FINAL WATER RESOURCES MANAGEMENT PLAN 2024

APPENDIX 1H – 2022 DROUGHT

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1 Exec summary

It is a statutory requirement that all water companies publish a Drought Plan which sets out the tactical measures to maintain supplies of wholesome water to our customers during the varying degrees of drought events, whilst at the same time continuing to protect the environment. The latest version of our Drought Plan was published in April 2022.

In this document we discuss the impact of the prolonged dry weather in 2022 and the insight we gained from this experience.

We started the calendar year of 2022 with below average groundwater levels and this trend continued into the summer. On the 17th August 2022 we crossed our Level 1 drought trigger as we officially entered a 'developing drought' and formally enacted our Drought Plan.

The actions we took are detailed in the sections in this report and included:

- An enhanced communications campaign to spread customer awareness of the developing drought conditions and provide water efficiency tips, including direct appeals to voluntarily reduce water consumption,
- An enhanced Active Leakage Control and Pressure Management Plan; and,
- Increased production activity to ensure the effective operability of our sites

Groundwater levels did not drop sufficiently to cross our Trigger 2 Level which meant that the developing drought did not progress to an official 'drought'. Therefore, we did not need to introduce mandatory use restrictions for customers, nor prepare Drought Permit applications.

Despite the impacts that the weather had on our leakage levels and PCC, we are proud to say we effectively managed our resources to always maintain supplies to customers within our resource zone with no restrictions. The developing drought in the summer of 2022 has increased our understanding of how we can operate during future events.

The following points summarise our key lessons learnt as detailed throughout this report, and how we can use the experience for future planning:

- Early modelling of various rainfall scenarios is essential for pre-emptive work to mitigate the impacts of a developing drought.
- Our enhanced communications plan was effective but can and will be improved (both internally and externally) with the support of our new Communications and Marketing Manager and team.
- We would have benefitted from real-time PCC data so that we could have more effectively focussed our efforts and seen the impacts of our actions with higher granularity. We aim to improve this with the roll out of our smart metering programme, and the support of our new Data and Insights Business Manager and team.
- Our Active Leakage Management plan was effective but would have been more so with additional resources which has now been rectified.
- We maintained supplies throughout the summer without the use of restrictions, despite record levels of demand.
- Our current Levels of Service are deemed appropriate.

Based on this review of summer 2022, we will be carrying out the following:

- Set up an internal quarterly review of our production capacity against demand scenarios and groundwater resources will provide a forward-looking risk mitigation tool.
- Investigate further supply-side options for our next Drought Plan.
- Possible inclusion of internal drought triggers for proactive work for pre-drought plan implementation.
- Incorporate updates to the Codes of Practice in our next round of planning.

We will continue to work closely with the Environment Agency and the National Drought Group as we move forwards to ensure an up to date and relevant Drought Plan

2 Introduction

It is a statutory requirement that all water companies publish a Drought Plan which sets out the tactical measures to maintain supplies of wholesome water to our customers during the varying degrees of drought events, whilst at the same time continuing to protect the environment. The latest version of our Drought Plan was published in April 2022.

Shortly after the publication of our Drought Plan, it became evident that our groundwater levels were declining, and that in the summer of 2022 we were likely to pass our first Drought Trigger Level 1. This meant that we would be in a 'developing drought' scenario, and the 'Appeals for Restraint and Enhanced Leakage and Pressure Management' actions within the Drought Plan would be implemented. Table 1 shows a summary of the different stages of drought, and the corresponding drought management actions we would take in each as the drought progresses.

Option Name	Appeals for Restraint and Enhanced	Temporary Ban	Non-Essential Use Ban	North Arundel Drought Permit
Trigger (or preceding actions)	Groundwater Level 1	Groundwater Level 2 (Following consultation on Temporary Ban)	Groundwater Level 3 (Follows Temporary Ban)	Groundwater Level 3 (Follows Temporary Ban) Serious Shortage of Rainfall (Relate to SPI indices levels)
Drought Plan Stage Description	Developing	Drought	Severe Drought	Severe Drought

Table 1: Drought management actions for Levels 1 to 3

This section describes the water resource position that led us into the developing drought, and a summary of the actions that we implemented as per our Drought Plan.

Water Resource position

Groundwater levels are a good indicator of the water available from the chalk aquifer from which we abstract most 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 our position relative to the Drought Trigger lines.

As the graph in Figure 1 shows, we started the calendar year of 2022 with below average groundwater levels due to relatively low rainfall in the previous months. During the spring as groundwater levels continued to decline, we modelled the impact that various rainfall scenarios would have on our groundwater levels throughout the rest of the year, particularly focusing on the summer months when demand is at its highest.

Modelling suggested that continued below-average rainfall would result in our Level 1 drought trigger being passed, although it would be unlikely to pass into a Level 2 'Drought'.

As a result, we pre-emptively convened our Internal Drought Management Group in July. The group met every fortnight to discuss the emerging developing drought conditions and the coordination of our response.

The modelled scenario became the reality as the rainfall throughout spring and summer was not sufficient to return the groundwater levels back to the long-term average, and they continued to decline as shown in Figure 2. On the 17th August 2022 we crossed our Level 1 drought trigger as we officially entered a 'developing drought'.

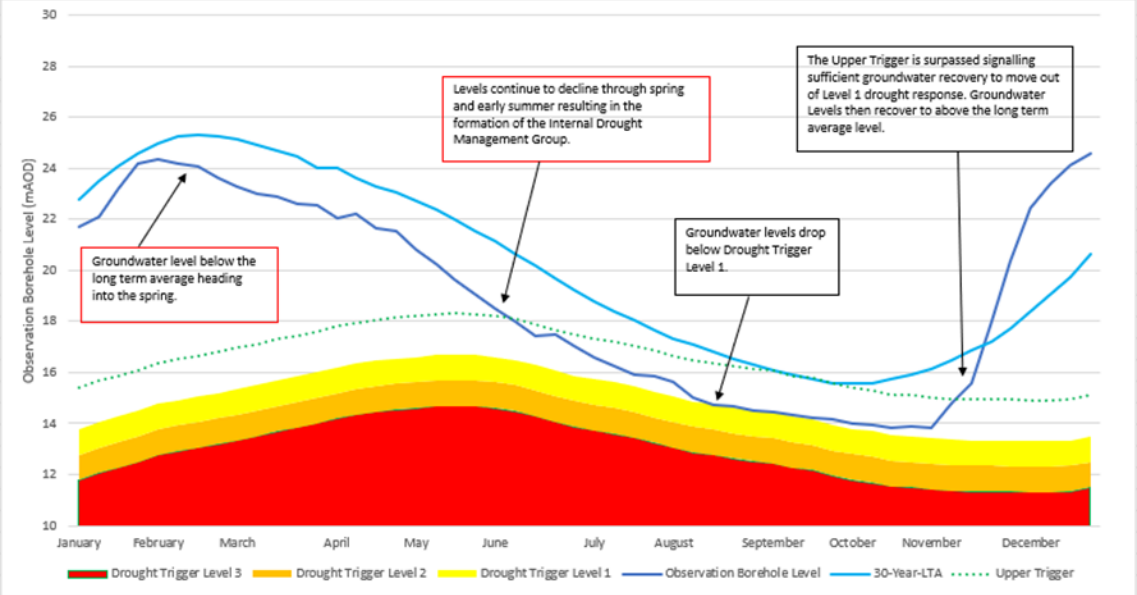

Figure 1: Groundwater levels compared to 30 Year LTA and Level 1 Drought Trigger

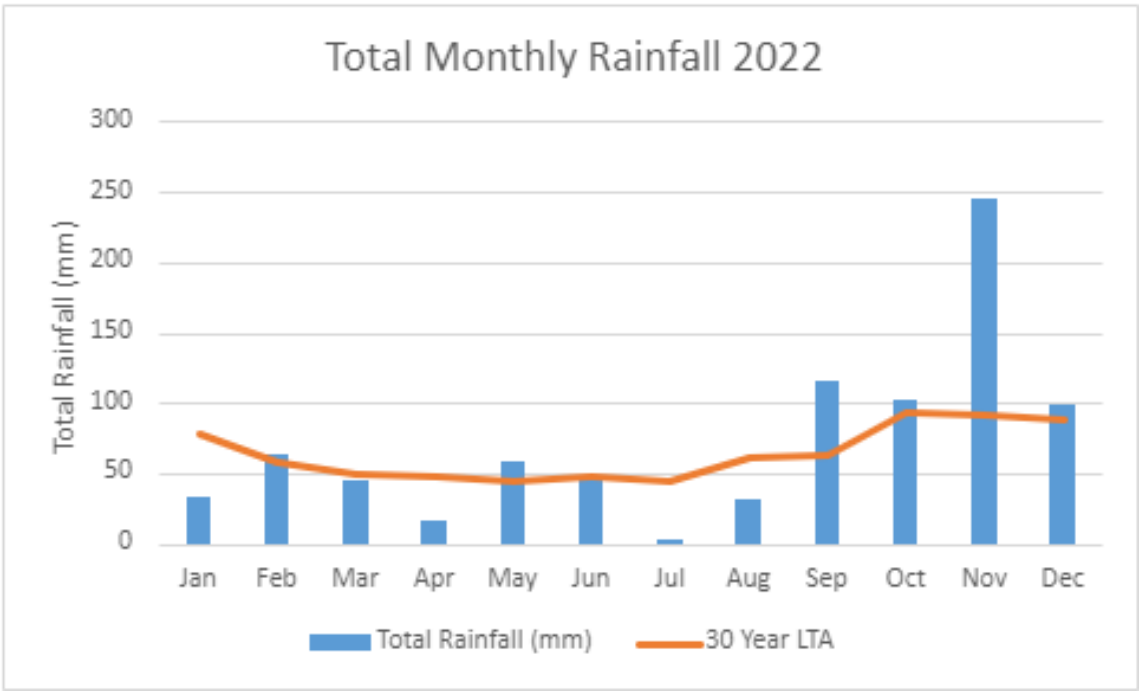

Figure 2: Total monthly rainfall 2022

Drought Management Actions

After crossing our Level 1 drought trigger, we formally commenced our operations for a 'developing drought' in accordance with our Drought Plan.

The actions we took are detailed in the sections in this report and included:

- An enhanced communications campaign to spread customer awareness of the developing drought conditions and provide water efficiency tips, including direct appeals to voluntarily reduce water consumption,
- An enhanced Active Leakage Control and Pressure Management Plan; and,
- Increased production activity to ensure the effective operability of our sites

As our modelling predicted, groundwater levels did not drop sufficiently to cross our Trigger 2 Level which meant that the developing drought did not progress to an official 'drought' in accordance with our Drought Plan. Therefore, we did not need to introduce mandatory use restrictions for customers, nor prepare Drought Permit applications.

The Autumn rainfall we experienced after the Summer meant that our aquifers began to recharge, and groundwater levels rose back above our upper trigger level in November 2022, signalling a return to 'business as usual' status. Our Internal Drought Management Group continued to meet fortnightly until 16th November 2022. Before standing down the group we reflected upon our summer, the effectiveness of our response and to form our considered responses to the required Environment Agency prospect reports.

During the developing drought event, we are proud to say we effectively managed our resources to always maintain supplies to customers within our resource zone with no restrictions. This report sets out the details on how we did this, and then lessons we learned and the actions we are taking in response to this.

Southern Water

Our neighbouring water company, Southern Water (SWS) had also been monitoring their drought conditions throughout the year. Their Drought Triggers are based on the surface water levels in the Rivers Test and Itchen. SWS reported they first dropped below their '60-day' trigger on the River Test on June 17th. This is their 'pre-consultation' trigger where formal dialogue began with the EA and other stakeholders, including Portsmouth Water. A draft drought permit application was made on 24th June.

Surface water levels continued to decline, and during the week commencing July 11th, their '35-day' trigger was breached. This is the period before a potential breach of Hands-Off Flow Licence as specified in their Section 20 agreement with the Environment Agency. As a result, SWS submitted a final drought permit for the River Test on July 19th. Having crossed their Level 2 Drought Trigger, SWS implemented TUBs on 5th August in Hampshire and the Isle of Wight.

Throughout the year, we maintained communications with SWS to understand their water resource position but did not implement TuBs for the reasons outlined above.

3 Demand

Our Distribution Input (DI) is the amount of water we put into our network each day and is our headline measure of demand. The components of demand include Per Capita Consumption (PCC) and leakage. Figure 3 shows how our **monthly average** DI has varied over the last three reporting years. The peak in summer 2022 was greater than we've seen in recent years, including at the height of covid restrictions in 2020. However, once the hot weather abated, DI reduced significantly and continued at levels comparable to the previous two years.

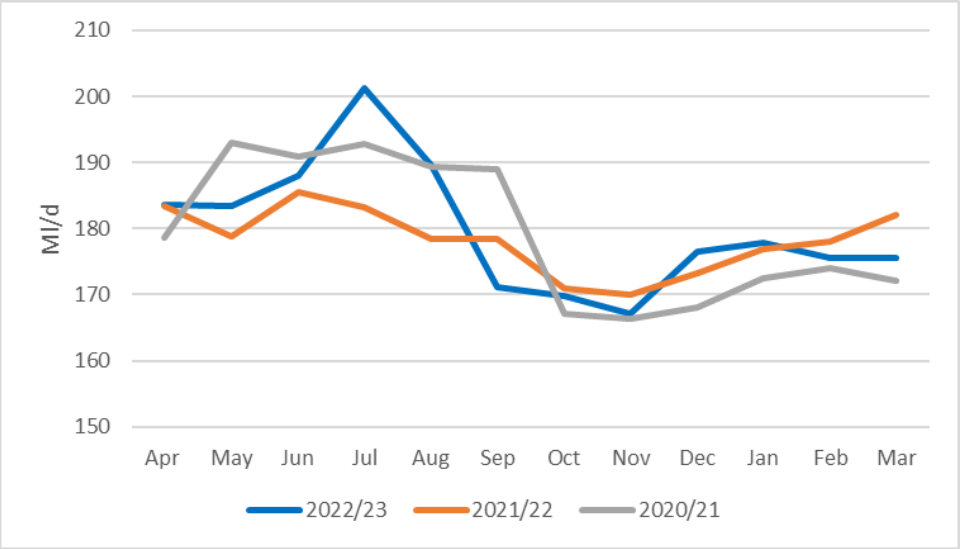

Figure 3: Distribution Input (monthly averages)

The DI trend broadly follows the same trend as PCC and leakage in that there is a peak in July which abates in August and is significantly reduced by September and October. It therefore indicates that:

- The summer heatwaves and dry weather caused both a rise in consumption and leakage
- An effective communications campaign and active leakage management plan, combined with the slight increase in rainfall in August helped to reduce DI

The following sections will detail our drought management actions throughout the summer 2022.

4 Enhanced Communications Campaign

In this section we discuss the content and effectiveness of our enhanced communication plan which we implemented throughout the period of developing drought. With the continued dry weather and in sympathy with national messaging and campaigns from our neighbouring companies in the Southeast, we initiated our communication plan in May 2022. Our internal team were proactive and with some external resourcing support from a local design and creative agency we had pre-prepared an enhanced summer communications plan to make customers aware of the emerging drought status and we provided water efficiency recommendations to voluntarily reduce consumption. This included email and letter communications, social media communications and event activation.

Upon crossing Trigger Level 1 on 17th August we intensified our efforts, in accordance with our Drought Plan.

The plan was designed to work across multiple platforms and to:

- Raise awareness of the water resource position.
- Appeal to customers to voluntarily use less water.
- Give our customers simple, seasonally relevant ways they might save water.
- To signpost where people could go to find out more information if they wanted to.

We aimed to initially hit a light-hearted, eye-catching tone in our communications (see an example in Figure 4), with plans to change that tone to a more serious one should conditions worsen, and we would start to consider the introduction of TuBs. This possibility was always considered to be remote, but preparations were made, nonetheless.

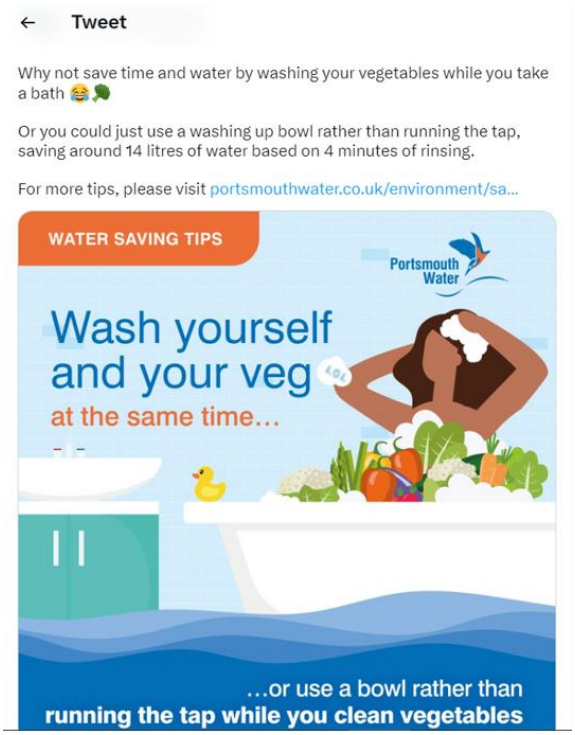

Figure 4: Example of water efficiency messaging on social media

In order to raise awareness of the water resource position, we developed a water resources dashboard that we shared monthly on our social media platforms. An example of the dashboard for August 2022 can be seen below in Figure 5. It shares current groundwater position, rainfall levels, customer demand levels and a water efficiency tip.

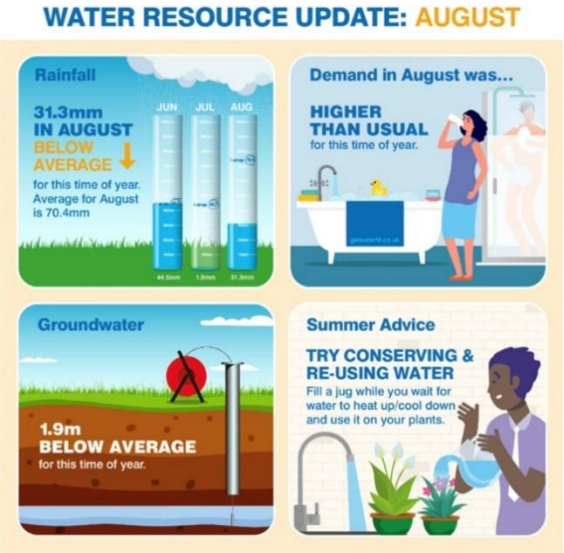

Figure 5: Water Resource dashboard shared on social media platforms

In between these dashboards we also shared water efficiency tips twice a week. Some further examples of the messages we showed on social media platforms are shown below as Figure 6.

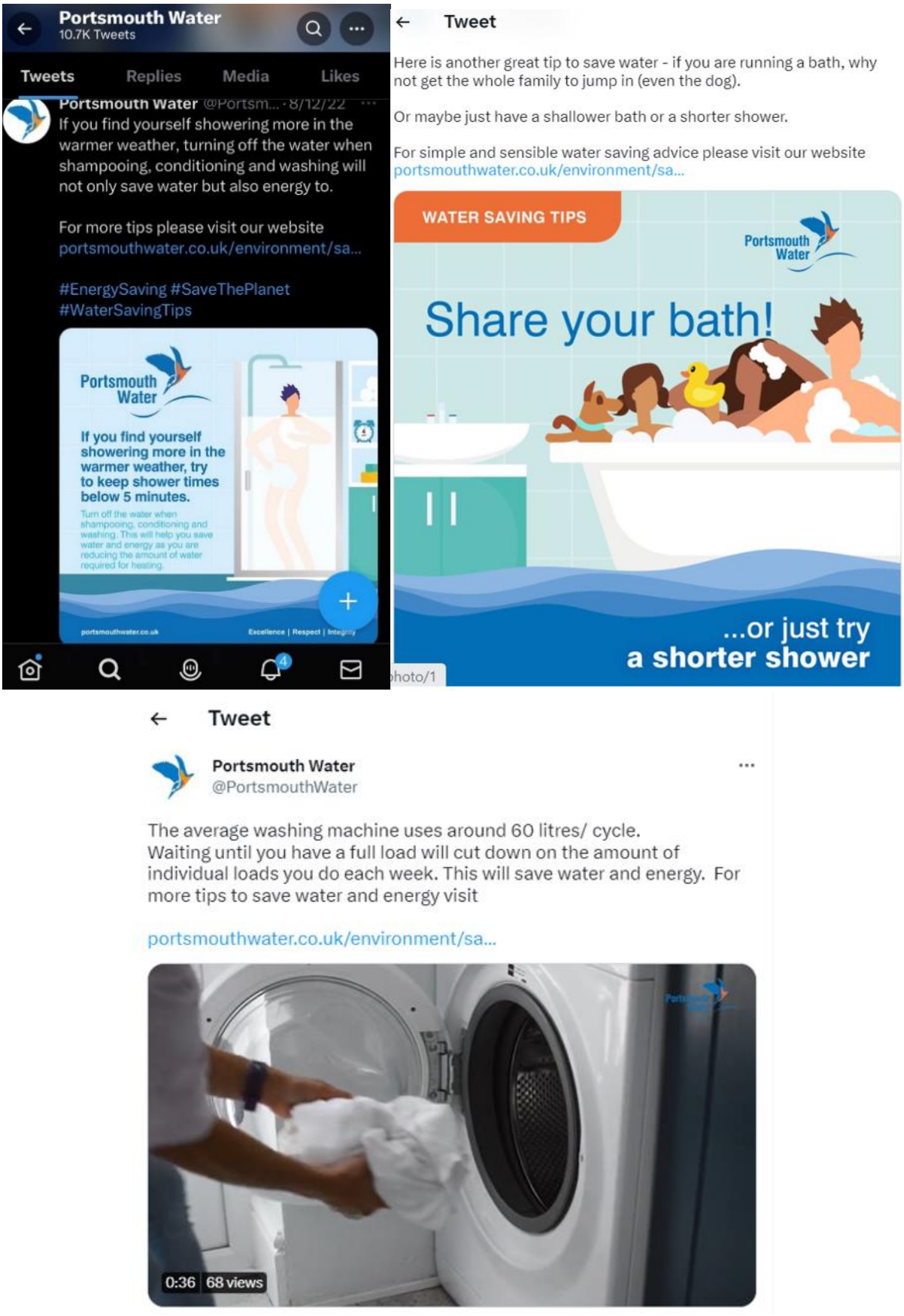

Figure 6: Examples of water efficiency messaging shared fortnightly on social media platforms

In our posts we also continued to promote our GetWaterFit platform, encouraging customers to sign up in order to receive water saving devices and further efficiency tips that were specific to their personal situation.

As part of our contingency planning for a more extreme drought developing, we investigated alternative means of communications including paid advertising using local news outlets, delivered household leaflets, and an advertising campaign displayed on local buses, bus stops and advertising hoardings. Mock ups of how these would have looked are shown below in Figure 7.

Figure 7: Advertising mock-ups as part of our advertising contingency plan

We also explored the options for direct communications with our customers in the event that local zones experienced high demand which could potentially threaten supply interruptions. This preparation was opportune because during a heatwave in July, extreme levels of demand were experienced throughout our company area, specifically in Chichester and Bognor.

As a result, we issued 43,000 SMS text messages and 104,000 e-mails to residents urging them to reduce their water consumption for the period of the hot weather to avoid supply interruptions.

Impacts on demand

Figure 8 shows **monthly average** PCC throughout the last 3 years. There was a clear peak in PCC as the hot weather started in the summer, with the July heatwave causing the largest increase in water consumption. Despite the extreme temperatures, the peak of PCC was not as high as the peak seen in the height of covid restrictions. Speculatively, this could be attributed to the early implementation of our communications plan in early May controlling the peak seen in July. A number of factors will have contributed to the significant reduction in PCC in the months that followed, including:

- Increased awareness due to the scale of the national debate around drought and water usage
- Customer consciousness of water efficiency following the implementation of the SWS TuBs
- The intensification of our communications plan after 17th August
- The abating heatwaves and increase in rainfall

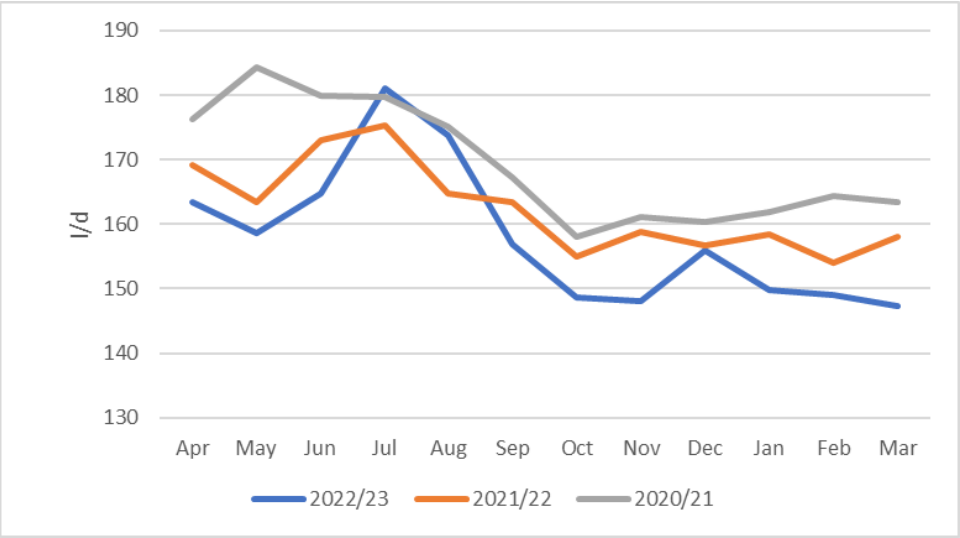

Figure 8: Average PCC (household and non-household) over the last 3 years

It is hoped that the impacts of the campaign and the developing drought conditions helped to change behaviours which continued throughout the year, as shown by the reduced PCC levels when compared to the previous two years. To more accurately assess the impact that our actions had on PCC, we would have needed real-time data. This is discussed in the lessons learnt section below, where we explain what we could have done differently and our actions going forwards.

Lessons learnt

Although we were able to effectively roll out our communications plan which helped reduce demand, we learnt valuable lessons along the way. This section outlines those lessons learnt, and how they will enable us to improve our effectiveness during future events, so that we can aim to reduce demand even further to mitigate against interruptions to supply and network stresses.

Customer Reach

During the developing drought, we found social media to be a very quick and effective tool to reach our customers for providing updates and messages on a regular basis. However, we acknowledge that we could increase our social media presence which will enable us to post water efficiency and drought messages to a wider spread of customers.

We believe we needed to have more out of home communications activity, however, deadlines from external parties out of our control were not set up for the reactivity the campaign required. We are now aware of this challenge, next time we will adopt more paid digital spent to reach more audiences. As well as being proactive, we also saw a spike in customer queries, predominantly as a result of the announcement of the Southern Water hosepipe ban.

We have since hired an experienced Marketing and Communications Manager who is now responsible for communication channel management. She will shortly have a larger team who will provide resilience in the event of prolonged dry weather and will be aiming to grow our social media presence to engage directly with more customers. She is also forming her own links with Marketing Agencies that will provide access to further resource to support our effort in the future.

We will work closely with her in the months preceding any dry weather event, to ensure a timely and effective campaign. She will also be a welcome member of the Drought Event Management Group.

Campaign planning

As part of our contingency planning, we explored alternative means of communications including paid advertising using local news outlets, delivered household leaflets, and an advertising campaign displayed on local buses, bus stops and advertising hoardings. We now have a greater understanding on the lead times required for each of these communication channels. Local printed media outlets including household delivered leaflets require a six-week notice period whilst the local bus companies require four weeks. This understanding allows us to factor in the lead times when implementing the communication strategy should they be required.

Campaign effectiveness

One of the key findings was that although we could pinpoint specific areas of extreme demand, we weren't able to measure the effectiveness of targeted campaigns within those areas. At current we do not have the levels of smart meter penetration required to effectively monitor and manage consumption at a daily level of granularity and so are not able to evaluate the specific impact our communications had on reducing demand. Once we have the widespread use of smart meters in our network, we will be able to obtain invaluable real time PCC data which will allow for more effective drought management. In the meantime, we are in the process of ordering 'smart' flow loggers to improve data from existing SAMs and to increase the overall number of SAMs that we have. This will improve frequency and accuracy of the data used for the monthly water balance.

We have recently employed a Data and Insights Business Manager, who is looking at implementing systems to allow a greater degree of PCC analysis. In the future we should be able to improve our targeted communications in terms of location and method, based on daily PCC readings.

Drought awareness

Throughout the summer, we received calls and emails from customers asking about our drought status and restrictions. As previously mentioned, other water companies in the Southeast may implement drought management actions at slightly differing times based on location and drought triggers. This may potentially lead to confusion amongst the public, especially if the customers do not use social media, or may not have seen our other methods of communication.

We are aiming to improve our drought messaging and awareness as outlined in our 'customer reach' lessons learnt, but we can also improve this by increasing the awareness of drought events within all our staff, especially those who interact with customers directly. We will post more updates on our internal platform, email updates to all staff, and encourage department leads to regularly update their staff on drought status and restrictions. Having an aware and well-educated workforce, especially those who are likely to be interacting with customers such as meter readers, leakage technicians and customer service operatives, would lead to increased awareness and confidence within the public, which will help reduce demand by spreading the message to use water wisely.

5 Leakage and Pressure Management

This section describes how our leakage was impacted by the developing drought, what actions we took, and how we are moving forwards to mitigate against the impact of drought events in the future.

As groundwater levels continued to decrease throughout the spring and the reality of a developing drought become evident, in June we implemented our 'Active Leakage Recovery Plan', pre-empting the action formally required by the crossing of our Level 1 Drought Trigger.

The purpose of this plan was to focus on; data, increasing leakage detection rates, focusing repair resource and optimising the pressure management of our network. The specific work carried out is outlined in the points below:

- **Data –** this workstream sought to maintain 90% operability of all District Meter Areas (DMA) and Small Area Meters as well as undertake in-depth logging of non-household use in 5 DMAs. The granularity of this meant we were able to increase the effectiveness of targeting the detection efforts.
- **Detection –** mobile acoustic loggers were deployed to zones where they would have maximum effect.
- **Repair –** Leakage teams had a stretched target to reduce their outstanding jobs by 50%
- **Pressure management –** the team worked to optimise our ability to control fluctuations of pressure in key areas of our network, with the effect of reducing the volume of water lost through active leaks prior to repair, whilst also calming the network to reduce new leaks breaking out.

This work was initially successful and resulted in a drop in average weekly leakage of just over 5Ml/d from 30.0 Ml/d to 24.6 Ml/d by early July.

However, the lack of rainfall and high temperatures in July had a significant impact on ground movement which caused leakage to increase by c.10Ml/d. In response, we intensified the plan by diverting resource from other areas of the business to help with Active Leakage Control activity, and initiated weekend repairs. Our increased efforts meant that our leakage levels were recovered to pre-summer levels by mid-September. Figure 9 reflects our leakage performance from April 2022 to March 2023.

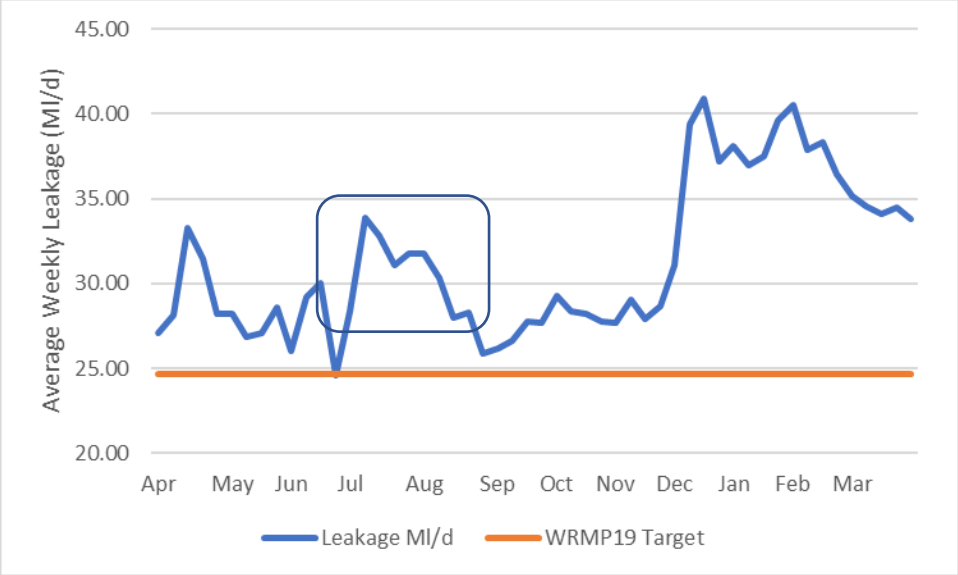

Figure 9: Total average leakage levels April 2022 to March 2023

The graph shows a further spike in leakage levels during December 2022. However, this is not explained in this document; please see the Water Resources Management Plan Annual Review 2023 for further details.

Lessons Learnt

Leakage detection and repair plays a fundamental role in our daily business operations, and we are continuously finding ways to further decrease our levels of leakage. The rapid increase in leakage experienced in July taught us some valuable lessons which are outlined in this section.

Resources

During the hot and dry summer last year we experienced a significant increase in leakage due to the associated increased ground movement. With limited repair resource available, our early results were hampered during the Active Leakage Recovery Plan. The impact in leakage recovery would have been far greater had we had a full leakage team or the external options which are now available. We could have targeted outstanding leaks whilst having available resources to identify and repair new leaks.

Immediately after this experience we initiated a contract with a third-party leak detection service. This has increased the number of leakage technicians we have available in the field overall and spread the risk of turnover and sickness. In addition, we have employed five additional internal leakage detection staff. The additional resources are dedicated to recovering our leakage performance throughout the year as business as usual, and during times of developing drought events.

Further investments

Over the next 12-months we are continuing to focus on driving down leakage as part of our ‘business as usual’ activity. We are investing in new technologies that will increase leakage detection frequency and location, enabling faster repair times which will drive down outturn leakage. This will be beneficial all year round but will be particularly useful during future drought events as we will be able to react more efficiently.

Specifically, we have purchased 200 new-generation sensors, which use artificial intelligence technology to provide rapid, pinpoint locations. These sensors can be installed throughout our network to provide a wide range of coverage, particularly in areas vulnerable to leakage.

We are also planning to invest in satellite imagery that works by detecting elevated chlorine levels in surface and shallow subsurface water. Chlorine is an indicator of the presence of treated water and therefore a point of interest to investigate a potential leak. Satellite imagery will be most effective during dry weather and drought events where there is minimal sub surface shallow water because of rainfall. Therefore, this will be particularly valuable during any future drought events.

Finally, we are set to purchase several of the latest generation hand-held mobile acoustic monitors. These monitors are highly intuitive and require minimal training to operate. This characteristic will allow for a wider pool of Portsmouth Water staff to be able to undertake leak detection operations, which will ultimately increase detection rates and the speed with which we can sweep our network.

6 Production

Despite a summer of low groundwater levels and rapid increases in demand during intense hot conditions, we maintained a constant supply of wholesome water to our customers. This section explains how we achieved that, and what we learnt going forwards for similar events in the future.

Our Final Drought Plan (April 22) does not include any supply-side drought management actions other than a single drought permit to maintain supplies to our customers in severe drought events. Nonetheless, as it became evident that groundwater levels were declining and below average rainfall was forecast, a number of additional options were considered should they be required. This included:

- Maximising Deployable Output (DO) at boreholes,
- Managing outage; and,
- How and when to recommission sites currently not in use.

Low lift pumps were used to maintain supply to our largest water treatment works and we explored the option of reinstating one of our four decommissioned sites. Work was carried out at one site which was close to being returned into service however, as demand dropped, the decision was taken to leave the site on standby and not to be fully recommissioned.

Due to the increase in workload during this time, additional resources had to be brought in to support the team. Internal resources, including office-based staff, were diverted to work at our abstraction sites to help maintain DO. Despite the intense conditions and consistent high levels of demand, we were resilient to the developing drought and maintained supply throughout.

It is important that the sites are operational and able to provide the required deployable output during dry weather events. Outage programmes and the delivery of DWI notice activities (e.g., reservoir cleaning) should not be carried out during these times to maximise resilience to drought. This is already considered within the programmes as it is normal for us not to undertake reservoir cleaning between April and October and other planned work was cancelled as we switched to a largely reactive position.

Outages that were experienced at sites last summer were temporary and resolved quickly. Therefore, the outage assessment does not need review based on the experiences of last year.

Bulk Supplies

During summer 2022 we successfully maintained our existing Bulk Supply Agreements with Southern Water. The existing agreements mean that up to 30Ml/d of water is available for up to 1-in-200-year drought event. We supplied the water requested of us by Southern through the reserving process outlined in our Bulk Supply agreement. This equated to an average over the summer months of 13.63 Ml/d.

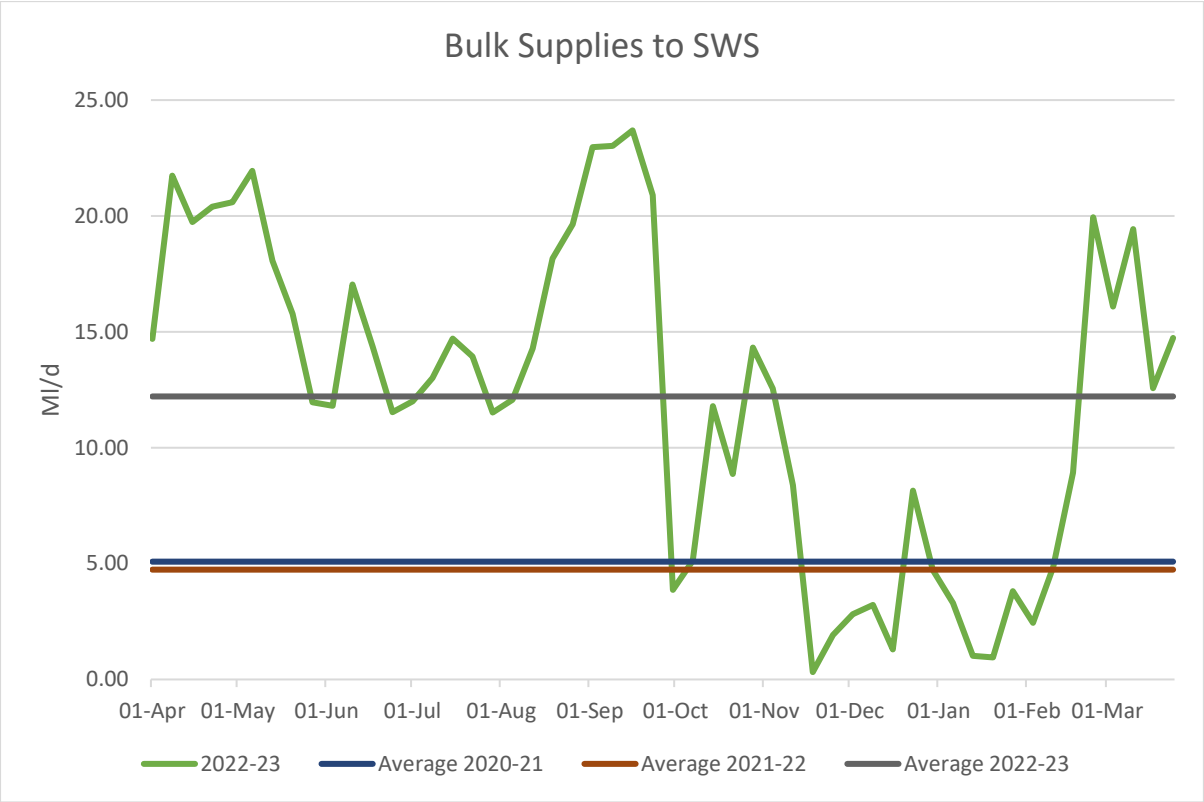

Figure 10: Bulk Supply from Portsmouth Water to Southern Water April 2022 – March 2023

The Figure above shows the weekly average exports throughout the year, alongside the averages compared to the previous two years. It is evident that the 2022-23 average bulk supplies significantly exceeded those seen previously.

Lessons Learnt

Despite record breaking yield at five of our abstraction boreholes we do not intend to increase the deployable output from these sites in the long term as we are committed to reducing groundwater abstractions to protect and enhance the environment.

Supply side options

The only supply-side option we have in our Drought Plan is the North Arundel Drought Permit. We did not have to apply for drought permits because groundwater levels remained above our level 2 drought triggers and therefore, preparation nor an application was not needed.

As a result, we do not have any lessons learnt specific to the application of drought permits. However, other water companies that did are currently leading on their own lessons learnt project which is contributing towards updates in the Drought Code of Practice 2023.

We now also have a greater understanding of what short-term supply-side options we have should a drought occur including:

- Maximising DO at boreholes
- Managing outage
- Returning infrequently used sites into production

We could potentially include these as supply-side options in our next Drought Plan. This will be discussed with the Environment Agency.

Production Planning

- Following the events of last summer, we are currently developing a tool to enable a proactive approach to dealing with any future developing drought events. An internal production capacity report has been produced which provides a RAG status for each of the sites to prioritise the mitigation measures required to increase storage or capacity. The current production capacity will be reviewed quarterly against projected demand scenarios, groundwater levels and bulk supply reservations for Southern Water to proactively have sight of our situation as the year progresses.

7 Drought triggers and Levels of Service

Upon assessment, our existing groundwater control curve drought triggers are sufficient in effective drought management. Groundwater levels did recede beyond our first drought trigger but did not progress further. Our level 1 drought management was deemed to be effective, and we maintained supply capability within our network without disruption. Since we did not surpass our Level 2 drought trigger, we didn't have to impose mandatory restrictions. It is therefore considered that our demand forecasting and Levels of Service remain appropriate. We will be able to reassess this if we cross our Level 2 drought trigger in the future as we will have the data to support any changes.

Prior to receding beyond our first drought trigger we were proactive in our drought management response and established our internal drought group in preparation for a more severe drought event. We stepped up our external customer communications appealing for a voluntary reduction in consumption and initiated a leakage recovery plan mentioned above. The internal drought management group was established due to concerns regarding receding groundwater levels and not by other means. Therefore, we will consider establishing an agreed internal drought preparation trigger or triggers that we use to co-ordinate our drought management response. Our current drought triggers are separated by 1-meter intervals. An example of how these internal triggers could look is shown in the table below.

Internal Trigger	Control Curve	Action
Internal Trigger 1	Set at 1-meter above our level 1 drought trigger.	Notify members of the internal drought group about crossing of the Internal Trigger 1 allowing for proactive management of relevant responsibilities (i.e.., enhanced customer communication plan, leakage recovery plan, customer service updates)
Internal Trigger 2	Set at 0.5-meters above our level 1 drought trigger.	Formally convene the internal drought group and conduct regular meetings discussing drought preparations and management.

Once agreed, we will subsequently be updating our current Drought Plan with these additional internal triggers.

8 Future Resilience Schemes

From 2029, the completion of Havant Thicket Reservoir unlocks new local and regional options for future water security. The reservoir capabilities have been tested using the Pywr model and has been coupled with peak demands to demonstrate resilience to droughts occurring once every 500 years, as detailed in our WRMP24.

Additional drought resilience can be attributed to the installation of smart meters across our network, a leakage reduction target of 50%, and enhanced water efficiency activity; all of which are included in our WRMP24. The cumulative savings from these options combined with Havant Thicket Reservoir means that we have a level of resilience up to a 1:500-year drought event.

9 Update to the Drought Codes of Practice

The Code of Practice (CoP) provides guidance to all water companies in England and Wales on the effective implementation of water use restrictions by the way of Temporary Use Bans (TUBs) and Drought Orders. Should we be required to implement TUBs or apply for Drought Orders at Portsmouth Water, as per our drought plan, we should refer to the Code of Practice on how to implement demand-led water use restrictions. The CoP is non-statutory and non-binding and serves as best practice guidelines for water companies to follow to ensure universal consistency and alignment. Following the CoP should mean that customers can be confident that their interests have been considered and they are not disadvantaged by restrictions in comparisons to customers in neighbouring water company areas. The current CoP was published in 2013 and this is currently being updated in 2023 to provide up to date guidance following the events of 2022.

Once finalised, we will be reviewing the updated CoP and using the guidance to inform our next round of planning.

10 Conclusions and further work

Conclusions

The developing drought in the summer of 2022 has increased our understanding of how we can operate during future events. The following points summarise our key lessons learnt as detailed throughout this report, and how we can use the experience for future planning:

- Early modelling of various rainfall scenarios is essential for pre-emptive work to mitigate the impacts of a developing drought.
- Our enhanced communications plan was effective but can and will be improved (both internally and externally) with the support of our new Communications and Marketing Manager and team.
- We would have benefitted from real-time PCC data so that we could have more effectively focussed our efforts and seen the impacts of our actions with higher granularity. We aim to improve this with the roll out of our smart metering programme, and the support of our new Data and Insights Business Manager and team.
- Our Active Leakage Management plan was effective but would have been more so with additional resources which has now been rectified.
- We maintained supplies throughout the summer without the use of restrictions, despite record levels of demand.
- Our current Levels of Service are deemed appropriate.

Further Work

Based on this review of summer 2022, we will be carrying out the following:

- Set up an internal quarterly review of our production capacity against demand scenarios and groundwater resources will provide a forward-looking risk mitigation tool.
- Investigate further supply-side options for our next Drought Plan
- Possible inclusion of internal drought triggers for proactive work pre-drought plan implementation
- Incorporate updates to the Codes of Practice in our next round of planning

We will continue to work closely with the Environment Agency and the National Drought Group as we move forwards to ensure an up to date and relevant Drought Plan

11 WRPG checklist

The Water Resources Planning Guidance (WRPG) has requested that we review our resilience to managing customer demands during the hot weather of Summer 2022 as part of preparing our WRMP.

The WRPG specifically requires that,

'Your plan should clearly include an appendix to demonstrate how experiences from 2022 have been considered. You should set out any lessons you have identified through the 2022 drought event and actions you are taking in response to these. This should include changes you have made to your plan as a result and further work you are planning to undertake.'

Table 2, below, details the guidance requirements and how these have been addressed in this Appendix.

Guidance Note	**How comment has been addressed**
considering how you can improve the resilience of your supply system to similar events	This appendix contains details of lessons learnt and actions delivered and in progress.
considering whether any new temporary schemes implemented during the drought could be made permanent, ensuring they are assessed as an option in your plan	For our next Drought Plan, we will assess the following options for increasing drought resilience: • Maximising DO at boreholes • Managing outage • Reinstating decommissioned sites
include any newly identified drought permits as an option in your plan	There are no newly identified drought permit options in our plan. As groundwater levels did not further recede past Level 2 and 3 Triggers, the use of mandatory restrictions and drought permits was not required. We have identified a need to conduct a significant works programme (detailed in the North Arundel EAR) if we were required to apply for our existing North Arundel Drought Permit, which is capable of supply an additional 8.5 Ml/d.
ensuring the assumed benefits in your options list for drought interventions (such as drought permits/orders and Temporary Use Bans) implemented this year reflect your latest understanding	Our water resource zone showed resilience to the emerging drought conditions during the Summer of 2022 without the need to implement any mandatory water restrictions. Our planned levels of service

reviewing your planned level of service	and use of drought options are to remain consistent with the WRMP24 and Drought Plan 2022. Having not been required to implement them, we will continue to use the demand savings assumptions associated with Temporary Use Bans and Non-Essential Use Bans.
updating deployable outputs where you have gained an improved understanding of how your sources respond to drought	Despite record breaking yield at five of our abstraction boreholes we do not intend to increase the deployable outputs from these sites in the long term as we are committed to reducing groundwater abstractions to protect and enhance the environment. The short-term resilience these sites offered will be offset by Havant Thicket Reservoir when it comes into operation.
ensuring your planning assumptions for dead storage and emergency storage are accurate	N/A
reviewing your demand forecast assumptions, following your experience of the impact of 2022 drought and heatwaves on household and non-household customer demand, including the extent and duration of peak demands	Our demand forecast assumptions are considered appropriate. Based on our latest WRMP assumptions, the critical period distribution input did not reach the forecast WRMP levels for a dry year where restrictions would have been implemented.
if you do not currently use dry year critical period scenario/s, consider whether you should introduce this scenario in your planning	N/A
ensuring you consider high demand (leakage) resulting from all extreme weather - including heat waves, as well as freeze-thaw events	We utilise dry year critical periods within our Pywr model runs to simulate high demands within our water resource zone to identify resilience to drought events and the subsequent network constraints. The critical period baseline demand we use is multiplied by a demand factor to demonstrate water availability during periods of significantly elevated demand.
considering whether you need to include any schemes as part of your business plan to improve connectivity and zone integrity	We will not be including any schemes as part of our business plan. However, we are making an early start on our WRMP29 unconstrained options list which will investigate the need for improving connectivity and zone integrity.

including investment in your business plan to ensure infrastructure or operational constraints are not a limiting factor to sources or issued drought permits, providing environmental and licence conditions are met	These were reviewed for our WRMP24 DO assessments and will be reviewed again for our WRMP29 unconstrained options work.
reflecting any updates to bulk supply agreements, including pain-share agreements discussed during the drought	We are not including any updates to bulk supply agreements as a result of Summer 2022. During summer 2022 we successfully maintained our existing Bulk Supply Agreements with Southern Water. The existing agreements mean that up to 30Ml/d of water is available for up to 1-in-200-year drought event. On average over the summer months, we supplied them with 13.63 Ml/d.
reviewing your forecast outage, as this is particularly important in acute drought events.	We will not be reviewing our forecast outage as a result of the events of summer 2022.

Table 2: Portsmouth Water response to WRPG request that we review our resilience to managing customer demands