



APPENDIX E

SUPPLY-DEMAND BALANCE TABLE COMMENTARY & FORECAST ASSUMPTIONS

This appendix provides additional information regarding the assumptions we applied in developing our forecasts for the Draft Regional Plan as well as providing supplementary commentary on the supply demand balance tables, to help explain the data populated within these (see Section E.1).

The data presented in this appendix is based on updated forecasts and refreshed supply-demand balances for our region, which were finalised in May 2022 ahead of the second inter-regional reconciliation. We also included a summary of changes that have occurred between the emerging regional plan (January 2022 version) and the Draft Plan forecasts (see Section E.2). Further information is provided on the approach that each company has used to profile the changes in drought resilience, personal consumption and leakage across the planning period (Section E.3).

All data included in the supply demand balance tables for the WRW water resource zones is fully consistent with the equivalent tables in the relevant company's WRMP. For more detailed information regarding the data in the tables, please see the commentary within the relevant WRMP. Here we give a commentary which highlights the regional consistency (or differences) in the data. This is intended to provide confidence that the appropriate regional context has been taken into account in the WRMPs and to evidence the consistency of approach which was necessary to produce the regional plan.

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E.1. Regional tables commentary

Table 1. Supplementary information and commentary on supply-demand balance tables and approach/assumptions applied.

Tables component	EA tables data position	WRW commentary
Planning period	2020 to 2080, with 2080 to 2100 optional	WRW has adopted a 60 year planning period from 2025-2085 as per our previously agreed methodologies. Our data is provided from 2025 as this is the start of the new planning period. Company business plans are already in place for the preceding period and this data is therefore of no benefit to this submission.
		Hafren Dyfrdwy has adopted the planning approach detailed above.
		Severn Trent has adopted the planning approach detailed above.
		South Staffs has adopted the planning approach detailed above.
		United Utilities has adopted the planning approach detailed above.
		Welsh Water has adopted the planning approach detailed above.
Supply forecast and options	Implement supply options in baseline scenario that are either delivered by 2025, and those planning for implementing after 2025 with PR19 funding.	<p>WRW supply forecasts were generated using the agreed WRW methodology. This is based on the system response method (sometimes called the Scottish Method) for deployable output (DO) and a 1 in 500 level of service for emergency drought orders (EDOs) from 2039 (1 in 200 before then). This reflects a reporting change from the emerging plan data tables which reported DO assessment at the 1 in 500 over the full planning horizon in line with expectations for the first reconciliation. This change results in fewer and smaller deficits prior to 2039 and addresses one of the main feedback points from the Environment Agency.</p> <p>All existing level of service were considered when setting the 1 in 500 EDO based DO. The hydrology and climatology are based on the datasets prepared consistently for regions by Atkins. This produces a full stochastic dataset of 19,200 years.</p>



Tables component	EA tables data position	WRW commentary
		<p>Hafren Dyfrdwy. DO for the Wrexham and Llandinam and Llanwrin zones provides resilience to 1 in 500 throughout the planning period (from 2025 onwards). The Llanfyllin and Saltney zones are supplied by bulk imports from Severn Trent.</p>
		<p>Severn Trent. DO for Strategic Grid, Nottinghamshire and Newark zones were defined by TUBs (3 in 100) level of service for most of the climate change scenarios.</p> <p>DO assessments have assumed implementation of those WRMP19 options that are being delivered in AMP7: GRD18-Peckforton Group BHs asset and water treatment enhancements; CRO05-Thornton to Cropston capacity increase; NOT04-Heathy Lea to North Nottinghamshire transfer solution.</p>
		<p>South Staffs. DO provides 1 in 500 EDO resilience for the South Staffs Water Resource Zone, and continues to be defined by 1 in 40 TUBs year level of service, in-line with WRMP19.</p>
		<p>United Utilities. DO for the Strategic Resource Zone provides 1 in 500 resilience to customers by 2039/2040 and meets all other levels of service. Between 2025 and 2039 DO is constrained by our 1 in 20 TUBs level of service, which also provides 1 in 200 resilience. DO for Carlisle, North Eden and Barepot resource zones provides 1 in 500 resilience to customers from 2025 and meets all other levels of service. The supply-demand balances for these zones however will be presented as 1 in 200 resilience between 2025 to 2039 and 1:500 resilience thereafter to keep levels of service in line with the Strategic resource zone, and consistent across all zones. DO assessments have been updated to account for EA feedback on UU's supply resilience (see below).</p>
		<p>Welsh Water supply forecasts represent the most significant change to reported data since WRMP19. The company has migrated its water resource models from WRAPSIM to Aquator and used the additional functionality to better represent its water supply systems. Hydrological assessments have also been updated utilising the GR6J software to provide a better representation of catchment inflows including updated stochastic inflow sequences.</p>



Tables component	EA tables data position	WRW commentary
Drought resilience and measures	Deployable output under 1 in 500 year scenario without the use of drought permits and orders, TUBs and NEUBs.	<p>The DO assessment for the Vowchurch WRZ includes the benefits of the WRMP19 network option that improves its drought resilience.</p> <p>WRW has followed the guidance, and calculated the DO with and without the drought measures in place. Benefits of drought measures under 1 in 500 drought scenarios were assessed. Baseline DO is reported excluding the benefit of drought measures. Final plan DO includes the benefit of drought measures which are shown in the tables as final plan options.</p> <p>Hafren Dyfrdwy reports it has followed the guidance.</p> <p>Severn Trent reports it has followed the guidance.</p> <p>South Staffs has reported DO based on 1:40 level of service for TUBs and 1:500 EDO resilience. The results demonstrate that the company’s WRMP19 level of service for TUBS of 1:40 years continues to remain valid.</p> <p>United Utilities reports it has followed the guidance. The benefits of drought measures¹ have also been calculated for all other levels of service (e.g. 1 in 200 resilience and 1 in 20 TUBs).</p> <p>Welsh Water reports it has followed the guidance. Also to note, the Welsh Water WRMP is based on a 1:200 drought resilience under RCP6.0 and so this is the scenario we have used to populate the WRMP tables. However, to ensure consistency with the rest of the Region, we have populated the WRW tables on the basis of 1:500 drought resilience under RCP6.0 – therefore the DO, climate change and headroom values are different. This is only noticeable for SEWCUS. The only zones are not affected as they are not level of service constrained.</p>
Climate change	Appropriate approach within each region, regarding use of UKCP18	WRW has moved on fully from UKCP09 and utilises UKCP18 Regional and Probabilistic projections to assess impacts of climate change on our resources, in accordance with the agreed WRW methodology.

¹ This is the benefit of drought permits and water use restrictions detailed in the companies’ drought plans.



Tables component	EA tables data position	WRW commentary
	<p>products (use of RCM and/or probabilistic projections in line with guidance)</p>	<p>We used the following UKCP18 products / projections with the full or a subset of the stochastic time series (i.e. 19,200 years):</p> <ul style="list-style-type: none"> • 12x Regional Climate Models (RCM) outputs for the core of the approach • Up to 100x WRW agreed Monte Carlo simulated probabilistic projections (England and Wales level) to help better understand uncertainty. The number of projections used varied from RZ to RZ depending on the level of vulnerability and available tools. <p>Reported DOs are based on RCP6.0, although RCP8.5 has been modelled following the WRW methodology. The assessment of climate change impacts is an area of considerable uncertainty given the large range and scale of potential impacts from the new UKCP18 projections and the use of both RCMs and probabilistic data.</p> <hr/> <p>Hafren Dyfrdwy followed the agreed WRW methodology to assess impacts of climate change on its resources. 12 regional and 20 probabilistic projections were sub-sampled and were used to assess DO impacts. It will present results under both a high emission (RCP8.5) and a medium emission (RCP6.0) as per Welsh guidance.</p> <hr/> <p>Severn Trent followed the agreed WRW methodology to assess impacts of climate change on its resources. 12 regional and 20 probabilistic projections were sub-sampled and were used to assess DO impacts.</p> <hr/> <p>South Staffs followed the agreed WRW methodology to assess impact of climate change. 12 Regional and 13 probabilistic projections were sub-sampled and used to assess DO impacts.</p> <hr/> <p>United Utilities followed the agreed WRW methodology but with additional modelling to support its understanding of uncertainty. It modelled the supply system DO impact of all 100x WRW agreed Monte Carlo simulated probabilistic projections. It also simulated the performance of the supply system using 3000x probabilistic projections for the North West river basin.</p>



Tables component	EA tables data position	WRW commentary
		<p>Welsh Water followed the agreed WRW methodology to assess impacts of climate change on its resources. 12 regional and 20 probabilistic projections were sub-sampled and were used to assess DO impacts.</p> <p>Welsh Water will present results under both a high emission (RCP8.5) and a medium emission (RCP6.0) as per Welsh guidance.</p>
<p>Confirmed sustainability changes</p>	<p>The DO reduction of any confirmed sustainability changes and consistent with WINEP.</p>	<p>Confirmed sustainability changes are company specific.</p> <hr/> <p>Hafren Dyfrdwy does not have any confirmed sustainability reductions to include within its reported DO.</p> <hr/> <p>Severn Trent has 41 to 43 groundwater sources that have confirmed licence changes in the AMP7 WINEP. These include:</p> <ul style="list-style-type: none"> • Sustainability reductions relating to AMP6 RSA implementation schemes, at 14-16 sources, where average licence reductions will be reduced to ~33MI/d below the WFD recent actual abstraction baseline (2030). • A further 27 sources have been identified to be in the higher WFD no deterioration risk ADAPT category and these will have their licences reduced to the WFD baseline (2030). <p>Severn Trent included the unconfirmed sustainability reductions for our WFD no deterioration INVESTIGATION (38) and PREVENT/MITIGATE (23) risk category groundwater sources. At this time Severn Trent has assumed a 50% reduction, between its average DO and the August 2020 agreed recent actual abstraction WFD baseline, at these sources by 2030. The exact distribution and timing of these reductions are still to be agreed as part of its 2020-25 (AMP7) WINEP programme. The remaining reductions, down to WFD baseline, have been assumed to be implemented by 2040. Similar assumptions have been made for groundwater sources not in the AMP7 WINEP to give a worst case view at this stage. These numbers have been derived using planning assumptions and have not been confirmed but have been included in this line to</p>



Tables component	EA tables data position	WRW commentary
		<p>separate the earlier regulatory needs from the longer term environmental destination. Further refinement and engagement will be undertaken with EA prior to the final plan.</p> <p>It also has confirmed licence and operational changes at four surface water sources:</p> <ul style="list-style-type: none"> • The River Dove Egginton hands off flow (2030) • Cropston and Swithland reservoir compensation changes (2024 - 2028) • Ashop, Noe and Jagers Clough flow changes (2024-2028) • Tittesworth Compensation / Deep Hayes <p>These surface water reductions have been included in the Aquator water resource modelling.</p> <p>The total reductions included in the data tables is 179.37Ml/d by 2040. Recent licence changes have also been agreed with the EA; these were agreed post analysis for the draft plan:</p> <ul style="list-style-type: none"> • An additional licence reduction is occurring at Astley as a result of licence capping being applied to the time limited element of this licence, for the final plan these reductions will be included in the baseline. • Licence reductions are also proposed at Green Street, Kinsall, Overton Scar, Lee Brockhurst and Preston Brockhurst as a result of licence capping being applied to sites within our No Deterioration investigations, this is accounted for in the reduction allowance for 2030. • The No Deterioration investigations for Plemstall and Bigwell have concluded that no licence capping is required. Currently licence capping has been assumed in the draft plan, these will be removed for the final plan. <hr/> <p>South Staffs has agreed to licence changes in line with the no deterioration licence capping approach. This leads to a loss of DO of 9.29 Ml/d and will be in place by 2029/30.</p> <hr/> <p>United Utilities has agreed licence reductions in line with recent 2020-25 (AMP7) WINEP investigations. These include Corn Close BHs, South Cumbria BHs (Schneider and Thorncliffe Road) and Bearstone BH.</p>



Tables component	EA tables data position	WRW commentary
		<p>Wirral and West Cheshire investigations have been extended out to March 2023, however we have included a provisional licence reduction to take forward for draft submission. This is however subject to change once the investigation has concluded in 2023 and therefore will be included for revised draft.</p> <p>New compensation flow has been confirmed for Pennington reservoir.</p> <hr/> <p>Welsh Water does not have any confirmed sustainability reductions to include within its reported DO.</p>
<p>Environmental destination</p>	<p>Indicative best estimate of loss to PWS DO, based on ‘low’, ‘BAU+’ and ‘enhanced’ scenarios.</p>	<p>WRW member companies have modelled the ‘low’, ‘BAU+’ and ‘enhanced’ scenarios as defined by the Environment Agency for the English part of our region. These scenarios are based on the 2050 National Framework data and feature significant uncertainty. All affected companies in our regional group have agreed to include BAU+ as the baseline in their supply-demand balances, as requested in the EA Feb 22 consultation response on the emerging plan. Further information on scenarios is provided in Appendix D.</p> <hr/> <p>Hafren Dyfrdwy is wholly in Wales and is following the Welsh guidance on environmental destination. In Wales the environmental destination focus is on catchment improvements and not licence reductions. These scenarios have therefore not been considered.</p> <hr/> <p>Severn Trent has included the BAU+ locally verified scenario in the tables. This is the same as the BAU for the Severn Trent area following a review of protected areas and NE catchment specific documents “Moving towards common monitoring guidance targets”. This equates to a DO reduction of 262.65MI/d in addition to the reductions in the line “confirmed sustainability changes”. The total reductions across the two lines are 442.02MI/d.</p> <p>The Ofwat low scenario has a DO reduction of 158.5MI/d and the Enhanced scenario has a DO reduction of 291.9MI/d; this is in addition to the reductions in the line “confirmed sustainability changes”. This takes the total sustainability reduction DO reductions to 337.87 MI/d and 471.27MI/d respectively.</p>



Tables component	EA tables data position	WRW commentary
		<p>The scale of the reductions require solutions that will take multiple AMPs to deliver. We have tested multiple scenarios that would accommodate changes by 2050. We will continue to explore the opportunity to deliver this earlier, without putting security of supply at risk, and we are proposing to undertake a large AMP8 WINEP investigation and options appraisal programme to refine the plan.</p> <hr/> <p>South Staffs has included the BAU+ locally verified scenario in the table. This is the same as BAU for the South Staffs zone as there are no SAC rivers affected by its abstraction. This equates to a reduction of 48.01 MI/d. The reductions that have already been committed to through the no deterioration licence caps contribute directly to this.</p> <p>The Ofwat low scenario of BAU+ locally verified is the same as BAU at 48.01 MI/d as we have no SACs within our abstraction area. The enhanced scenario looks at a proposed reduction of 59.62 MI/d.</p> <p>A phased implementation of the reductions have been assumed from 2030 to 2050 with an increasing annual straight line profile. At this stage, it has applied the reductions in a linear fashion to represent the progressive need for reductions and to manage the impact of these reductions through its general operations in the most efficient way.</p> <hr/> <p>United Utilities has included locally verified BAU+ DO impacts in the supply forecast for the Strategic and Carlisle Resource Zones. After review and agreement with the EA, BAU+ is the same as the original BAU scenario. The SRZ DO impact has been profiled across 2039 to 2050, assuming a stepped profile with the reductions increasing at the end of each AMP period. The impact is inclusive of the provisional AMP8 sustainability reductions (based on unconfirmed AMP7 WINEP investigations) and AMP9 WFD no-deterioration licence capping. The DO impact for Carlisle has been applied in 2050.</p> <p>The Ofwat Low and Enhanced scenario DO impacts have been applied to our adaptive planning scenarios.</p>



Tables component	EA tables data position	WRW commentary
		<p>Welsh Water has assessed one minor ‘uncertain’ licence reduction (0.3 MI/d) on the River Teme at its Leintwardine groundwater source, from the National Framework data. This reduction was assumed to be delivered by 2030 based on discussions held with both EA and NE during the AMP7 WINEP investigation. The delivery of the licence reduction is dependent on the outcome of further studies planned at this site in AMP8.</p>
<p>Outage allowance and process losses</p>	<p>Outage allowance covering the risk of temporary or short term losses of supply (both planned and unplanned) and raw water treatment losses</p>	<p>WRW’s approach to outage is built on the established approach that the companies used for WRMP19. It uses Monte-Carlo simulations of all the legitimate outage scenarios. In accordance with the agreed WRW methodology, we used the 80th percentile for all WRW zones.</p> <hr/> <p>Hafren Dyfrdwy has reviewed and updated its WRMP19 outage models. It uses a combination of a risk based approach and ‘source to tap’ models to assess potential outage. These methods comprised of Monte-Carlo simulations with the risk based approach using outage events taking the 80th percentile and ‘source to tap’ models using industry standard, company specific and expert judgement outage data.</p> <hr/> <p>Severn Trent used its WRMP19 outage model with improvements to the outage datasets (e.g. the addition of more recent outage data).</p> <hr/> <p>South Staffs has reviewed its WRMP19 outage model to include 2020/21 outage data.</p> <hr/> <p>United Utilities used its WRMP19 outage model but with significant improvements to:</p> <ol style="list-style-type: none"> 1. Incorporate additional high quality outage data collated in recent years 2. Adapt the model to produce outputs better aligned to the 1 in 500 year supply forecast. <p>Outage assessments have been updated to account for EA feedback on UU’s supply resilience (see below).</p> <hr/> <p>Welsh Water used its WRMP19 outage model with improvements to the outage datasets (e.g. the addition of more recent outage data).</p>



Tables component	EA tables data position	WRW commentary
Population and property forecasts	Local authority population / property numbers as WRMP24 guidance	WRW property and population forecasts for our region have followed the WRPG and the agreed WRW methodology.
		Hafren Dyfrdwy has used Local Authority data for household projections and Welsh Government population growth forecasts.
		Severn Trent used Local Authority property growth forecasts and the Office for National Statistics (ONS) population growth forecasts.
		South Staffs used the Local Authority plan based property and population forecasts.
		United Utilities used the Local Authority plan based property and population forecasts.
		Welsh Water used the Local Authority plan based property and population forecasts and ONS/Welsh Government population growth forecasts.
Household consumption	Policy assumption (e.g. 110 l/p/d by 2050) with regional statement	WRW household consumption forecasts for our region have followed the WRPG and the agreed WRW methodology. This adopts the planning assumption of 110 l/p/d consumption in a dry year, shown as an additional household demand reduction required (from 2025 onwards) beyond the baseline forecast.
		Hafren Dyfrdwy is planning to a target of 118 l/p/d. There is no requirement to plan to 110 l/p/d in Wales.
		Severn Trent used the 110 l/p/d target for dry year consumption.
		South Staffs used the 110 l/p/d target for dry year consumption.
		United Utilities used the 110 l/p/d target for dry year consumption.



Tables component	EA tables data position	WRW commentary
		<p>Welsh Water used the 110 l/p/d target for dry year consumption.</p>
<p>Non-household consumption</p>	<p>Large user forecasts and economic forecasts at a sector level in line with WRMP24 guidance</p>	<p>WRW non-household consumption forecasts for our region have followed the water resources planning guideline and the agreed WRW methodology.</p> <hr/> <p>Hafren Dyfrdwy forecast is derived from an econometric multi-linear regression model looking at factors including coronavirus impact, Brexit and population change.</p> <hr/> <p>Severn Trent forecast derived from an econometric multi-linear regression model looking at factors including coronavirus impact, Brexit, HS2, and population change.</p> <hr/> <p>South Staffs forecast derived from an econometric multi-linear regression model looking at factors including coronavirus impact, Brexit, HS2, and population change.</p> <hr/> <p>United Utilities forecast derived from an econometric multi-linear regression model looking at factors including coronavirus, Brexit, HS2, Northern Powerhouse and population change.</p> <hr/> <p>Welsh Water forecast derived from an econometric multi-linear regression model.</p>
<p>Leakage</p>	<p>Policy assumption (e.g. 50% reduction by 2050) with regional statement</p>	<p>WRW projections of baseline leakage align to the water resources planning guideline, so reflect 2020-25 (AMP7) leakage targets and remain flat thereafter. The companies have then adopted a policy based target of a 50% reduction in leakage by 2050 (compared to 2017 baseline). Each company then derived an optimised leakage reduction glidepath based on the options available to them and best value considerations.</p> <hr/> <p>Hafren Dyfrdwy has adopted a 50% reduction glidepath from 2017/18 levels by 2050 in each WRZ. The glidepath to 50% reduction includes the company's AMP7 leakage delivery.</p> <hr/> <p>Severn Trent has adopted a 50% reduction glidepath by 2045 in each WRZ. The glidepath to 50% reduction includes the company's AMP7 leakage delivery.</p>



Tables component	EA tables data position	WRW commentary
		<p>South Staffs has adopted a 50% reduction glidepath by 2050. The glidepath to 50% reduction includes the company’s AMP7 leakage delivery.</p> <hr/> <p>United Utilities has adopted a 50% reduction glidepath by 2050. The 50% target is applied at company level. No leakage reductions are currently applied in the small North Eden RZ where leakage reduction is very cost-inefficient and the supply demand balance remains in surplus.</p> <hr/> <p>Welsh Water’s final plan has adopted a 50% reduction glidepath by 2050. The 50% target is applied at company level and incorporates the AMP7 delivery target.</p>
<p>Uncertainty</p>	<p>Target headroom - supply, demand, options uncertainty</p>	<p>WRW target headroom projections for our region have followed the WRPG and the agreed WRW methodology.</p> <hr/> <p>Hafren Dyfrdwy reports its target headroom modelling has followed the WRPG and also the agreed WRW methodology. The target headroom model has been updated with some improvements to the demand and climate change uncertainty distributions. The target headroom glidepaths have been assessed and refined for the draft plan as the company has developed its understanding of the new risks and uncertainties. This is pertinent for Wrexham which has a climate change and demand uncertainty profile which increases through the plan. The updated Wrexham glidepath is 95% until 2029 then reducing in even target headroom increments to 85% in 2040 onwards. The smoothing of the glidepath ensures a steady transition in target headroom as the company accepts greater risk in the future. The WRMP19 glidepath for Llandinam & Llanwrin was 95% till 2024 reducing to 90% in 2025 onwards; this has been shifted forwards for WRMP24 to 95% till 2029 reducing to 90% in 2030 onwards. The forward shift is to maintain higher certainty of supply being able to maintain demand in the short term, which is 95% till 2029 for both zones.</p> <hr/> <p>Severn Trent used its updated headroom model with some improvements to the climate change uncertainty distributions. The target headroom glidepaths have been assessed and refined for the draft plan as we have developed our understanding of the new risks and uncertainties presented by the 1 in 500 year supply demand balance and the interactions with</p>



Tables component	EA tables data position	WRW commentary
		<p>the UKCP18 climate impact modelling. WRMP19 glidepaths (previously used for all WRZs except Strategic Grid; 95% till 2029 reducing to 90% in 2030 onwards) were applied to Bishops Castle, Chester, Forest and Stroud, Kinsall, Mardy, Newark, Ruyton, Shelton, Stafford, and Whitchurch and Wem. Updated glidepaths were applied to Nottinghamshire, and Strategic Grid, North Staffordshire and Wolverhampton (95% till 2029 then reducing in even target headroom increments to 90% or 85% in 2040 onwards respectively).</p> <hr/> <p>South Staffs has reviewed its WRMP19 headroom model, to review supply and demand components including changes to deployable output as a result of climate changes scenario assessment.</p> <hr/> <p>United Utilities has reviewed all input data and assumptions in its WRMP19 model, updating these as required to reflect the latest WRMP24 supply and demand forecasts and climate change assessments. Additional supply-side components have been added to the headroom model to reflect uncertainty in stochastic methods used for 1 in 500 year supply modelling. A full review of water quality risks (surface water and groundwater sources) has been undertaken to update the headroom gradual pollution risk components. Compared to WRMP19 it lowered the glide paths in the Strategic and Carlisle zones to reflect the additional uncertainty in a 1 in 500 year supply demand balance, the need to avoid disproportionate investment in the early years of the plan and the additional approach to addressing key areas of uncertainty through adaptive planning.</p> <hr/> <p>Welsh Water has followed a similar approach to WRMP19 for the calculation of its headroom allowance, having reviewed its models to account for the updated data in WRMP24.</p>
Regional plan supply options	As WRMP24 guidance	<p>WRW regional plan options have followed the water resources planning guideline and the agreed WRW methodology. We have not adopted any size threshold to distinguish between regional plan and WRMP options. The initial list of unconstrained supply options has been screened using the common WRW high level screening criteria and as a result a number of options that were previously screened out of individual company plans at WRMP19 have now been added to the feasible option list.</p>



Tables component	EA tables data position	WRW commentary
		<p>Scheme costs have been updated since the emerging plan using the latest PR24 cost curves where available and the latest government carbon costs.</p> <p>The SEA, HRA, WFD assessment of options has concluded and the outputs have informed the assessment of best value.</p> <p>Options selected for the final plan are shown in planning Table 3b. The full set of options considered is shown in planning Table 4.</p> <hr/> <p>Hafren Dyfrdwy reports it has identified unconstrained options for the WRMP, none of which are suitable for regional transfers.</p> <hr/> <p>Severn Trent reports that all options are provided as per guidance. Uncertainty around scheme costs and benefits has been incorporated into the decision making investment models.</p> <hr/> <p>South Staffs reports that:</p> <ul style="list-style-type: none"> • All groundwater options have been removed from the feasible option list following feedback at pre-consultation from the EA regarding the water availability and licensing constraints. • Several new options have been included that involve increasing reservoir capacity, third party trades and transfers, and additional sizes of transfer from United Utilities. • All feasible options have been updated for WAFU benefits and costs, including carbon costing. • SEA, NCA and WFD assessment review of WRMP24 environmental metrics have been completed. <hr/> <p>United Utilities reports that options are provided as per guidance. WAFU benefits were calculated using a full system response approach.</p>



Tables component	EA tables data position	WRW commentary
		<p>Welsh Water reports that options are provided as per guidance. It is not presenting any external transfer options in the WRW Draft Regional Plan.</p> <p>In the Hereford water resource zone, Welsh Water has a potential WINEP licence change which may reduce deployable output later in the 2025-2030 period, pending the outcomes of the planned investigation at the start of that period. The company has identified that the ‘Best Value’ solution to resolve any shortfall in supply would be a network enhancement scheme “Bewdley to Dinmore SRV”. This is not included in the preferred plan due to the uncertainty around the need and scale of any licence reduction, but recognising the potential for this and following discussion with regulators, it is included as such in the options table.</p>

E.2. Summary of changes made between January 2022 submission and the Draft Regional Plan

A significant amount of work has been completed for this draft regional plan through updating our forecasts, drawing on new guidance and accounting for feedback received from regulators and stakeholders on the emerging regional plan (January 2022). We also undertook a second round of reconciliation with other regions, allowing us to put forward a draft regional plan which can meet our needs as well as supporting other regions’ needs. We will continue to refine our plan, taking into account the feedback we will gather from the draft plan consultation.

Particular areas of change between the emerging and draft regional plan versions are summarised below in Table 2.

Note: Hafren Dyfrdwy is not incorporated in this table as it was not a core member of WRW when the emerging plan was produced.

Table 2. Summary of key changes between emerging plan forecasts and draft plan forecasts.

Change area	Company	Summary of changes made
Headroom allowances and revisions to target headroom profiles	Severn Trent	The company updated its headroom model with some improvements to the climate change uncertainty distributions. The target headroom glidepaths have been assessed and refined. WRMP19 glidepaths (previously used for all WRZs except Strategic Grid) were applied to Bishops Castle, Chester, Forest and Stroud, Kinsall, Mardy, Newark, Ruyton, Shelton, Stafford,



Change area	Company	Summary of changes made
		and Whitchurch and Wem. Updated glidepaths were applied to Nottinghamshire, Strategic Grid, North Staffordshire and Wolverhampton.
	South Staffs	No change
	United Utilities	Input data updated with latest WRMP24 supply and demand forecasts (see comments below). Percentile glidepaths reviewed and updated.
	Welsh Water	No change to process since the Emerging Regional Plan. Actual values updated to reflect updated deployable outputs and demand forecast.
Leakage and PCC reductions	Severn Trent	Leakage and water metering profiles updated to reflect latest PR24 investment plan.
	South Staffs	Leakage profile shows optimum profiling from AMP8 to 2050 to achieve the 50% leakage reduction. PCC profile also updated to reflect our metering strategy and the optimum delivery of the 110 l/p/d by 2050.
	United Utilities	The company has applied the leakage reduction profiles from FY18 rather than FY20. PCC updated to 110 l/p/d by 2050 for a dry year.
	Welsh Water	Leakage profile updated to reflect the achievement of 10% reduction during AMP8 and the 50% reduction by 2050. PCC profiles updated to reflect our metering strategy and the achievement of 110 l/p/d by 2050.
Demand forecasts	Severn Trent	New properties growth consultation feedback included in property growth forecasts. Updates to COVID impact assumption and dry year factor (from using 2018 based to 95 th percentile of historic demand-weather ranking).
	South Staffs	Updated to incorporate latest local authority information.



Change area	Company	Summary of changes made
	United Utilities	Re-based occupancy rate to recent FY21 survey for all resource zones, which resulted in a minor decrease in our demand forecast for FY26. We also updated the new connection forecast for Carlisle resource zone using the latest local authority information. This resulted in a small decrease in the household consumption forecast.
	Welsh Water	Now using a fully updated demand forecast produced for our draft WRMP24 compared to the re-based WRMP19 demand forecast used in the Emerging Regional Plan.
Demand management options	Severn Trent	Severn Trent has updated the costs and benefits of household water efficiency options and considered how they can deliver demand reduction with non-household users in their region.
	South Staffs	Updated costs and profile for delivery of demand management options, and also included consideration for reduction non-household demand in the region, in line with the proposed Environment Act target.
	United Utilities	Updated and developed additional demand management options.
	Welsh Water	Demand options have not changed from the emerging plan and will meet the company's Water 2050 commitment. Welsh Water will continue to monitor developments in smart metering technology and move to AMI meters as the technology matures and costs reduce.
Supply options	Severn Trent	Scheme costs and benefits updated to reflect latest PR24 cost models and government's carbon costing methodology.
	South Staffs	Following feedback from the Environment Agency at pre-consultation stage, the company has removed all groundwater options due to concerns around water availability in the corresponding catchments. It has also included some new options: two relating to increasing the level of storage at Chelmarsh reservoir, and three relating to a third party which includes licence trading, a new reservoir and a potable import.



Change area	Company	Summary of changes made
	United Utilities	Updated costs and benefits for the preferred options.
	Welsh Water	One new preferred option identified for SEWCUS.
Deployable output (DO)	Severn Trent	<p>The company reports:</p> <ul style="list-style-type: none"> • Failure criteria has been implemented in the model. Previously, Severn Trent had applied this criteria in post-processing • Groundwater DOs have been updated; this has also impacted calculation of WINEP and environmental destination reductions • Demand centre profiles have been updated • Green recovery schemes are included in the model, and these now contribute directly to the baseline DO (Green recovery schemes have been included previously as option benefits) • Other network updates have also been included (e.g., abstraction and pipe capacities) based on model investigations and new information • WINEP impacts are now split across WRZs based on impacts on sources rather than impacts on demand met in the zone (which was used previously). The sum of impacts on sources in a zone and impacts on overall demand met in a zone are different for the interconnected zones due to transfers across zones • The sum of source level environmental destination impacts has been used to populate the table rather than modelled zonal level environmental destination impacts (which was used previously) • Raw water abstracted and losses lines have been updated, but this won't impact the supply demand balance • The baseline 1 in 200 and 1 in 500 DOs have changed significantly due to the combined effects of the above updates.
	South Staffs	No change



Change area	Company	Summary of changes made
	United Utilities	The company has reviewed and updated its DO assessment to take account of Environment Agency feedback on its supply resilience. Updated 1:20 (baseline) and 1:40 (final planning) TUBs, 1:200 and 1:500 deployable output calculations for the Strategic and Carlisle resource zones. For more details see the company's draft WRMP supply technical report. In the final plan supply resilience improvements to 1 in 40 TUBs level of service is proposed.
	Welsh Water	Updated 1:200 and 1:500 DO calculations for the SEWCUS zone.
Climate change impacts on deployable output	Severn Trent	Climate change impacts have been updated to reflect the changes associated with moving 1 in 500 resilience from 2040/41 to 2039/40 in line with the guidance.
	South Staffs	No change.
	United Utilities	Incorporated outcomes of Dee General Directions (DGD) Technical Working Group climate change assessment. This led to a minor increase in DO impact for the Strategic Resource Zone. Updated DO climate change impacts for the Carlisle resource zone following additional model runs of RCM scenarios.
	Welsh Water	Fully updated following the change to calculated 1:200 and 1:500 DOs for the SEWCUS zone.
Outages and losses	Severn Trent	The outage modelling outputs were re-reviewed in light of the other changes e.g. to DO, and for some zones the outage values were updated.
	South Staffs	No change since the emerging plan.
	United Utilities	Reviewed and updated outage allowance to take account of EA feedback on the company's supply resilience. The change in DO from prolonged outages was updated for the Strategic zone following remodelling of the 1 in 500 impact of future planned outages. Also minor updates made to the outage allowances for the Carlisle and Strategic resource zones from



Change area	Company	Summary of changes made
		incorporating an additional year of reported outage data. For more details see the company's draft WRMP supply technical report.
	Welsh Water	No change to the process since the emerging plan. Outage values for the SEWCUS zone were updated to reflect updated 1:200 and 1:500 DO values.
Scale and pace of achieving 1:500 drought resilience standard	All companies	There is a reporting change from the emerging plan data tables which reported DO assessment at the 1 in 500 over the full planning horizon in line with expectations for the first reconciliation. The companies have now reported a 1 in 200 DO before 2039 and then a 1 in 500 DO. This change results in fewer and smaller deficits prior to 2039 and addresses one of the main feedback points from the Environment Agency.
	Severn Trent	The start of 1 in 500 resilience has been included in 2039/40 in line with the guidance.
	South Staffs	No change – 1:500 drought resilience will be achieved by 2039.
	United Utilities	1:500 drought resilience will be achieved by 2039 in all resource zones. Leakage and demand management options, selected in the optimum glidepath to achieve the 2050 policy targets, deliver the improvement by 2039. So there is no rationale for later delivery of 1:500 resilience.
	Welsh Water	1:500 drought resilience will be achieved in all zones in advance of 2039, even though we are now reporting SEWCUS as a deficit zone, compared to the surplus position presented in the emerging plan.
Confirmed sustainability changes	Severn Trent	Adaptive pathways have explored different scenarios for the pace of implementing licence reductions to WFD baseline between 2030 and 2040. Final licence change decisions have still to be agreed with EA via WINEP.



Change area	Company	Summary of changes made
	South Staffs	Updated the deployable output impacts for 2025-30 (AMP8) sustainability reductions using the latest agreed position with the EA. This has reduced the deployable output impact.
	United Utilities	Updated the deployable output impacts for 2025-30 (AMP8) and 2030-25 (AMP9) sustainability reductions using the latest available information. As a result the deployable output impact has increased.
	Welsh Water	The company has no confirmed sustainability reductions to include within the plan.
Scale and pace of delivering environmental destination scenarios	Severn Trent	<p>In the emerging plan, Seven Trent include confirmed reductions for 41 groundwater sources and 4 surface water licences in the ‘confirmed sustainability change line’. In addition we included a 50% reduction between the average deployable output and the WFD baseline for our groundwater WINEP investigation and prevent mitigate sources. All to be delivered by 2030. Further reductions were included in scenario analysis. For the final plan we have included deployable output reductions down to the WFD baseline staged between 2030 and 2040 which equates to 179.37Ml/d by 2040.</p> <p>In the emerging plan, Severn Trent did not include reductions relating to environmental destination in the baseline tables but included them in scenario analysis. In the draft plan, we have included the BAU+ scenario which equates to a deployable output reduction of 262.65Ml/d in addition to the reductions in the line “confirmed sustainability changes”. The total reductions across the two lines are 442.02Ml/d. This reduction is included from 2050.</p>
	South Staffs	In the emerging plan, South Staffs did not include reductions relating to environmental destination in the baseline tables. In the draft plan, we have included the BAU+ scenario which equates to a reduction of 48.01 Ml/d. This reduction has been linearly profiled from 2030 to 2050.
	United Utilities	For the emerging plan we used outputs from the National Framework dataset to calculate impacts on deployable output from the Enhanced Future Potential Environmental Destination



Change area	Company	Summary of changes made
		scenario. For the draft plan, we have used the outputs from the EA Water Body Abstraction Tool to calculate deployable output impacts of the locally verified BAU+ scenario. The 1 in 500 deployable output impact of this scenario is 131Ml/d by 2050.
	Welsh Water	We have only one identified National Framework ‘uncertain’ licence reduction at Leintwardine which could be delivered depending on AMP8 NEP investigations outcome.

E.3. Profiling changes in drought resilience, personal consumption, and leakage across the planning period to optimise outcomes

This section summarises the approach that each company has used to profile the changes in drought resilience, personal consumption and leakage. These are significant areas of investment to achieve policy-driven outcomes by an assumed date (2039/40 for drought resilience and 2049/50 for the demand policies). It is therefore right for the companies to consider broad best value implications of this, including affordability for customers, deliverability and the additional value that options to meet these targets may bring.

Hafren Dyfrdwy

Hafren Dyfrdwy’s water resource zones are resilient to 1 in 500 drought. No further work is required to achieve this target.

Severn Trent

Severn Trent’s investment scenario modelling has demonstrated that the choices that we need to make by 2040 are dominated by abstraction licence capping to avoid WFD deterioration. We have tested different timings of when licence capping could occur between 2030 and 2040. Our preferred plan provides the low/no regret solutions to meet this. This is the most material issue we face by 2040. Severn Trent has yet to test the sensitivity of the timing of 1 in 500, and intends to explore this between draft and final plan, but we do not anticipate this will change actions needed to be taken by 2040 as these are driven by licence capping.



South Staffs

South Staffs has reviewed a number of scenarios for achieving the changes to both personal consumption and leakage. These scenarios looked to optimise the profile of achieving these changes from both a cost and delivery point of view, and therefore identified any key enablers to deliver this work. Key enablers include the delivery of the Government initiative of water labelling which is a key driver in the reduction of household consumption. In addition, universal smart metering is also required in order to deliver the scale of reduction of both leakage and household consumption required in the timescales required.

The profiles included for achieving these policy-driven outcomes are reliant on the rollout of universal smart metering throughout the South Staffs water resource zone during 2025-30 (AMP8) and 2030-25 (AMP9). This unlocks additional options that provide value for money to target demand reductions and provide the best value for customers. Without smart metering, we are unable to achieve these policy-driven outcomes. This is also true for water labelling – without the introduction of water labelling, we are unable to meet the reduction in household consumption to 110 l/p/d.

The South Staffs water resource zone is already resilient to a 1 in 500 year drought and so no additional work is required to achieve this level.

United Utilities

United Utilities has reviewed a number of scenarios for achieving the policy targets for both personal consumption and leakage. These scenarios looked to optimise the profile of achieving these changes from both a cost and delivery point of view, and therefore identified any key enablers to deliver this work. Key enablers include the delivery of the Government initiative of water labelling which is a key driver in the reduction of household consumption. Smart metering is also required in order to deliver the scale of reduction of both leakage and household consumption required in the timescales required. The profiles included for achieving these policy-driven outcomes are reliant on the rollout of smart metering throughout our water resource zone during 2025-30 (AMP8) and 2030-35 (AMP9). This unlocks additional options that provide value for money to target demand reductions and provide the best value for customers. Without smart metering, we are unable to achieve these policy-driven outcomes. This is also true for water labelling – without the introduction of water labelling, we are unable to meet the reduction in household consumption to 110 l/p/d.

United Utilities' supply area is currently not resilient to a 1 in 500 year drought, but with the ambitious leakage and demand plans described above it is highly likely United Utilities will be resilient to 1 in 500 year droughts by 2039. United Utilities reports that:

- Our preferred plan delivers on the Government's policy target to halve leakage and reduce per capita consumption (PCC) to 110 l/p/d by 2050.
- We have continued to evolve our leakage strategy, further increasing our focus on prevention and awareness. As such, our proposed programme includes significant investment in mains renewal and network sensors.
- In terms of PCC, we are proposing to implement extensive smart metering across our area, plus undertake a wide range of water efficiency activities.



- Despite our comprehensive plans, it is clear we will need to work in collaboration with Government to achieve a PCC of 110 l/p/d. In particular, our proposed plan is contingent on the introduction of water labelling and it providing the benefits estimated by industry studies.

Welsh Water

The achievement of a 1:500 level of service is dependent on the delivery of our enhanced metering policy during AMP8 and AMP9 and the savings in demand for water this will bring. The identified network schemes in SEWCUS are 'best value' as they address the identified pinch points in supply during drought. Delivery is required in 2025-30 (AMP8) to ensure we can achieve drought resilience of 1:200 before the reductions in demand enable the move to a higher level of resilience of 1:500.