WATER RESOURCES MANAGEMENT PLAN

ANNUAL REVIEW 2022

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 EXECUTIVE SUMMARY

The purpose of this annual review is to report on our performance during 2021-22 and it has been updated from the version published in June 2022 following regulator feedback. It compares our outturn values for 2021-22 with our forecast Revised WRMP19 values, and how these may differ from our original WRMP19. It does not contain information on our performance or progress during 2022-23.

The separate Revised WRMP19 (December 2022) provides the updated supply demand balance forecasts for AMP7 and beyond. It sets out the latest progress on AMP7 schemes and mitigation measures associated with our 1 in 200 year drought scenario. Our Revised WRMP19 is published here: https://www.portsmouthwater.co.uk/news/publications/water-resources-planning/

We are a community focussed water company, with a strong history in supporting and maintaining good relationships with our customers. We also have a changing role in delivering a resilient water supply across the South East region, with our bulk supplies to our neighbouring water company, and the development of the Havant Thicket winter storage reservoir in collaboration with Southern Water, which is due for completion early 2029.

Our Water Resource Management Plan (WRMP) 19 was published in November 2019 and sets out how we plan to maintain our supply demand balance up to a 1 in 200 year dry weather scenario between 2020 and 2045. Our Annual Review 2020 highlighted that in 2019-20, we had not achieved certain WRMP19 targets (PCC), but that we had over performed significantly on other WRMP19 targets (leakage). In addition to this, our proposed AMP7 supply schemes have been undergoing environmental assessment and further analysis which has meant adjustment to the implementation schedule of these schemes.

In consultation with the Environment Agency, we decided that producing a set of revised planning tables was the most appropriate way to identify whether a risk was present to our proposed bulk supply commitment to Southern Water or the supply of water to customers may not be fully resilient up to a 1 in 200 drought event. Our Revised WRMP19 makes use of our most recent data, knowledge and methodologies, using our new forecasts which have recently been updated in 2022 for our WRMP24.

There is no doubt that the impact of Covid during 2020-21 was significant on the operation of our business. It affected both how we could work as a business and how our customers consumed water. This meant a significant change in the pattern of water use, with people using water in their domestic property throughout the day and a large drop off in commercial water use due to the closure of businesses. To some degree, these challenges persisted into 2021-22. Despite this we maintained our supply with no significant impacts to our customers. Furthermore, we have moved forward with our Havant Thicket delivery plan.

The key headlines within this Annual Review are:

- Our outturn value for PCC is 160.3 l/h/d, which is above our Revised WRMP19 forecast of 154.3 l/h/d. Whilst not on target, this is a significantly improved position compared to 2020-21, when average household PCC was 15 l/h/d higher than target. We are continuing to implement our plans to reduce PCC.

- Driven by a cold winter, our outturn leakage figure is 26.93 Ml/d, which is higher than our Revised WRMP19 target by around 1.6 Ml/d. Despite this we are aiming to achieve our WRMP19 leakage targets throughout AMP7, with a recovery plan in place.

- Despite the challenges of Covid we maintained a surplus in our outturn supply demand balances of 10.04 Ml/d and 27.05 Ml/d for the annual average and critical period scenarios respectively, so our customers were not at risk. However, it is recognised that if Southern Water had taken the full 30 Ml/d of bulk supplies (e.g. during a severe drought), the annual average supply-demand balance would have been in deficit.

- Our Revised WRMP19 shows that we are no longer meeting our target headroom for a 1 in 200 year drought scenario i.e. our risk and uncertainty allowance for the supply demand balance is fully used. It means there is a slightly higher risk we'd need to introduce emergency restrictions in a severe drought. This reflects a reduced benefit and increased delay in implementing our supply side options and also revisions to the baseline demand forecast to reflect outturn values and new WRSE methodologies.

Severe events such as a 1 in 200 year drought take multiple dry winters to evolve and so the risk of such an event within the next few years is low. However, we will continue to progress mitigation measures via our Revised WRMP19 in parallel with ensuring the development of a robust WRMP24 for 2025 and beyond.

2 GENERAL

2.1 Introduction

The Water Act 2003 places a duty on all water companies to prepare a Water Resources Management Plan (WRMP). As part of the WRMP process, it is a statutory requirement to review progress against the Plan and report it to the Secretary of State in an Annual Review.

We published our Final WRMP in November 2019 (WRMP19)[1], which has recently been updated to reflect both our current company position and advances in industry-wide approaches to improve our data and forecasts. This Annual Review will set out our performance in 2021-22 in comparison to this Revised WRMP19 (December 2022), which is published here: https://www.portsmouthwater.co.uk/news/publications/water-resources-planning/

Updated guidance published in March 2022[2] sets out the content of the Annual Review and the submission procedure. In accordance with the guidance, this review will:

- Highlight any changes that have been made since the development of WRMP19;
- Report on the actions that the Environment Agency and Defra asked us to work on after the publication of our final WRMP19 and Annual Review 2020;
- Report on progress against our forecast data for 2021/22 in our revised WRMP19 (Revised WRMP19); and,
- Report on the overall summary of the supply-demand situation
- Provide a forward-look for our WRMP programme

Our annual return data is used to confirm our Supply Demand Balance Index (SDBI), an Environmental Performance Assessment measure, previously called Security of Supply Index (SoSI). Our annual review and annual returns data will also be used in future to monitor our

[1] https://www.portsmouthwater.co.uk/wp-content/uploads/2019/11/Final-Water-ResourcesManagement-Plan-2019.pdf

[2] Water resources management plan annual review and annual data return, Guidance for water companies in England and Wales. Developed by the Environment Agency and Natural Resource Wales (March 2022)

progress in delivering the National Framework measures for England, such as reductions in per capita consumption, leakage and increases in water supply.

2.2 Supply Area

Portsmouth Water is a community focussed water company, with a strong history in supporting and maintaining good relationships with our customers. We also have a changing role in the South East region. We support our neighbouring water company, Southern Water, with bulk supplies of wholesome water so that they can reduce their abstractions on world renowned chalk rivers. Additionally, we are developing Havant Thicket winter storage reservoir in collaboration with Southern Water, which is due for completion early 2029, to enable a further bulk supply into their Hampshire zone.

Our supply area comprises a single Water Resource Zone (WRZ). The distribution system includes significant strategic treated water storage and a spine main that runs East to West across our Region. This system ensures that all of our customers in the supply area shown in Figure 1 experience the same level of service.

Figure 1: Portsmouth Water's supply area

There have been no changes to the company area or WRZ configurations since WRMP19. However some customers on new housing estates are supplied by New Appointments and Variation companies (NAVs).

2.3 Levels of Service and our drought plan

When dry weather conditions persist, causing groundwater levels to pass predefined trigger levels, we will implement our drought plan. Continued dry weather would result in a steady escalation of restrictions on household and commercial users of water, designed to reduce their demand for water. These restrictions range from Temporary Use Bans (TUBs) such as bans on the use of hosepipes to Non-Essential Use Bans (NEUBs, also referred to as ordinary drought orders) that may start to impact businesses in the local area.

As a last resort, water companies may also ask for emergency drought orders to allow the use of standpipes and rota cuts to further reduce the demand for water. These actions are part of the Emergency Plan and not the Drought Plan. We have agreed with our customers the

frequency at which demand restrictions might need to be implemented. The agreed Levels of Service (LoS) are:

- Temporary Use Bans to be implemented no more frequently than in a 1 in 20 year drought event.
- Non-Essential Use Bans to be implemented no more frequently than in a 1 in 80 year drought event.
- Emergency Drought Orders to be implemented no more frequently than in a 1 in 200 year drought event.

As we did this summer 2022, in advance of the possible implementation of TuBs we would engage with our customers to make them aware of the implications of the dry weather episode on the water resource situation for the company and ask them to reduce their water consumption voluntarily. In approaching customers, we use the full range of media types to efficiently reach as many sections of our customer base as possible.

Given that we did not introduce any water restrictions on customer usage in 2021-22, we have upheld our performance commitment in the WRMP and Business Plan.

Our new 2022 drought plan has been published since the last annual review, which complies with the latest drought planning guidance from regulators (Defra and Environment Agency, December 2020). The structure and tone of this plan has changed in order to meet the evolving requirements, including the need for plans to be clearer and easier for customers and other stakeholders to follow.

There have been no changes to our previously agreed LoS or supply side drought permit options. However, we have on-going programmes of work that were agreed with the Environment Agency and Natural England as part our permission to publish. We are continuing to work with Southern Water regarding their new drought triggers on the Itchen and we aim to provide the Environment Agency with a joint position statement, which will form an addendum to our drought plan. We also have on-going environmental assessment work taking place alongside the development of our draft WRMP24, which we will use to update our drought plan appendices once finalised.

3 WATER RESOURCE POSITION

In this section we provide a general view of the water resource position during 2021-22.

We experienced a dry start to the year with virtually no rainfall recorded at the Havant Station (E11470) during April. This was followed by a wet summer, a warm dry September, intense rainfall in October and then cold snaps and dry spells over the winter.

There was still some degree of Covid lockdown restrictions in place until September 2021. The eventual removal of the travel bans together with unseasonably wet conditions meant that demand was reduced during the summer months.

We went into the year with groundwater levels looking healthy, however despite the wet summer we dropped below average levels towards the end of the year. The following section explains weather fluctuations, groundwater levels and Covid impacts in more detail.

3.1 Rainfall & Groundwater Levels

Groundwater levels are a good indicator of the water available from the chalk aquifer from which we abstract the majority of our water for supply. We therefore monitor the levels on a daily basis and compare them to the 30 year long term average (LTA) and the Drought Trigger line, as shown in Figure 2.

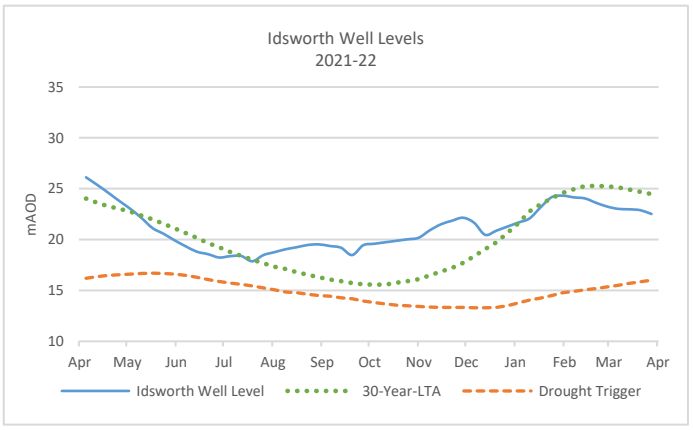

Figure 2: Groundwater levels

The effect of passing this trigger would have been to start proactively working with our customers directly and through the media, asking them to use less water voluntarily.

As the graph in Figure 2 shows, we started the year in a healthy resource position due to the wet winter at the start of the 2021 calendar year, which recharged our groundwater supplies.

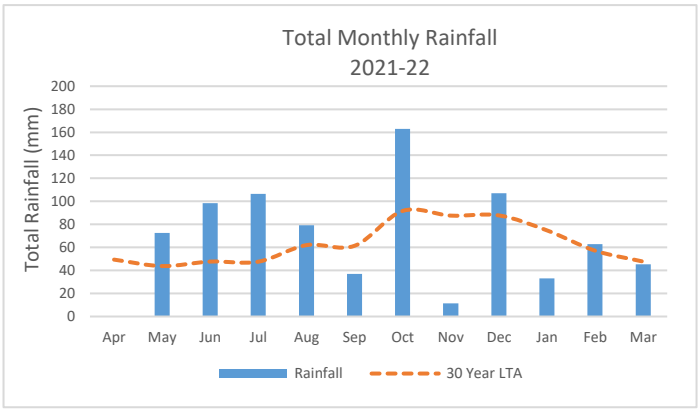

Figure 3: Total monthly rainfall

As shown in Figure 2 and Figure 3, a particularly dry April led to groundwater levels dropping below the LTA, although an unseasonably wet summer resulted in significant aquifer recharge and a recovery to above LTA. Whilst September was relatively dry, a very wet October (including Storm Aurore that caused widespread flooding) meant that our groundwater levels continued to rise. However, dry conditions prevailed in November and January, and as a consequence, we moved into April 2022 with groundwater levels having dropped below the LTA again.

This data clearly shows that 2021-22 was not considered a 'dry year' for reporting purposes.

3.2 Overview of the Impacts of coronavirus

As a company we have had to evolve alongside Covid and have now had time to adapt to the challenges it presents. As lockdown restrictions eased, we have been able to operate at a relatively normal capacity. This includes an increase of staff working within our offices, continuation of meter readings and fittings, and completion of priority repair and renewal works. That being said, lockdown restrictions and the ways in which our customers operate has still influenced water consumption. Change in usage habits compared to pre-Covid has resulted in a volumetric step up in household demand.

We have provided more detail on the impacts of Covid in the relevant sections throughout this report. However, the following points summarise changes compared to 'expected' results based on our demand models.

- **Distribution input** – We saw a 2% increase in Distribution Input (DI) demand compared to that expected in the year by our demand model. We estimate that this 2% increase is due to Covid related impacts (with no variation due to weather).
- **Household demand** – We have seen an 8% increase in household consumption compared to the model. The impacts of covid account for the entire 8% increase, with benign weather conditions. This is an increase of c.10 Ml/d in normal water usage, although we did not see the high peak demands experienced in 2020.
- **Non-household demand** – We have seen a 13% reduction in non-household demand compared to the model. The impacts of Covid account for the entire 13% reduction with c.10 Ml/d less demand during restriction periods. However, we have seen a gradual bounce-back in demand as restrictions eased during 2021/22, with usage nearing pre-Covid levels. Peak demand in 2021 was lower than 2020 due to benign weather.

Table 1 below shows our estimates of the overall changes in demand by customer category for each month. Note that household demand is consistently higher than expected whilst non-household demand is lower.

Effect of Covid				
Month	HH Demand	NHH Demand	Leakage	DI
April	10%	-10%	0%	4%
May	7%	7%	0%	6%
June	-6%	-21%	0%	-7%
July	-4%	-24%	0%	-7%
August	12%	-8%	0%	6%
September	6%	-11%	0%	2%
October	9%	-20%	0%	1%
November	13%	-19%	0%	4%
December	11%	-16%	0%	4%
January	13%	-13%	0%	5%
February	10%	-8%	0%	4%
March	14%	-9%	0%	7%
Average	**8%**	**-13%**	**0%**	**2%**

Effect of Weather				
Month	HH Demand	NHH Demand	Leakage	DI
April	1%	1%	5%	2%
May	-8%	-8%	4%	-6%
June	3%	3%	-9%	1%
July	0%	0%	-13%	-2%
August	0%	0%	-9%	-1%
September	0%	0%	5%	1%
October	0%	0%	-2%	0%
November	0%	0%	-8%	-1%
December	0%	0%	3%	0%
January	0%	0%	2%	0%
February	0%	0%	16%	2%
March	0%	0%	16%	2%
Average	**0%**	**0%**	**1%**	**0%**

Table 1: Effect of covid and weather on demand and DI

Despite the ongoing challenges of Covid we maintained supplies with no significant impacts to our customers. Furthermore, we have moved forward with our Havant Thicket delivery plan.

3.3 Daily Water Balance

In order to ensure sufficient production capacity is available to deliver the water required by our customers we use a live tool called the daily water balance. In the tool we have a rolling demand forecast that is used to plan production capacity requirements. Actual demand is overlain in the tool to improve future demand forecasts.

Figure 4 shows the data from the tool for 2021-22. It shows actual demand (DI) in blue and our available supply production capacity in amber.

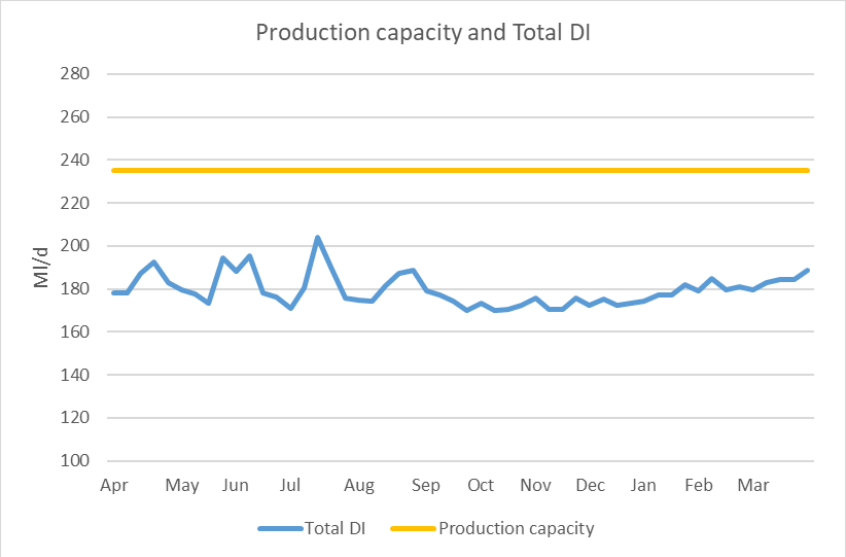

Figure 4: DI and production capacity forecast

As you can see in Figure 4, our production capacity remained the same throughout the year whilst total DI remained consistently below this. Above average rainfall during the summer meant the peak demand was significantly below demand forecast, which meant our network remained unstressed.

4 WRMP19 AND OUR REVISED WRMP19

In this section we discuss feedback we received from our WRMP Annual Review 2020, which reported on our 2019-20 performance, and the work subsequently undertaken as a result.

4.1 Background

Our WRMP19 sets out how we plan to maintain our supply demand balance up to a 1 in 200 year drought scenario between 2020 and 2045. Our Annual Review 2020 highlighted that in 2019-20, we had not reached certain WRMP19 targets (PCC), but that we over performed significantly on other WRMP19 targets (leakage). In addition to this, our proposed AMP7 supply schemes had been undergoing environmental assessments and further analysis which meant that we needed to adjust the implementation schedule of these schemes.

Feedback from Defra, Ofwat and the Environment Agency on the annual review 2020 was centred around concerns that the revised delivery schedule of schemes and the relatively high PCC could present a risk to our potential bulk supply commitment of an additional 9 Ml/d to Southern Water in 2024 and that our supply of water to customers may not be fully resilient up to a 1 in 200 drought event.

Our recommended action from Defra, Ofwat and the Environment Agency was to:

"keep track of the water available for bulk supplies to the region as a whole, and focus on demand management activities to minimise the risks to these proposed transfers."

Furthermore, the Environment Agency specifically stated that:

"The company should review the water available for the bulk supplies to Southern Water as given the multiple issues identified there is a risk to bulk transfer and potentially to security of supply that Portsmouth Water need to recognise, investigate and address. The company need to report progress through quarterly meetings and AR2021."

In consultation with the Environment Agency we decided that producing a set of revised planning tables was the most appropriate way to identify whether a risk was present. By creating revised planning tables, we could fully understand if there is a security of supply risk to our own customers, and to the bulk supplies to Southern Water in each drought scenario, and if so, identify potential mitigation measures to put in place until WRMP24 is implemented in 2025.

Our Revised WRMP19 tables draw upon our most recent data, knowledge, and methodologies, developed through workstreams associated with our emerging draft WRMP24. We believe this is the most appropriate information to use to give us an accurate view of our current position. Our Revised WRMP19 includes:

- Updated demand forecast, using outturn data and WRMP24 methodologies;
- Revised demand modelling to include a range of drought scenarios for calculation of baseline demand and demand option benefits;
- Re-calculation of target headroom figures to reflect uncertainty in new demand forecasts;
- Updated outage assessment, using WRMP24 methodologies;
- Updated leakage forecast, using outturn data and WRMP24 methodologies;
- Updated demand management options using current AMP7 strategies and WRMP24 forecasts;
- Updated deployable output and supply option schedule and benefits following further scheme analysis, including via our new Pywr system simulation model; and
- Use of our Pywr model to define the benefits from Temporary Use Bans (TUBS) and Non-Essential Use Bans (NEUBS) during the relevant drought scenarios.

Using industry best practice techniques, this work has refined our view of the original WRMP19 'options' that were selected by us to maintain the supply-demand balance. We have captured this refinement in Table 2.

It is recognised that because of this work there have been updates to our Revised WRMP19 relative to our Final WRMP19, and the reasons for these updates are outlined within this Annual Review report where appropriate. Following Annual Review guidance, such changes to components of the water balance and/or supply-demand balance because of better understanding are not routinely considered a 'material' change of the WRMP.

The initial development of our Revised WRMP19 took place as a separate piece of work to the 2021 annual report and was separately shared with stakeholders and regulators at the end of June 2021. The Revised WRMP19 report and accompanying tables have been updated again during December 2022 and are available here: https://www.portsmouthwater.co.uk/news/publications/water-resources-planning/.

Throughout the Revised WRMP19 project, we have been working closely with the Environment Agency to ensure that our approach is acceptable and answers the regulators original concerns. The values in our December 2022 Revised WRMP19 tables now represent our most up to date position and supersede the values in our original WRMP19. Therefore, we have compared our outturn data to our Revised WRMP19 values and supplied our original WRMP19 values for illustrative purposes only to show how they have changed.

Option code	Preferred Final Plan Option name	AMP7 (2020/21-2024/25)	AMP8 (2025/26-2029/30)	Revised WRMP 2019 adjustment
CO46	Household water efficiency programme (partnering approach, home visit)	2020–21		New basket of demand side options and benefits to reflect latest WRSE Group related work streams. Including; • Revised water efficiency programme • Virtual home visits • Change of Occupier metering • Further fixed network noise loggers to reduce leakage • The targeted provision of water saving devices
CO46b	Waterwise programme	2020–21		
CO26	Subsidy to customers that purchase water efficient appliances (washing machines and dishwashers, showers and WCs)	2020–21		
CO34	Water saving devices – Retrofitting existing toilets	2020–21		
CO06a	Metering on change of occupancy – existing meter pits	2020–21		
DO04a	Fixed network of permanent noise loggers connected to telemetry – Tranche 1	2020–21		
CO40	Water saving devices – spray taps	2020–21		
CO84	Voids metering	2020–21		
CO78	Voluntary restraint and leakage action	2020–21		
CO79	Mandatory restraint	2020–21		New view on the effectiveness of mandatory restraint from Pywr modelling
CO80	Imposition of Drought Direction Restrictions (mandatory commercial restraint)	2020–21		
RO68	Source S – Drought Permit	2020–21		Completed analysis and environmental reports. Revised yield benefit following Pywr modelling.
RO21a	Source O – Maximising DO	2020–21		Delivery now expected to be 2024-25 with a revised yield benefit following a feasibility review and Pywr modelling.
RO23a	Source H – Maximising DO	2020–21		Delivered and in place for 2022-23.
RO24a	Source C– Maximising DO	2020–21		Delivery now expected to be 2024-25 with a revised yield benefit following feasibility review and Pywr modelling.
RO22a	Source J – Maximising DO	2024–25		Updated assumptions regarding yield benefit and operation following a feasibility review and Pywr modelling. No change to implementation date.
DO04b	Fixed network of permanent noise loggers connected to telemetry – Tranche 2		2025–26	New basket of demand side options and benefits to reflect latest WRSE Group related work streams. This includes universal metering from 2025-26.
CO06	Metering on Change of Occupancy – all properties		2025–26	
RO13	Havant Thicket Winter Storage Reservoir		2029–30	Revised DO based on updated designs and further Pywr modelling

Table 2: Preferred Final and Revised WRMP19 Options

5 SUPPLY

In this section we review the elements of our performance that collectively account for our supply capability. We identify the outturn performance we have achieved from our sites against the Revised WRMP19, and subsequently explain the reasons for any difference between these values and our original WRMP19.

A summary of the differences between our Final WRMP19 and Revised WRMP19 **dry year** (1 in 200 year event) supply is provided in Table 3, alongside the outturn values of 2021-22.

Dry Year Supply 2021-22 assumptions (WRMP tables reference)	Final WRMP19 (1 in 200 year)		Revised WRMP19 (1 in 200 year)		Outturn Values	
	Annual Average Ml/d	Critical Period Ml/d	Annual Average Ml/d	Critical Period Ml/d	Annual Average Ml/d	Critical Period Ml/d
Deployable Output (7FP)	206.86	251.50	213.56	264.40	211.66	261.80
Outage (10FP)	12.2	11.6	6.7	6.4	7.8	9.12
Treatment works losses (9FP)	2.4	2.4	2.4	2.4	6.84	4.65
Bulk supply exports (6FP)	30	30	30	30	4.63	7.55
Total Water Available For use (WAFU) (13FP)	**161.41**	**206.60**	**174.46**	**225.60**	**192.39**	**240.48**

Table 3: Supply – Final WRMP19, Revised WRMP19 and outturn comparisons

Table 3 demonstrates our outturn WAFU was greater than both the Final WRMP19 and Revised WRMP19 requirements. It is noted that, unlike the Revised WRMP19, the Final WRMP19 data and outturn data does not include the benefit of TUBs and NEUBs within Deployable Output.

The following sections provide detail on the various contributing components of our supply capabilities displayed in the table above and explain our outturn values.

5.1 Deployable Output as Baseline supply

We completed a full review of Deployable Output (DO) in 2017 for WRMP19. In the review we explored 'conventional plus event-based DO or time-series' in line with Risk Composition 2 within the UKWIR guidance[3], which allowed us to consider the implications of alternative/more severe droughts than those in the historic record through the consideration of stochastic data. We have provided full details of this method in our Final WRMP19 and the DO Assessment.

A review of our water resource zone DO assessment has been carried out for WRMP24 using our new Pywr system simulation model, and the subsequent changes are now accounted for in our December 2022 Revised WRMP19 and the outturn DO calculation.

5.1.1 Outturn Deployable Output

This section summarises the adjustments made at an individual site basis when calculating our outturn DO.

We did not include Source U within the WRMP DO numbers, as we converted it to a solely raw water augmentation source prior to 2017. However, two sources (Source I and Source E) have

[3] UKWIR, 2016, "WRMP 2019 Methods – Risk Based Planning", UKWIR Ref. 16/WR/02/11.

experienced long term outages due to water quality issues since 2017 and have been removed from the outturn DO for 2021-22.

We have provided the total adjustments made to the WRMP19 DO values in Table 4.

DO Reductions	Annual average Ml/d	Critical period Ml/d
Final plan 2021-22 dry year DO in Revised WRMP19	213.56	264.40
Source I: Long term outage	-1.5	-2.1
Source E: Long term outage	-0.4	-0.5
Outturn 2021-22 dry year DO against Revised WRMP19	**211.66**	**261.80**

Table 4: Outturn dry year DO for 2021-22

The outturn DO values for the 2021-22 dry year are 211.66 Ml/d and 261.80 Ml/d for the annual average and critical period, respectively.

5.1.2 DWI Notices

We have had a number of DWI notices served on our treatment works for parameters including cryptosporidium, hydrocarbons, and risks to disinfection. Each site has a programme of works designed to deal with the issues, including treatment upgrades, installation of monitors where required, increased monitoring and changes to company processes. None of the DWI notices and associated works currently have any impact on the resilience of supply from a WRMP perspective. However the planned site review and investigation of aluminium issues at Source A might lead to a requirement for works in the future that could temporarily impact available DO.

5.2 Outage

Outage is defined as a temporary loss of deployable output at a source works. It can relate to planned or unplanned events and covers a wide range of influences from power failure to short term pollution incidents.

5.2.1 Revised WRMP19 Outage

Our Revised WRMP19 uses the new consistent approach to outage assessment which was developed for the Water Resources South East (WRSE) regional plan, and which each of the member companies are using for the development of their WRMP24s. This provides the most up to date industry approach and latest company knowledge.

For the Final WRMP19, we analysed data for the period 2007-2016. For the Revised WRMP19, we based our assessment on data from 2013-2020. We selected this period to provide a good balance between data quality and length of data set. The new outage assessment includes the benefits of our Final WRMP19 preferred options, as well as accounting for the actions we have undertaken during AMP6 and in support of our Business Plan to consider resilience and additional requirements both in the short and long term.

The assessment methodology and results were presented to the Environment Agency to ensure they found the approach acceptable for use in the Revised WRMP19.

We calculated outage allowances for the dry year annual average (DYAA) and dry year critical period (DYCP) scenarios. The calculated outage allowance values are shown in Table 5 and they represent the scenario with a probability of 90% (or an exceedance probability of 10%).

Outage allowance scenario	Final WRMP19		Revised WRMP19	
	Value in Ml/d	As a % of DO	Value in Ml/d	As a % of DO
DYAA	12.2	5.9	6.7	3.1
DYCP	11.6	4.6	6.4	2.4

Table 5: Outage allowance for the Final and Revised WRMP19

The revised outage allowance is lower than the published Final WRMP19 allowance for the following reasons:

- All long duration events were capped at 90 days.
- Events were separated into long and short duration events, with specific probability distributions for both. This prevented the skewing of duration distributions, which artificially increases the outage allowance.
- The choice of distributions used were reviewed for all site/hazard combinations with a contribution to outage >0.2 Ml/d.
- Length of data record used in the assessment was also reviewed. In order to balance data quality with capturing a sufficient period of data, the record from 2013 to 2020 has been used for the revised assessment to determine the outage allowance.

In addition to our Revised WRMP19, the revised outage allowance is being used within our draft WRMP24, which is out for public consultation here until 20 February 2023: https://haveyoursayportsmouthwater.uk.engagementhq.com/.

5.2.2 Outturn Outage

In the WRMP guidance, outturn Outage falls into three categories:

- Less than 3 months and which has not been undertaken for maintenance or other planned reasons
- Less than 6 months and should have an action plan to recover the losses
- Longer than 6 months but the mitigation plan has been agreed by regulators

Therefore outages longer than 6 months without an agreed mitigation plan are not included in our outturn outage figures but have been accounted for in reductions to the DO detailed in section 5.1.1.

In the 2021 Annual Review Source H was a long term outage (water quality concerns) with a plan to bring the site back on line. Source H is now back on line, although for most of the review year it was still off line and therefore remains within the outturn outage calculation for 2021-22.

This makes the 2021-22 actual outage 7.8 Ml/d annual average and 9.12 Ml/d critical period, compared with our Revised WRMP19 outage allowance of 6.7 Ml/d average and 6.4 Ml/d critical period (see Table 5).

5.2.3 Managing outage

We understand the need to manage outage carefully as it is a key component of our supply demand balance. A major threat to outage at our treatment works is from oil spills, and so one of the studies we undertook in AMP6 explored the most effective solution to ensure resilience to this risk. Although no properties are at risk of supply on an average day, around 100,000 customers would be at risk of short term low pressure at peak demand. Our 2020-25 Business Plan therefore includes £2.4m to address the risk and improve resilience at peak demand.

As part of this investment, we participate in three Catchment Partnerships which include initiatives to reduce domestic oil pollution for example through the offer of subsidised surveys of old oil tanks and/or subsidised replacement of oil tanks with plastic double bunded tanks. We have also recently installed VOC monitors at all sites at risk from pollution, to be able to better monitor the pollution plume and make an informed decision on when the site can be started up again. This is likely to reduce the outage durations of any future pollution events related to oil spills.

Furthermore, we are implementing a new system called Storage and Production Optimisation in Real Time ("SPORT"). The SPORT system will continuously analyse and select the optimum pump combinations from the multiple inter-connected sources we operate to balance reservoirs and meet customer demand. Where outage occurs, the SPORT system will allow automated capability to restart works, and where this is not possible, SPORT will analyse and modify the optimum pump combinations on available pumps. Only where reservoirs cannot be balanced within defined limits will out of hours responses be required.

5.3 Bulk Supplies

We currently operate two bulk supplies to Southern Water. One is feeding East into their Sussex Zone, with a capacity of 15Ml/d which is available on a 'best endeavours' basis, with a sweetening flow of 1 Ml/d required at all times. Our second bulk supply to Southern Water is from our Source A, sending water West into their Hampshire Zones. It is also up to 15 Ml/d with water volumes guaranteed through a reservation basis, implemented between our respective company production teams.

In addition to our current bulk supplies, we are also planning to supply Southern Water with additional bulk supplies in the future to support their Hampshire zones as they continue to reduce abstraction from their chalk rivers. One of these additional bulk supplies is due to commence in 2024 at a volume of 9 Ml/d, although it is dependent on the outcome of on-going borehole investigations.

5.3.1 Outturn bulk supplies

For conservative planning purposes, in the Final and Revised WRMP19 plans we have assumed that the exports are 15 Ml/d for both annual average and critical period, totalling 30 Ml/d to Southern Water. In 2021-22 we exported significantly less than the 30 Ml/d the plans allow for, as shown in Table 6. This difference has supported the surplus in our outturn supply demand balance.

	WRMP19 2021-22	Outturn value 2021-22
Annual average	30 Ml/d	4.63 Ml/d
Critical period	30 Ml/d	7.55 Ml/d

Table 6: Total bulk supply exports to SWS

The critical period value is defined as being the volume supplied to Southern Water during the peak week (i.e. the week at which total distribution input was at its highest).

5.4 Treatment works losses and operational use

Treatment losses is the term used to describe water that is taken from the environment but does not enter supply due to requirements of the treatment process or maintenance and upkeep of the distribution network.

To calculate losses, we subtract the bulk supplies and distribution input values from the total raw water abstracted. Table 7 below shows the numbers used to derive our outturn average and critical period values for 2021-22. We have further detailed distribution input in section 9.

As with the bulk supplies, the critical period is defined as the peak week at which total distribution input was at its highest. We have explained the impact of covid on distribution input in section 9.2.

Losses	Annual average Ml/d	Critical Period (Ml/d)
Raw water abstracted	188.66	219.74
Bulk Supplies	4.63	7.55
Distribution Input	177.19	207.54
Treatment works losses and operational use	**6.84**	**4.65**

Table 7: Calculation of outturn treatment works losses and operational use

5.5 Sustainability Schemes as Baseline supply

Portsmouth Water's area of supply includes numerous protected rivers, harbours and coastlines, highlighted in Figure 5.

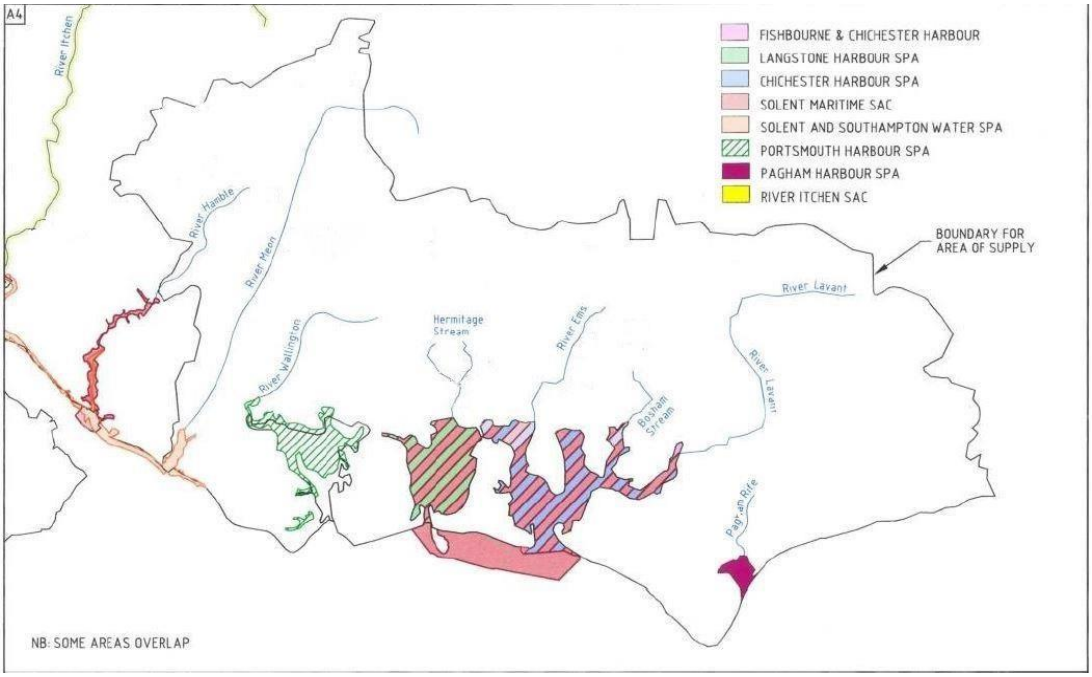

Figure 5: Protected areas within Portsmouth Water's area of supply

The Company has complied with all previous sustainability reductions and has voluntarily reduced a number of abstraction licences in the past.

5.5.1 AMP7 WINEP Schemes

In this section we set out which activities were included in the Water Industry National Environmental Programmes (WINEP) for AMP7 and our progress against our delivery targets.

In 2018, the Environment Agency set out which activities were to be included in our WINEP3. This included three water resource schemes to be undertaken during AMP7. The schemes remain in their investigatory phases, and so have no impact on the DO forecasts of 2021-22. However, we have outlined them in the following sections.

Scheme 1; Source F WFD No Deterioration

This WINEP investigation is required to investigate and undertake options appraisal for preventing deterioration of ecological status from flow pressures, in the two waterbodies identified by the EA as being impacted by abstraction at our Source F. In June 2020 we appointed a consultant, Wood, to undertake this WFD No Deterioration investigation on our behalf. Phase 1 of the project was completed which included a summary of previous investigations, a review of impacts of abstraction in the Meon catchment, a review of ecology data, and an assessment of the predicted future abstraction growth from the site.

From previous investigations and an initial review of current data it may be concluded that the river is not adversely impacted by current rates of abstraction. However, it cannot be concluded at this stage that there is no risk of future increases in abstraction within and beyond the Meon catchment that could potentially further reduce river flows in the Meon. As the Meon is already failing the EFI (at Q50 and below), any further increase in abstraction impact is considered to present a risk of deterioration according to the Environment Agency guidance. Since failures of the EFI do not appear to have manifested in ecological impacts, this might suggest that a local flow target may be more appropriate for the river than the EFI.

During 2021-22 the focus on the Source F WINEP study initially shifted to a review of the Meon catchment as a whole, and then to a holistic (but preliminary) review of licences across the Portsmouth Water supply area. This allowed us to estimate the uncertainty associated with the environmental ambition and emerging licence capping scenarios promoted by the Environment Agency. These estimates are being used within the WRSE regional planning processes and strongly influence our draft WRMP24, which is out for public consultation here until 20 February 2023: https://haveyoursayportsmouthwater.uk.engagementhq.com/.

The delivery date for the Source F WINEP study is the end of March 2025. However, it is possible delivery will need to move to AMP8 to allow the licence to be formally reviewed alongside some of our other licences. This would take place via the AMP8 WINEP process and allow the best value environmental solution(s) across catchments and the wider Portsmouth Water supply area to be identified.

Schemes 2 & 3; River Itchen CSMG & River Itchen Salmon Action Plan

In our annual review 2020-21 we reported how a WINEP investigation was scheduled to be undertaken to assess the impact surface and groundwater abstraction has on the flow of the river Itchen. Alongside Southern Water and South East Water we developed a scope, and commissioned Wood to undertake the assessment during 2020-22. In April 2022, Wood published their first draft report titled 'River Itchen CSMG flow target and Salmon Five Point Approach WINEP investigations'.

During the course of the investigation, stakeholders partook in eight Project Steering Group (PSG) meetings during the Impact Assessment and Options Appraisal stage. The PSG discussed how reducing or ceasing abstraction at certain points along the river would impact flow in the

Itchen in order to meet flow standards. Based on provided data, models were run to show the water demand within the catchment and the viability towards achieving flow standards.

It was concluded that a 'light touch' options appraisal is the most appropriate for this WINEP study because its aim was to indicate the scale of the problem and the possible costs and timescales associated with the water resource imports that would be needed to replace local abstractions. Groundwater and river flow models have shown with a high degree of confidence that the flows in the river Itchen are not compliant with either EA EFI ASB3 or Natural England's CSMG environmental river flow standards in the upper reaches of the River Arle SSSI Unit, throughout the Candover Stream SSSI Unit, and in the Middle/Lower Itchen SSSI Units. For standards to be met, licence reduction would have to occur for roughly 40% of the time with greater reduction during periods of low flow. No other types of flow support mitigation are considered to be acceptable as they would not permit the achievement of Natural England's 'natural functioning' Favourable Condition Table conservation objectives.

New water resource strategic schemes are currently under consideration within regional modelling that will inform our WRMP24 (and South East Water and Southern Water's WRMP24s). The water companies could provide additional alternative supply but at high capital and operational costs with significant extra carbon associated with construction, treatment and pumping operations. These strategic schemes may be in operation by 2030-2040 bringing additional supply from Havant Thicket Reservoir, recycled water, new small groundwater schemes and the Thames Transfer Strategic Regional Option (SRO). Planning for both environmental and public water supply resilience will be very important in the face of future climate change and more extreme droughts.

Work continues to investigate other types of holistic catchment mitigation and improved land stewardship which should lead to significant water quality improvements and the creation of more resilient habitats. However, whilst essential for water quality these measures will not generate significant additional water resource or river flows during dry periods. The timescale for any implementation of CSMG targets, associated licence changes, and day-to-day management remains a key question for water company planning, and Environment Agency regulation. For the River Itchen, further detailed work is required to assess how CSMG licencing would be implemented and regulated in real time. In particular, more research and operational trials are needed to explore if and how the 'battery' of water from alternative distant reservoir(s) could be imported regularly and flexibly in response to the variable supply shortfalls from constrained local sources within the catchment.

6 SUPPLY OPTIONS

In this section we discuss the progress made in understanding and delivering the enhanced DO schemes identified in the final WRMP19.

Our Final WRMP19 required supply-side interventions to ensure the supply of our customers and of the bulk supplies we have committed to exporting to Southern Water. Since publishing the Final WRMP19, we have made significant advancements in our understanding of the DO benefits using our Pywr simulation model and have also updated the implementation timelines of these schemes. The updated knowledge is accounted for within our Revised WRMP19 (December 2022) and therefore within the deployable output aspects of this 2022 annual review. We have provided the 1 in 200 year benefits in Table 8 below for comparison.

Supply Side Scheme	Final WRMP19			Revised WRMP19 (December 2022 tables)		
	Assumed DO benefit (average) Ml/d	Assumed DO benefit (critical period) Ml/d	Implementation date	Assumed DO benefit (average) Ml/d	Assumed DO benefit (critical period) Ml/d	Implementation date
GW schemes total benefit (maximising DO at Source O, C, H & J)	20.3	22.8	2019-20	13.3	10.5	Source H recently implemented. Source O, C and J to be implemented in 2023-24.
Drought Permit at Source S	8.5	8.5	2017-18	3.6	4.5	2020-21
Havant Thicket winter storage reservoir	23	50	2029-30	21.1	21.3	2029-30
TUBS/NEUBs (at 2021/22)	20.66	43.22	All	16.6	21.5	All

Table 8: Final WRMP19 and Revised WRMP19 supply-side option benefits and implementation (1 in 200 yr)

6.1 Maximising DO at Source C, Source H, Source O and Source J

Further information on these groundwater supply schemes and assumptions is provided within the Revised WRMP19 (December 2022) located here: https://www.portsmouthwater.co.uk/news/publications/water-resources-planning/

6.2 Drought Permit at Source S

Source S is our drought permit source, which was estimated to provide 8.5 Ml/d benefit to the DYAA and DYCP scenarios in droughts equivalent to, or worse than, a 1 in 125 year event. The nature of the option remains unchanged from our Final WRMP19. However we have undertaken further work to demonstrate:

- that the source has operated at rates close to those required in the past.
- there is sufficient time to mobilise temporary treatment infrastructure as a drought develops.
- the environmental impact of the drought permit and the necessary monitoring and mitigation.

Furthermore we have used our Pywr model to check for constraints within our supply network. The results indicate that Source S permit may only provide a benefit of up to 4.5 Ml/d under the DYAA and DYCP scenario in droughts equivalent to, or worse than, a 1 in 125 year event.

This is because we cannot fully transfer water from the Source S permit to the parts of our Water Resource Zone where this water is most needed. We have used the Pywr modelled benefits within our Revised WRMP19 tables and the final supply demand balance.

We are working closely with Southern Water on the environmental monitoring to maximise opportunities for joint efficiencies with a source they operate nearby. We have also provided the reports and progress updates to the Environment Agency through our regular meetings.

Further information is available within our final 2022 Drought Plan published here: https://www.portsmouthwater.co.uk/news/publications/water-resources-planning/

6.3 Havant Thicket winter storage reservoir

Havant Thicket Winter Storage Reservoir is a significant construction project being undertaken as a collaboration between Portsmouth Water and Southern Water. It will provide resilient water supplies to the region, supporting reduced abstraction on chalk rivers. The project has an overall biodiversity net gain and will offer a new community leisure facility for the area.

Planning permission for the reservoir has been granted and the implementation date of this option (2029-30) has not been adjusted for the Revised WRMP19. However, since publication of the Final WRMP19, there is more clarity on the operational methodology of the completed reservoir and initial assumptions have been revised. Further information is available in our Revised WRMP19 here: https://www.portsmouthwater.co.uk/news/publications/water-resources-planning/

6.4 Temporary Use Bans and Non-Essential Use Bans

Our Drought Plan describes how we use Temporary Use Bans (TUBs) and Non-Essential Use Bans (NEUBs) to lower the demand for water and conserve supplies as a drought develops.

We have used the regional Pywr simulation model to identify the supply benefit of TUBs and NEUBs. Our Revised WRMP19 now includes this benefit as a supply side option in line with our levels of service and regulator guidance. It is noted that our Final WRMP19 used a different approach and included the benefit as a demand side option.

7 BASELINE DEMAND

In this section we discuss how we have used the latest methodologies to assess baseline demand and applied that view to this report.

Since the publication of our Final WRMP19 in 2019, we have produced an updated baseline demand side forecast to input into the WRSE regional model for the development of the draft regional plan, and subsequent WRMP24. We have followed the most recent methodologies and used the latest data which has been audited both internally and externally by WRSE. The forecasts included previous outturn values to produce forecasts starting prior to 2020. It was therefore appropriate to use this data as the basis for our Revised WRMP19.

The base year for the demand forecast is the Revised WRMP19 Is 2019-20 and we have used updated methodologies for calculating Per Capita Consumption (PCC) and leakage. It is important to note that the base year outturn values were pre-covid. Therefore the forecasts do not include any effects from the change in consumption patterns due to the pandemic, which are described further in section 9.2. Due to the uncertainty in future covid impacts on baseline demand, we have included this uncertainty as a component within our revised target headroom assessment instead of adjusting the baseline demand forecast itself.

Table 9 shows the difference between the Final WRMP19 and Revised WRMP19 forecasts.

	Baseline demand forecast (annual average)	
	Final WRMP19 (Ml/d)	Revised WRMP19 (Ml/d)
2020-21	175.93	176.89
2044-45	185.08	194.69

Table 9: Baseline demand forecast start and end values for Final and Revised WRMP19

The overall baseline demand forecast for our Final WRMP19 rises from 175.93 Ml/d in 2020-21 up to 185.08 Ml/d by 2044-45. Our Revised WRMP19 reflects our latest methodologies and previous outturn values, which results in a higher starting point of 176.89 Ml/d in 2020-21, rising to 194.69 Ml/d by 2044-45.

Further information on our Revised WRMP19 baseline demand forecast, including properties and population, household and non-household consumption and leakage components can be viewed here: https://www.portsmouthwater.co.uk/news/publications/water-resources-planning/

8 DEMAND MANAGEMENT OPTIONS

In this section we discuss how we have reviewed our demand options and how that has been used in our Revised WRMP19 work.

8.1 Final WRMP19 options

The demand options selected for our Final WRMP19 for implementation throughout AMP7 and beyond were:

- Household water efficiency programme (partnering approach, home visit)
- Waterwise programme
- Subsidy to customers that purchase water efficient appliances (washing machines and dishwashers, showers and WCs)
- Water saving devices – Retrofitting existing toilets
- Metering on change of occupancy – existing meter pits
- Fixed network of permanent noise loggers connected to telemetry–- Tranche 1
- Voids metering
- Water saving devices – spray taps
- Water saving devices – trigger nozzles for hoses
- Smart Meter MNFR Trial
- Voluntary restraint and leakage action
- Mandatory restraint
- Imposition of Drought Direction Restrictions (mandatory commercial restraint)

The demand options selected for implementation in 2025–26 and beyond were as follows:

- Fixed network of permanent noise loggers connected to telemetry – Tranche 2
- Metering on Change of Occupancy – all properties

8.2 Revised WRMP19 options

We have updated our AMP7 demand management options to reflect the new basket of options selected by WRSE towards its draft regional resilience plan, and in preparation for our WRMP24.

Our demand management options in AMP7 and beyond have been updated in our Revised WRMP19 to reflect our current strategies, which are based on our WRMP19 starting point (2020-21) and best available information going forwards. The Revised WRMP19 options are as follows:

- Optant metering
- Change of occupancy metering
- Universal metering (after 2024-25)
- Household Water Efficiency Programme
- Non-House Hold (NHH) Water Efficiency
- Leakage reduction (AMP7)
- Leakage reduction (Long Term i.e. after 2024-25)

We have included the benefit of these options within the final supply demand balance of our Revised WRMP19. Our Revised WRMP19 provides further information on these options and can be accessed here: https://www.portsmouthwater.co.uk/news/publications/water-resources-planning/

9 DISTRIBUTION INPUT

Our distribution input (DI) is the amount of water we put into our network each day and is our headline measure of demand. In this section we detail our Revised WRMP19 final plan forecast demand against our outturn demand for water in 2021-22. We consider distribution input, and its components, including household demand, water efficiency, non-household demand, PCC and leakage. The impact of Covid on our outturn demand is also considered.

For most outturn years the 'Macro Components' of demand; unmeasured demand and measured demand, do not add up precisely to the measured Distribution Input (DI). The Annual Review process requires us to reconcile any imbalance using the Maximum Likelihood Estimation (MLE) methodology. All outturn data provided in this review are the post MLE values and are provided in the data tables in Appendix A using the new data return guidelines[4].

We have compared outturn results against the Revised WRMP19 dry year (1 in 20 year) forecasts. This approach is aligned with the EA guidance for the Annual Review which requires comparison against dry year values.

9.1 Outturn distribution input

A summary of how our DI compared to our Revised WRMP19 forecast is shown in Table 10 below.

	Revised WRMP19 Forecast 2021-22		Outturn 2021-22	
	Annual average Ml/d	Critical Period Ml/d	Annual Average Ml/d	Critical Period Ml/d
Distribution Input	174.50	215.79	177.19	207.54

Table 10: Outturn Distribution Input compared to Revised WRMP19 DI

It is clear from the outturn values that our annual average outturn DI has exceeded that planned for 2021-22. The year was not considered a 'dry year', yet the DI is higher than that forecast for a dry

[4] Technical guidance for completion of WRMP annual review data return, Environment Agency, March 2022

year. We believe this is primarily due to the impacts of Covid on customer consumption, which we have explained in detail below, and in the other relevant sections in this report.

9.2 Impact of weather and Covid on distribution input

In this section we outline the analysis we have undertaken to investigate how Covid impacted demand and the various components. The 'expected' DI values stated and shown in the figures refer to the expectations from our demand model, rather than the Revised WRMP19 forecast.

Figure 6 below looks across the year. We have observed a 2% increase in Distribution Input compared with pre-Covid demand. We have estimated this to be fully owing to Covid impacts. Increased household consumption was offset by a reduction in non-household demand until the autumn. It is also noted that benign weather in 2021-22 reduced the peak demand relative to the previous year.

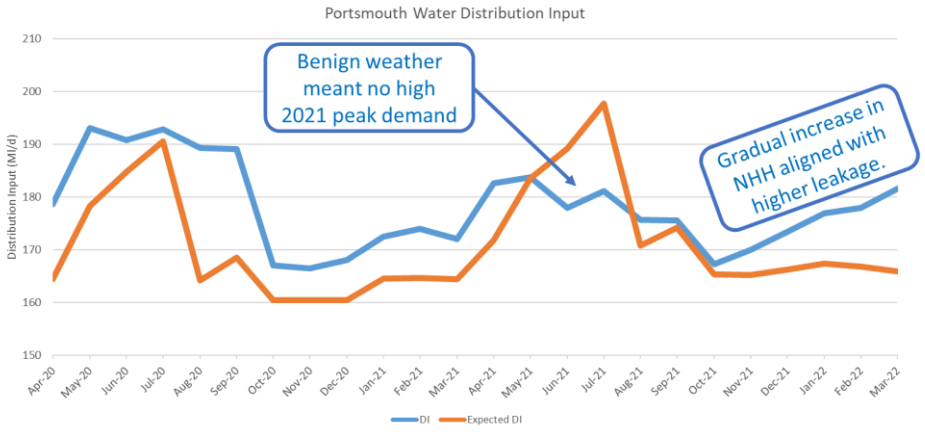

Figure 6: Outturn Distribution Input

9.3 Leakage contributing to distribution input

In this section we cover our leakage performance. Leakage is an element of demand that is mostly in the control of companies, but is also subject to the impact of weather, typically extremes of weather that cause ground movement.

A summary of how our outturn leakage compared to our Revised WRMP19 forecast is shown in Table 11 below.

	Revised WRMP19 Forecast 2021-22		Outturn 2021-22	
	Annual average Ml/d	Critical Period Ml/d	Annual average Ml/d	Critical Period Ml/d
Leakage	25.34	25.34	26.93	26.93

Table 11: Outturn 2021-22 leakage compared to Revised WRMP19

Despite the increase in outturn leakage compared with the previous year, we remain in a good position to achieve our leakage targets throughout AMP7. A recovery plan is in place to reduce leakage to pre-Covid levels.

Since missing our target in 2017-18, our leakage recovery plan has reduced leakage from 33.38 Ml/d down to 26.93 Ml/d through improved efficiencies and additional expenditure. We are fully committed to continuing to reduce leakage, and will do so by:

- Expanding our network of acoustic monitors;
- Continuing our innovative work on micro-pressure logging and AI software; and,
- Continuing to enhance our ability to run a calm network through the creation of a company-wide Digital Twin network model.

9.3.1 Impact of the weather and covid on leakage

There have been no impacts on leakage due to covid. However, we did see a 1% overall increase in leakage compared to what we would have expected, due to the cold winter weather. Figure 7 shows the expected and actual levels of leakage throughout the year.

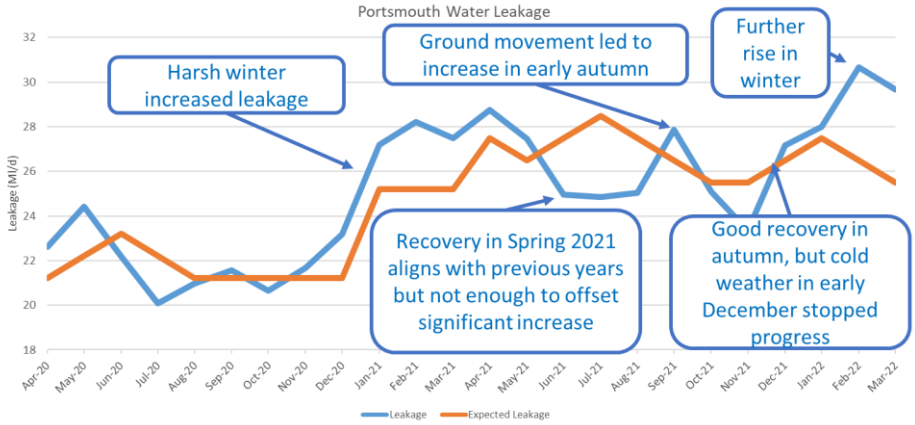

Figure 7: Impacts of weather and covid on leakage

9.4 Household Per Capita Consumption contributing to distribution input

In this section we cover our PCC performance, how it compares to our Revised WRMP19 dry year forecast for 2021-22 and the reasons for variation. Table 12 provides an overview of the figures.

Per capita consumption (l/h/d)	Revised WRMP19 Forecast 2021-22		Outturn 2021-22	
	Annual Average	Critical Period	Annual Average	Critical Period
Measured Household	137.00	175.00	144.61	173.95
Unmeasured Household	163.00	227.00	167.02	213.67
Average Household	**154.31**	**209.60**	**160.30**	**201.70**

Table 12: Outturn PCC compared to Revised WRMP19 dry year

Our average measured and unmeasured PCC is between 4 and 8 l/h/d higher than forecast, leading to an average PCC of 6 l/h/d higher for 2021-22 compared to our Revised WRMP19.

Our critical period measured and unmeasured PCC is between 1 and 13 l/h/d lower than forecast, leading to an average critical period PCC of 8 l/h/d lower for 2021-22 compared to our Revised WRMP19.

Despite missing our annual average targets the outturn values reflect a significant improvement compared to 2020-21, when average household PCC was 15 l/h/d higher than target.

The following sections explain why we have not met PCC targets.

9.4.1 Summary of covid impacts on PCC

In our 2020-21 annual review we identified PCC to be the main performance commitment which has been affected by Covid. In general, our more rural and affluent customers are located in the northern part of our supply area, and their Per Household Consumption (PHC), is typically about 400 litres per property per day, compared to those in more urban and coastal customers with demand often less than 300 litres per day per property.

In 2020-21, we saw general increases in demand, with the largest increases focussed in urban areas, Portsmouth in particular, but also Gosport and Bognor. This reflected the impacts of the Covid lockdown which prompted significant changes to the working patterns of the population. Urban areas tend to have more working aged people living in them and the lockdown saw many staying at home who would normally be at their place of work.

Figure 8 illustrates how the previous reporting year's PHC increased as well as geographical differences throughout our supply area.

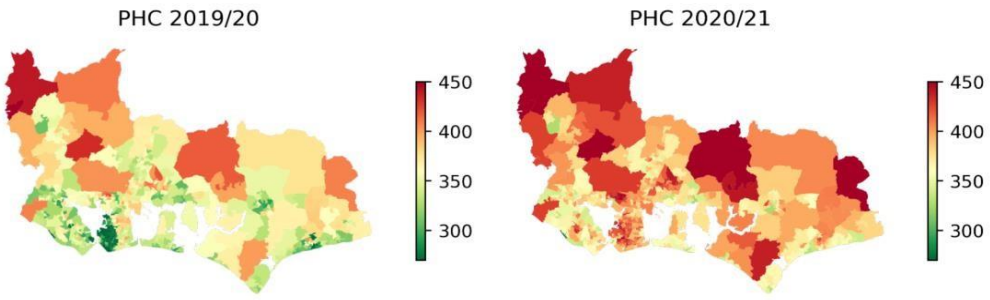

Figure 8: Geographical and volumetric difference in PHC between 2019-20 and 2020-21

In the current reporting year we saw an 8% increase in household demand compared to what we would have expected based on our demand model in 2021-22, and we attributed all the increase to Covid impacts given the benign weather conditions.

We will continue to closely monitor this issue and engage with Ofwat and other stakeholders to ensure we all understand what the impacts of Covid have been.

Figure 9 illustrates how household demand changed throughout the reporting year.

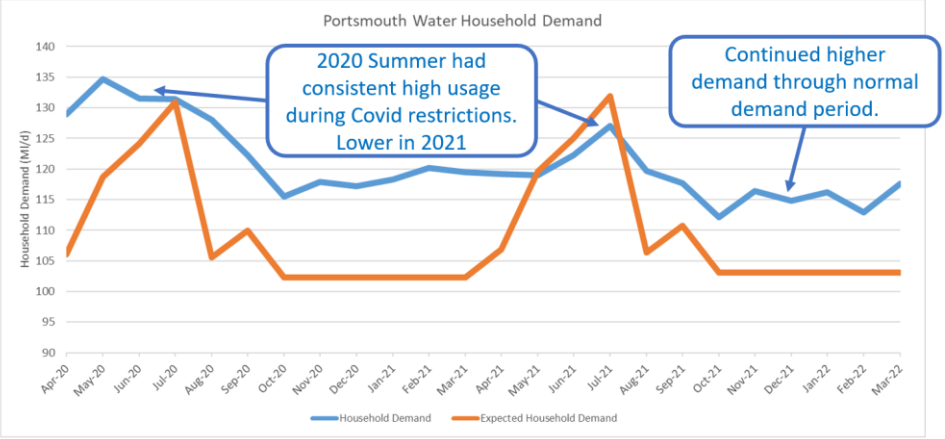

Figure 9: Household demand and the impacts of covid in 2020-21 and 2021-22

9.4.2 Metering and water efficiency

Over 2021-22, the number of metered properties on our network has risen by 2,255. Our plans to install meters were hampered due to several limitations. Firstly, impacts associated with Covid including staff absences and adhering to social distancing rules to protect our customers. Secondly, a lack of uptake from customers to voluntarily ask for meter installation and lastly, limitations within our Change of Occupier scheme where should a customer vacate an unmetered property, they should inform Portsmouth Water allowing us to install a water meter before the new occupier moves in.

In last year's Annual Review 2020-21 we reported that we were due to launch a smart meter challenge for around fifty customers in the Portsmouth Water area. We have implemented this scheme however, invitations for the challenge were only accepted by twenty-seven customers. As a result, we have installed twenty-seven "Jellyfish" smart devices to new meters installed for customers. A Jellyfish device is attachment to the meter which reads meters automatically and transfers real time data to an information network. Over the course of the trial we have not billed customers using smart meter readings, but we have used the data to explore ways of talking to customers about their consumption in a 'safe space' and have identified a number of customer side leaks. We have also uncovered lots of learning points through this small scale trial, which will inform the progressing business case for the provision of a universal metering programme in future years.

Across the past year we have had 3,727 new customers sign up for the Get Water Fit scheme. This is a mobile friendly platform run by Save Water Save Money where customers can complete a survey on their household usage, order free water saving devices and complete daily challenges to reduce consumption. Of these 3,727 customers, 657 or 17% took part in water efficiency challenges and found that they saved around 989 litres per day. This equates to around 1.5 l/h/d. Early indications suggest that if all our domestic customers were to sign up to this scheme, we could reduce demand by as much as 1.1 Ml/d.

Our aim is to get 10,000 customers signed up to the Get Water Fit service by March 2023.

Across 2022-23 we are planning to increase customer engagement within water efficiency schemes. With the assistance of Advizzo we are set to launch a scheme for 20,000 of our customers residing in metered properties. This involves the development of an accessible platform which gives customers insights into their water consumption as well as sharing advice as to where they can change behaviours to reduce usage.

Further information on our PCC recovery action plan is provided within our Revised WRMP19, which is located on our website here:
https://www.portsmouthwater.co.uk/news/publications/water-resources-planning/

9.4.3 Water stress status

Portsmouth Water was previously in an area of 'moderate water stress' and therefore unable to pursue compulsory metering. Due to our low level of meter penetration, since 2005 the Company has encouraged optional metering and required all new properties to be metered.

The Environment Agency has recently reassessed which water companies are under serious water stress, defined in the regulations as where 'the current household demand for water is a high proportion of the current effective rainfall which is available to meet that demand. Or the future household demand for water is likely to be a high proportion of the effective rainfall which is likely to be available to meet that demand'.

The final classification (1 July 2021) has confirmed that we have now moved from an area of 'moderate' to 'serious' water stress. This will allow us to target water efficiency measures in those areas of greatest need and greatest potential benefit. We are proposing this in our next Water Resource Management Plan (WRMP24) through compulsory metering, if it is shown to be both supported by customers and cost beneficial.

9.5 Non-Household Consumption contributing to distribution input

We have seen a 13% reduction in non-household demand compared to what we would have expected from our demand models. We have attributed all this decrease to Covid impacts, with benign weather conditions.

Covid has resulted in a reduction of c.10 Ml/d in demand during periods of enforced restrictions. The 2021 peak period saw an increase in demand again due to added UK based tourism prompted by the wide restrictions on international travel (staycations), although the peak was lower than in 2020 due to the benign weather conditions. We have seen a gradual bounce-back in demand as restrictions eased in 2021-22, with usage nearing pre-Covid levels. Figure 10 illustrates the variations in non-household demand throughout the year.

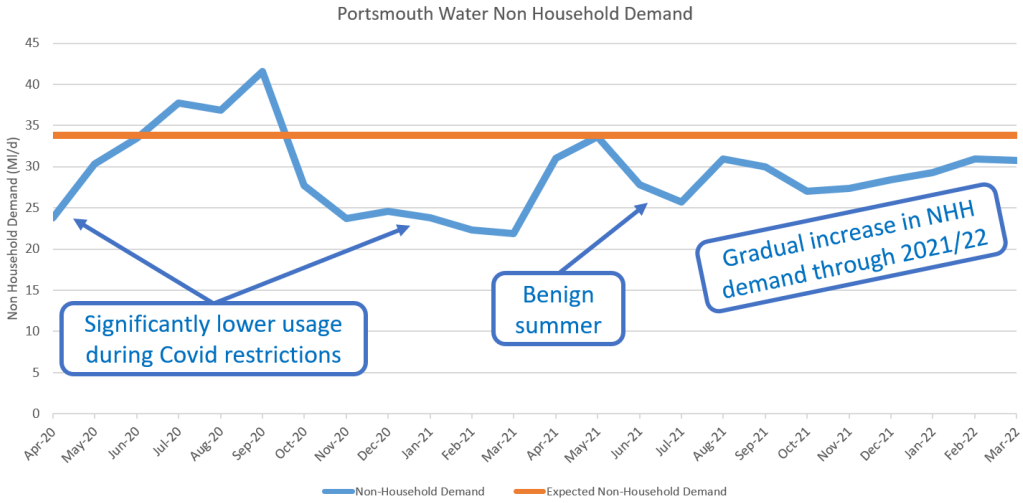

Figure 10: Non-household demand and the impacts of covid

10. HEADROOM ASSESSMENT

In this section we discuss the impact our work on the revised WRMP19 project has had on our understanding of the headroom we need to maintain.

10.1 Target Headroom

In accordance with the Water Resources Planning Guidance, the supply-demand balance includes a margin between supply and demand to allow for uncertainties inherent within the supply and demand forecasts. This margin is known as 'headroom.' The headroom value determined for each year across the planning horizon is termed the target headroom allowance. The aim of calculating a target headroom allowance is to provide a reasonable margin to cover the combined impact of factors leading to uncertainty on the supply-demand balance at a defined level of risk.

The standard methodology used for the Final WRMP19 considered thirteen uncertainty factors. We have now updated the target headroom allowance to follow a new WRSE methodology, which incorporates the uncertainty associated with future Covid impacts. Further information is provided within our Revised WRMP19, which is published on our website: https://www.portsmouthwater.co.uk/news/publications/water-resources-planning/

As a result of this work, we have revised our view on target headroom allowance. Table 13 below illustrates the comparison between our Final WRMP19 and latest Revised WRMP19, for the start and end of AMP7 in a dry year for comparative purposes only.

Headroom	WRMP19 final Ml/d		Revised WRMP19 Ml/d	
	2019-20	2024-25	2019-20	2024-25
Dry year annual average (Ml/d)	5.3	5.6	4.89	4.95
Dry year Critical Period (Ml/d)	7.1	7.7	5.66	5.74

Table 13: Target headroom allowance final WRMP19 and Revised WRMP19

The results show that we have now decreased our target headroom allowance for the Revised WRMP19. We have also used the updated allowance within our draft WRMP24.

11 SUPPLY-DEMAND BALANCE – 1 IN 200 DRY YEAR SCENARIO

This section describes the overall summary of the 2021-22 supply-demand balance situation, considering our performance for the year and comparing this against our Revised WRMP19 **dry years** (i.e. 1 in 200 year drought) scenario, as per the requirements of the guidance.

11.1 Forecast Revised WRMP19 and outturn supply-demand balance – Dry Year scenario

Using the outturn values described throughout this report, the final dry year supply-demand balance has been calculated for both annual average (Table 14) and critical period (Table 15) scenarios for 2021-22. The outturn supply-demand balance shown here is using the guidance definitions for each of the components (e.g. actual bulk supply figures).

Annual Average	Revised WRMP19 Forecast 2021-22 (Ml/d)	Outturn Values 2021-22 (Ml/d)
Final Plan Deployable Output	213.56	211.66
Outage	6.70	7.80
Treatment works losses and operational use	2.40	6.84
Water Available For Use in a Dry Year	**204.46**	**197.02**
Potable water exported (bulk supplies to SWS)	30.00	4.63
Total Water Available for Use	**174.46**	**192.39**
Distribution Input	174.50	177.19
Target headroom	5.16	5.16
Supply Demand Balance	**-5.20**	**10.04**

Table 14: Annual Average supply-demand balance for Revised WRMP19 and Outturn 2021-22

Critical period	Revised WRMP19 Forecast 2021-22 (Ml/d)	Outturn Values 2021-22 (Ml/d)
Final Plan Deployable Output	264.40	261.80
Outage	6.40	9.12
Treatment works losses and operational use	2.40	4.65
Water Available For Use in a Dry Year	**255.60**	**248.03**
Potable water exported (bulk supplies to SWS)	30.00	7.55
Total Water Available for Use	**225.60**	**240.48**
Distribution Input	215.79	207.54
Target headroom	5.89	5.89
Supply Demand Balance	**3.92**	**27.05**

Table 15: Critical period supply-demand balance for Revised WRMP19 and Outturn 2021-22

Table 14 and Table 15 show how our performance in 2021-22 affected our supply-demand balance, and how this compares to our Revised WRMP19. We note that our Revised WRMP19 shows that we are no longer meeting our target headroom for a 1 in 200 year drought scenario i.e. our risk and uncertainty allowance for the supply demand balance is fully utilised. It means there is a slightly higher risk we would need to introduce emergency restrictions in a very severe drought. This reflects a reduced benefit and increased delay in implementing our supply side options and revisions to the baseline demand forecast to reflect outturn values and new WRSE methodologies.

The conclusion with respect to our performance in 2021-22 is that we have maintained a positive supply-demand balance, so customers were not at risk in either the annual average, or critical period scenarios. However we recognise that if Southern Water had taken the full 30 Ml/d bulk supply throughout the year (e.g. in a severe drought), the outturn annual average supply-demand balance would have been in deficit as demonstrated by the tables in Appendix A.

Our Annual Review normally reports on the supply-demand balance index (SDBI), previously known as security of supply index (SOSI). This metric is an indication of whether our customers would have been at risk if 2021-22 was a 'dry year', with a 1 in 20 year return period and is calculated by using the outturn values, with the forecast Revised WRMP19 dry year DI.

The impact of Covid on our annual average DI meant that our outturn DI was in fact larger than our forecast 'dry year' DI in our Revised WRMP19. Therefore, the usual method of calculating SDBI, does not work in this instance.

12 FORWARD LOOK

As we look forwards, we have challenges to resolve around our resilience in extreme dry weather events in the future. We do not perceive there to be a significant risk now, but we are working hard on the mitigation measures outlined in our Revised WRMP19 to minimise the risk. For example, the Revised WRMP19 identifies our recent substantial progress on installing meters against the end of AMP7 target.

We also recognise the importance of delivering our remaining AMP7 schemes to ensure a healthy starting position for WRMP24. There will be a key decision point in early 2023 with respect to our Source J scheme (and associated additional bulk supply to Southern Water),

because we will have an improved understanding of potential yield from our on-site investigations.

We will continue to work closely alongside the Environment Agency via our on-going fortnightly and quarterly meetings, which provide regular opportunities to discuss our progress, to highlight any risks and concerns. This includes making steps towards addressing the Environment Agency's new licence capping policy, including identification of the associated environmental investigations and options appraisals that will be required in the AMP8 WINEP (2025 to 2030).

We are also committed to working with Southern Water throughout the planning process to ensure that we do everything we can to best protect the security of supply. As well as ad hoc meetings when necessary, we have regular quarterly meetings, where we are able to discuss progress, risks and mitigations that arise as we continue to develop our WRMP24.

We have an on-going project with Southern Water to develop and implement a joint Pywr simulation model for our supply areas in Hampshire to allow improved understanding of risks and potential solutions, which should be available for testing scenarios in early 2023. These scenarios include re-assessing our AMP7 scheme benefits to inform our decision making.

Portsmouth Water is committed to continuing full participation with Water Resources South East (WRSE) in the development of the multi-sector regional plan. WRSE consulted on the emerging plan in January 2022 and we have supported WRSE in the development of a Best Value Plan that has shaped our draft WRMP24. Both the draft regional plan and draft WRMP24 are being consulted on until 20 February 2023.

13 DATA TABLES

The data tables are based on outturn data which we adjusted using the MLE process to achieve a water balance. For this Annual Review, we have provided the tables in Appendix A for average and peak conditions.

APPENDIX A

WRMP ANNUAL REVIEW DATA RETURN - WATER BALANCE COMPONENTS

ANNUAL AVERAGE

Water Company: Portsmouth Water
Number of resource zones: 1
Year of data submission: 2021/22
Reporting against WRMP: Revised WRMP19

Row numbering in line with WRMP structure	Component	Derivation and type of data	Units	DP	Data requirement	Water company total data
	SUPPLY					
	Resources					
1_{AR}	Raw water abstracted	Input outturn data	Ml/d	2dp	Required	188.66
2_{AR}	Raw water imported (in the reporting year)	Input outturn data	Ml/d	2dp	Required	0
3_{AR}	Potable water imported (in the reporting year)	Input outturn data	Ml/d	2dp	Required	0
5_{AR}	Raw water exported (in the reporting year)	Input outturn data	Ml/d	2dp	Required	0
5.1_{AR}	Non potable water supplied	Input outturn data	Ml/d	2dp	Required	0
6_{AR}	Potable water exported (in the reporting year)	Input outturn data	Ml/d	2dp	Required	4.63
7_{AR}	Deployable output	Input dry year figure	Ml/d	2dp	Required	211.66
12AR	Water Available For Use (own sources)	(Deployable Output + changes to DO) - (Treatment works losses and operational use + outage experienced).	Ml/d	2dp	Required	197.02
13AR	Total Water Available For Use	WAFU own sources + (total water imported) - (total water exported). Total WAFU is based on maximum contractual volumes as stated in WRMP19.	Ml/d	2dp	Required	167.02
	Process Losses					
9_{AR}	Treatment works losses and operational use	Input outturn data	Ml/d	2dp	Required	6.84
10_{AR}	Outage experienced	Input outturn data	Ml/d	2dp	Required	7.8
	DEMAND					
11_{AR}	Distribution input (in reporting year)	Outturn data for: Total household and non-household consumption + water taken unbilled + distribution system operational losses + total leakage	Ml/d	2dp	Required	177.19
	Consumption					
23_{AR}	Measured non household - consumption	Input outturn data	Ml/d	2dp	Required	29.05
24_{AR}	Unmeasured non household - consumption	Input outturn data	Ml/d	2dp	Required	0.61
25_{AR}	Measured household - consumption	Input outturn data	Ml/d	2dp	Required	31.95
26_{AR}	Unmeasured household - consumption	Input outturn data	Ml/d	2dp	Required	85.50
29_{AR}	Measured household - pcc	Outturn data: (Measured household consumption * 1,000,000) / (measured household population * 1,000)	l/h/d	0dp	Required	144.61
30_{AR}	Unmeasured household - pcc	Outturn data: (Unmeasured household consumption * 1,000,000) / (Unmeasured household population * 1,000)	l/h/d	0dp	Required	167.02
31_{AR}	Average household - pcc	Outturn data: (Measured and unmeasured household consumption * 1,000,000) / (measured and unmeasured household population * 1,000)	l/h/d	0dp	Required	160.3
32_{AR}	Water taken unbilled	Input outturn data	Ml/d	2dp	Required	2.62
33_{AR}	Distribution system operational use	Input outturn data	Ml/d	2dp	Required	0.52
	Leakage					
34_{AR}	Measured non household - uspl	Input outturn data	Ml/d	2dp	Required	0.6
35_{AR}	Unmeasured non-household - uspl	Input outturn data	Ml/d	2dp	Required	0.05
36_{AR}	Measured household - uspl	Input outturn data	Ml/d	2dp	Required	5.07
37_{AR}	Unmeasured household - uspl	Input outturn data	Ml/d	2dp	Required	7.11
38_{AR}	Void properties - uspl	Input outturn data	Ml/d	2dp	Required	0.4
39_{AR}	Distribution Losses	Input outturn data	Ml/d	2dp	Required	13.7
40_{AR}	Total leakage	Outturn data: Total USPL + distribution losses	Ml/d	2dp	Required	26.93
	CUSTOMERS					
	Properties					
42_{AR}	Measured non-household - properties	Input end of reporting year data	000's	3dp	Required	12.054
43_{AR}	Unmeasured non-household - properties	Input end of reporting year data	000's	3dp	Required	1.503
44AR	Void non households - properties	Input end of reporting year data	000's	3dp	Required	2.459
45_{AR}	Measured household - properties	Input end of reporting year data	000's	3dp	Required	102.222
45.7_{AR}	Measured void household - properties	Input end of reporting year data	000's	3dp	Required	2.293
46_{AR}	Unmeasured household - properties	Input end of reporting year data	000's	3dp	Required	198.505
47_{AR}	Unmeasured void household - properties	Input end of reporting year data	000's	3dp	Required	4.712
48_{AR}	Total resource zone properties (inc voids)	End of reporting year data : Total non-household properties + total void non-household properties + total household properties + total void household properties	000's	3dp	Required	323.748
	Population					
49_{AR}	Measured non-household - population	Input end of reporting year data	000's	3dp	Required	12.598
50_{AR}	Unmeasured non-household - population	Input end of reporting year data	000's	3dp	Required	1.571
51_{AR}	Measured household - population	Input end of reporting year data	000's	3dp	Required	220.913
52_{AR}	Unmeasured household population	Input end of reporting year data	000's	3dp	Required	511.948
53_{AR}	Total resource zone population	End of reporting year data: Unmeasured and measured household population + Unmeasured and measured non-household population	000's	3dp	Required	747.03
	Metering					
57_{AR}	Total measured household metering penetration (incl. voids)	Outturn data: Measured household properties exc. voids / (measured household properties exc. voids + unmeasured household properties exc. voids) + measured and unmeasured household void properties)	%	2dp	Required	33.22
57.1	Total households with a meter installed	Input outturn data (See technical annex for guidance)	%	2dp	Optional	
	Total numbers of household meters installed	Input outturn data	000's	3dp	Required	2.255
	SUPPLY-DEMAND BALANCE					
16AR	Target headroom	Input adjusted reporting year figure or dry year WRMP	Ml/d	2dp	Required	5.16
18AR	Observed supply-demand balance (in reporting year)	(Total WAFU - DI) - target headroom	Ml/d	2dp	Required	-15.33
QA check 1	Distribution input	23AR + 24AR + 25AR + 26AR + 32AR + 33AR + 40AR				0.01
QA check 2	Water available for use (own sources)	7AR - (9AR + 10AR)				0.00
QA check 3	Total properties	42AR + 43AR + 45AR + 45.7AR + 46AR + 47AR				0.00
QA check 4	Total population	49AR + 50AR + 51AR + 52AR				0.00
QA check 5	Household metering	42AR / (42AR + 43AR + 45.7AR + 47AR)				0.00
QA check 6	Average pcc	((25AR + 26AR) * 1,000,000) / ((49AR + 50AR) * 1,000))				0.04
QA check 7	Total leakage	34AR + 35AR + 36AR + 37AR + 38AR + 39AR				0.00
QA check 8	Supply-demand balance	(13AR - 11AR) - 16AR				0.00

WRMP ANNUAL REVIEW DATA RETURN - WATER BALANCE COMPONENTS

CRITICAL PERIOD

Water Company: Portsmouth Water
Number of resource zones: 1
Year of data submission: 2021/22
Reporting against WRMP: Revised WRMP19

Row numbering in line with WRMP structure	Component	Derivation and type of data	Units	DP	Data requirement	Water company total data
	SUPPLY					
	Resources					
1_{AR}	Raw water abstracted	Input outturn data	Ml/d	2dp	Required	219.74
2_{AR}	Raw water imported (in the reporting year)	Input outturn data	Ml/d	2dp	Required	0
3_{AR}	Potable water imported (in the reporting year)	Input outturn data	Ml/d	2dp	Required	0
5_{AR}	Raw water exported (in the reporting year)	Input outturn data	Ml/d	2dp	Required	0
5.1_{AR}	Non potable water supplied	Input outturn data	Ml/d	2dp	Required	0
6_{AR}	Potable water exported (in the reporting year)	Input outturn data	Ml/d	2dp	Required	7.55
7_{AR}	Deployable output	Input dry year figure	Ml/d	2dp	Required	261.8
12AR	Water Available For Use (own sources)	(Deployable Output + changes to DO) - (Treatment works losses and operational use + outage experienced).	Ml/d	2dp	Required	248.03
13AR	Total Water Available For Use	WAFU own sources + (total water imported) - (total water exported). Total WAFU is based on maximum contractual volumes as stated in WRMP19.	Ml/d	2dp	Required	218.03
	Process Losses					
9_{AR}	Treatment works losses and operational use	Input outturn data	Ml/d	2dp	Required	4.65
10_{AR}	Outage experienced	Input outturn data	Ml/d	2dp	Required	9.12
	DEMAND					
11_{AR}	Distribution input (in reporting year)	Outturn data for: Total household and non-household consumption + water taken unbilled + distribution system operational losses + total leakage	Ml/d	2dp	Required	207.54
	Consumption					
23_{AR}	Measured non household - consumption	Input outturn data	Ml/d	2dp	Required	29.05
24_{AR}	Unmeasured non household - consumption	Input outturn data	Ml/d	2dp	Required	0.61
25_{AR}	Measured household - consumption	Input outturn data	Ml/d	2dp	Required	38.43
26_{AR}	Unmeasured household - consumption	Input outturn data	Ml/d	2dp	Required	109.39
29_{AR}	Measured household - pcc	Outturn data: (Measured household consumption * 1,000,000) / (measured household population * 1,000)	l/h/d	0dp	Required	173.95
30_{AR}	Unmeasured household - pcc	Outturn data: (Unmeasured household consumption * 1,000,000) / (Unmeasured household population * 1,000)	l/h/d	0dp	Required	213.67
31_{AR}	Average household - pcc	Outturn data: (Measured and unmeasured household consumption * 1,000,000) / (measured and unmeasured household population * 1,000)	l/h/d	0dp	Required	201.7
32_{AR}	Water taken unbilled	Input outturn data	Ml/d	2dp	Required	2.62
33_{AR}	Distribution system operational use	Input outturn data	Ml/d	2dp	Required	0.52
	Leakage					
34_{AR}	Measured non household - uspl	Input outturn data	Ml/d	2dp	Required	0.6
35_{AR}	Unmeasured non-household - uspl	Input outturn data	Ml/d	2dp	Required	0.05
36_{AR}	Measured household - uspl	Input outturn data	Ml/d	2dp	Required	5.07
37_{AR}	Unmeasured household - uspl	Input outturn data	Ml/d	2dp	Required	7.11
38_{AR}	Void properties - uspl	Input outturn data	Ml/d	2dp	Required	0.38
39_{AR}	Distribution Losses	Input outturn data	Ml/d	2dp	Required	13.7
40_{AR}	Total leakage	Outturn data: Total USPL + distribution losses	Ml/d	2dp	Required	26.91
	CUSTOMERS					
	Properties					
42_{AR}	Measured non-household - properties	Input end of reporting year data	000's	3dp	Required	12.054
43_{AR}	Unmeasured non-household - properties	Input end of reporting year data	000's	3dp	Required	1.503
44AR	Void non households - properties	Input end of reporting year data	000's	3dp	Required	2.459
45_{AR}	Measured household - properties	Input end of reporting year data	000's	3dp	Required	102
45.7_{AR}	Measured void household - properties	Input end of reporting year data	000's	3dp	Required	2.293
46_{AR}	Unmeasured household - properties	Input end of reporting year data	000's	3dp	Required	198.505
47_{AR}	Unmeasured void household - properties	Input end of reporting year data	000's	3dp	Required	4.712
48_{AR}	Total resource zone properties (inc voids)	End of reporting year data : Total non-household properties + total void non-household properties + total household properties + total void household properties	000's	3dp	Required	323.748
	Population					
49_{AR}	Measured non-household - population	Input end of reporting year data	000's	3dp	Required	12.598
50_{AR}	Unmeasured non-household - population	Input end of reporting year data	000's	3dp	Required	1.571
51_{AR}	Measured household - population	Input end of reporting year data	000's	3dp	Required	220.913
52_{AR}	Unmeasured household population	Input end of reporting year data	000's	3dp	Required	511.948
53_{AR}	Total resource zone population	End of reporting year data: Unmeasured and measured household population + Unmeasured and measured non-household population	000's	3dp	Required	747.03
	Metering					
57_{AR}	Total measured household metering penetration (incl. voids)	Outturn data: Measured household properties exc. voids / (measured household properties exc. voids + unmeasured household properties exc. voids) + measured and unmeasured household void properties)	%	2dp	Required	33.2178649
57.1	Total households with a meter installed	Input outturn data (See technical annex for guidance)	%	2dp	Optional	
	Total numbers of household meters installed	Input outturn data	000's	3dp	Required	2255
	SUPPLY-DEMAND BALANCE					
16AR	Target headroom	Input adjusted reporting year figure or dry year WRMP	Ml/d	2dp	Required	5.89
18AR	Observed supply-demand balance (in reporting year)	(Total WAFU - DI) - target headroom	Ml/d	2dp	Required	4.6
QA check 1	Distribution input	23AR + 24AR + 25AR + 26AR + 32AR + 33AR + 40AR				0.01
QA check 2	Water available for use (own sources)	7AR - (9AR + 10AR)				0.00
QA check 3	Total properties	42AR + 43AR + 45AR + 45.7AR + 46AR + 47AR				0.00
QA check 4	Total population	49AR + 50AR + 51AR + 52AR				0.00
QA check 5	Household metering	42AR / (42AR + 43AR + 45.7AR + 47AR)				0.00
QA check 6	Average pcc	((25AR + 26AR) * 1,000,000) / ((49AR + 50AR) * 1,000))				0.00
QA check 7	Total leakage	34AR + 35AR + 36AR + 37AR + 38AR + 39AR				0.00
QA check 8	Supply-demand balance	(13AR - 11AR) - 16AR				0.00