rodborough	5.30	5.30	0.00	6.56	5.30	-1.26	Reduced capacity due to borehole condition
	Netley Mill	4.54	4.54	0.00	5.27	5.67	+0.40	Update to the mass balance model
	Shalford	27.80	27.87	+0.07	27.80	27.87	+0.07	Update to the mass balance model
Total Guildford				0.07			-0.79	
Total Thames Valley				**-5.06**			**-0.79**	

*SWA: Slough, Wycombe, and Aylesbury

Appendix 2 - Summary of dry year uplift methodology

Dry/normal year uplifts are applied to outturn water leakage and usage values to convert them to their dry/normal year equivalents.

To generate the uplifts, our dry-year demand model is used. This model uses regression analysis to fit a set of weather factors to demand data that has had both trends and seasonal impacts removed. Coefficients are used to split demand into leakage and usage and to generate weather factors with the assistance of raw weather data (sunshine hours, temperature, and rainfall). This regression step uses both the current and historical data for weather and demand.

Once fit, the current year weather-dependent leakage and usage can be isolated and compared to historical data. In this way, cumulative distributions of weather-dependent leakage and usage can be generated, with datapoints at the yearly level. From these distributions, we can select the current year, normal year (50^{th} percentile), and dry year (80^{th} percentile) datapoints.

Uplifts are ascertained simply from the difference between the normal/dry year values, and the current year values. These uplifts can be applied directly to outturn demand components in order to convert them to normal/dry year versions.

Appendix 3 – Impact of Covid and cost of living on PCC

During AMP7 we have seen changes in water demand due to covid restrictions, increased working from home, persisting covid effects i.e. behaviour change, drought and temporary use bans, drought awareness, cost of living and consecutive peak summers. Output from the recently published study, '*Water use shock event effects and regulatory treatment'*, found the impacts of increased working from home and persisting covid effects to be significant and to have continued into 2023/24.

As stated in previous annual returns, we have observed the impact of Covid-19, post Covid-19 hybrid working and the cost of living crisis on household demand since the start of AMP7.

The recently completed sector-wide '*Water use shock event effects and regulatory treatment'* study by Artesia and Frontier Economics, has resulted in significant improvements in understanding the impacts of external factors on household consumption and PCC. Table 18 shows the results of the study for various potential shocks impacts averaged over financial years.

Table 18: Impact of shock events on per household consumption, shown as % change in household consumption.

Period	Covid restrictions	Work from home	Persisting Covid effect	TUB	Drought awareness	Cost of living	Consecutive peak summers	Net impact
2020-21	5.48	2.28	1.28	0	-0.06	-0.11	2	10.87
2021-22	2	2.24	1.38	0	-0.05	-1.13	1.45	5.89
2022-23	0	1.52	1.46	-0.31	-0.34	-3.22	2.28	1.39

The scale of PCC movement from external factors is significant and greater than the water savings volumes that are achieved from water company funded activities such as metering and water efficiency.

Covid impact on PCC

The covid restrictions put in place in 2020 had a significant impact on household water consumption which is estimated in Table 18.

The rise in the percentage of people working from home due to Covid-19 has had a lasting and significant impact on Per Household Consumption (PHC) up to the present time, as has a 'persisting covid impact' which has changed behaviours and practices.

Phase 2 of the ''Water use shock events effects and regulatory treatment' study used additional data to confirm the impact of covid on household consumption. The study found that per household consumption has increased by approximately +8.5 litres per property per day and that this increase will persist indefinitely.

Phase 2 of the ''Water use shock events effects and regulatory treatment' study will identify a persistent Covid impact of around +2.7% into AMP8, based on analysis of Thames Water data and recommends an adjustment to the starting level AMP8 performance commitment to account for this.

Cost of living impact on PCC

The '*Water use shock event effects and regulatory treatment'* study found the cost-of-living crisis had started having a noticeable, negative, effect on PCC by mid 2021 which continued until the end of 2023. There is less confidence and greater uncertainty associated with the magnitude of

this effect compared to the Covid-19 impacts. Phase 2 of the study found no evidence that the impact of cost of living would persist into AMP8.

How changes are captured in WRMP24

The base year of the demand forecast used in rdWRMP24 is 2021/22 which was outside of the significant covid restrictions, but would have been impacted by ongoing restrictions, working from home changes, and persisting covid effects. At the time of publishing rdWRMP24, the long-term impacts were unknown, and we were unable with any confidence to predict a most likely outcome to include in our demand forecast. Given this uncertainty we considered the most prudent way forward was to consider the potential for longer term impacts within target headroom and to not include any actual Covid-19 impacts within the demand forecast directly.

Phase 2 of the ‘‘Water use shock events effects and regulatory treatment’ study highlights the potential for covid to cause a long-term persistent increase in water consumption. This is accounted for in our management of supply demand balance by incorporating consumption into our WRMP24 monitoring plan. Significant change above and beyond the expected persistent change in water demand related to Covid-19 impacts would trigger our adaptive plan.

Appendix 4 – Summary Explanation of Supply-demand Balance Calculation Differences

Within our WRMP Annual Review we report on several different variants of the supply-demand balance. While all the supply-demand balance calculations are based a similar calculation (comparing Water Available for Use, WAFU, with Distribution Input, DI, and allowing for a buffer known at Target Headroom), due to regulatory requirements the different supply-demand balance components can be different between the different calculations.

We note that the outcome of SDBI is 100 with all zones in surplus, while the outcome of SoSI is 99 due to a deficit in SWOX DYCP. The AR24 Data Tables shows surpluses in all zones.

Difference between SDBI and SoSI

Table 19 highlights the 3 key supply-demand balance components that differ in the SDBI and SOSI calculations: Outage, Distribution Input (DI) and Reporting Year Target Headroom. Of these components, the difference in DI is by far the most impactful. Dry Year uplifted DI used in SoSI for SWOX is much larger than the Actual DI experienced this year, and than the forecasted Dry Year DI used in our WRMP19. As a result, there is a deficit in the SWOX WRZ for SoSI, while the same zone is in surplus in the SDBI calculation.

Table 19 Key components that differ in SoSI and SDBI.

Component	SDBI	SoSI
Outage	Actual Outage	Outage Allowance
Distribution Input	Actual OR Dry Year WRMP19 Forecast**	Dry Year Uplifted
Reporting Year Target Headroom*	Demand uncertainty component based on Actual DI	Demand uncertainty component based on dry year uplifted DI

*The use of Reporting Year Target Headroom in the SDBI calculation is an adjustment (the EA methodology sets out an expectation for use of WRMP19 Target Headroom). This has been discussed and justified accordingly with the EA. The use of Reporting Year Target Headroom in SoSI aligns with the Ofwat definition.

**As per EA methodology, we submit two versions of the SDBI calculation, one using Actual DI and one using WRMP19 Forecast Dry Year DI.

AR24 tables supply-demand balance

In the AR24 tables, there are three supply-demand balance scenarios shown. These are the AR Outturn, DYAA and DYCP scenarios.

Table 20 below summarises how the 3 scenarios in the data tables align with SDBI/SoSI.

Table 20: Summary of how the EA AR data tables align with SDBI and SoSI.

Scenario	Alignment
AR Outturn	All components align with SDBI. Minor exception with Actual DI & Population: Our High Confidence SDBI submission on 10th May used AR23 MLE Adjustments and population. This was done to meet the EA deadline as these AR24 components would still be undergoing assurance processes. The Actual DI and population in the Outturn data table uses the available, assured AR24 MLE adjustments.

	The small difference in MLE Adjustments and Populations do not impact the outcome of the SDB calculations.
DYAA	All supply side components align with SDBI. Target Headroom aligns with SDBI. DI uses Dry year uplifted DI, which aligns with DYAA DI used in SoSI
DYCP	All supply side components align with SDBI. Target Headroom aligns with SDBI. DI uses Dry year uplifted DI, which aligns with DYCP DI used in SoSI

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