Our draft
Water Resources
Management Plan

7:Headroom, Baseline and Challenges

Contents

7 Baseline, Headroom and Challenges

Document purpose:

This chapter consolidates our demand and supply forecasts and establishes our target headroom and our baseline forecast. We discuss the uncertainties associated with the demand and supply forecasts and hence the headroom and baseline forecasts. We use the baseline forecast, together with the drivers for change, to define the challenge that we face over the short, medium and long-terms and therefore define the needs to be addressed by our Plan.

The chapter includes a comparison of our WRMP19 and WRMP24 2024/25 forecasts with an explanation of the changes. We have also included a short discussion on water trading, and how this is being considered within our WRMP.

Summary

We have regulatory targets to achieve within our dWRMP24:

- 50% reduction in leakage by 2050 from a 2017/18 baseline.
- A reduction in our per capita consumption to 110 litres per person per day by 2050
- Achieve 1 in 500 drought resilience by 2039 / 2040.
- Achieve environmentally sustainable river abstractions (which in turn results in large required reductions in abstraction licenses across our region.)

We have used these targets to develop a supply-demand baseline that has enabled us to understand the size and scale of our planning challenge over the next 25 years.

We have used our supply and demand forecasting described in Chapter 5 and 6 and then calculated a target headroom "as *a buffer between supply and demand designed to cater for specified uncertainties"*. This buffer takes into consideration the variations in forecasts and uncertainty in the calculation of underlying components of the supply demand balance. We have used the UKWIR 2003 methodology for headroom analysis. We have chosen a higher 95% probability at the beginning of the planning period, reducing to 85% at the end of 25-year period.

In accordance with the Water Resources Planning Guidelines we have assessed the impact of climate change uncertainty on the headroom assessment. We have noted that Bournemouth and Wimbleball have a greater % of climate change uncertainty within the headroom at the end of the planning period compared to WRMP19. Roadford and Colliford have similar or slightly reducing % uncertainties compared to WRMP19.

The supply-demand balance in all our WRZs has changed since WRMP19. In summary:

- As described in **Chapter 6: Forecasting Demand**, demand in our WRZs is higher than previously forecast.
- Colliford enters deficit in AMP8 and would remain in an increasingly worse deficit until the end of the planning period, with potential abstraction reductions in AMP9 and AMP10 reducing WAFU further.
- Roadford and Wimbleball enter deficit in AMP9 and would remain in increasingly worse deficit until the end of the planning period, with potential abstraction reductions in AMP9 and AMP10 reducing WAFU further.
- Bournemouth enters deficit in AMP10 as abstraction reductions start to significantly reduce WAFU and continue to increase the deficit to the end of the planning period.

Our supply-demand balance against 1 in 500-year events for each of our four WRZs is summarised below.

	AMP8	AMP9	AMP10	AMP11	AMP12
Colliford	Shift to deficit	Deficit	Deficit	Deficit	Deficit
Roadford	Shift to deficit	Deficit	Deficit	Deficit	Deficit
Wimbleball	Surplus	Shift to deficit	Deficit	Deficit	Deficit
Bournemouth	Surplus	Shift to deficit	Deficit	Deficit	Deficit

1 A summary of our WRMP challenges

The following section summarises our planning challenges and investment needs for our WRMP24.

- We have regulatory targets to achieve
  - 50% reduction to our leakage targets by 2050 compared to 2017/18 (this is equivalent to a leakage level of 64.25 MLD in 2050)
  - a reduction in per capita consumption to 110 litres per person per day by 2050. For this to be achieved in a cost-efficient way we will need support from Government in implementing policies such as water labelling and changes to regulations and building standards to facilitate these ambitious targets.
- 1 in 500 drought resilience by the end of the 2030s without the need to resort to emergency drought orders such as standpipes and rota cuts
- We have both a regulatory obligation and a strong internal ambition to protect the environment. We must ensure that our future abstractions are sustainable and protect the environment. From the studies completed through our Water Industry Environment Programme (WINEP), and through our Environmental Destination plan which meets Government objectives, we will need to significantly reduce the quantities of water taken from environmentally sensitive waterbodies.
- Due to climate change our rainfall is forecast to reduce in summer and winter rainfall will become more intense. So, in addition to reducing the water we abstract from our rivers in the summer, we must also consider how we capture the additional rainfall during the winter.
- Our population is forecast to grow by 320,000 by 2050 (an increase of c. 14% over current levels). The number of properties that will need to be supplied is expected to grow by 44,000 over AMP8, and by a total of 189,000 by 2050. These increases will push up the demand for water by 14 MLD. There is also more uncertainty in demand forecasts as changes driven by the pandemic become embedded in customer behaviour (e.g., more people working from home).
- As a result of these challenges, we will have significantly less water available.

2 Target headroom

2.1 Target headroom introduction

The target headroom is defined as *a buffer between supply and demand designed to cater for specified uncertainties* recommended in UKWIR (2002) and outlined in Table 1. A headroom allowance is a safety margin between supply and demand to allow for associated risks and the variations in the forecast due to uncertainty in the calculation components.

The available headroom in a WRZ is defined as the difference between the Water Available for Use (WAFU) and the Dry Year Annual Average or Critical Period Unrestricted Daily Demand. WAFU is the Deployable Output (DO), including raw water imports, with raw water exports and outage subtracted from it.

If the available headroom is predicted to be less than the target headroom, then we should take action to avoid the risk of failing to meet our level of service. The choice of the target headroom allowance requires a balance to be made between the cost to customers against the risks to supply and the environmental impacts. This involves judgement as to the appropriate level of risk that should be included in the forecasts – our technical teams have recommended a position for the draft plan based on insight from stakeholders including the Board.

2.2 Target headroom vs scenario testing

In developing our dWRMP24 adaptive plan we have undertaken scenario testing (outlined later, in Chapter 10) to explore uncertain futures which could require different programmes of future options to meet the balance of supply and demand. The scenarios represent different, as-yet-unknown future pathways.

Target headroom covers the uncertainty that we associate with the supply-demand balance calculation in any given year and it is not contingent on the future pathways. It reflects the fact that there is uncertainty in the underlying assumptions in how we calculate our supply-demand balance. Our target headroom assessment does not duplicate the uncertainty that we explore in our scenario testing.

For example, in our Target Headroom climate change assessment, we only explore the uncertainty inherent in the range of climate change projections for the RCP6.0 emissions scenario. This uncertainty reflects that the climate change scenarios provide us a range for a given emission scenario. In our scenario testing, however, we explore a higher rate of future emissions (from RCP8.5), which represents a different possible future pathway.

2.3 Target headroom methodology

We have adopted the improved approach of the UKWIR 2003 methodology to calculate the target headroom. In this approach, a probability distribution is assigned to each individual risk or uncertainty factor within the supply-demand balance. These are then combined and analysed using a Monte Carlo simulation. The approach uses the mc2d Monte Carlo framework in R using 5,000,000 iterations to ensure consistent results.

For WRMP19, we commissioned AECOM to assess an appropriate target headroom for our water resource zones (see Appendix 7.1). For this Plan, we have continued to use its framework and approach but re-analysed and updated the data ourselves. We have used the uncertainties from the UKWIR 2003 methodology, and the assumptions we have made around these are shown in Table 1. For comparison purposes, the assumptions made for the WRMP19 headroom analysis are also shown. The same headroom factors have been used consistently across all the WRZs.

Factor	WRMP19	WRMP24
Supply-Related		
S1 - Vulnerable surface water licences	No vulnerable surface water licences identified	No change
S2 - Vulnerable groundwater licences	No vulnerable groundwater licences identified	No change
S3 - Time limited licences	Environment Agency guidelines preclude these from the headroom analysis	No change
S4 - Bulk imports	No bulk imports into any WRZs	No change
S5 - Gradual pollution causing a reduction in abstraction	No sources at risk in any WRZ	No change
S6/1 - Uncertainty for yields constrained by pump capacity	SWW: no allowance included: groundwater DO assessments use actual pumping rates rather than nominal pumping capacities or groundwater sources are constrained by licence BW: main groundwater sources constrained by licence therefore this component does not apply	No change
S6/2 - Meter uncertainty for licence critical sources	95% probability that the reading is within ±5%. Error is distributed normally around a mean of 0 Ml/d	No change
S6/3 - Uncertainty for aquifer constrained groundwater sources	SWW: no allowance included: Wimbleball WRZ has some aquifer constrained sources however a high confidence in the ability of the drought curve to estimate the source performance meant it was not included BW: main groundwater sources constrained by licence therefore this component does not apply	No change
S6/4 - Uncertainty for climate and catchment characteristics affecting surface waters	95% probability that the value is within ±10%. Error is distributed normally around a mean of 0 Ml/d	No change

Factor	WRMP19	WRMP24
S8 - Uncertainty of impact of climate change on source yield	Triangular distribution with upper and lower bounds of the impact of climate on supply, and the best estimate is the difference between the two. New methodology to determine the upper and lower bounds used	No change
S9 - Uncertain output from new resource developments	No allowance included	No change
Demand-Related		
D1 - Accuracy of sub-component data	95% probability that the recording is within ±2.5%. Error is distributed normally around a mean of 0 Ml/d	No change
D2 - Demand forecast variation	Triangular distribution starting with 0 variation in first year, leading linearly to ±15% at the end of the planning period	No change
D3 - Uncertainty of impact of climate change on demand	Triangular distribution of uncertainty increasing to ±2.5% of consumption.	No change
D4 - Uncertain outcome from demand management measures	Triangular distribution with 0 as most likely, ±10%	No change

Table 1: Summary of Assumptions Informing the Headroom Analysis

We have considered how much our headroom allowance can be reduced in the future, recognising that a higher level of risk is more acceptable in the future because, as time progresses, the uncertainties around the headroom reduce, and there is more time to adapt to any changes. Our choice of risk allowance over the long term is an informed judgement. Our customers consider a safe and reliable water supply as a high priority. Our SWW supply regional economy is heavily dependent on tourism and it is appropriate to take a balanced view of this while taking wider factors into account. Lower or higher long-term levels could be chosen; however, we have chosen a flexible plan that can adapt, and the choice of the percentile uncertainty over the long term does not drive new water resource schemes in our Plan.

We determine the acceptable level of risk to be the 95th headroom percentile at the beginning of the planning period, falling steadily to the 85th percentile by 2050, this is consistent with the approach we used in our previous plan. The chosen level of risk is consistent with the EA and Ofwat's expectations and guidance which state that to avoid unnecessary expenditure a higher level of risk should be accepted further into the future.

Table 2 shows how the target headroom allowance changes for the level of uncertainty chosen to the end of the planning period.

WRZ (Ml/d)	Probability				
	75%	80%	85%	90%	95%
Colliford	7.91	9.38	11.12	13.23	16.41
Roadford	12.90	14.60	16.70	19.05	22.69
Wimbleball	5.09	5.86	6.79	7.87	9.53
Bournemouth (DYCP)	11.07	13.32	15.33	17.63	21.35

Table 2: Target Headroom at the End of the Planning Period

2.4 Target headroom over the planning period

Figures 1 to 4 summarise how the headroom uncertainty varies over time in each WRZ. The graphs also show the target headroom we have included in our forecasts, the percentiles used to define our target headroom are the same as those used in our previous Plan. The water resources planning guidance asks us to plan to a higher level of risk further into the future because as time progresses the uncertainties will reduce, and we will have time to adapt to any changes. We have followed this guidance by planning to the 95th percentile of headroom in the first 5 years of the Plan, and then reducing the headroom percentile we use for each of the next two decades.

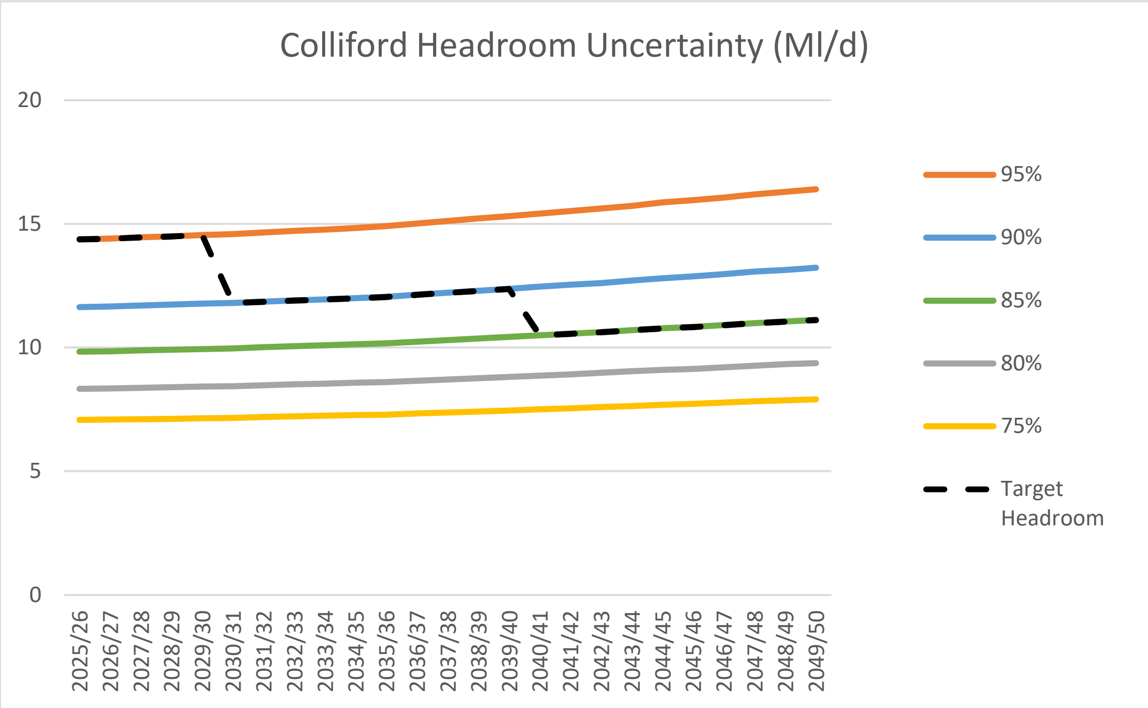

Figure 1: Headroom Uncertainty and Varying Risk Percentiles and Target Headroom for the Colliford WRZ

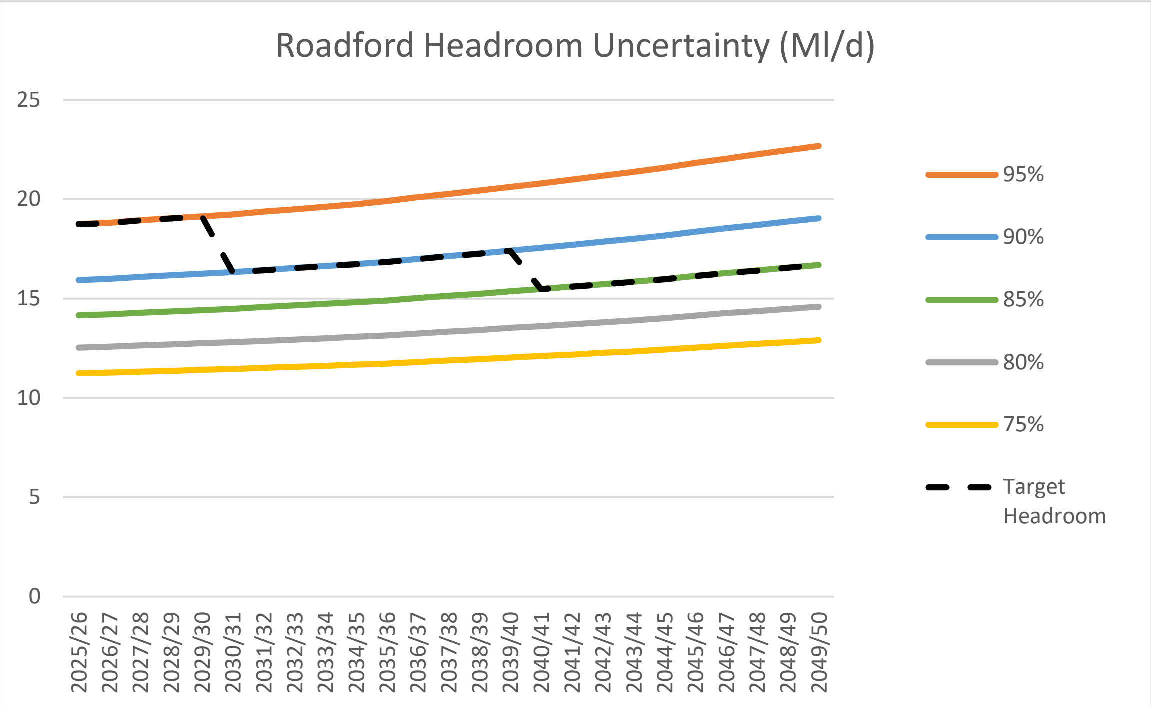

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Figure 2: Headroom Uncertainty and Varying Risk Percentiles and Target Headroom for the Roadford WRZ

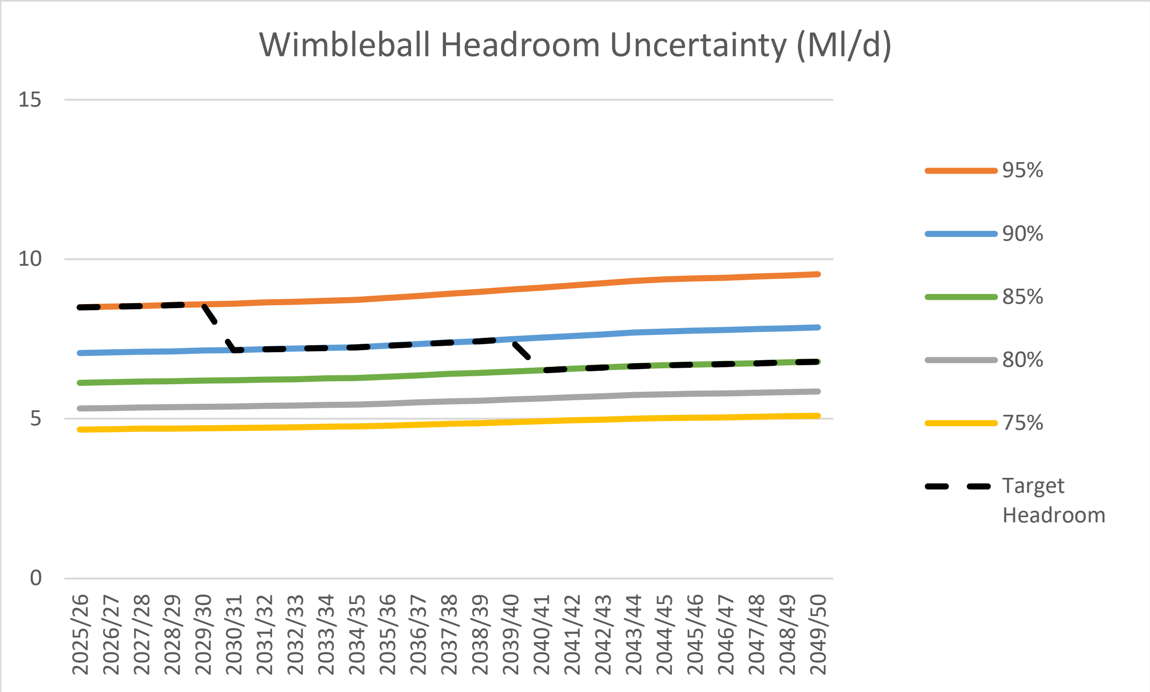

Figure 3: Headroom Uncertainty and Varying Risk Percentiles and Target Headroom for the Wimbleball WRZ

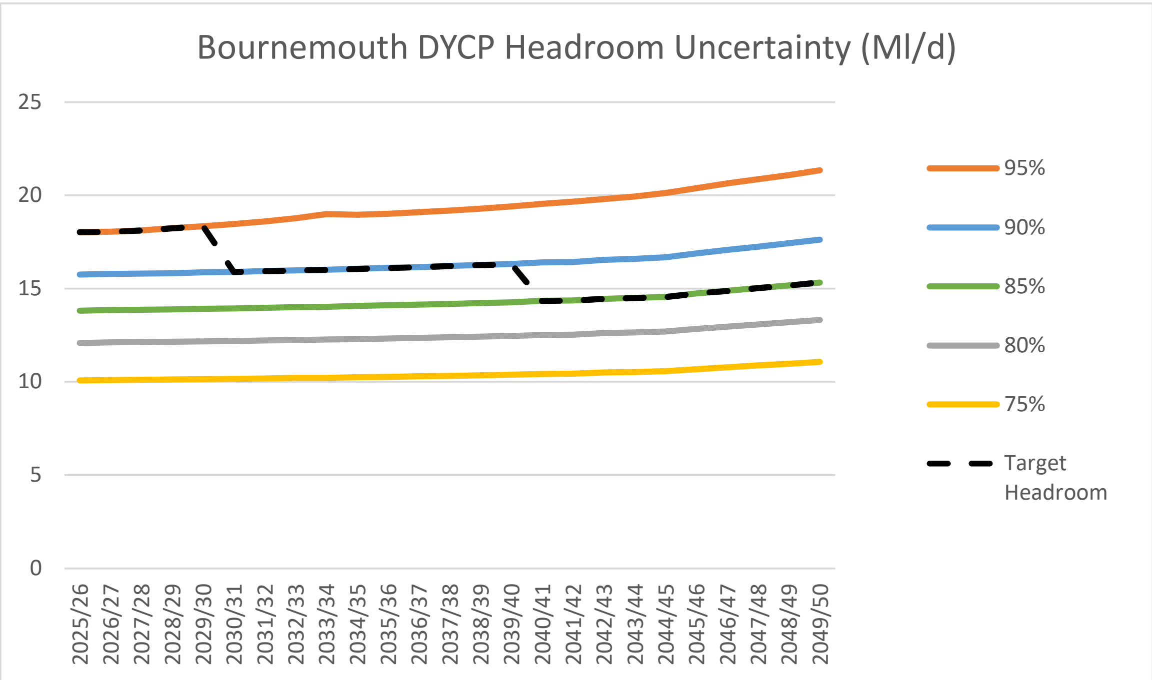

Figure 4: Headroom Uncertainty and Varying Risk Percentiles and Target Headroom for the Bournemouth WRZ (DYCP)

It can generally be seen that the uncertainty increases with time, however the 'glidepath' approach means that the headroom allowance is lower at the end of the planning period than it is at the start.

2.5 The impact of climate change uncertainty

The uncertainty associated with the impact of climate and catchment characteristics on surface water is small in the early years of the plan, but as uncertainty increases into the future it becomes one of the largest components.

The impact of climate change on the target headroom allowance has been assessed separately in accordance with the Environment Agency's Water Resources Planning Guideline. A summary of the results, and how they differ compared to WRMP19 values, is shown in Table 3. Climate change related headroom in the Colliford WRZ is comparable to that used in WRMP19, but in Roadford and Wimbleball has notably changed. This is due to our updated assessments of the impact of climate change in a 1 in 500-year event being greater than in the WRMP19 1 in 200 year drought estimates. In WRMP19 the Bournemouth WRZ was constrained by our capacity to treat and distribute water, but in this Plan the abstraction reductions we are required to make mean that in the future we will be constrained by licenced abstraction. This makes the water available for use in Bournemouth far more vulnerable to climate change than it was in our last plan.

WRZ (Ml/d)	Estimated % Contribution of Climate Change on Headroom			
	Start WRMP19	End WRMP19	Start WRMP24	End WRMP24
Colliford	2.6	9.8	1.4	9.9
Roadford	5.0	19.2	4.5	15.1
Wimbleball	1.5	5.4	1.3	9.2
Bournemouth (DYCP)	0	0.5	0.2	4.8

Table 3: Comparison of the Contribution of Climate Change on the Headroom Allowance

2.6 Comparison with WRMP19

Table 4 compares the 95th and 85th percentiles for the WRMP19 and WRMP24 headroom analyses, to provide a like-for-like comparison.

WRZ (Ml/d)	Headroom Allowance (Ml/d)			
	Start WRMP19 (95th %)	End WRMP19 (85th %)	Start WRMP24 (95th %)	End WRMP24 (85th %)
Colliford	15.87	13.68	14.38	11.12
Roadford	23.59	20.38	18.75	16.70
Wimbleball	8.73	7.1	8.50	6.79
BW (DYCP)	21.10	18.36	18.03	15.33

Table 4: Headroom Allowance Summary and Comparison

The assumptions made for WRMP19 have been followed through with this assessment. As with WRMP19 the headroom allowances for WRMP24 reduce across all zones towards the end of the planning period as we gradually move from the 95th percentile to the 85th percentile. Comparing our current understanding of headroom to the WRMP19 values shows a slight reduction in forecast uncertainty.

3 Baseline supply-demand balance

The supply-demand balance in all our WRZs has changed since WRMP19. In summary:

- As described in **Chapter 6: Forecasting Demand**, demand in our WRZs is higher than previously forecast.
- Colliford enters deficit in AMP8 and would remain in an increasingly worse deficit until the end of the planning period, with potential abstraction reductions in AMP9 and AMP10 reducing WAFU further.
- Roadford and Wimbleball enter deficit in AMP9 and would remain in increasingly worse deficit until the end of the planning period, with potential abstraction reductions in AMP9 and AMP10 reducing WAFU further.
- Bournemouth enters deficit in AMP10 as abstraction reductions start to significantly reduce WAFU and continue to increase the deficit to the end of the planning period.

Our supply-demand balance against 1 in 500-year events for each of our four WRZs is summarised in Table 5.

	AMP8	AMP9	AMP10	AMP11	AMP12
Colliford	Shift to deficit	Deficit	Deficit	Deficit	Deficit
Roadford	Shift to deficit	Deficit	Deficit	Deficit	Deficit
Wimbleball	Surplus	Shift to deficit	Deficit	Deficit	Deficit
Bournemouth	Surplus	Shift to deficit	Deficit	Deficit	Deficit

Table 5: A summary of our baseline supply demand position

3.1 Colliford WRZ

Figure 5 shows the forecast baseline supply-demand balance in the Colliford WRZ. Supply reduces across the planning period due to potential abstraction reductions during AMP9 and AMP10 and climate change. We forecast baseline demand to gradually increase by 2.1% over the planning period in Colliford due to population and climate change. This results in the WRZ entering deficit in AMP8 and being 19 Ml/d in deficit at the end of the planning period without any interventions.

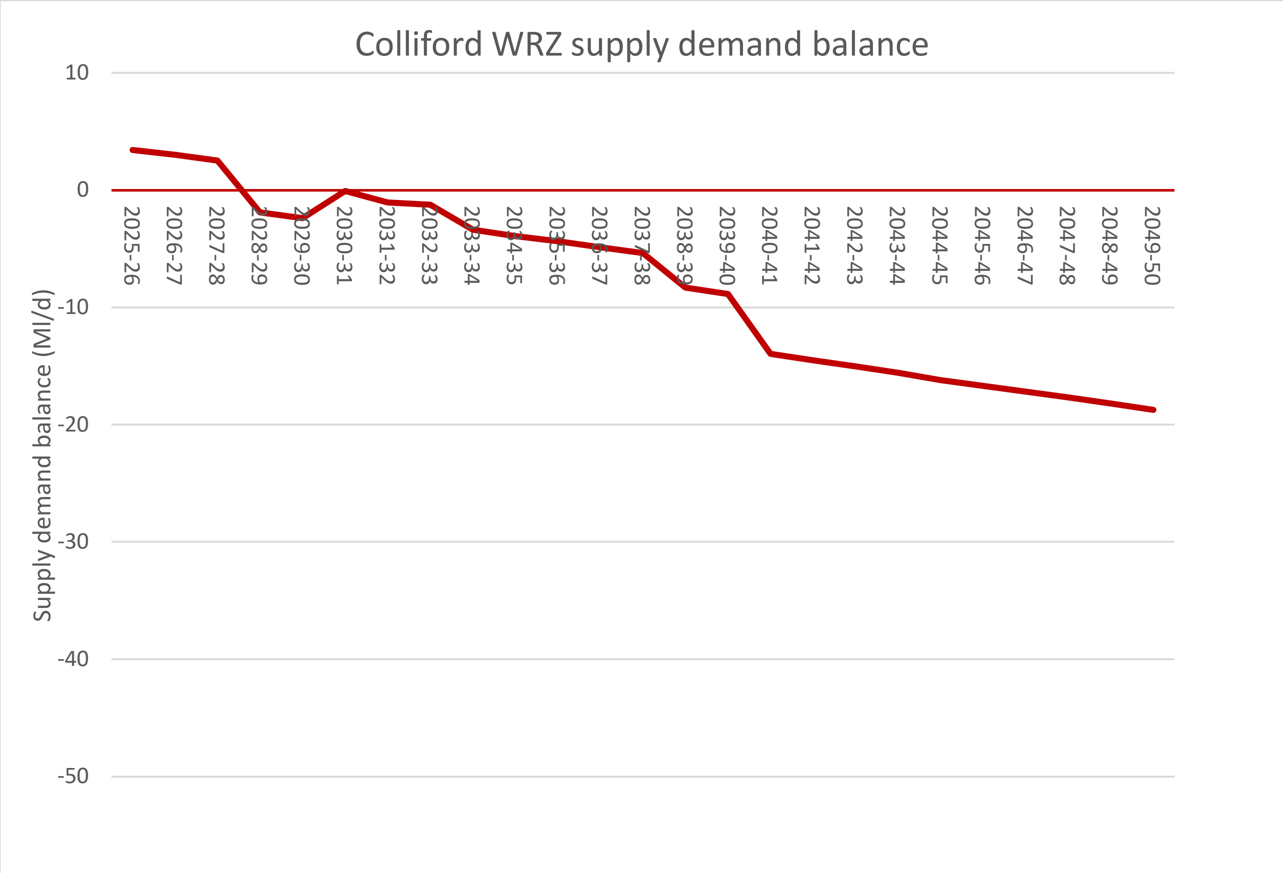

Figure 5: The Colliford WRZ Baseline Supply-demand Position

This situation clearly shows the need to evaluate supply and demand management options in AMP8 to provide resilience.

3.2 Roadford WRZ

Figure 6 shows the forecast baseline supply-demand balance in the Roadford WRZ. Supply reduces across the planning period due to climate change and potential abstraction reductions during AMP9, AMP10 and in particular AMP12 during which a large abstraction reduction on the River Dart is assumed to be implemented. We forecast baseline demand to gradually increase by 2.7% over the planning period in Roadford due to population and climate change. This results in the WRZ entering deficit in AMP9 and would be 45 Ml/d in deficit at the end of the planning period without any interventions.

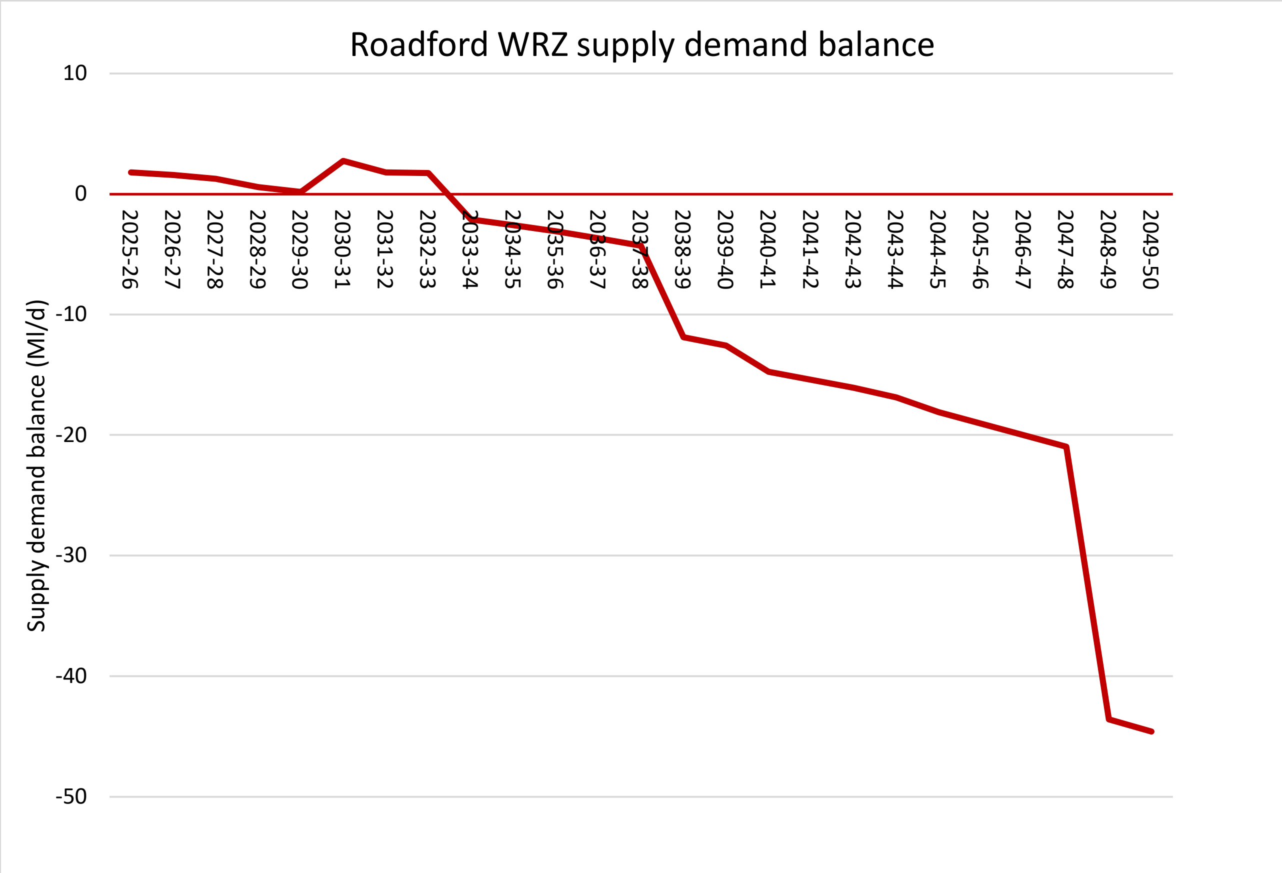

Figure 6: The Roadford WRZ Baseline Supply Demand Position

This situation clearly shows the need to evaluate supply and demand management options in AMP8 to provide resilience in AMP9 and for the rest of the planning period.

3.3 Wimbleball WRZ

Figure 7 shows the forecast baseline supply demand balance in the Wimbleball WRZ. Supply reduces across the planning period due to potential abstraction reductions during AMP9, AMP10 and AMP11 and climate change. We forecast baseline demand to gradually increase by 5.8% over the planning period in Wimbleball due to population and climate change. This results in the WRZ entering deficit in AMP9 would be 16 Ml/d in deficit at the end of the planning period without any interventions.

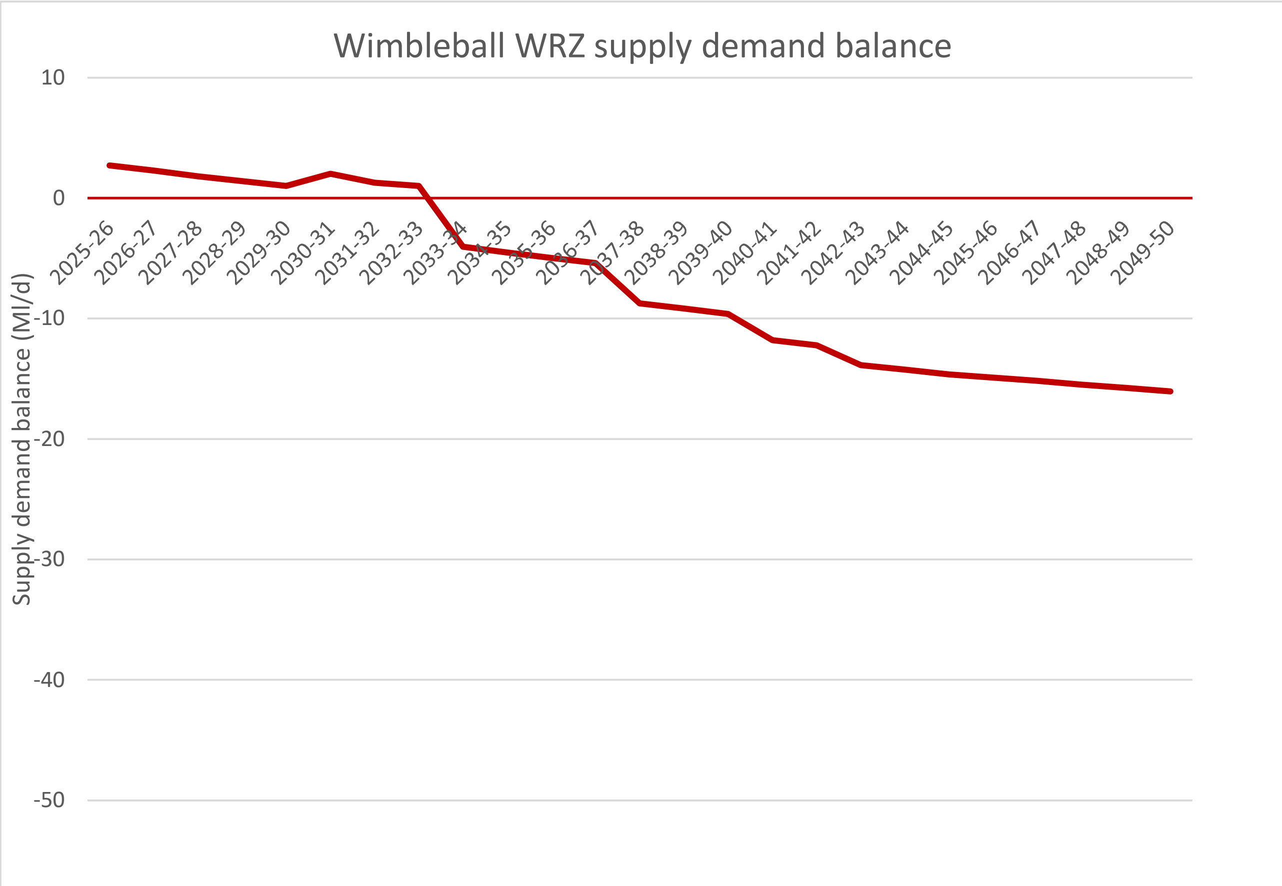

Figure 7: The Wimbleball WRZ Baseline Supply Demand Position

This situation clearly shows the need to evaluate supply and demand management options in AMP8 to provide resilience in AMP9 and for the rest of the planning period.

3.4 Bournemouth WRZ

In the Bournemouth supply area during the peak demand period, the infrastructure constraints limit our WAFU until abstraction reductions on the River Avon are assumed to be implemented. Figure 8 shows the forecast supply-demand balance in the Bournemouth WRZ. Each step down relates to River Avon abstraction reductions, which are assumed to be implanted in stages over the planning period, while climate change is visible as a more gradual reduction in the balance. We forecast baseline demand to largely stay the same over the planning period in Bournemouth with slight variation in profile due to population and climate change. This results in the WRZ entering deficit in AMP10 would be 89 Ml/d in deficit at the end of the planning period without any interventions.

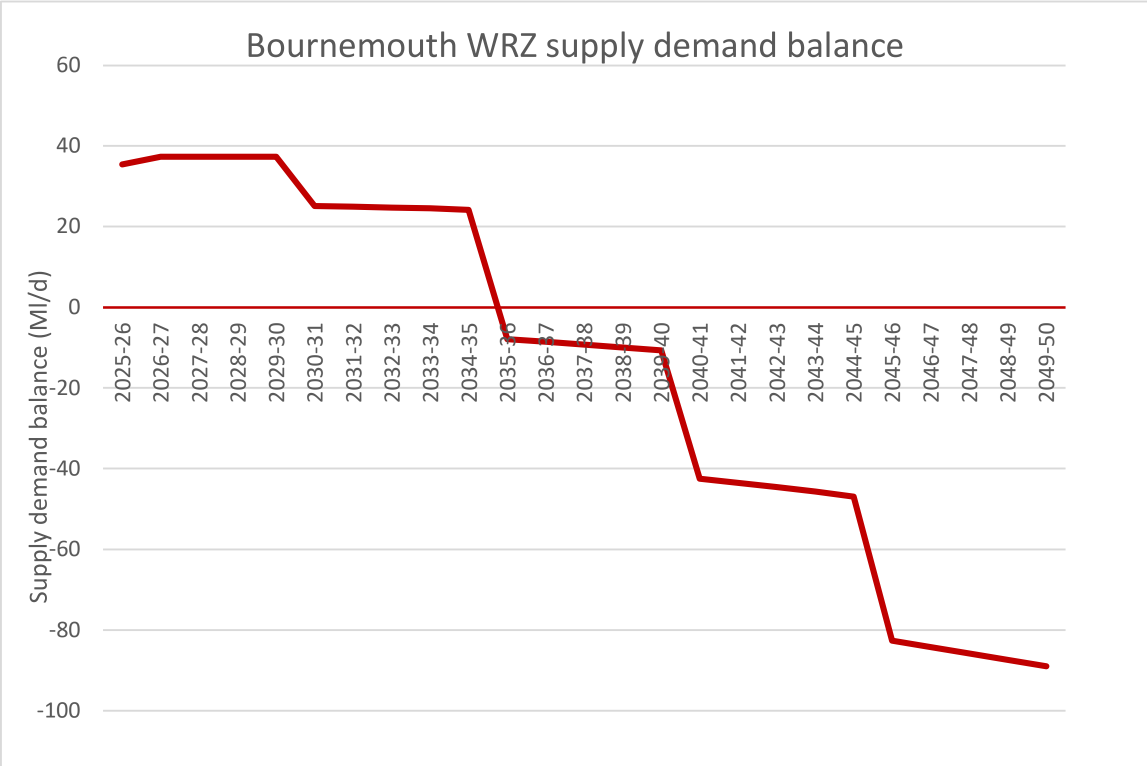

Figure 8: The Bournemouth WRZ Baseline Supply Demand Position – DYCP

This situation clearly shows the need to evaluate supply and demand management options in AMP9 to provide resilience in AMP9 and for the rest of the planning period.

4 Water Trading

Water trading is where a water company responsible for supplying water in an area buys it from someone else (either another water company or third party provider) rather than developing its own water resources. Trades can be for raw or treated water and are typically agreed as part of the water resources management plan (WRMP) process to ensure long-term water supply in an area.

The graphs set out above show that we are starting from a position of forecast deficit and through our engagement around development of our draft plan we have published our interest in hearing from anyone who has a water resource such as a lake or borehole which could be commercially utilised to supplement our current sources of water or who has significant sources of reclaimed water that may be of benefit to us.

Our geography means that opportunities for trades with other water companies are limited – Only our Wimbleball and Bournemouth WRZs have boundaries with other companies (Wessex & Southern) with longer transfers being required to reach more distant providers. These zones have some of the largest forecast deficits and as such our primary focus has been on closing the deficit gap rather than on creating surplus water resources for trade with others.

We already have several trades (bulk supply agreements) with Wessex Water and these are set out in our baseline figures.

We have explored further opportunities through our regional planning approach with the WCWRG, engaging both with water companies and more widely with other potential suppliers, and are seeking to develop strategic options as a result.

Our approach for closing the supply demand gap is set out in subsequent chapters.

In producing our dWRMP we have not identified any opportunities for water trades beyond those subsequently described in Chapter 8.

Nevertheless South West Water remains keen to open-discussions with anyone who thinks they may be able to meet our requirements. We would like to explore commercial opportunities, links or partnerships with environmental groups, charities, and other interest groups and opportunities to work with academic institutions.

We are especially interested in providers who would be able to implement end to end solutions from concept through to delivery and benefit realisation.

If you are interested in pursuing any commercial opportunities arising from this information, it is important that you contact us about your proposal, as our network and the way we provide services to our customers is subject to a range of factors that can change how beneficial opportunities may be or how, when and where we might be able to use them.

5 Comparison of baseline supply-demand balance with WRMP19

As per the water resources planning guideline this section provides a comparison of the supply-demand balance between WRMP19 and WRMP24 for the year 2024/25 (i.e., start of plan position). A graph is presented for each WRZ which demonstrates how the component parts of the supply-demand balance differ between WRMP19 and dWRMP24. A negative number indicates a negative contribution to the dWRMP24 supply-demand balance and a positive number a positive contribution to the dWRMP24 supply-demand balance. The components outlined in table 6 are included in the assessment.

Component	Label	Description and reference to planning tables
Deployable Output	DO	The WRZ Deployable Output (6BL)
Deployable Output Climate Change	DO CC	The reduction in Deployable Output as an impact of climate change. (7BL)
Potable Water Imports	DO Imports	Imports to the WRZ. (3BL)
Potable Wate Exports	DO Exports	Exports from the WRZ. (5BL)
Outage	Outage	The outage for the WRZ. (9BL)
Distribution Input	DI	Distribution Input for the WRZ. (45BL)
Target Headroom	THR	Total target headroom allowance for the WRZ. (48BL)
Supply-demand balance	SDB	The supply-demand balance for the WRZ. (50BL)

Table 6: Elements including in WRMP19 to WRMP24 2024/25 comparison

5.1 Colliford WRZ

In Colliford the overall supply-demand balance has seen a reduction of 23.42 Ml/d in WRMP24. This has been primarily driven by increases in the amount of water put into supply (Distribution Input) as discussed in Chapter 6. There are also small reductions in DO in moving to a 1 in 500 year design drought and through updated climate change modelling leading to DO reductions.

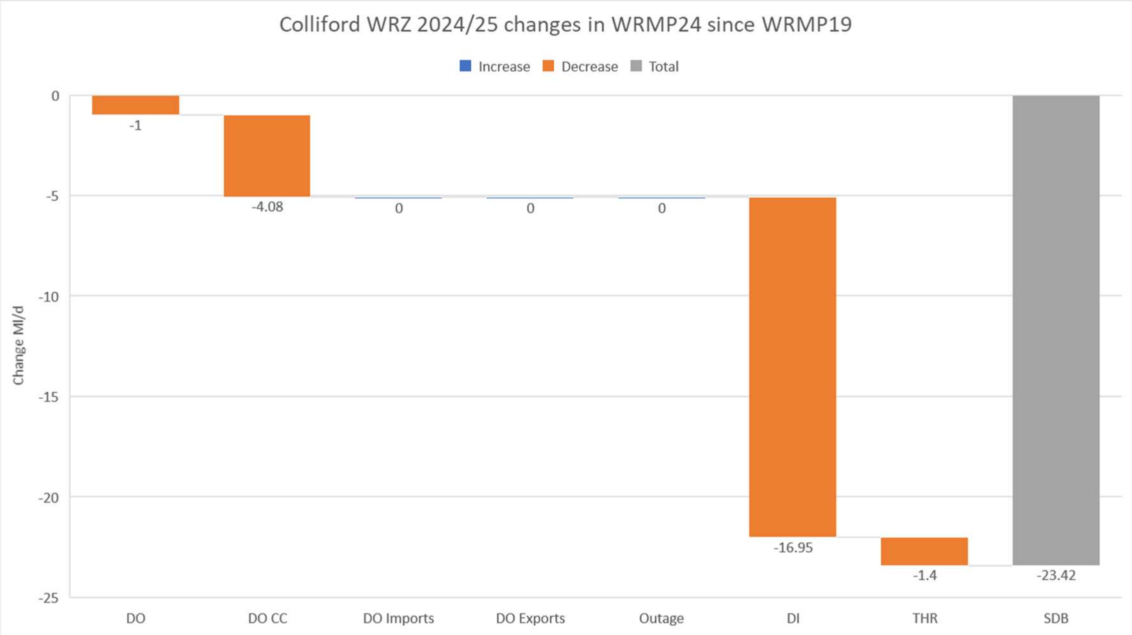

Figure 9 Colliford WRZ comparison of DYAA supply-demand balance components between WRMP19 and WRMP24 for the year 2024/25.

5.2 Roadford WRZ

In Roadford the overall supply-demand balance has seen a reduction of 16.77 Ml/d in WRMP24. This has been primarily driven by increases in Distribution Input as discussed in Chapter 6. There is also a large reduction of the import from Wimbleball WRZ to keep more water within Wimbleball WRZ due to the supply-demand deficit in this zone.

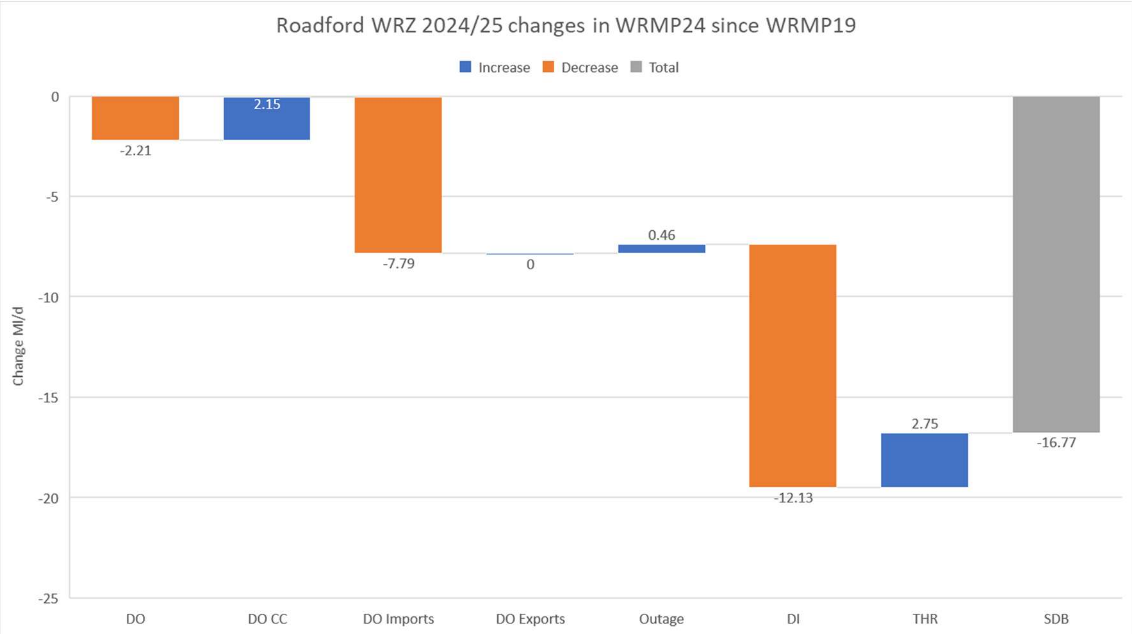

Figure 10 Roadford WRZ comparison of DYAA supply-demand balance components between WRMP19 and WRMP24 for the year 2024/25.

5.3 Wimbleball WRZ

In Wimbleball the overall supply-demand balance has seen a reduction of 10.29 Ml/d in WRMP24. The largest driver in this is a reduction in DO as a consequence of moving to a 1 in 500 year design drought. To compensate for this the export to Roadford has been reduced.

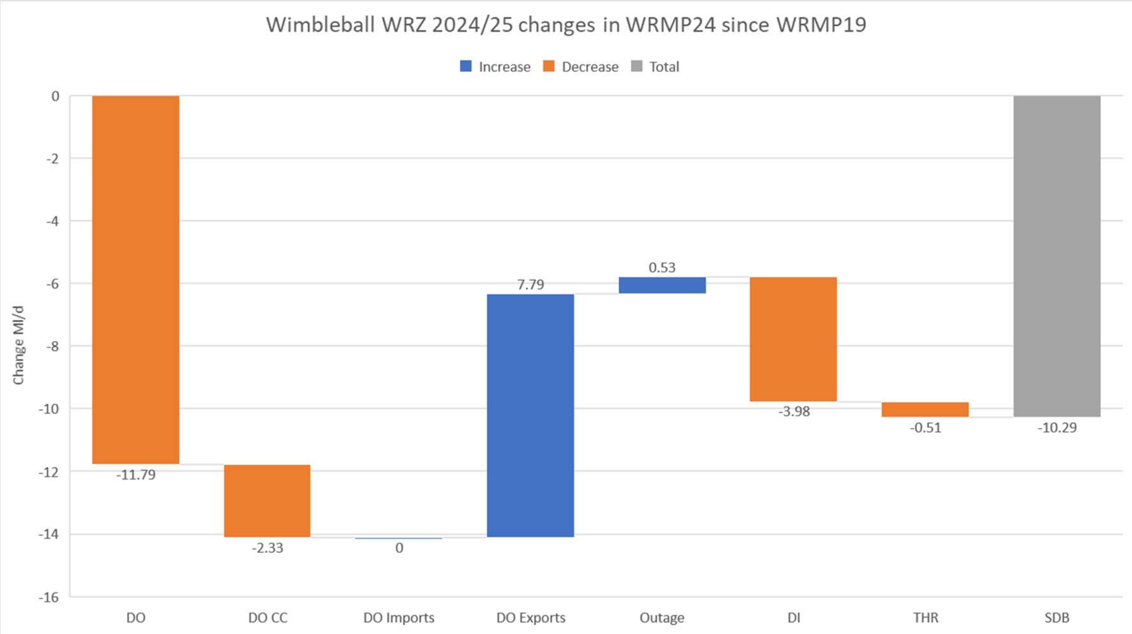

Figure 11 Wimbleball WRZ comparison of DYAA supply-demand balance components between WRMP19 and WRMP24 for the year 2024/25.

5.4 Bournemouth WRZ

In Bournemouth WRZ the overall supply-demand balance has seen an increase of 8.52 Ml/d in WRMP24. This is primarily linked to a decrease in overall distribution input. There is also a reduction in the export to Wessex Water due to the large supply-demand deficit that occurs later in the planning period driven by Environmental Destination.

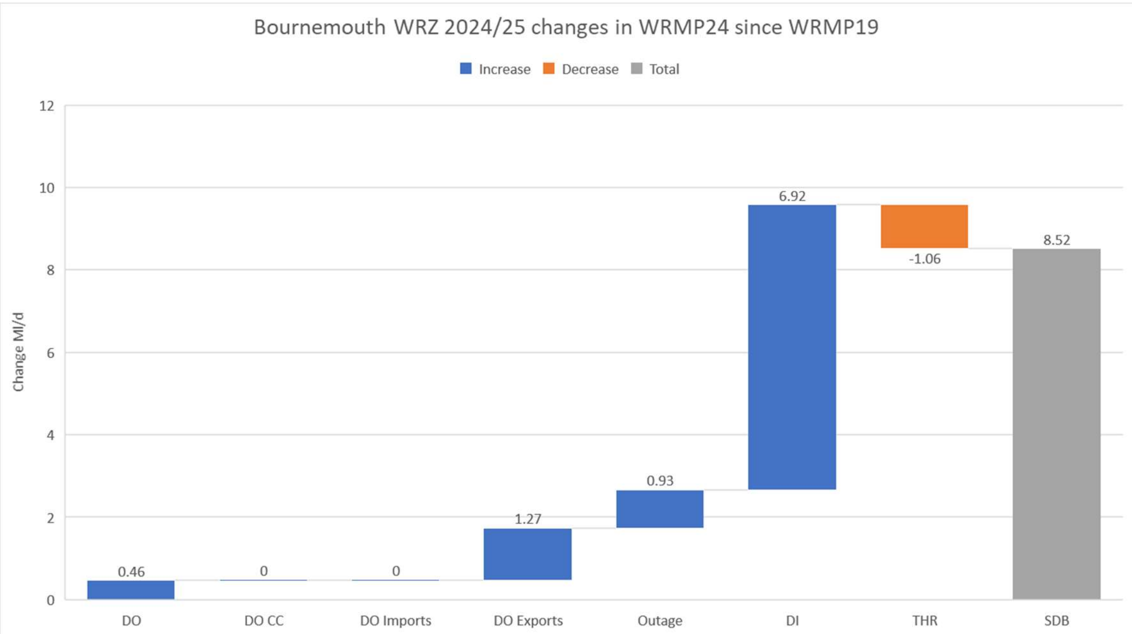

Figure 12 Bournemouth WRZ comparison of DYCP supply-demand balance components between WRMP19 and WRMP24 for the year 2024/25.

South West Water

Bournemouth Water

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