

2022 Drought Review

Wessex Water

January 2023



1. Introduction

The drought in 2022 was one of the driest periods on record, the ten months leading up to and including September were all below average rainfall apart from February. The Wessex region was declared in environmental drought status by the Environment Agency at the end of September, later than most regions in the country. Some of our reservoirs reached their lowest levels on record. Peak demand periods coincided with temperatures in excess of 30°C in the middle of July and again in the middle of August.

Our Drought Plan was activated with carefully managed supply side and demand side actions as the drought management level increased through the summer but remained in Level 1b overall.

Our extensive customer communications, advertisements and water saving messaging helped to reduce demand without the need to impose restrictions. We almost certainly benefited from the “neighbour effect” with Southern Water and South West Water imposing Temporary Use Bans in August.

An overall supply side strategy of reservoir conservation was enacted, with groundwater supplies being utilised to the maximum and later spine reversal to aid recovery. Weekly Drought Action Group meetings kept communications agile and ensured all relevant parts of the business were informed and could contribute to the supply side strategy.

This Drought Review details our resource position throughout the drought and the actions that were taken alongside key lessons learnt to take forward for future droughts.

2. Story of 2022

2.1 Hydrometrics

2.1.1 Rainfall and Soil Moisture Deficit

Figure 1 shows 2022 rainfall and notable previous years. 2022 was preceded by below average rainfall at the end of 2021. The first eight months were exceptionally low, and one of the lowest rainfall periods on record. Rainfall in September and October was just above average and November and December saw very high rainfall at 166 and 121% of long-term average. Overall 2022 had 91% of the long term average rainfall.

Figure 2 shows the 2022 soil moisture deficit against notable previous years. 2022 SMD tracked very closely to 2021 until May then tracked closely to the previous significant dry year in 2018 from June. At the end of August the SMD went just above the historic maximum at 132.4 mm. A rapid reduction back to long-term average levels was seen in October following heavy and prolonged rainfall and at the end of 2022 the SMD was near zero.

Figure 1 2022 Rainfall

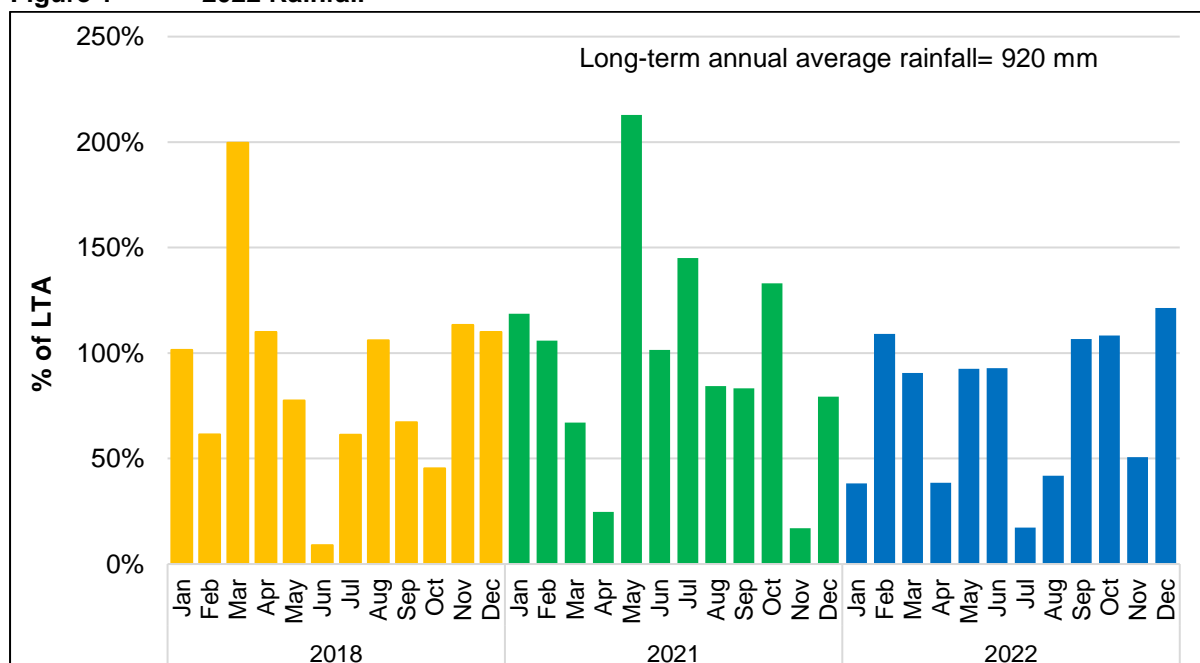
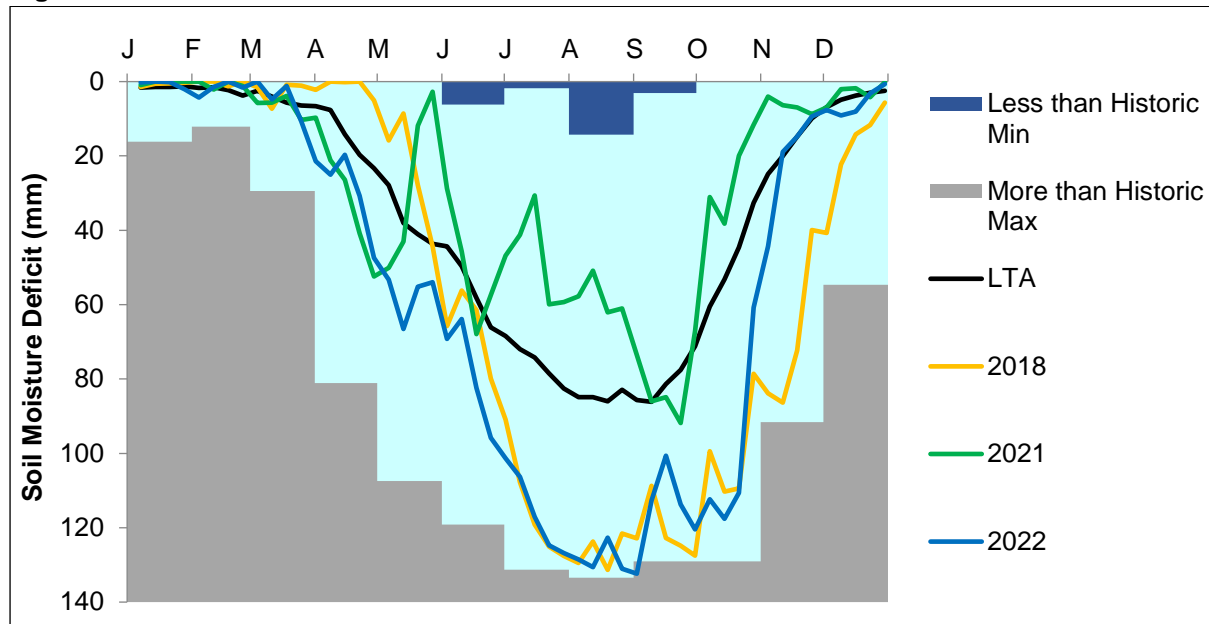


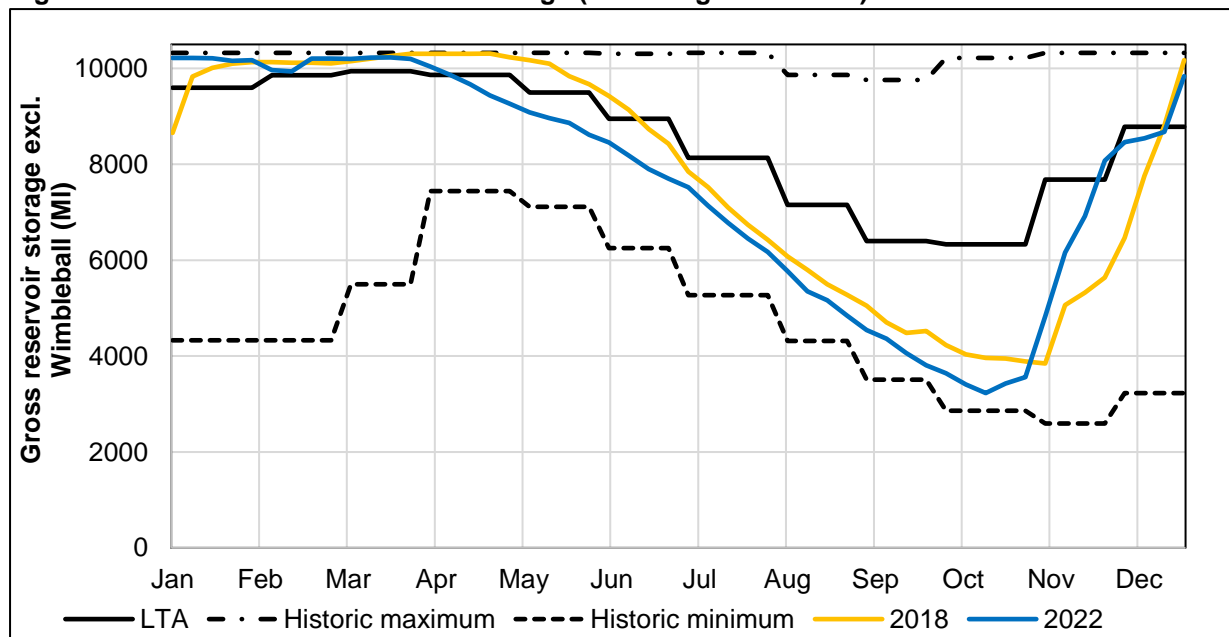
Figure 2 2022 Soil Moisture Deficit



2.1.2 Reservoir levels

2022 combined gross reservoir storage (excluding Wimbleball) is shown in Figure 3. 2022 storage was below the long-term average from early April until mid-November with storage close to the historic minimum in September and October. In mid-November total storage was 31% at its lowest (excluding Wimbleball). 2022 storage tracked very similar to that in 2003, another dry year, until September, but tracked below that seen in the last dry year in 2018 until rapid recharge occurred from late October.

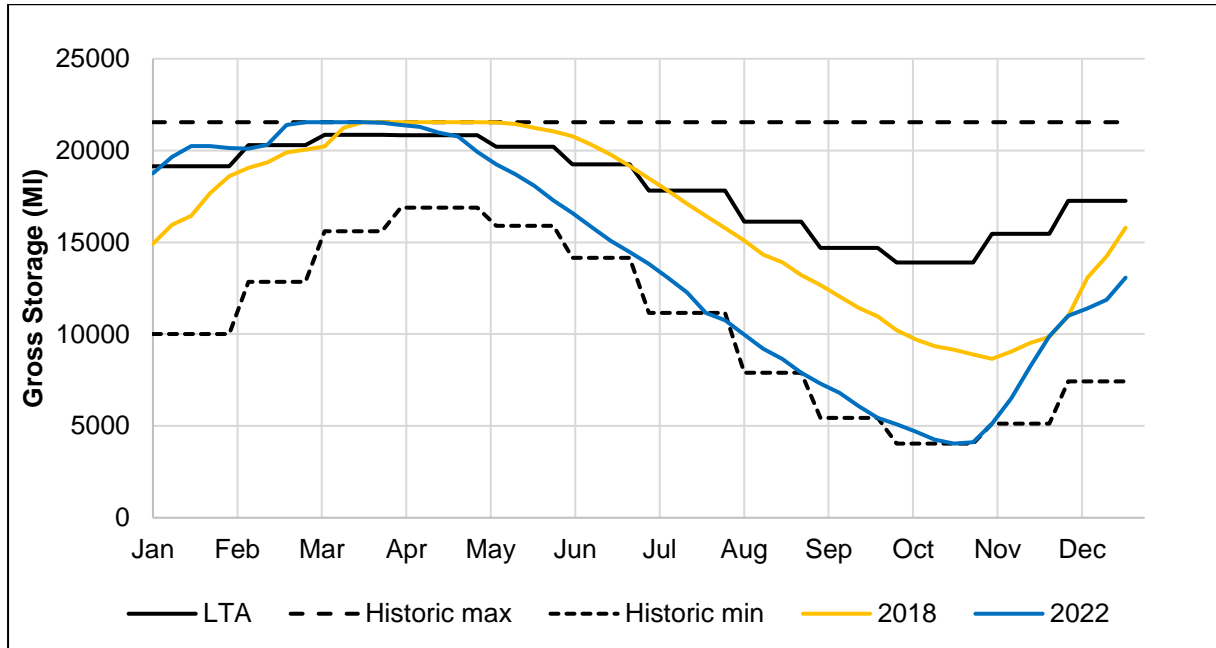
Figure 3 2022 Gross reservoir storage (excluding Wimbleball)



2022 Wimbleball reservoir storage is shown in Figure 4. Storage was below the long-term average from mid-April and the end of 2022 saw storage recovery towards the long-term average but still below levels seen in 2003 and 2018, previous dry years. New historic

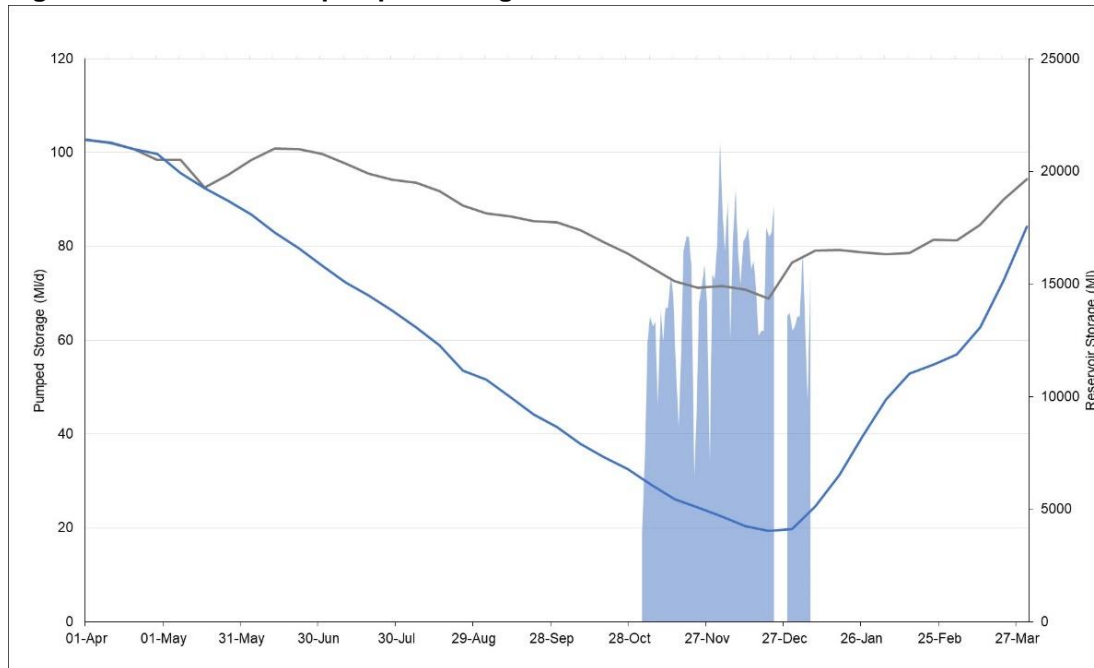
minimum storage was reached in mid-July until early November, with the lowest storage at 19% in October. Photographs of some of our reservoirs at low levels are shown in Annex A.

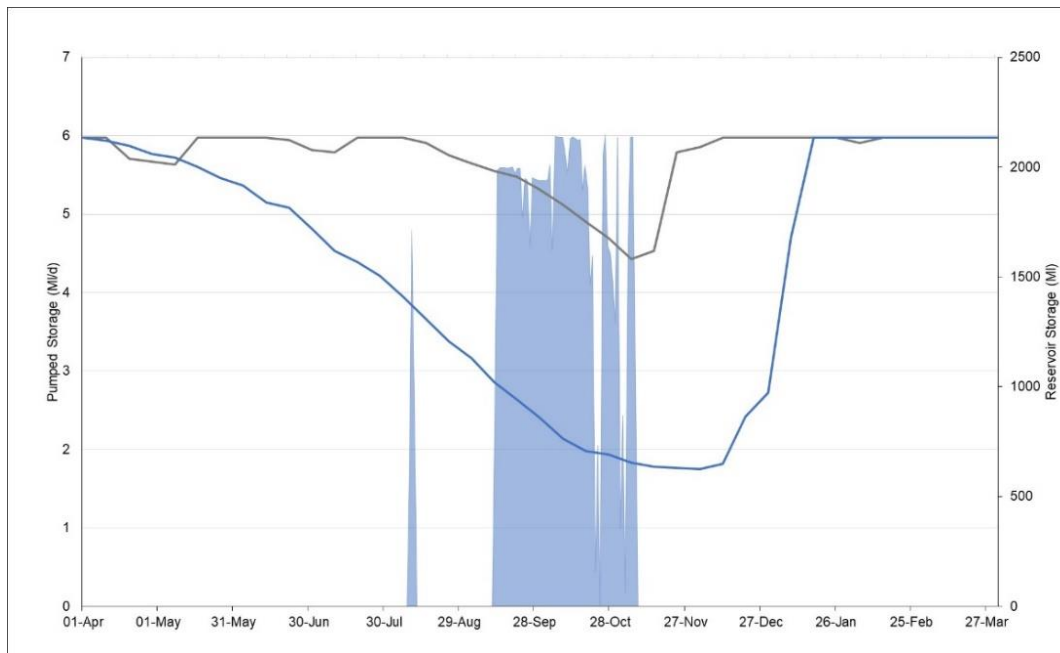
Figure 4 2022 Wimbleball reservoir storage



Pumped storage was used to aid reservoir recovery far more in 2022 than the previous year. Figure 5 shows the pumped storage at two reservoirs in 2022 compared to 2021 when there was none.

Figure 5 reservoir pumped storage in 2021 vs 2022

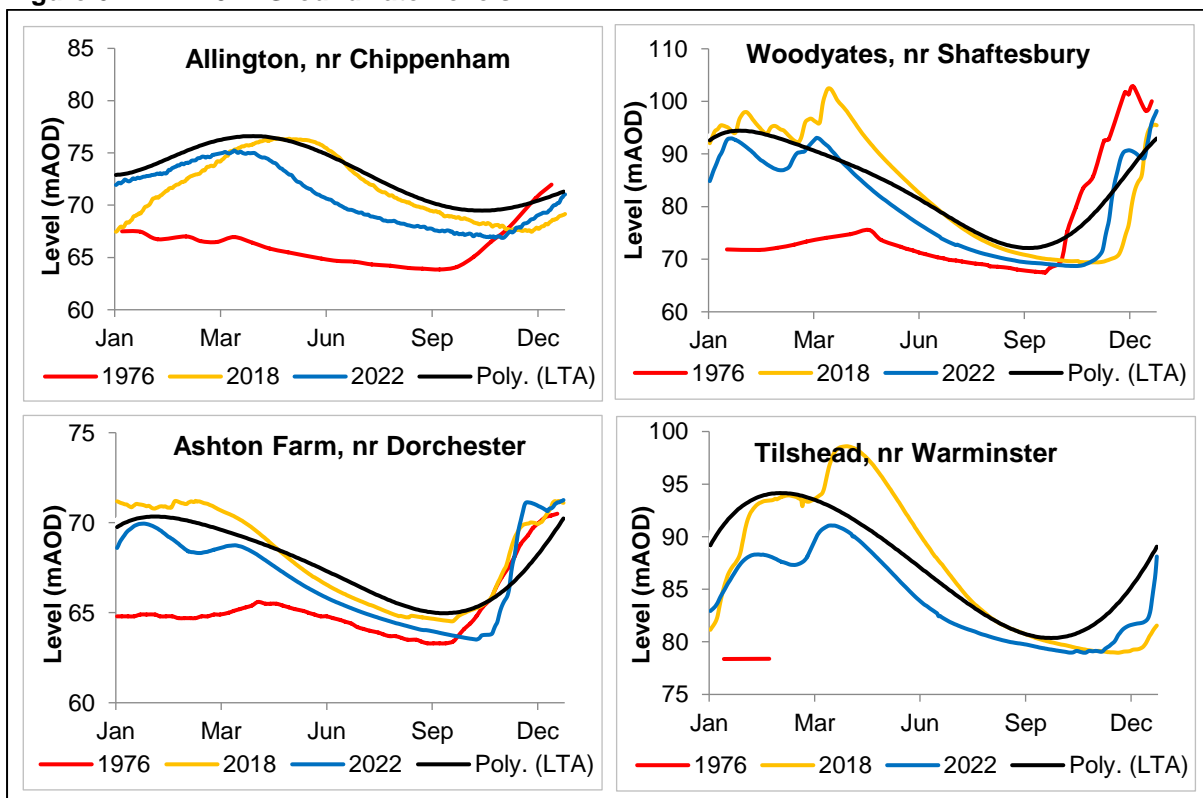




2.1.3 Groundwater levels

2022 groundwater levels are shown in Figure 6 with previous notable years. Groundwater levels tracked below the previous dry year in 2018 until November when there was rapid recharge in October. Groundwater levels also went below those in 1976 in September. Ashton Farm and Tilshead groundwater levels remained below the long-term average throughout the year. The end of 2022 saw levels reach the long-term average, or just above.

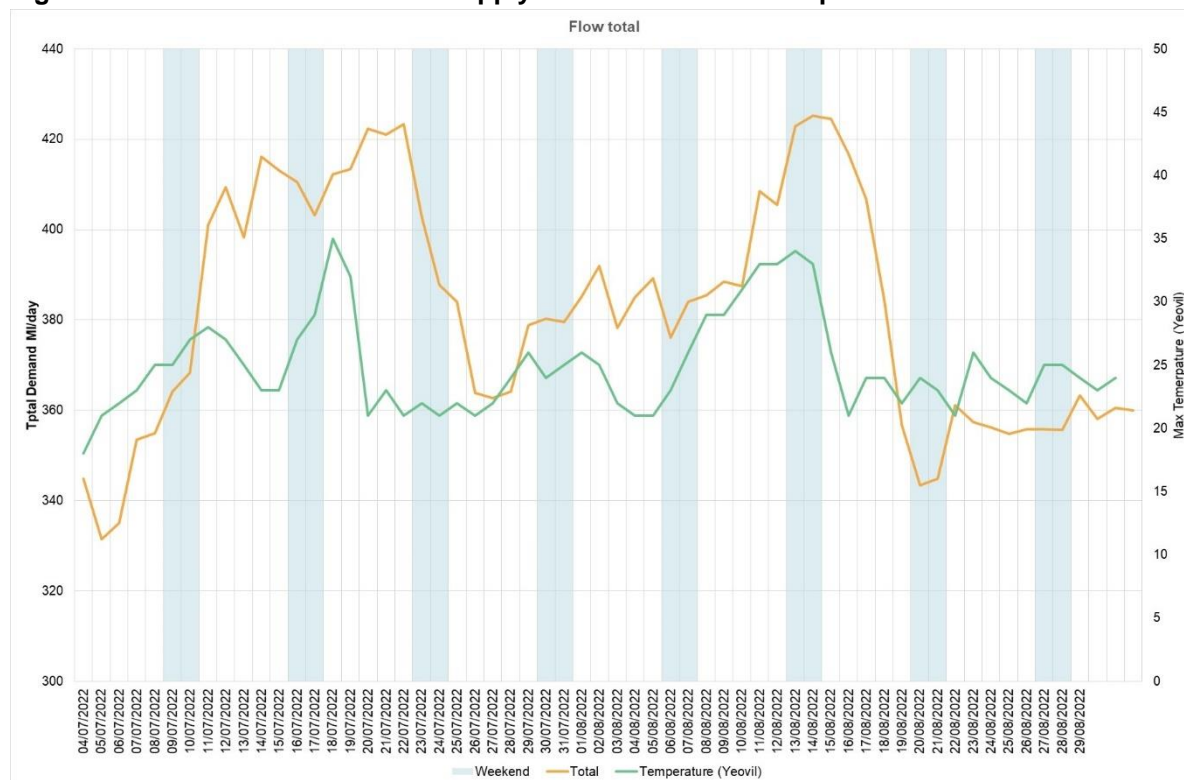
Figure 6 2022 Groundwater levels



2.2 Demand

In 2022 we saw demand across our supply zone reach in excess of 420 MI/d, with peak periods of demand coinciding with temperatures in excess of 30°C, as shown in Figure 7.

Figure 7 2022 Summer total supply zone demand and temperature



A correlation of temperature (at a representative town in our supply zone) with the demand in that area in 2022 is shown in Figure 8. There is a clear change in correlation after ~29°C where demand doesn't increase beyond this temperature. Other towns in our supply area show a similar pattern.

Comparing 2022 with previous dry, hot years across our total supply zone shows a similar pattern with little increase in demand beyond ~27°C but also highlights some differences between years. Figure 9 shows our supply zone demand vs a representative town's temperature for 2018, 2020 and 2022 summer periods. 2020 and 2022 saw higher peak temperatures than 2018, but the demand was higher in 2018 at lower temperatures, with demand above 420 MI/d from temperatures between 24 and 29°C.

Figure 8 Yeovil water into supply zone vs temperature

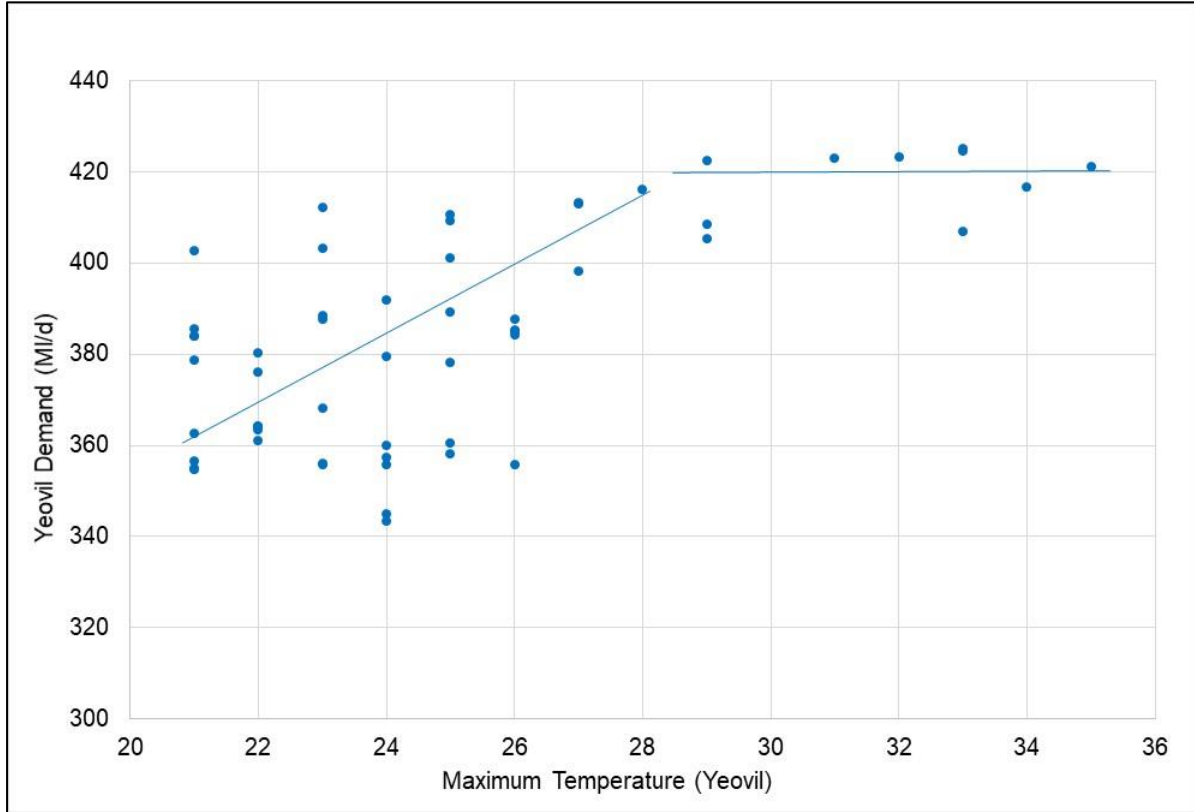
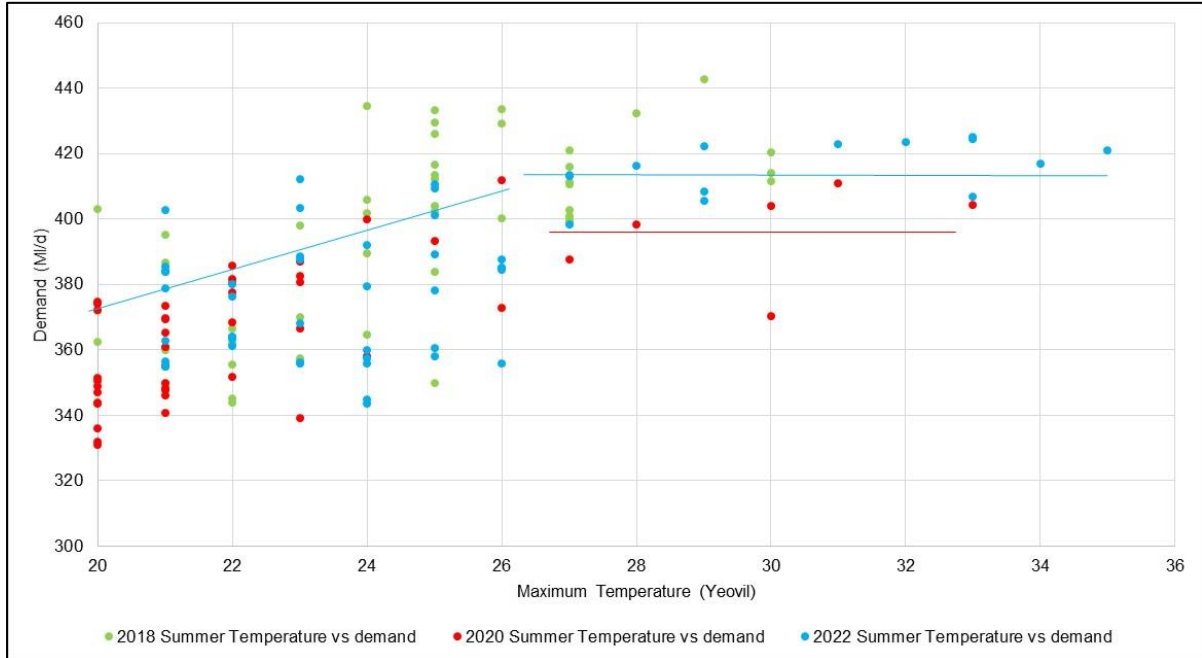


Figure 9 Total water into supply vs temperature



2.3 Drought triggers

Table 1 shows the timeline of when our drought triggers were reached for both reservoirs, groundwater and our overall position.

Table 1 Drought Triggers timeline

Drought Trigger	Reservoirs	Groundwater	Overall position
Normal Operation	Since start of 2022	Since start of 2022	Since start of 2022
Level 1a	08/07/2022	10/06/2022	10/06/2022
Level 1b	22/07/2022	08/07/2022	08/07/2022
Level 2	12/08/2022	-	-
Level 1b	28/10/2022	-	-
Level 1a	04/11/2022	13/11/2022	04/11/2022
Normal operation	11/11/2022	18/11/2022	11/11/2022

By the end of July both our groundwater and reservoir positions were in Level 1b of our Drought Management Levels and we formed a weekly Drought Action Group Meeting that brought together representatives from water resources, water efficiency, communications, leakage, operations, water production, system optimisation and planning, engineering and delivery, compliance and catchment services. Meetings commenced on 10th August and continued weekly until 8th December. The purpose of the group was defined as being to:

- Work together to maintain supplies, water quality compliance and customer confidence during the extended dry weather.
- Use the Drought Plan triggers to inform our drought position and ensure appropriate actions are taken, including preparations for specific drought actions.
- Ensure continued alignment of resource saving and demand reducing measured across all our teams.
- Evaluated and action operational issues or constraints that could impact supplies and/or quality.
- Ensure we have the right contingencies in place in the event of a dry autumn/winter and lack of recharge affecting supplies for summer 2023.

2.4 Neighbouring restrictions

Nationally, several water companies imposed temporary use bans this summer for some or all of their customers, as shown in Table 2. Our Drought Plan sets out demand side actions such as Temporary Use Bans when we are in Level 2 of our Drought Management Levels. We entered this level for our reservoirs in early August. However, we remained in Level 1b overall throughout the summer due to our groundwater levels remaining in Level 1b and the majority of our supply sources being from groundwater. Due to our demand and supply side actions throughout the summer we were able to avoid imposing temporary use bans on our customers.

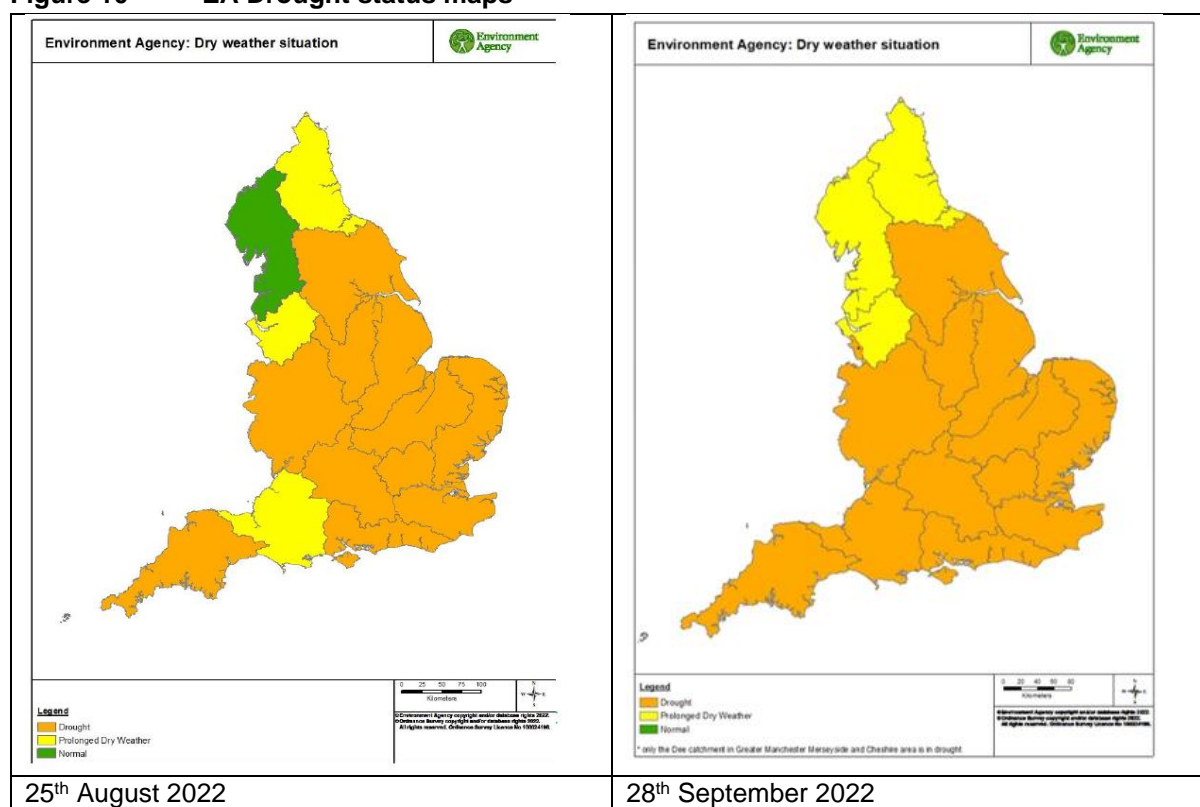
It is likely that we benefited from a “neighbouring effect” when our closest water company neighbours imposed their restrictions. It would likely have encouraged a number of our customers to be more efficient with their water use during this time.

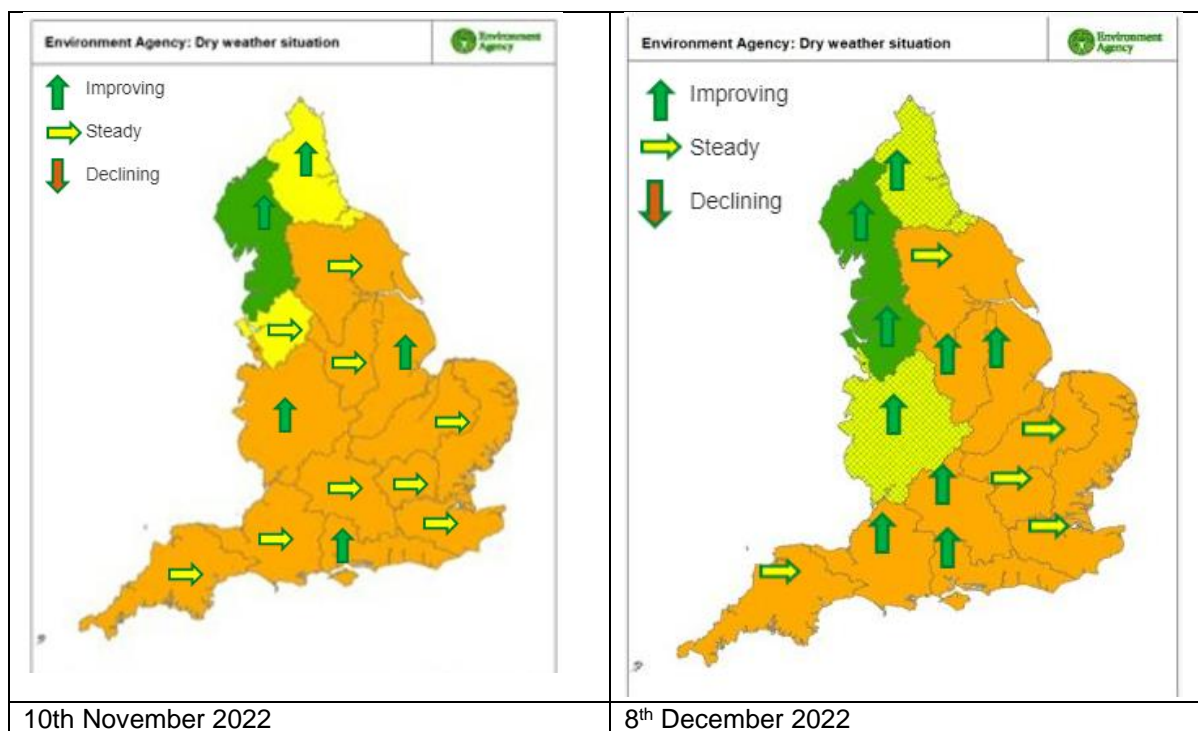
Table 2 Temporary Use Bans – Other Water Companies

Company	Date TUB imposed	Date TUB lifted	Population affected (millions)	Properties affected (millions)
Southern Water	05/08/2022	04/11/2022	0.935	0.411
South West Water	23/08/2022	Still in place	0.558	0.254
South East Water	12/08/2022	30/11/2022	1.4	0.575
Thames Water	26/08/2022	22/11/2022	10.3	4
Yorkshire Water	26/08/2022	06/12/2022	5.3	2.3

2.5 National/local Environment Agency response and requests

Throughout the developing drought the Environment Agency published regional drought status updates. These were defined by reference to stress on environmental receptors. By 26th July most of the country was in a prolonged dry weather status, with the Wessex area remaining in Normal status until 2nd August. Figure 10 shows a series of drought status maps up to December. At the time of writing, Wessex has been moved to “Normal” status.

Figure 10 EA Drought status maps



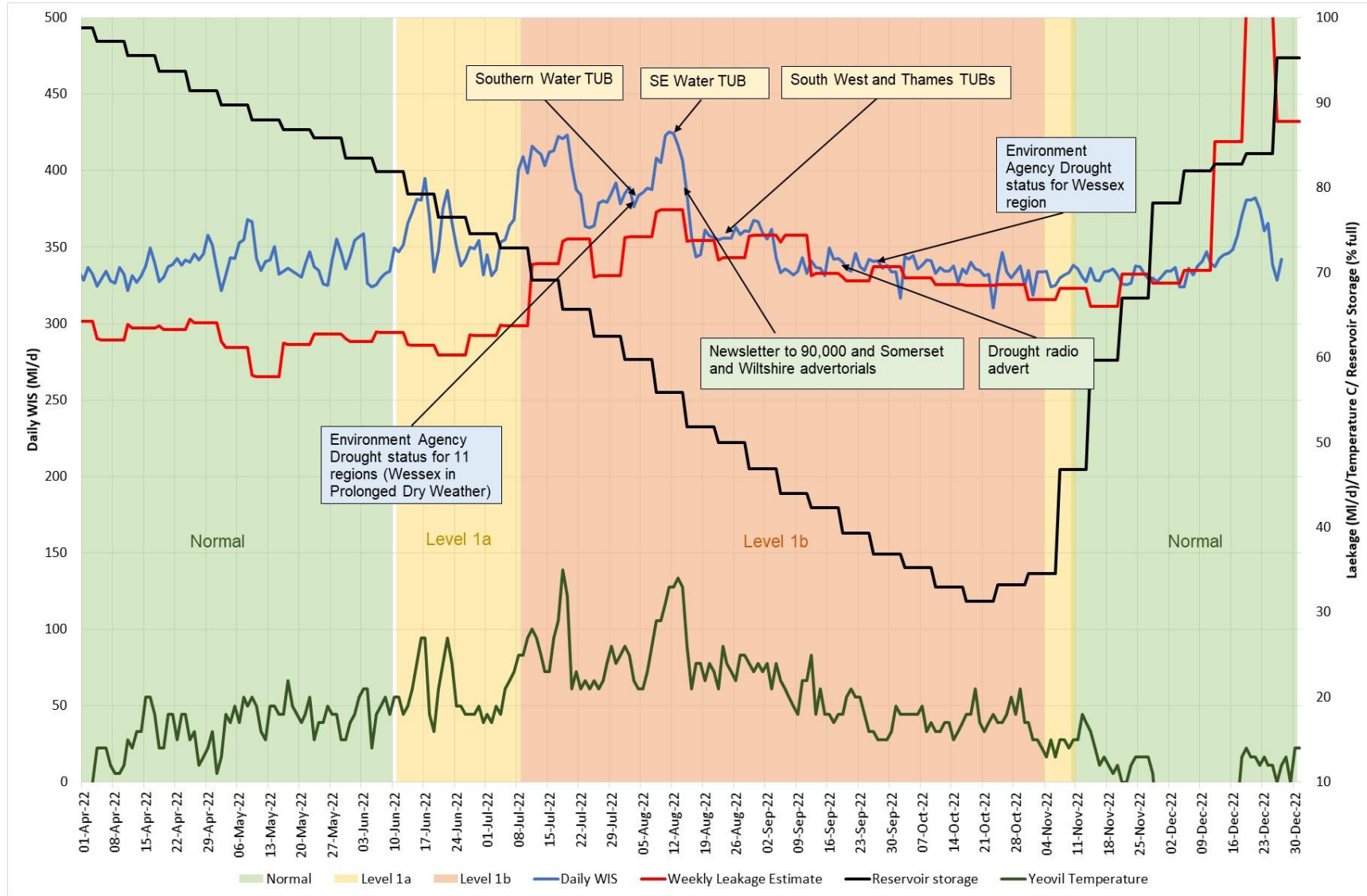
In response to the prolonged dry weather the Environment Agency convened a monthly National Drought Group (NDG), starting on 26th July. The group was made up of senior decision makers from the Environment Agency, government, water companies, Water UK, the NFU and environmental protection groups. A Water Supply Sub-Group was also convened on 17th August to meet monthly, with a purpose of sharing water company status and reporting back to NDG. Wessex Water had representatives attending both groups.

In August 2022 the Environment Agency issued a Drought Prospects request, which requested water companies to share drought prospects from end September 2022 to end March 2023 on a range of modelled rainfall scenarios. We modelled our prospects into spring 2023 for 100%, 80%, 60% LTA and worst on record rainfall scenarios.

2.6 Summary timeline

Figure 11 overleaf shows the key timelines from the 2022 drought, alongside demand, leakage, a representative temperature for the region, our reservoir levels, key communication events and our overall drought management level position.

Figure 11 Summary timeline through the drought



3. Demand actions

3.1 Leakage control

Additional leakage activity was staged through the various drought management levels and geared towards greater detection and repair resources. As the magnitude of the hot weather breakout became evident, additional resources were brought in and existing resource maximised out of hours to recover and keep pace with a quickly increasing basket of work. Non urgent & low priority work was reviewed throughout the summer and autumn to enable appropriate prioritisation of risks.

3.2 Customer communications and water efficiency engagement

We promote water saving messages to customers throughout the year. Our planned communications typically ramp up in frequency in the summer months and specific messages focus on seasonal activities such as garden watering and outdoor use.

As the drought situation intensified with heatwaves in the summer, an integrated multi-channel campaign was launched, providing customers with key behavioural messages as well as promoting free water efficiency products. More stock of products (e.g. eco showerheads and water butts) than we usually hold or distribute in a year were ordered to enable engagement and promotions to be maintained at a high level.

As we moved into the autumn, our messaging shifted from advice around garden water use and the environmental impact of water wastage to the potential monetary savings on water and energy bills of saving water.

Television and Radio

Our 'There At Every Turn' TV campaign was launched in August and was also shared on YouTube, Facebook and Instagram in boosted advertising campaigns for the same duration.

Through our partnership with Global, water saving messaging was broadcast on Heart Radio across our supply region throughout the entire drought period. Starting with an audio version of There At Every Turn, then moving into water saving advice and mentioning that the dry summer has affected our rivers, and ending with the savings on water and energy bills as we approached winter.

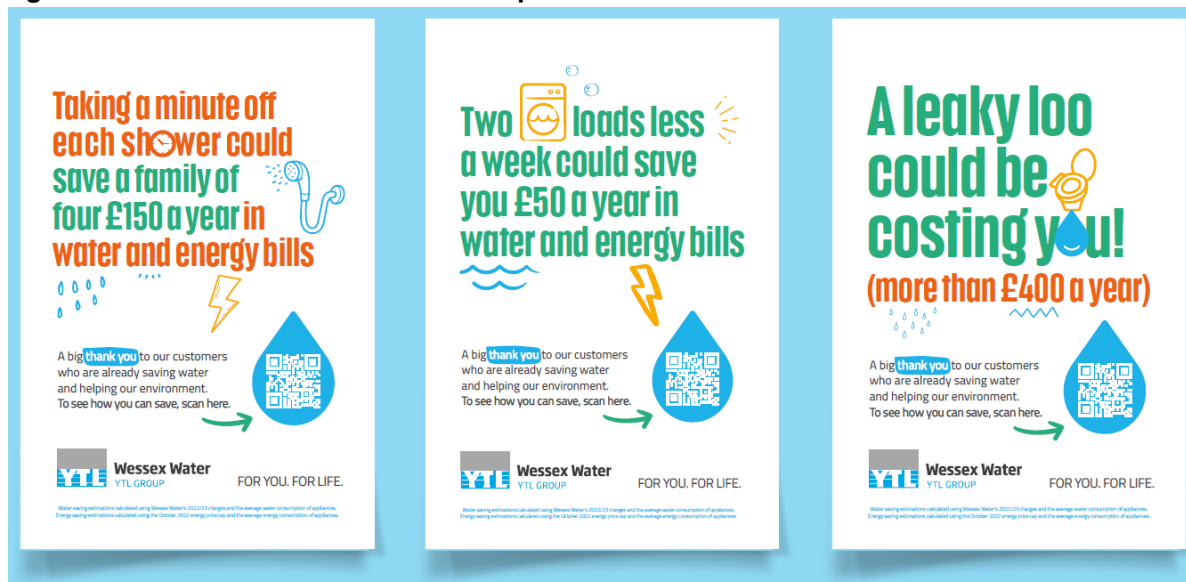
Advertorials

To get our messaging and advice across to customers with detail, we ran two sets of advertorials during the drought, both in print and online, through our media partnerships. The first went live in September and focused on how we need to work together with customers to protect our rivers – explaining what we're doing to help with leak repairs and stream support, and advising customers on ways they can save water to help. The second advertorial went live in November and focused on the energy and money savings that could be made by saving water, while also signposting customers to the 'help to pay' section of our website if they are struggling with their bills, and a section on our leakage performance.

Out-of-home

To support the energy savings narrative, we launched a series of out-of-home adverts which featured on buses, bus stops, phone boxes, posters and in train stations.

Figure 12 Out-of-home advert examples



Social media

While water efficiency content is usually the main focus for the summer months on our social media channels, in 2022 we ensured it remained a core theme of our feeds throughout the autumn due to the drought. Throughout September we acknowledged the drought in our content to get across the severity of the situation to customers and offered various tips for ways to save water in the home. In November we ran two targeted Facebook promotions – one to give away free showerheads and one to promote the energy and financial savings.

Eshot

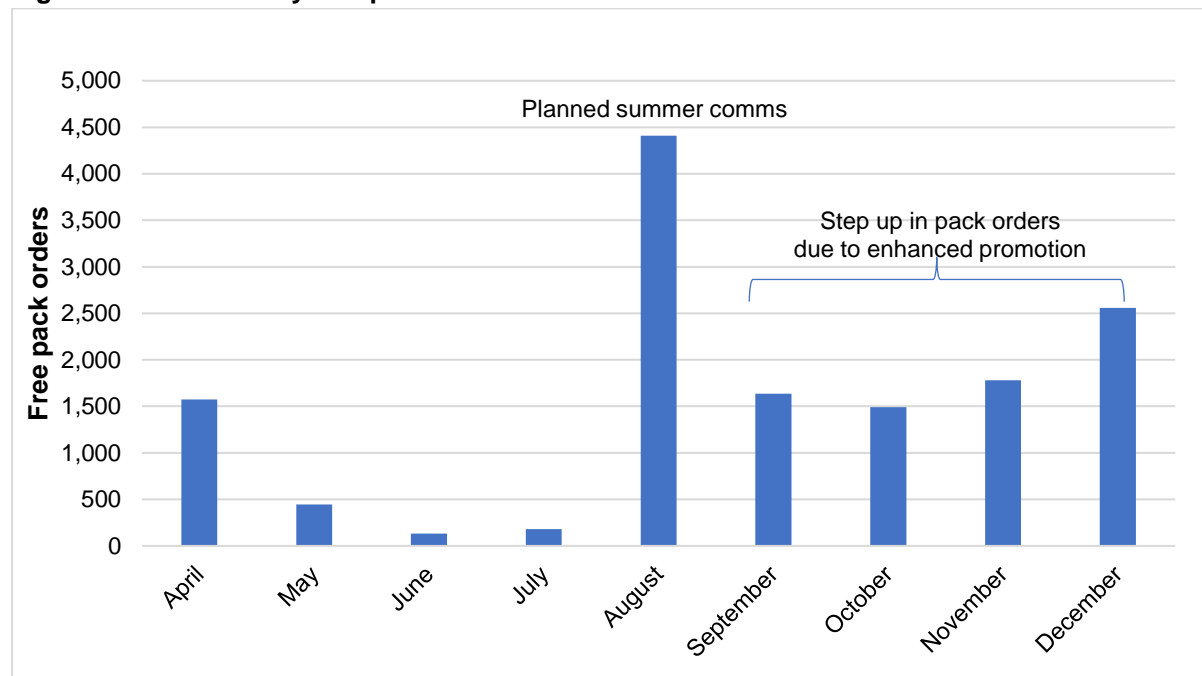
In August we included a showering article in one of our customer e-shots. The article included a range of tips on how to use less water in the shower as a promotion for our eco showerhead. This worked well as a new channel to distribute water saving products through.

Media engagement

In late-August we issued a press release thanking customers for using water wisely over the summer and urging households to keep up the good work which had helped to avoid us going into a hosepipe ban. In line with the seasonal shift in messaging, another release was issued in November to promote the energy and financial savings that come with using water responsibly.

In a normal year we distribute around 4,000 free water saving packs (in Covid impacted years this rose to around 10,000 as we increased reliance on customers fitting devices themselves). From April to December 2022, we distributed over 14,000 packs. Figure 13 shows the step up in free pack orders following the increased promotion.

Figure 13 Monthly free pack orders 2022-23



4. Supply actions

4.1 Supply Optimisation

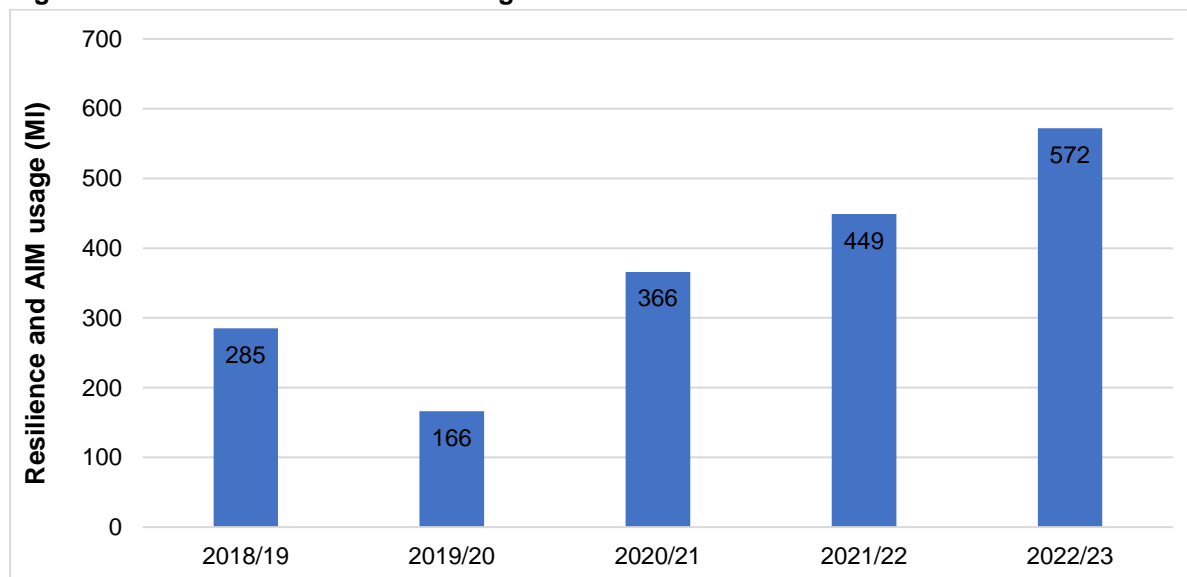
As we entered the summer, we shifted to a Resource Conservation Strategy. The water supply GRID, that has been in place since 2018, provided considerable flexibility to the network in order to meet peak demand and support a number of licence restrictions at key sites in the summer.

Some restricted licences include an additional 'Resilience' allowance or 'Abstraction Incentive Mechanism' (AIM) allowance. These allow for a fixed total volume of water to be abstracted during the period that the sites are restricted to support summer demand and drought scenarios.

For example, one of our Warminster sources is restricted from 20MI/d to 1MI/d in the summer when river levels hit the minimum prescribed flow, however, during this restricted period, we can abstract up to a 6MI/d to a total sum of 100MI.

These allowances are key to meeting peak demand and are managed throughout the summer accordingly. Due to the extended dry period after the summer, this is the first year since 2018 that the source's aggregate Resilience Licence was used, with all others achieving ~90% allowance usage. The significance of this, compared to previous years, is seen in Figure 14 which details Resilience and AIM usage since 2018.

Figure 14 Resilience and AIM usage



The extended dry weather also impacted on the stream support season and there was a significant increase in total stream support required in 2022 compared to previous years. PWS sites linked to stream supports were restricted for longer, thereby, restricting water available for supply and headroom.

It is significant to note that Resilience and AIM licences are included in annual abstraction licence volumes. In addition, there are a number of PWS sites that have stream support

requirements which are included in annual licence volumes. Therefore, the dry weather impacted considerably on balancing remaining annual licence usage across the region.

With the prolonged dry weather into the autumn, the supply system continued to be constrained by licence restrictions in many areas due to the low groundwater and river levels. This also impacted considerably on available yield at a number of borehole and spring sites across the region where historic low yields were observed. Above average rainfall from November enabled abstraction restrictions to be lifted and site outputs increased in a phased process alongside yields, which slowly recovered across the region.

The interconnectivity of our network enables water to be transferred across the region and as such any surplus water could be transferred to the West to support reservoir recovery which dropped to an historic low from October onwards. One Somerset reservoir storage being most significant at 19% in mid-October.

From 13th November a major transfer was reversed to support conserving a treatment site and reservoir recovery in Somerset. This continued in full until 14th December, when it was part reversed back as other Somerset reservoirs recovered. The transfer reversal was finally returned to normal operation on Friday 6th January at which point the reservoir with 19% storage in mid-October was now >70% full.

Furthermore, adjustments to the network were regularly made, following unplanned events, as we headed into the unsettled winter weather to maintain support for the West recovery, as well as minimise risk to supply.

The challenge up until the end of March 2023 is to continue to optimise the supply network, and ensure we manage annual licence compliance in light of the summer drought and higher leakage. This needs to be taken into account alongside meeting any planned or unplanned outage requirements. Furthermore, we aim to continue to review site outputs and carry out maximum trials at all sites and key trunk mains to ensure 'supply ready status' ahead of next spring/summer.

4.2 Planned outages

There were no significant planned outages during the summer, with the exception of the major refurbishment scheme at a WTC near Bridgwater. All other significant outages, other than those with a regulatory deadline were rescheduled. This was in part to ensure sufficient resilience in the network and support the West reservoir recovery, and also to conserve annual licence.

The Bridgwater site was returned to supply from early October at an output of ~10MI/d. This in conjunction with the major transfer reversal played a significant part in supporting reservoir recovery in the West.

Unplanned outages included a site in Bath from 8th June to 12th August due to modifications on the treatment process. The deficit of 3 MI/d was met by the Bristol Water import.

With the sudden recharge of groundwater following the exceptional rainfall in November and December a number of sources were impacted by water quality in terms of turbidity with low yield as well as on recharge. Some sites were also impacted by a surge in pesticide levels following rapid recharge.

4.3 Coordination with neighbouring companies

During the drought, regular communication occurred with our neighbours at Bristol Water, South West Water (including Bournemouth Water) and Veolia Water.

Bristol Water were not as impacted by the drought as ourselves and others with their main supply from the River Severn holding up well. Towards the end of the drought we requested an increase in the bulk transfer we receive from them in Bath, and they agreed to supply us with up to 15 Ml/d. This required some infrastructure improvements on our side which were completed. We did not use these additional quantities due to demand having subsided and the start of recharge occurring.

With South West Water the bulk of our communication with them (including the Directors in their Drought Incident team) was about our shared reservoir in Exmoor which had dropped to historic low levels that were of concern to both companies. In our case we recognised that we could not run our associated WTC and achieve its minimum flow without abstraction from this reservoir alongside another in the region. Preparations were made for over pumping should dead storage be reached but this was not required.

We contacted Veolia Water during the drought to confirm that their bulk supply to us was secure and it was confirmed that this supply was not at risk.

4.4 Drought permit options

Wessex Water's Drought Plan was published in final in June 2022. This plan details the actions we should consider taking in a drought, including Drought Permits. A drought permit can be granted by the Environment Agency to increase water supply during a drought by altering existing or new abstraction licence conditions temporarily.

Ten drought permit options were included in our Drought Plan and ranked in order of environmental impacts. Leading up to the publication of the plan we moved to become drought permit application ready by completing Environmental Assessment Reports (EARs) for each permit option and preparing application templates. As we moved through July and into drought management level 1b we started to prepare for drought permit applications as one of our identified supply-side actions. As per the plan we reviewed the least environmentally damaging options first. These were both winter drought permits to increase pumping up to the daily licensed maximum but beyond the annual licensed volumes. The two options considered were:

- River Stour annual licence
- Dorchester site annual licence

As part of a drought permit application an exceptional shortage of rain analysis must be undertaken. The purpose of this analysis is to show that for the period leading up to and covering the period that has impacted resources there has been an exceptional shortage of rain. This analysis demonstrated that the 6 month's rainfall up to end September 2022 was severely dry and the 4th driest in the historical rainfall record.

Despite the analysis demonstrating the justification for drought permits, by early October it was clear that only the Dorchester site would be worthwhile applying for based on the annual licence used. A pre-application was submitted to the Environment Agency in mid-October which received extensive comments which needed to be responded to and highlighted the potential need for additional time-consuming supporting assessments. By mid-November the water resources position had started to improve and it was clear that the annual licence available at the Dorchester site was sufficient and the permit was not required.

5. Key lessons and considerations

5.1 Reservoirs

5.1.1 *Wimbleball*

For security reasons this section has been edited in the version of this document published on our website.

5.1.2 *Bridgwater Reservoir*

For security reasons this section has been edited in the version of this document published on our website.

5.2 Data

Two areas of positive outcomes of the drought management in 2022:

- **Good quality and timely hydrometric updates needed to track the current water resource position.** The weekly Drought Action Group meetings were an excellent forum to share these hydrometric updates and resource position with the wider company. These meetings enabled optimum management of our resources with influences from across the company to ensure all operational, regulatory, water quality and source elements were considered efficiently, and our reservoir conservation strategy could be enacted throughout the drought. Additionally, a regular smaller meeting set up by our CEO was useful in providing line of sight of activity and challenge at a more senior level.
- **Regular and effective communication with South West Water.** During the drought and when levels at our shared reservoir were becoming critically low, operational and water resource teams had weekly and sometimes daily communications with South West Water to understand their abstraction and storage predictions.

An area identified where data improvements could be made was:

- **Remote access to South West Water's pumped storage flow data on telemetry.** Currently we are reliant on updates from SWW on the pumped storage rates and it would be beneficial at critical times of low reservoir level to have visibility on telemetry of the pumped storage flows at site.

5.3 Water efficiency

Key considerations in relation to customer engagement during the drought include:

- It is straight forward to be very agile with social media communications and print/online media – the lag time between deciding to put information out and it reaching customers is short and can be arranged within a day or so
- Including water efficiency device promotions in the communications (rather than offering behavioural advice alone) increases the lead time for making a communication

live if products are not already in stock. We typically carry enough stock for the next 6-10 weeks of 'regular' levels of promotion.

- Customer uptake of free showerhead promotions via social media in the summer and autumn of 2022 was strong, demonstrating significant appetite for opportunities to save water – the uptake will be in part related to rising energy prices though, rather than purely a customer response to the drought. The uptake of a showerhead promotion in January 2023 was more muted, possibly indicating saturation of customer interest at this time through the channels we're currently using.

We have a bespoke water efficiency performance commitment and will be ending 2022-23 in a strong position partly resulting from the increased customer engagement during the drought.

It is challenging to measure the absolute benefit of the water efficiency engagement on demand and to separate this from the other influences (not least leakage, NHH demand and wider behavioural influences) on Distribution Input or PCC. We are however actively engaged with the current UKWIR project WR/02/A/209 - Review of Demand Management Measures 2022 and 2013 Code of Practice [for TUBS implementation] update. We will view the outputs from this study with interest.

5.3.1 What did we learn from customers during the drought?

In 2022 we ran a longitudinal customer research project exploring customer attitudes to water efficiency and smart metering. It was serendipitous that this overlapped with the drought and heatwaves as we were able to glean insight into customer views on these topics too.

These research outputs will be used in combination with our other multiple sources of customer insight to shape general dry weather communications in 2023 and when we get the next period of drought conditions/heatwave.

Our Customer Tracker survey of 250 customers every quarter also yielded some interesting results on shifts in appetites for certain water saving behaviours and views on whether water resources are plentiful in our area as the drought developed.

5.4 Drought permit application readiness

The Environment Agency's Drought permit and drought order guidelines state that the most likely needed drought permits should be as "application ready" as possible. In order to meet this requirement, all of our drought permit options in the Drought Plan had an Environmental Assessment Report (EAR) carried out independently. These EARs set out the likely impacts of each drought permit option and has an associated Environmental Monitoring Plan.

Despite this preparedness and regular Environment Agency liaison during the development of the drought permits and associated EARs, the Environment Agency consulted extensively internally during the pre-application of the Drought Permit at the Dorchester site and returned a high volume of detail. Comments were received from a variety of teams within the EA relating to impacts outside of those considered in the EAR, and also indicated additional monitoring requirements that were not identified in the Environmental Monitoring Plan.

The highlighted problems have demonstrated that more work is required to be truly application ready across all the drought permit options listed in our Drought Plan. This will avoid delays in implementing drought options during a future drought. We have subsequently arranged an additional review with the Environment Agency for all our drought permits to ensure they have consulted fully internally, and we address any additional concerns/requirements in advance of applications in future.

A positive outcome from the exercise is that we have an accepted methodology and presentation for the exceptional shortage of rainfall analysis. We have working models in place to reproduce further rainfall analysis for future permits.

5.5 Supply/knowledge improvements

The following supply/knowledge improvements have been made:

- A list of drought actions was established covering potential improvements in all areas of supply.
- A priority list of groundwater sources was established to target critical sites for hydrological review to establish what we can expect to abstract in a dry year.
- An over-pumping plan has been developed and costed for our shared reservoir with South West Water.
- Back pumping from a Trowbridge service reservoir to support annual licence and provide more resilience in drought years.
- Further key network constraints identified for investigation and trials to be carried out.
- Investment needs identified on existing sites to ensure 'supply ready status'.
- Nitrate blending and stream support season overlap impacting considerably on network flexibility and headroom.
- Better understanding of impact of rapid recharge following low yield in terms of proactive catchment management and water quality.
- A commendable collaborative effort across the business to support the drought actions and resource conservation strategy.

5.6 Summary of lessons learnt

The main lessons learnt:

- Greater understanding of risks around our key reservoir, Wimbleball, which we share with South West Water. A greater understanding of lower reservoir levels and improved communications with South West Water. Over-pumping plan developed and costed and on the shelf.
- Greater understanding of the agility of customer promotions and the associated time lag.
- Recognition that it is challenging to measure the absolute benefit of the water efficiency engagement on demand and to separate this from the other influences (not least leakage, NHH demand and wider behavioural influences) on Distribution Input or PCC.
- Drought permit application readiness. During pre-application of our drought permit at the Dorchester site, we identified that the EA process of review of permits during their development had not allowed for full consultation across EA departments. A review

process of all drought permit options is underway, with first workshop with local EA scheduled for end February 2023. This will be to ensure all additional requirements by the EA in advance of future pre-applications are captured, discussed and implemented as appropriate.

- A hydrogeological review of critical groundwater sites to understand maximum capacities and in dry years is ongoing.

Annex A. Reservoir photographs

August and October 2022



Sutton Bingham –Spring and October 2022



Luxhay- October 2022

