Drought Plan

Final Plan

Wessex Water

June 2022

Wessex Water
YTL GROUP

Contents

Executive summary

This Drought Plan sets out our tactical and operational response to extended periods of dry weather and drought. The Plan identifies the actions we will take before, during, and after a drought to maintain a secure supply of water and outlines how we will assess and mitigate against the environmental impacts of our actions. It has been developed following Defra and the Environment Agency's current drought plan guidance and Defra's drought plan direction.

Supply context and dry weather management

Wessex Water supplies an average of 340 million litres of water each day to approximately 1.3 million customers in the south-west of England, using water from around 80 sources. At the time of publication of our last plan in 2018, we completed our £230 million investment in our water supply grid to reduce abstraction from environmentally sensitive sources and improve supply resilience for our customers.

We manage water resources against five drought management levels reflecting the level of resource available in the supply system from surface reservoirs and groundwater storage. We typically operate in "Normal Operation" and move to a lower drought management level as a period of below average rainfall progresses and resource availability declines. The management levels are used to:

- trigger more detailed analysis and drought scenario forecasting to guide our decision-making;
- inform the order and type of actions that will be implemented at different stages of a drought to counter the effect of dry weather and strengthen our resource position.

Drought Management Level	Operational Strategy and Actions
Normal Operation	Normal Operation and cost saving strategy. Background Water Efficiency, metering and leakage activity. Normal seasonal water efficiency messaging to customers and retailers.
Level 1a	Move towards resource saving strategy and review of outage programme. Increase water efficiency campaigns and leakage control.
Level 1b	Further enhance water efficiency campaign and leakage control. Additional transfers from neighbouring companies and use of standby sources coupled with further system optimisation.
Level 2	Least environmentally damaging drought permit options Temporary Use Bans
Level 3	Non-essential use bans and high-profile water efficiency campaign Moderate/Most environmentally damaging drought permit options
Emergency Plan	Emergency drought orders (e.g. standpipes/rota cuts)

In each management level, different supply side and demand side actions can be taken, which align with the Environment Agency's required levels for classifying drought actions. The actions have been ordered to minimise impact on customers and the environment, through optimisation of our existing system in the first instance, followed by actions to reduce demand, and then implementation of the least environmentally damaging drought options first.

Despite periods of dry weather in the recent historical record, notably in 1991, 1995, 2003, 2012, and the dry hot summer of 2018, we have not had to impose restrictions on customer water use, apply for drought permits or drought orders for 45 years, since 1976.

Drought triggers

Wessex Water has an integrated supply system, and since 2018 the new integrated grid helps to balance water use across different sources to meet demand, reflecting different constraints on each source's water availability. An extended period of dry weather and drought further constrains water availability, which requires drought triggers to balance water use.

In a change to our previous drought plan, we will now trigger drought actions based on three drought metrics (effectively constraints), namely combined reservoir storage, groundwater level, and remaining annual licence at key sources, as follows:

- **Reservoir storage -** is controlled by natural catchment inflows and pump storage availability. During a drought, reservoir inflows will be lower and lower river levels will restrict available pumping to storage.
- **Groundwater level –** low groundwater levels constrain output from certain sources during drought, typically during the later summer when demand may be high.
- **Annual licence –** annual licence constrains the total available abstraction throughout the year. During a drought, high demands during peak-summer periods and constraints on hydro-geologically constrained sources mean more abstraction from licence constrained sources.

The importance of these different factors in constraining supplies during drought varies spatially across our supply system, and in time during a drought. The combined triggers guide us as to which is the most constraining factor in the supply system at a given point in time during drought, and therefore what actions we need to take to overcome potential supply issues.

Actions we take during a drought

There are a number of management actions that we can consider taking during dry weather to maintain and improve the water resources situation. The actions are grouped against the five drought management levels, aligning with the Environment Agency's drought options level categorisation. The actions we consider in each level, and the indicative order we would expect to implement them, are shown in the table below. It is important to maintain flexibility when selecting actions during a particular drought to allow for issues such as the

impact of the dry weather on the local environment, and the resource position of neighbouring companies.

EA Level	Drought Management Levels	Demand-Side Actions	Supply-Side Actions
-	Normal Operation	BAU water efficiency campaign	Implementation of cost saving strategy
		Ongoing leakage management strategy	Operation of stream support
		BAU metering campaign	Seasonal reduction in abstractions limited by river flows
		Normal spring/summer water efficiency campaign	Operation of pump storage
Level 1	Level 1a	Water Efficiency Campaign - Level 1a	Implement resource saving strategy – Level 1a
		Enhanced Leakage Control – Level 1a	Review planned outages for small maintenance schemes
	Level 1b	Water Efficiency Campaign - Level 1b	System optimisation
		Enhanced Leakage Control – Level 1b	Drought permit application preparation
			Additional transfers from neighbouring companies
			Use standby source
			Implement resource saving strategy – Level 1b
Level 2	Level 2	Temporary Use Bans (seasonal dependent); continued Water Efficiency and Leakage.	Least Environmental Impacting Drought Permit Options
Level 3	Level 3	Non-essential use bans and all possible actions	Moderate Environmental Impacting Drought Permit Options
		Water Efficiency Campaign – Level 3	All Potential Drought Permit Options, including emergency drought options
		Enhanced Leakage Control – Level 3	
Level 4	Emergency Plan	Emergency drought orders (standpipes and rota cuts)	

For this drought plan we have increased the number of drought permit options from 5 to 10 to increase the range of options to help maintain supply security in the event of drought. These additional options may help to meet demand during peak periods when demand is high and groundwater levels are low and help to conserve reservoir storage during the winter. As per changes in guideline requirements, we have also included more potential

extreme drought options in the plan that may be implemented immediately before (and hopefully to avoid the need for) the Level 4 restrictions of standpipes and rota cuts.

Permit application readiness

In developing this drought plan we have worked towards being “application ready” for the drought options we are most likely to implement during drought, through development of:

- Environmental Assessment Reports for all drought permit options
- Off-the-shelf exceptional shortage of rainfall analysis and document templates
- Application templates and checklist requirements

We will work with our local Environment Agency on an ongoing basis to test our drought application readiness, to ensure our drought permit applications are satisfactory.

Our local environment during a drought

Our region contains a wide range of important landscapes and habitats and we are committed to playing our part in their protection.

The volume of water we abstract from the environment to serve our customers has been falling since the mid-1990s despite population growth and housebuilding in our area. This has occurred because of reductions in leakage, falling industrial demands and growing efficiencies in the use of water by customers triggered by increases in water metering and the uptake of water efficient devices and behaviours.

The main way of ensuring our water supply activities do not have an unacceptable impact on the environment is through abstraction licensing. Since 1995, we have worked closely with the Environment Agency, Natural England and others to investigate sources where concerns over the level of abstraction has been raised. Our water sources have been reviewed to examine the impact on river flows and ecosystems of the full volume we would be licenced to abstract. In many cases, these studies have led to reductions in licenced quantities to improve environmental protection.

This drought plan includes ten drought permits that are technically and hydrologically credible options to increase available water supplies during a drought. These options comprise either an increase in abstracted quantities over those currently licensed at certain sources, or a reduction in compensation flows or stream support. The choice of options gives flexibility with some, for example, helping to conserve reservoir storage during the winter; and others that could be implemented during the summer to help meet peak demands.

For each of these options we have produced Environmental Assessment Reports and undertaken the appropriate Habitats Regulations, Water Framework Directive and Strategic Environmental Assessments. For some of these assessments we have considered a range of potential impacts of drought options to inform our public consultation on the most

appropriate implementation of different options, to help balance meeting demand and minimising the impact on the environment.

The environmental assessments have helped to inform the ordering of drought option implementation. We would implement the least environmentally damaging drought options first, and based on our scenario modelling, would only expect to implement the more environmentally damaging options in extreme droughts, beyond those seen within the historic record. Such options therefore have a low likelihood of use, and additionally some of the new ones have a lower environmental impact thereby reducing the need to implement some of our previous and more environmentally damaging options.

An environmental monitoring plan has also been established which sets out environmental features that will be monitored before, during and after implementation of drought permit options should they be used.

We are continuing to work with our regulators on an ongoing basis to review the appropriateness of some of the more extreme drought permit options and actions, in particular those which impact the designated RAMSAR sites in the Somerset Levels and Moors.

Drought plan testing

We have developed and tested our drought plan, triggers and drought actions against our design drought, 1975/76 which is our worst drought on the historic record, as well as other historic droughts (1921) and more severe events. We have also incorporated analysis from our newly derived stochastic drought dataset, which provides a wide range of simulated droughts, to test the likelihood of needing to implement specific drought actions.

This analysis enables us to understand which scenarios could lead to supply difficulties and therefore help us to position the drought management levels to take drought actions in a timely manner. The position of our new drought management levels reflects the need to minimise impact on customers, but also taking timely actions to reduce demand to help protect the environment.

The drought trigger positions also reflect the new requirement to implement demand restrictions including Temporary Use Bans (hosepipe bans) ahead of application for drought permit options and to have those restrictions in place long enough to observe a measurable impact on demand prior to drought permit application (in the summer months). These changes, in addition to our new stochastic dataset analysis, mean we would expect to implement Temporary Use Bans once in every thirty years on average (i.e. entering Drought Management Level 2 in the summer months).

With the implementation of supply optimisation, demand restrictions and the least environmentally damaging drought permit options, we would only expect to need to use our most environmentally damaging drought options in very extreme droughts.

Management and communication during a drought

Water resource availability is actively managed (regardless of the underlying drought position) by staff with specific responsibilities from the water resources, supply operations and asset strategy teams. Supply strategy meetings are held on a monthly basis to discuss and agree target source outputs for the coming month and other strategic issues such as source outage planning. These meetings are integral to ensuring the appropriate use of resources.

As a period of dry weather intensifies and we enter a drought, our internal management actions include:

- an increase in the frequency of the supply strategy meetings.
- the formation of a Drought Management Team, as part of our company's Emergency Planning Tactical Group, to oversee our response to the dry weather including the implementation of supply side and demand side actions and our communication plan
- the regular production of water resource position update papers to brief staff.

Effective communication with others during a drought is important and in our communication plan, we set out how we will deliver clear, consistent and timely information during periods of dry weather and how we will tailor this to the needs of particular stakeholder groups. In particular, as part of the West Country Water Resources Group, we have a communications plan in place to ensure we are aware of each-others resource position, and to help align customer communications in drought.

As our resource position changes, so too may our communication methods. Flexibility in our approach is important to account for external influences such as media interest, changes in weather, and weather-related demand, and the resource position of neighbouring companies. Our agile communication plan takes account of these factors, and lessons learned during recent periods of dry weather, our own customer research and recent publications from Waterwise, CCW and UKWIR.

Commercial confidentiality
In the publication of this Plan we are required to exclude any matters of commercial confidentiality and any material contrary to the interests of national security. Our plan does not contain information that is commercially confidential. In the version of the plan we are publishing on our website we have excluded some of the technical information relating to the location of key assets on the advice of our certifier for emergency planning in the interests of national security

1 Introduction

1.1 Overview of the drought planning process

This document sets out our tactical and operational response to extended periods of dry weather. We are required to prepare and maintain a Drought Plan under Section 39B and 39C of the Water Industry Act (1991), as amended by the Water Act (2003). This plan has been developed in accordance with the guideline published by Defra and the Environment Agency in December 2020[1], Defra's drought plan direction (2020), and government expectations for drought planning letter (April 2020).

Water companies typically produce Drought Plans on a five-yearly cycle, and we published our last plan as a final version in 2018. In 2020 we were directed by the secretary of state to develop our next plan.

A Drought Plan identifies the actions we will take before, during and after a drought to maintain a secure supply of water. It also outlines how we will assess the environmental impacts of our actions and what we will do to mitigate for potential negative impacts. The plan considers actions we will take under present circumstances, and does not therefore account for factors such as climate change and population growth. These longer-term issues are considered in our Water Resources Management Plan (WRMP), which looks at how we manage the balance between supply and demand for water over a minimum of 25 years into the future.

Table 1-1 shows an overview timeline for how we developed the drought plan. Following the end of public consultation on the draft plan, we developed a revised draft final plan. Alongside the revised plan, we produced a statement of response, which showed how we considered comments received during consultation, clearly setting out any changes made, and the reasons for making them. We sent these to the Secretary of State, and in April 2022, were given permission to publish the final plan.

As shown in Table 1-1, during development of this drought plan towards a final version, we are also working on developing the initial draft of our first Regional Plan as part of the West Country Water Resources Group (WCWRG). This plan will provide the first regional assessment of cross-sector water resources needs in the long term for the region and will align with our next Water Resources Management Plan (WRMP). As part of the regional group, we have worked with Bristol Water and South West Water to consider how our drought plans can best align in terms of sharing water resources and co-ordination of communications and drought actions. These links are signposted in Section 1.1.2.

[1] Environment Agency (Updated December 2020) Water Company Drought Plan guideline, December 2020 (Version 1.2). See also: https://www.gov.uk/government/collections/how-to-write-and-publish-a-drought-plan

Table 1-1 Drought Plan and company planning timeline*

Date	Plan	Action
April 2020-March 2021	Drought Plan	Drought plan pre-consultation
30th March 2021	Drought Plan	Draft plan submission to Secretary of State and regulators
April 2021	Drought Plan	Regulatory review of Draft Drought Plan leading to permission to publish
May to June 2021	Drought Plan	Public consultation
April to December 2021	WRMP	WRMP enhanced pre-consultation
July to September 2021	Drought Plan	Produce revised draft plan and statement of response and submit to Secretary of State.
August 2021	Regional Plan	Publish Initial Draft Regional Plan
June 2022	Drought Plan	Final plan publication following receipt of permission to publish from the Secretary of State.
October 2022	Regional Plan and WRMP	Publish Draft Regional Plan and Draft WRMP

*Note: the timing of some of these activities is provisional depending on whether further work is required to produce a final plan.

Our current WRMP was published in 2019 and has assessed the vulnerability of our supply system to droughts of various return periods, types and severities[2]. This drought plan complements the WRMP and shows how we will manage supplies during such droughts.

In February 2021 we received the final planning guidelines to develop our next WRMP, and have begun development alongside our regional plan towards draft submission in October 2022. The planning requirements for these plans represent a significant step-change in long-term planning requirements. Of particular relevance is that our system should be resilient to drought so that we do not expect to need exceptional demand restrictions more than 1 in 500 years on average by 2039 at the latest. To robustly assess system vulnerability to these extreme droughts, we are developing improved technical methods during 2021.

1.1.1 Structure of this document

This document is structured as follows:

- Section 1 (this section) introduces the context of drought planning and the Wessex Water specific context in relation to water demand and supply. The section also describes lessons learned from previous drought, and how this plan links to other plans
- Section 2 explains the management actions that we could take in a drought to reduce demand or increase available supplies.

[2] Wessex Water (2019) Water Resources Management Plan. The next 25 years in water, the Wessex Water Resource Plan

- Section 3 explains the drought triggers that we have developed to help guide our decision-making and the appropriate time to implement various actions.
- Section 4 considers the environmental impacts that can be associated with our actions during droughts and how we have assessed these.
- Section 5 outlines our management and communications strategy.
- Section 6 summarises the actions we would take at the end of a drought.
- Section 7 concludes the overall Drought Plan
- 11 Appendices are also included in the plan in support of the sections above.

1.1.2 Links to Water Resources Management Plan, Regional Planning and other plans

The EA drought plan guidance requires that the drought plan must be consistent with Regional Plans and Water Resources Management Plans. At the time of publication of this final plan, as part of the West Country Water Resources Group (WCWRG), we are currently developing the draft regional plan for October 2022, following publication by the Environment Agency of the National Framework. The water resources planning guideline has also been published by The Environment Agency in February 2021, for draft Water Resources Management Plan (WRMP) submission in October 2022. Alongside regional plan development, we are now starting work for our next WRMP.

Given the relative timings of drought plan, regional plan and WRMP development, plan alignment is a continued process; as we developed, consulted on, and finalised this drought plan, work progresses on regional and water resources planning. Table 1-2 describes areas of alignment between the drought plan and the Water Resources Management Plan and Regional Plan.

Table 1-2 Drought plan alignment topics with Water Resources Management Plan and Regional Plan

Plan area	WRMP and regional plan alignment	Plan section
Drought testing scenarios	As per guidance, WRMP should have assessed drought vulnerability to droughts of various return periods and types. Drought scenarios for drought testing in the plan are currently aligned with scenarios used in our currently published WRMP19[3]. Scenario testing alignment will be updated with scenarios used for WRMP24 if completed ahead of final plan submission	Section 1.3
Drought demand-side actions	Demand-side drought actions for water efficiency and leakage activities build on final WRMP19 plan options which were included in our latest Business Plan[4]	Section 2.1
Sharing water with neighbouring water undertakers	Regional water use via transfers and alignment of communications and TUBs with neighbouring companies	Section 5.2.3

[3] Wessex Water Resources Management Plan: The next 25 years in water, the Wessex Water Resource Plan

[4] Business plan 2020 (wessexwater.co.uk)

Plan area	WRMP and regional plan alignment	Plan section
Other water users	Working currently being undertaken as part of the WCWRG to understand demand from non-PWS sectors. To be updated in the final plan, as appropriate.	Section 2.5
Supply-side drought permit options	The supply-side drought permit options developed as part of this Drought Plan will be included in the list of feasible options for WRMP24, consistent with guidance[5].	Section 2.2.8

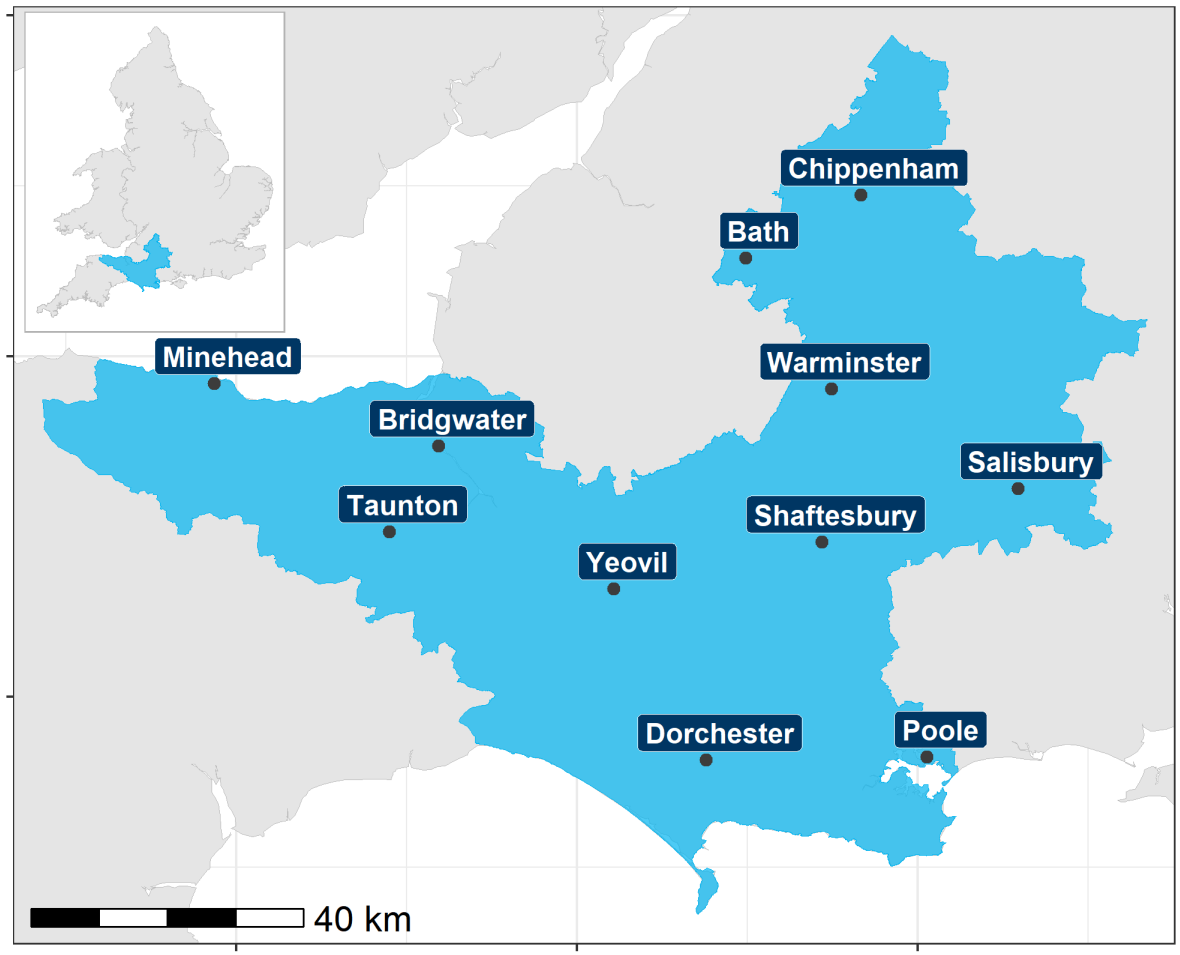
[5] Water resources planning guideline - GOV.UK (www.gov.uk)

1.2 Wessex Water – Our supply system and the demand for water

1.2.1 The demand for water

Wessex Water supplies over 1.3 million people in the south-west of England with high quality drinking water. Our region is predominantly rural but includes the urban areas of Bath, Bridgwater, Poole, Taunton, Salisbury, Weymouth and Yeovil (Figure 1-1). To supply our customers we use around 80 sources and over 12,000 km of water mains to treat and distribute approximately 340 million litres of water each day (Ml/d).

Figure 1-1 Wessex Water supply area with major towns and cities*

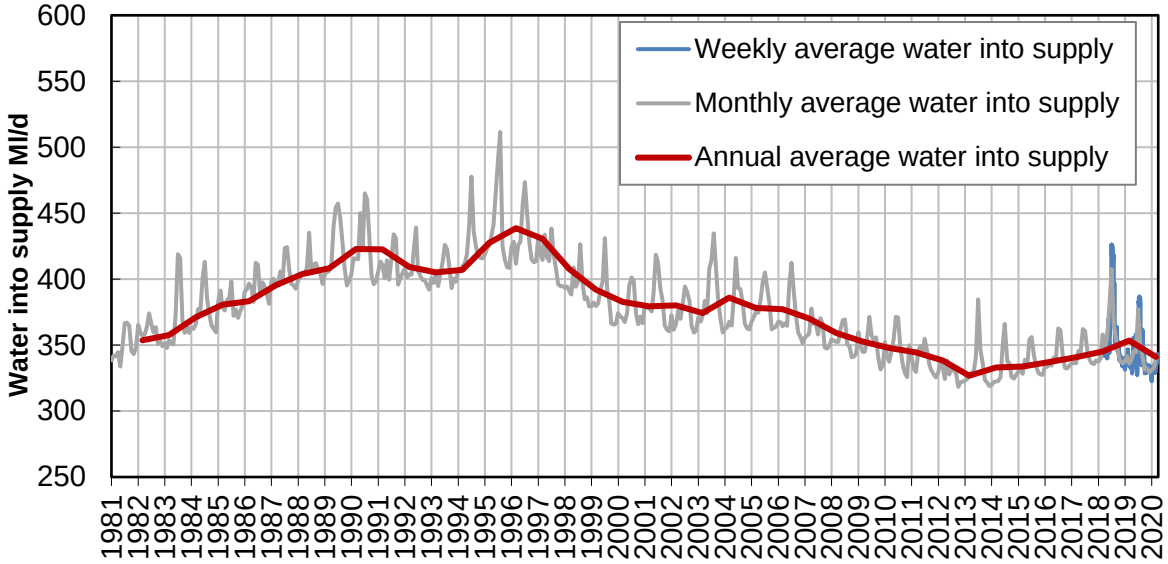


* Contains public sector information licensed under the Open Government Licence v3.0.

Since 1995 there has been a significant reduction in water into supply by approximately 100 Ml/d (Figure 1-2), which has resulted from:

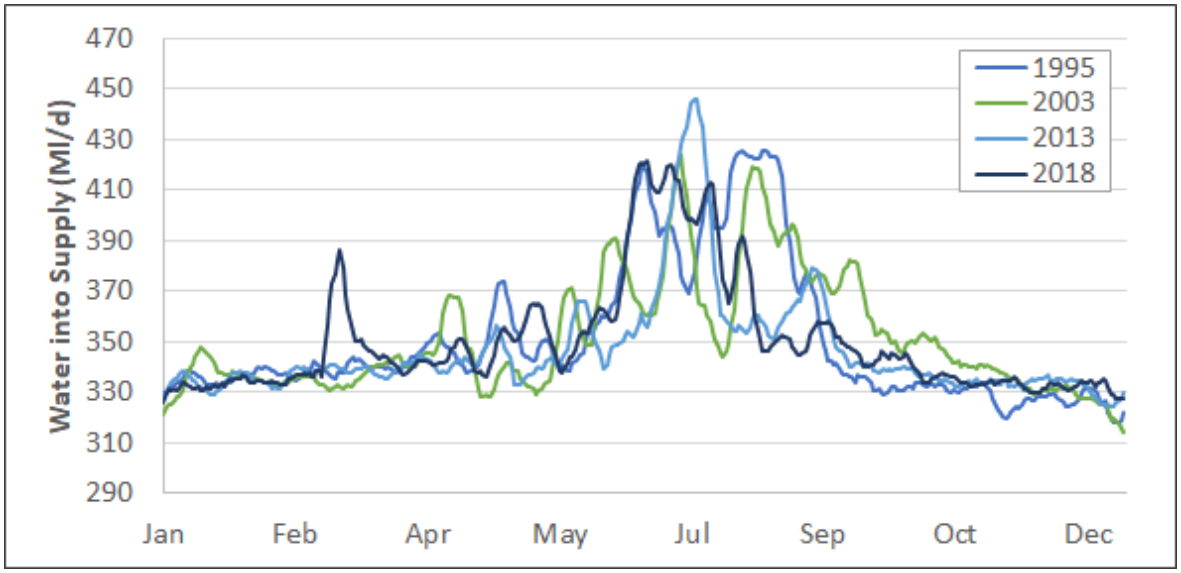
1 Leakage reduction – we have reduced leakage from our network by half from 140 to less than 70 Ml/d. In 2019/20, we fixed 90% of leaks reported to us in the same day;
2 Customers' switching to a metered supply – the proportion of metered households in our region has increased from less than 10% to nearly 70% today;
3 More efficient use of water in homes and businesses by our household and commercial customers.

Figure 1-2 Water into supply for 1981 to 2019 Water into supply from 1981 to 2019



During the summer, the demand for water generally increases as our customers use more in their gardens for watering plants and leisure activities, and inside their homes for showering and clothes washing (Figure 1-3). Water use by businesses also increases in the summer months, particularly in areas popular for tourism, notably on the south coast of our region.

Figure 1-3 Weekly average water into supply (normalised to 2019/20 baseline demand) for selected dry years

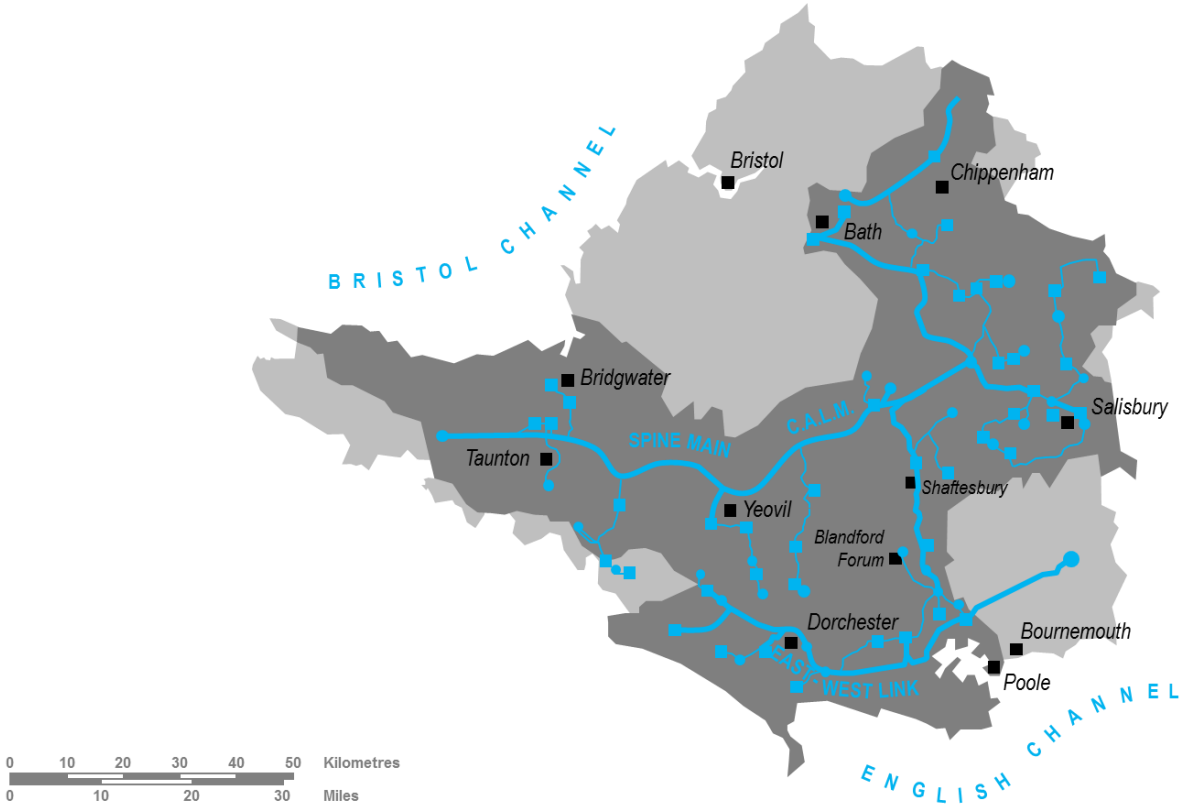


Reducing leakage, increasing metering and water efficiency continues to be our core approach to ensuring that there is a balance between water supply and water demand, particularly during droughts. By controlling the demand for water, and optimising our supply network, we have been able to reduce the amount of water we abstract from environmentally sensitive sources and reduce the risk of having to seek drought permits, drought orders or impose restrictions on customers' use.

1.2.2 Sources of water supply and our distribution network

The majority (around 75%) of the water we abstract for public water supply comes from groundwater sources in the East, South and North of our supply area (Figure 1-4). Important aquifers for us are located under Salisbury Plain in the east, the Cotswolds in the north and the Dorset Downs in the south of our supply area. The remainder of our water supplies (~25%) come from impounding reservoirs located in the west of our supply region in Somerset, which primarily capture surface runoff from Exmoor and the Quantock Hills.

Figure 1-4 Wessex Water supply area



Our region contains a wide range of important landscapes and habitats and we are committed to playing our part in their protection at all times. The maximum volume of water that can be taken from each source (typically each day and each year) is specified in abstraction licences, which are granted by the Environment Agency. The main river catchments in the Wessex Water region include the Hampshire Avon, Bristol Avon, Frome, Stour and Parrett.

The conditions on a licence are the main way of ensuring that our abstractions do not have an unacceptable impact on the environment. These conditions include limiting abstraction depending on local river levels, and at some sites, operating stream supports which add water to the river to help improve river flows. In the upper reaches of the Bristol Avon catchment for example, we can increase flows by more than 30 Ml/d using water taken from

boreholes that are nearly 100 metres deep. In the early 1990's the river all but dried up in hot dry periods but stream support now helps maintain a good flow through the town of Malmesbury even in the driest of years. This was most recently demonstrated during the dry summer of 2018.

In our 2009 Water Resources Management Plan, we identified key issues within the supply area that put the future supply-demand balance at risk, including reductions in abstraction licences designed to reduce our impact on the environment. These licence reductions came into effect in 2018. In 2010, we started work on a £230 million investment to develop a more integrated water supply grid. Completed in 2018, the new network connections now enable us to reduce abstraction from the most environmentally sensitive sources and improve supply resilience for our customers. The resulting changes improved connectivity between the north and south of the region. The new network infrastructure from sources near Poole to Salisbury enables us to transfer water from the south of our region in Dorset to Salisbury in Wiltshire via Blandford and Shaftesbury.

We are also able to transfer water West from sources in Wiltshire towards Yeovil via a large trunk main known as the C.A.L.M. main, which can also allow reversal of another strategic trunk main (our 'Spine Main') to move water from Yeovil towards the Taunton area. This was last undertaken for a sustained period of time during the dry summer and winter period of 2003 to help conserve reservoir storage.

Whilst our water resources supply zone is a single conjunctive use system, and the new integrated supply grid helps to balance source use across the system, a more integrated system means more degrees of freedom in operation. The system therefore requires careful management to properly balance supply availability between sources, as determined by hydrological, licence and water quality constraints, as well as the planned outage programme to ensure our system is maintained. To help manage this system we employ an automated control system, called The Optimiser.

The Optimiser is a closed-loop remote control system that responds intuitively to the supply network every 30 minutes, 24/7, 365 days a year. From the end of 2020, the Optimiser is remotely controlling 40% of water into supply (by volume). This covers the entire grid trunk main as well as the Bath/Warminster area that has been operated remotely since 2014. This highly integrated network, combined with highly complex remote control, provides a holistic systems-based approach to greater resilience and security of supply. We plan to extend the Optimiser software to cover more of the supply network during the current 2020-25 planning period.

For our previous drought plan we divided our supply system into three drought management zones to reflect spatial variability in factors which affected our supply system. Our actual experience with the plan however, in particular since we have operated the grid under our new set of licence conditions since 2018 (and our last Drought Plan), has shown that whilst we have different areas of supply, these are operating conjunctively across the grid, balancing abstraction from different sources based on the key constraints of reservoir storage, groundwater yield constraints and annual licences.

To reflect this, our Drought Plan is based on our supply area as a whole to reflect conjunctive water use across the supply system, with three drought triggers based on annual licence remaining, reservoir storage and groundwater level to reflect the key constraints on water availability in drought, and how our integrated grid needs to be operated to balance abstraction throughout a drought based on these constraints. The overall supply situation at a given point in time, and our overall risk during a drought will be based on which of these factors is most constraining (Section 3).

1.3 Baseline Water Resources and Drought vulnerability

The way in which our supply sources and network described in Section 1.2 are operated depends on natural variability in weather patterns and supplies across the supply area, and how this leads to drought vulnerability. This variability in turn influences what metrics we use to trigger drought actions and when we trigger them.

Water resource availability varies throughout the year in an annual cycle, responding to seasonal variability in rainfall. In most years from late spring through into early autumn, rainfall is typically at its lowest in the year, and the weather is at its warmest with higher evapotranspiration from vegetation. This not only leads to higher seasonal demand during the summer (Section 1.2.1), but results in a fall in groundwater levels, river flows, and in turn reservoir storage.

Groundwater levels and reservoir storage typically reach their lowest levels in October and November before higher rainfall in late autumn and winter, coupled with lower evapotranspiration rates, replenishes water storage. The highest groundwater and reservoir levels are therefore typically observed in February and March.

It is this annual variability in water availability combined with variability in demand that controls the available supplies versus demand for water, and in turn during dry periods, when we need to trigger drought actions. Assessment of inter-annual variability across the historic record helps us to understand the likelihood with which we will need to trigger these actions.

In our current Water Resources Management Plan 2019, we have undertaken an assessment of drought vulnerability to the weather conditions experienced from our historic record (since 1916), and to more severe drought events. We developed our drought testing scenarios following the UKWIR “WRMP 2019 methods - risk based planning” guidance for development of ‘drought events’ for a ‘resilience tested plan’, which included testing our supply system to drought events more severe than those observed within the historic record, including 1 in 200 and 1 in 500 droughts[6].

The analysis shows several severe droughts occurred within the 20th century, notably in 1921, 1933/34 and in 1975/76. The 1976 drought is a notable dry period within the historic

[6] These drought events were generated using Extreme Value Analysis. Further details of the methods applied can be found in our current Water Resources Management Plan 2019: https://www.wessexwater.co.uk/environment/water-resources/management-plan

drought record and was the last time that Wessex Water imposed water use restrictions on customers, 45 years ago.

The analysis we have undertaken shows that given the nature of our supply system, we are generally resilient to short duration “single season” drought events – e.g. a single hot and dry summer, but more vulnerable to multi-season droughts. These droughts occurred in 1921, with a hot, dry summer period leading into a dry autumn and winter, and the 1933/34 and 1975/76 periods, which saw dry winter and spring conditions, leading into a hot, dry summer period.

Informed by our WRMP19 analysis, we have tested our drought plan to severe droughts from the historic record, and more severe droughts developed as part of WRMP19. Further details of the events used to test the Drought Plan can be found in Appendix E. We have also incorporated some initial analysis from our newly derived stochastic drought dataset on the likelihood of reaching low groundwater levels, to test the likelihood of needing to implement specific drought actions.

This analysis enables us to understand which scenarios could lead to supply difficulties and therefore help us to position the drought management levels to take drought actions in a timely manner. The position of our new drought management levels reflects the need to minimise impact on customers, but also taking timely actions to reduce demand to help protect the environment.

The drought trigger positions also reflect the new requirement to implement demand restrictions including Temporary Use Bans (hosepipe bans) ahead of application for drought permit options and to have those restrictions in place long enough to observe a measurable impact on demand prior to drought permit application (in the summer months). These changes, in addition to our new stochastic dataset analysis, mean we would expect to implement Temporary Use Bans once in every thirty years on average (i.e. entering Drought Management Level 2 in the summer months).

With the implementation of supply optimisation, demand restrictions and the least environmentally damaging drought permit options, we would only expect to need to use our most environmentally damaging drought options in very extreme droughts.

Drought Vulnerability Framework

The UKWIR drought vulnerability framework provides guidance on undertaking an assessment of drought vulnerability of the supply system through construction of a drought response surface, which assesses how water resource vulnerability varies according to drought duration and rainfall deficit. The guidance details several methods that may be applied depending on the quality of the datasets and models available.

As part of our regional planning and WRMP24 preparations we are currently improving the quality of the data and models to improve our understanding of drought vulnerability, including the development of a stochastic weather dataset. These tools will allow us to undertake a more robust approach to the drought vulnerability framework assessment than the Extreme Value Analysis approach through better understanding of drought return-

periods, and allow us to simulate more robustly longer term drought time-series to populate the drought response surface. This improved analysis is important as we move towards understanding our 1 in 500 “system level” response to droughts – as required for our next WRMP. We are currently working on this, and will incorporate the drought vulnerability framework assessment, using these tools, in our WRMP24 publication in Autumn 2022.

1.4 Lessons learned from previous droughts

Wessex Water has not had to impose restrictions on customer water use, apply for drought permits or drought orders for 45 years since the drought of 1975/76. Thus, more recent periods of dry weather that have led to water use restrictions in other parts of the country have not led to drought conditions in the Wessex area. However, we can learn from insights gained during these recent droughts in other parts of the country, particularly around issues that arose from customer communications, which are included in Section 1.2, where we have considered the outcomes of the Waterwise Water Efficiency and drought communications report that was written following the drought of 2011/2012. During this drought we received customer contacts regarding temporary use restrictions, with customer’s uncertain about whether they were restricted, given the high media coverage of restrictions, particularly in London and the Southeast. This experience demonstrated clearly the need to consider and react to the national picture during periods of low rainfall across the country, which is reflected in Section 5, and in our work as a regional group to help ensure consistent communication.

Since the publication of our last drought plan, we have experienced two periods of exceptional demand during periods of very low rainfall. The following sections provide further detail of these events and some of the key learning points.

1.4.1 Summer 2018

We started the 2018/19 licence year following two months of above average rainfall, which helped ensure groundwater was largely above average and our reservoirs were at 100% capacity. As a result, we maintained a normal operating position until late May, despite the warmer weather and increased demand[7].

During June, July and August we experienced a record heatwave with consecutive months of below average rainfall, and a sustained period of increased demand from mid-June to early August. As a result, our drought position fell to Band 3[8] – further dry weather actions during late June and remained there until December. In response, and as per our Drought Plan, a Dry Weather Management Group was formed.

During the hot dry summer of 2018, we ‘ramped up’ our customer communications – a press release was issued to all regional media on 18 July which resulted in broadcast radio

[7] For context for our drought bands at the time, please refer to our current published drought plan: https://www.wessexwater.co.uk/environment/water-resources/drought-plan

[8] Note the drought band references refer to our current published Drought Plan and not the revised Drought Management Levels developed as part of this plan.

interviews. For the late August Bank Holiday weekend, we published advertorials in print media across our region, which gave information on our resource position, provided water saving tips and advertised our free water saving pack. Through social media we targeted communities with short videos, created specifically in response to the weather, that encouraged customers to re-use water and also provided tips relating to water use in the garden.

We increased the number of products available for customers to order from our free device pack, during the summer months, including showerheads and bath measures. We ran adverts for the pack on Facebook, which resulted in an uplift in the number of orders we received during these months, receiving over 2,000 orders for free devices between June and September 2018 compared to 1,400 for the same time period in 2017.

We also kept our website up to date with information about our resource position, and utilised pump storage to maintain our reservoir position.

In terms of demand, Table 1-3 compares 2018/19 distribution input to our WRMP19 forecasts. As an annual average, Distribution Input was slightly lower than forecast, whilst peak demand was slightly higher. The peak demands observed the summer of 2018 were some of the highest and of the longest duration we have experienced. Our WRMP19 includes a headroom allowance for peak demand uncertainty of ~15Mld, so the 2018/19 peak demand was well within the range of uncertainty we have planned for.

Following the peak demands in 2018 we have reviewed our approach to demand reductions which is covered in more detail in Section 2.1. We also now account for higher demands in our production planning to test our network to ensure there is adequate production capacity during the summer months for these peak demands.

Table 1-3 Distribution Input in comparison to WRMP19 planning tables

Scenario	WRMP19 Planning Tables Ml/d	2018/19 Actual Ml/d
Annal Average	348.09	347.68[1]
Peak Period	417.57	420.58[2]

[1]This is post MLE in the leakage calculation. As published in the Annual Performance Review 2019/20
[2]This value is peak week demand.

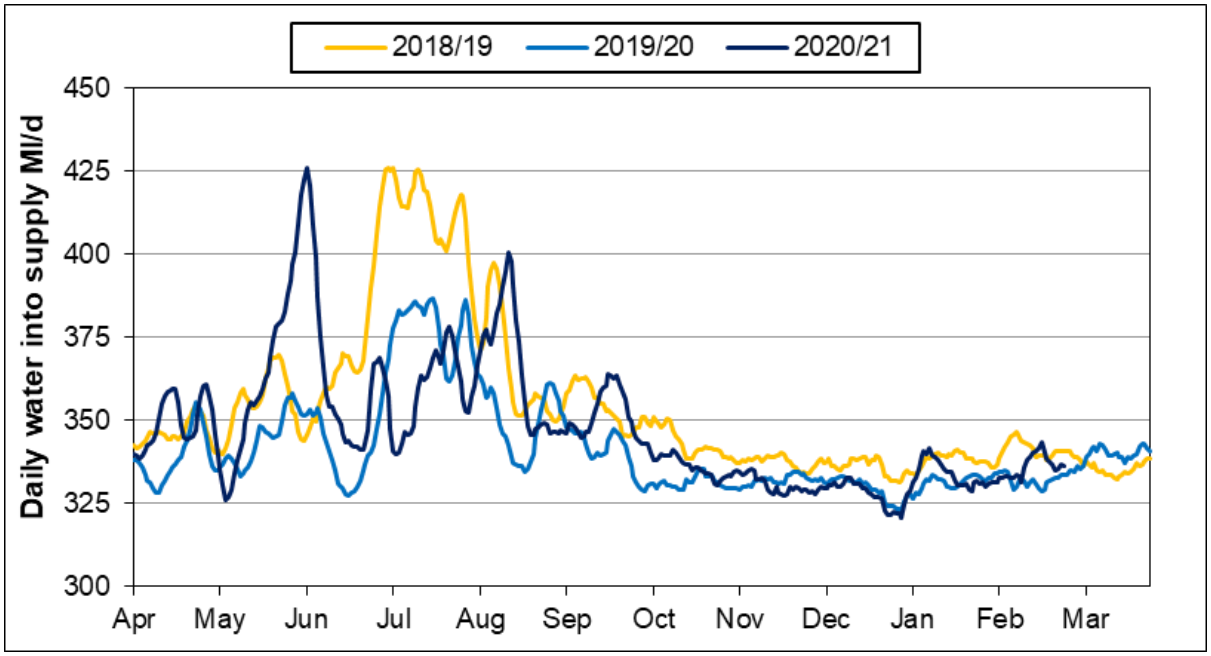
1.4.2 Spring 2020

During the end of May and early June of 2020, Wessex Water experienced unprecedented demand for water due to a combination of prolonged warm weather during the driest May on record (less than 10% of average rainfall) and a far larger number of people being at home than would be expected due to the Covid-19 pandemic. Much of the increase in demand was associated with additional activities in the garden, such as sprinklers, paddling pools, hot tubs, and increased lawn/plant watering using hosepipes.

Normally we would expect average May demand to be around 345 Ml/d. In May 2020 our May weekly average demand peaked at 418 Ml/d, which was a 21% increase on typical demands, before eventually peaking at 426Ml/d in early June. The May peak figure was the

highest demand (when normalised) over the last 40 years for the Wessex supply area in the month of May. During the last week of May, demand was increasing by an additional 3 to 7 Ml every day. The diurnal pattern of water usage was also very different to that previously experienced with higher sustained water use evident throughout the middle of day followed by peaks in demand much later in the day, between 6pm and 10pm.

Figure 1-5: 2020/21 Water Into Supply* in comparison to 2018/19 and 2019 /20 7-day average



*Water into Supply includes Treatment Works Operational Use (typically 4-5Ml/d), therefore higher than Distribution Input (Demand).

Meeting demand became particularly challenging during the period from 30 May to 2 June. This was not however due to drought or a lack of raw water resources, but related to reduced production capacity mainly as a consequence of ongoing outages. These included outages at a number of groundwater sources affected by high nitrates which remained higher than expected after heavy winter rain, reducing supply by 12.5 Ml/d at the time.

In the run up to the challenging demand period, existing source output was ramped up and our network optimised to enhance supplies. Additionally, our annual water efficiency campaign messages were put out on our website and other media earlier than in a typical year.

With concerns mounting about reduced production capacity on 29th May an emergency action plan was put in place. This included a project to potentially use Monkswood reservoir as an emergency source, fast tracking of planned outages at certain sites to bring them back into supply earlier. In order to meet the more immediate supply challenge we approached the Environment Agency to inform them about the possibility of operating outside the terms of our abstraction licences at Codford and Briantspuddle.
The immediate concerns receded with the onset of cooler and wetter conditions from 3 June onwards, and in the end taking more water from Codford than the restricted volume was only required for three days. Plans were also put in place to ensure that predicted peak summer

demand (perhaps also exacerbated by Covid-19, despite lessening of restrictions) could be met from enhanced production capacity and supply.

Table 1-4 compares the demand of 2020/21 with that in the WRMP19 Planning Tables. As an annual average we expect distribution input to be lower than our WRMP19 planning tables by around 4 Ml/d. Peak demand was higher than that planned in the WRMP19 Peak Period Scenario. This peak period was influenced by a very dry May and COVID restrictions, which resulted in higher domestic use. The Artesia COVID impact study indicates COVID increased demand above that expected. Further information is presented below, and further insight will be provided in the WRMP19 Annual Review once the study is finalised.

Table 1-4 Distribution Input in 2020/21 in comparison to WRMP19 Planning Tables

Scenario	WRMP19 Planning Tables Ml/d	2020/21 Actual Ml/d
Annual Average	347.18	343[1]
Peak Period	416.29	423[2]

[1]This is an estimate prior to end of year annual reporting. This value pre MLE adjustment, the final value is typically lower.
[2]This value is peak week pre MLE number. The peak week was late May / early June 2020.

Following May 2020 we have undertaken a number of actions which include:

- Reviewing our demand reduction strategy which is looking at new ways to increase customer metering and reducing internal plumbing losses within homes, such as leaky loos. In addition, we have undertaken a range of summer and winter campaigns aimed at supporting customers to reduce demand. We also plan to continue our baseline activity work such as water saving pack and home check (which is currently halted due to COVID; see Section 2.1).
- Our garden water saving campaign in July and August included two radio adverts produced for different audiences running on Heart FM and Smooth FM, offering advice on why it's important to save water. We also trialled YouTube advertising, targeting a specific customer groups.
- Reviewing our internal targets for production capacity to ensure outage is never greater than the in-month target for production capacity. This has been reviewed following our highest May demand recorded.
- We have joined a club project with other water companies to help understand the influence of COVID on household and non-household demand. The draft outputs indicate COVID increased overall demand by 2.6%, household demand by 9% (with higher increases in the peak periods) and a 25% drop in non-household demand (with nonlinear responses in night use in some non-household categories, suggesting plumbing losses increased). This will be discussed further in our WRMP19 Annual Review 2020/21.
- We are part of a club project looking at demand from high summer use industries, such as golf clubs and ways demand could be reduced during prolonged dry periods.
- We now have a weekly to monthly meeting with the Environment Agency to update them on our water resources position and any concerns we have. The meeting frequency demands on our current water resources position.

- Applied for a licence to abstraction from Monkswood reservoir, and incorporated the source use into our drought plan as a supply-side drought action for meeting peak summer demands (Section 2.2.5).
- Incorporate a potential May peak in demand into our monthly modelling and tactical planning meetings (see Section 3.4.3).

1.5 Pre-consultation of this Plan

The Drought Planning Guidelines require us to have preliminary discussions with statutory consultees prior to the submission of a draft Plan. We recognise the value this brings to the development of a robust Drought Plan. We held a pre-consultation on the drought plan which ran from the 8th October 2020 to 5th November 2020. The organisations listed in Appendix B were contacted and invited to return comments to us on any changes they would like to see to our existing plan or additional issues they would like us to consider in the development of the new draft Plan.

We also held several pre-consultation meetings with the Environment Agency, at which we discussed technical drought planning and related water resource planning issues. We also consulted on our Environmental Assessment Report methodology and SEA/HRA screening for the drought plan. The comments from organisations during the pre-consultation phase are summarised in Table 1-2, with cross-references to the sections where comments were addressed.

Table 1-2 Summary of pre-consultation comments and engagement

Organisation/Person	Summary of comments	Addressed in:
Environment Agency	• Bulk supply agreements: provide details of how bulk supply agreements with Bristol Water and Veolia Water Projects would operate during drought. Set out how operation of the Bath import will operate.	• Section 2.2.2
	• Drought scenarios and triggers: triggers should be based on a range of data sources and should reflect the actions you will take. Plan should be clear when and what actions you would take as a drought develops.	• Section 3
	• Drought testing and triggers: the drought plan must be tested against a range of scenarios. The drought plan should clearly outline the approach to testing the scenarios and include findings.	• Section 1.3; Appendix E
	• Should ensure consistency with the drought plan scenarios and your 2024 WRMP, as well as the regional plan.	• Section 1.3
	• Demand reduction actions: We expect you to take action to reduce leakage, outage and customer demand before taking more water from the environment	• Section 2.1

Organisation/Person	Summary of comments	Addressed in:
	• TUBS: you should consider how you would introduce TUBS to the whole region should the need arise.	• Section 2.1.3)
	• Drought plan should be a tactical manual. Should you need to apply for a drought permit, we would look to the plan to identify if it has been followed.	• Section 2.2.8
	• You should review TUBs savings using good quality data and experience.	• Section 2.1.3
	• Supply-side actions: Welcome early engagement on drought plan options. We would recommend that your most frequently used drought permits are prepared to be application ready. Permits and orders we would seek to use more should be application ready. The definition of a frequent drought permit will vary, however a 1:200 event may be used as a benchmark.	• Section 0
	• Recommend wide consideration of actions to delay level 4 emergency restrictions.	• Section 2.2.8 and Section 2.3
	• You should optimise system within recent actual abstraction before seeking a drought permit.	• Section 2.2.6 and Appendix E
	• We expect you to set out justification as to why you have or have not included options within your plan.	• Section 2.3
	• Ensure drought plan utilises work on feasibility study of drought permit options for the Bridgwater and Taunton canal is included, as asked in Defra 2018 drought plan permission to publish letter.	• Section 2.2.8; Section 4.5
	• Unused sources: environmental assessment required for utilisation of un-used source in Bath, if included in updated drought plan.	• NA – source not included in the drought plan
	• Dry year lessons: review and incorporate lessons learned from recent experiences, in particular from 2020.	• Section 1.4
	• Communications and engagement: should engage with neighbouring companies and West Country Water Resources Group. You will benefit from joint regional communications campaigns and aligned customer restrictions as well as supply actions.	• Section 5.2.3

Organisation/Person	Summary of comments	Addressed in:
	• You should demonstrate how you will pro-actively scale up household and retail customer communication campaigns.	• Section 2.1.1 and Section 5.2
	• Drought plan needs to detail how we will communicate with the EA and other regulators during a drought, including: how you are operating according to the drought plan and outline additional data to provide to regulators during and following a drought.	• Section 5.2.4 and Section 4.5
	• Consider all relevant statutory requirements including the drought plan direction and governments expectations.	• All sections of the plan
	• Customer and third party involvement: recommend consulting with a wider range of non-statutory consultees during drought plan development.	• Section 1.5.
Cholderton Water	• Now a private supplier	-
Natural England	• No comments received	-
Dorset Wildlife trust	• Reference to Blueprint for Water consultation response.[9]	-
Bristol Water	• Develop and align assumptions regarding the Bristol Water-Wessex Water bulk supply agreement.	• Section 2.2.2; Appendix E
Dorset Catchment Partnerships	• Reduce demand in drought (or before) – this is a target in the WRMP but key to impact drought condition	• Section 2.
	• Engagement with EA on environmental protection-prioritisation of catchments/habitats	• Section 4: Environmental Assessment
	• Establish minimum flow and GW level targets for the environment in a more holistic way, with whole river corridor consideration	• Relevant to long-term planning and delivery of environmental destination, and being addressed into WRMP24 • Relevant to long-term planning and delivery of environmental destination, and being addressed into WRMP24 • Relevant to long-term planning and delivery of environmental destination,
	• Develop measures to includes resilient catchments – improve raw water quality.	
	• An assessment of improved water storage could be undertaken for the Frome, Piddle and Stour Catchments	

[9] Water_Drought_Plan_Consultation_Response_to_EA_Oct2019.pdf (wcl.org.uk)

Organisation/Person	Summary of comments	Addressed in:
		and being incorporated into WRMP24
Southern Water	• Liaison on reliable volumes for existing transfers between companies during drought	• Section 2.2.2
	• Consideration of any further drought management actions that could provide joint benefit	• Section 5.2.2

2 Drought management action plan

Drought management actions help ensure we maintain a balance of supply and demand during an extended period of dry weather.

Our drought management actions build on actions we are already implementing as part of our overall water resources strategy to strengthen and maintain a good resource position and protect the environment, which includes:

- Reducing leakage from 140 Ml/d to less than 67 Ml/d since 1995. By 2024/45 we plan to reduce leakage further to 63.71 Ml/d.
- Increasing the proportion of our customers that are metered from less than 10% in 1995 to more than 67% today.
- The active promotion of water efficiency to our customers, including the provision of free water saving devices, an online platform (GetWaterFit) to help them understand their water use, in home visits (HomeCheck) and a schools' education programme.
- Reductions in abstraction from sources, which were having an unacceptable impact on the environment.
- Provision of compensation water from deep boreholes to sustain river flows, particularly during dry periods.

During an extended period of low rainfall there are several management actions that can be used to further maintain and improve water resource availability for public supply. The actions can be divided into two groups:

- **Demand-side actions**: those that reduce demand, such as water efficiency campaigns.
- **Supply-side actions:** those that increase supply, such as increased abstraction.

This Drought Plan considers a range of management actions as summarised in Table 2-1. The actions are grouped into five levels: Normal operation and four drought management levels, which reflect water resource availability from different sources and different constraints during drought, as explained in Section 3. The actions within each level have been mapped to the Environment Agency's Level 1-4 categories. Whilst the actions have been assigned to specific levels, many of the activities represent a continuum of activity as a drought progresses, and for some actions the indicated level identifies where the action will likely start, and continue/increase through subsequent (lower) levels (e.g. for drought permit options). Further, different drought trigger metrics will trigger different activities.

The actions are listed in the indicative order that we would expect to implement them within each level. The ordering of the actions has been made to minimise impact on customers and the environment. It is, however, important to maintain flexibility in selecting actions during a particular drought to account for external influences, such as customer/media interest and the resource position of neighbouring companies. Detailed information on the actions listed in Table 2-1 such as their anticipated impact on demand or supply, and the demand management zone for which they are applicable, is presented in Appendix C. Each of the supply-side actions have been ordered, and assigned accordingly to Drought Management Levels, to prioritise those with the least environmental impact, with

implementation of actions operating within our existing licences and system operation (e.g. review of planned outage, resource saving and system optimisation, and use of our standby source), implemented ahead of drought permit options. Within the drought permit options, those with the least environmental impact have also been implemented first (Level 2 options). The implementation of these options also delays the need to implement other potentially more damaging options.

Table 2-1 Summary of drought management activities in each Drought Management Level

EA Level	Drought Management Levels	Demand-Side Actions	Supply-Side Actions
-	Normal Operation	BAU water efficiency campaign	Implementation of cost saving strategy
		Ongoing leakage management strategy	Operation of stream support
		BAU metering campaign	Seasonal reduction in abstractions limited by river flows
		Normal spring/summer water efficiency campaign	Operation of pump storage
Level 1	Level 1a	Water Efficiency Campaign - Level 1a	Implement resource saving strategy – Level 1a
		Enhanced Leakage Control – Level 1a	Review planned outages for small maintenance schemes
	Level 1b	Water Efficiency Campaign - Level 1b	System optimisation
		Enhanced Leakage Control – Level 1b	Drought permit application preparation
			Additional transfers from neighbouring companies
			Use standby source (summer)
			Implement resource saving strategy – Level 1b
Level 2	Level 2	Temporary Use Bans (seasonal dependent); continued Water Efficiency and Leakage.	Least Environmental Impacting Drought Permit Options
Level 3	Level 3	Non-essential use bans and all possible actions	Moderate Environmental Impacting Drought Permit Options
		Water Efficiency Campaign – Level 3 (Extreme drought actions)	All Potential Drought Permit Options, including emergency drought options (Extreme drought actions)
		Enhanced Leakage Control – Level 3 (Extreme drought actions)	
Level 4	Emergency Plan	Emergency drought orders (standpipes and rota cuts)	

2.1 Demand-side actions

Wessex Water undertakes a range of baseline demand management activities consistent with our last Water Resources Management Plan and Business Plan to help deliver efficient water use in the region through water efficiency (inc. metering) and leakage reduction. This section set out these baseline activities, and how these activities will be enhanced as a drought progresses.

2.1.1 Water efficiency

Normal operation

Our customers are keen to be efficient in their use of water and we are committed to assisting them even under normal water resource conditions. We have a performance commitment to deliver 1.0 Ml/d of savings each year from 2020-25. Our strategy to achieve this includes:

- 'Baseline' customer engagement to provide advice and information via our social media channels, website, leaflets, magazine and our schools education services. In a typical year, we have approximately 6000 unique hits on our water efficiency web pages and our Education Advisers run classroom sessions and assemblies focussed on water efficiency with around 15,000 children.
- Digital engagement tool – our new platform, GetWaterFit, was launched in 2020 to help customers understand their water use, order free water saving devices (such as shower heads, cistern displacement devices and leaky loo strips) and book an online video consultation to talk through ways to save water with one of our advisers.
- In-home visits – from 2016 to 2020 we delivered nearly 22,000 HomeCheck water efficiency visits by a technician to provide bespoke behavioural advice and fit water saving devices that are appropriate for the household. We installed nearly 50,000 devices and the programme is estimated to have saved nearly 1 million litres. We will be relaunching the service, which has been paused owing to Covid-19 restrictions, later in 2021. To target households with the largest potential to save we are currently trialling a 'Leaky Loo' service that focusses on water wastage by leaking toilets. If successful we anticipate this will become part of our standard water efficiency customer offering.

We promote the efficient use of water and optional metering all year round. Our water efficiency engagement strategy typically follows a seasonal pattern with a shift in focus during the spring and summer months to include awareness of water saving in the garden. Campaigns typically include water saving behavioural tips messages on our social media channels, the inclusion of garden focussed products in our free device pack (e.g. hosepipe trigger guns, bottle top watering nozzles, drought tolerant seeds, water storing granules for pots), water butt promotions and direct customer engagement at summer events.

To widen the reach of our engagement we work collaboratively with various partners on water efficiency messaging – including Waterwise, Water UK and other water companies including the West Country Water Resources Group.

We support Waterwise's annual Water Saving Week campaign each March. The campaign is dedicated to raising awareness and includes challenges and tips based around daily themes – saving water at home, in the garden, at work, at school and in the community. We run promotions throughout the week and find this to be a good way to engage with customers at the start of spring. For the second year running we will be participating in the 'Water's Worth Saving' campaign which will run over 6 months and is coordinated by Water UK and Waterwise. The campaign aims to achieve national consistency of messaging under a monthly framework of specific themes for greater impact for greater awareness.

Metering is an important component of our overall demand management strategy; customers with a meter typically use less water than those without as they have an economic incentive to be efficient in their use to manage their bill.

Over 67% of the households that we supply pay metered charges and our metering strategy ensures that this proportion increases year on year. We install meters when there is a change of occupier in an unmeasured property and every year thousands of customers opt to switch to a metered supply often as a result of our promotion of the benefits to them and the wider environment. Additionally, all new properties are metered.

In 2016/17 we launched an enhancement to our optional metering programme with our 'Money Back Guarantee' which removes the financial risk for customers who want to try a meter because if after 2 years they have paid more than they would have done on unmeasured charges we will give them the difference back. At the time of writing over 90% of customers that switch to a meter save money.

Level 1a: Water efficiency campaign

In a period of extended dry weather and declining resource availability, a higher profile water efficiency campaign will be launched.

The specific details of a Level 1a water efficiency campaign would vary depending on the characteristics of the drought and the time of year that the trigger is crossed. For the purposes of this plan we have developed an example campaign design that has been informed by customer research and insight described in Appendix K and our significant experience of promotional activities with customers to promote water saving albeit normally when we are outside of drought conditions.

Table 2-2 summarises the key details the water efficiency campaigns we would likely implement in Level 1a.

Table 2-2: Example Level 1a water efficiency campaign

Aim	To provide clear information on the resource position and how behavioural changes and the use of water efficient devices can help reduce demand.
Communication channels	As per our communication plan (Section 5.2), we would expect to use our social media channels, website, local print media plus potentially radio advertising and attendance at local events.
Campaign messages	In addition to our baseline water efficiency messages regarding the wise use of water we would particularly focus on:

	1 Behavioural messages (potentially adapted depending on time of year): To encourage customers to shorten their showers by 1 minute, to only flush the toilet when necessary, to use water efficiently in the garden specifically by using a hose pipe for 1 minute less and raise awareness about plumbing losses, specifically how to identify whether a toilet is leaking and how to get it fixed. 2 Devices: Increased promotion of our GetWaterFit online tool and the free devices available through it with likely and specific promotions of flow regulating showerheads and leaky loo strips. We anticipate that in addition to our baseline work we would run two large scale promotional campaigns and two large scale behavioural change campaigns with continued organic messaging throughout the year.
Savings* *consistent with assumptions used for annual reporting against water efficiency performance commitment.	For modelling purposes, we have considered Spring and Autumn triggers and estimated the likely savings for both scenarios. Based on industry research and our own customer insight described earlier we have factored in a behavioural decay to accommodate for fatigue. We have also applied a high, most likely and low uptake multiplier to provide an estimate of the range of potential savings to allow for external factors (such as time of year, length of the drought, school holidays etc.) and the uncertainty around predicting the customer response to behavioural change campaigns. • Showering for 1 minute less could save 9 litres per person per day. A typical media campaign across several comms channels can reach around 400,000 people in our supply region, if we assume around 2% uptake that's an additional 13,200 people engaging in this behaviour (as a most likely estimate). This equates to an average monthly saving of 0.041 Ml/d in the months of the campaign or 0.29 Ml/d over the year. • Only flushing toilets when necessary could save 5 litres per person per day (assuming one flush is saved). Assuming the campaign encourages an uptake of 2% of the reach of the campaign channels the central / most likely estimate of monthly savings equates to 0.02 Ml/d during campaign periods and a yearly total of 0.17 Ml/d. • Using a hosepipe for a minute less could save 9 litres a day (assuming the garden is being watered daily). Assuming that 19% of households have a hosepipe (Manchester University, 2013) and 2% of our reach take up this behaviour there would be an average monthly saving of 0.009 Ml/d during campaign periods and a yearly total of 0.065 Ml/d. • Devices contained in our free water efficiency pack save on average 30 litres per household per day. In this example campaign, we assume that through additional promotion we would distribute an additional 600 packs per campaign saving an additional 0.048 Ml/d per campaign. • It is difficult to quantify the volume of water saved through raising awareness of how to identify and fix leaking toilets. Work completed by Water Industry Collaborative Fund Project (2015) indicates the average leak could be 215 litres a day. Recent evidence suggests it is particularly an issue for dual flush toilets and in homes without a water meter. At the time of writing we are in the trial phase of our Leaky Loo project, however as we don't currently have robust data on uptake, we have taken a conservative approach at this time and not assumed any savings from this activity.

	In combination we estimate that the Level 1a water efficiency campaign could save in the range of 0.49 to 0.81 Ml/d over the year. The month with the highest savings would depend on when the campaign is triggered – in the spring scenario it would be August with a total in-month saving of 0.15 Ml/d, in winter it would bin in October with 0.11 Ml/d. While the savings may appear small, they rely on achieving between approximately 26,000 and 40,000 behaviour changes over the course of a year in addition to our baseline / normal operation level of engagement. We believe this level of engagement would be stretching but achievable.

Water efficiency with retailers and non-households

Non-household (NHH) demands account for 24% of our demand in an average year and so supporting water efficiency with retailers and their business customers is important. Prior to retail separation we ran successful water saving programmes with NHHs and these were an important part of our overall programme to manage demand and achieve our water efficiency performance commitment.

Wessex Water is one of the wholesaler representatives participating in the Water Efficiency Sub-Group of the Retailer Wholesaler Group (RWG). The group has prepared an Action Plan[10] to help "deliver greater water efficiency in the business sector" and specifically "to develop and deliver 2024 water resource management plans that deliver significantly improved levels of water efficiency in the business sector".

The plan details five headline actions each with a series of associated sub actions. The key actions cover: developing shared ambition; treating data as an enabler to water efficiency; improving the links between wholesalers and retailers for WRMPs; tackling barriers; and raising customer awareness. Delivery of the plan is being progressed with all actions due to be completed by August 2021.

For this Drought Plan we have developed an outline drought management engagement /communications plan for retailers and businesses. The engagement plan is detailed in Appendix K and section 5.2 places this in the context of our overall drought management communications strategy.

Considering the ongoing RWG work we have taken the conservative view for this plan that engagement with retailers and NHHs will deliver nil water efficiency savings.

Level 1b: Water efficiency campaign

Should the dry weather continue taking our resource position into Level 1b, a more intensive water efficiency campaign would be launched. The specific details of a Level 1b campaign would vary depending on the characteristics of the drought and the time of year that the

[10] https://www.mosl.co.uk/download-document/596412ce32a352e5570825f5e8874d71

trigger is crossed. For the purposes of this plan we have developed an example campaign design that is summarised in Table 2-3.

Table 2-3: Example Level 1b water efficiency campaign

Aim	To provide clear information on the resource position and how behavioural changes and the use of water efficient devices by our customers can help reduce water demand.
Communication channels	As per our communication plan (Section 5.2), we would expect to more intensively use our social media channels, website, local print media plus potentially radio advertising and attendance at local events as we went into Level 1b. This might likely include more frequent social media posts, and the purchase of additional airtime in the case of radio. We might also seek to arrange media interviews with key staff on radio and/or television and expand work with our partners and local interest groups to spreads the messages more widely.
Campaign messages	The core messages (to which we can associate some savings) are likely to be unchanged from the earlier Level 1a campaign. We would particularly focus on: 4 Behavioural messages (potentially adapted depending on time of year): To encourage customers to shorten their showers by 1 minute, to only flush the toilet when necessary, to use water efficiently in the garden specifically by using a hose pipe for 1 minute less and raise awareness about plumbing losses, specifically how to identify whether a toilet is leaking and how to get it fixed. 5 Devices: Increased promotion of our GetWaterFit online tool and the free devices available through it with likely and specific promotions of flow regulating showerheads and leaky loo strips. We anticipate that in addition to our baseline work we would run four large scale promotional campaigns and four large scale behavioural change campaigns with continued organic messaging throughout the year.
Savings* *consistent with assumptions used for annual reporting against performance commitment.	For modelling purposes, we have considered Spring and Autumn triggers and estimated the likely savings for both scenarios. Based on industry research and our own customer insight described earlier we have factored in a behavioural decay to accommodate for fatigue. We have also applied a high, most likely and low uptake multiplier to provide an estimate of the range of potential savings to allow for external factors (such as time of year, length of the drought, school holidays etc.) and the uncertainty around predicting the customer response to behavioural change campaigns. • Showering for 1 minute less could save 9 litres per person per day. A typical media campaign can reach around 400,000 people in our supply region, if we assume around 4% uptake that's an additional 26,400 people engaging in this behaviour. This equates to an average monthly saving of 0.078 Ml/d in the months of the campaign or 0.55 Ml/d over the year. • Only flushing toilets when necessary could save 5 litres per person per day (assuming one flush is saved). Assuming the campaign encourages an uptake of 4% of our reach that's an average monthly saving of 0.05 Ml/d during campaign periods and a yearly total of 0.33 Ml/d. • Using a hosepipe for a minute less could save 9 litres a day (assuming the garden is being watered daily during drought conditions). Assuming that 19% of households have a hosepipe (Manchester University, 2013) and 4% of our reach take up this behaviour there would be an average monthly saving of 0.019 Ml/d during campaign periods and a yearly total of 0.13 Ml/d.

	• Devices contained in our free water efficiency pack save on average 30 litres per household per day. In this example campaign, we assume that through additional promotion we would distribute an additional 1600 packs for the first campaign, with a 10% reduction in packs for each subsequent campaign, saving an additional 0.048 Ml/d per campaign. • It is difficult to quantify the volume of water saved through raising awareness of how to identify and fix leaking toilets. Work completed by Water Industry Collaborative Fund Project (2015) indicates the average leak could be 215 litres a day. Recent evidence suggests it is particularly an issue for dual flush toilets and in homes without a water meter. At the time of writing we are in the trial phase of our Leaky Loo project, however as we don't currently have robust data on uptake, we have taken a conservative approach at this time and not assumed any savings from this activity. In combination we estimate that the Level 1b water efficiency campaign could save in the range of 0.91 and 1.52 Ml/d over the year in addition to the baseline. The month with the highest savings would depend on when Level 1b is triggered – in the spring scenario it would be July with a total in month saving of 0.3 Ml/d, in Autumn would be October with 0.25 Ml/d. While the savings may appear modest, they rely on achieving between approximately 49,000 and 74,000 behaviour changes over the course of a year in addition to our baseline / normal operation level of engagement. We believe this level of engagement would be stretching but achievable.

2.1.2 Enhanced leakage management

Baseline leakage activity

Wessex Water's leakage management strategy is a well-established baseline activity for the company outside of drought conditions. The strategy is based on an Active Leakage Control (ALC) policy with continuous night flow monitoring and pressure management throughout the year (D1.2) to meet our ambitious company leakage target. By 2024/45 we plan to reduce leakage from 66.9 Ml/d in 2019/20 to 63.71 Ml/d in 2024/25[11].

Our customer engagement for the last Business Plan highlighted the importance customers place on getting leaks fixed quickly, and therefore to address this we created a new target to fix customer reported leaks within a day. Significant effort has been made to streamline our processes and procedures to achieve a 90% compliance against this new target.

In recent winters we have experienced short-term increases in leakage related to freeze-thaw conditions and have been successful in adapting our strategy and deploying extra resources to recover our position quickly to ensure we meet our annual leakage target. The most notable recent event occurring during the so-called "Beast from the East" in March

[11] In the APR 2020/21 and WRMP19 Annual Review 2020/21 will restate our final baseline numbers for 2020/21 as part of our work to be fully compliant with the regulatory guidelines.

2018, which brought an extended period of freezing conditions to much of the UK. The end of the event saw a rapid ground thawing, which on 4th March 2018 led to a significant 55% step-increase in minimum night flows.

We dealt with around 200 weather-related leaks and gave advice to more than 1,500 customers who had problems in their home, indicating that the majority of the rise was related to leakage from customer pipes and plumbing which could be quickly isolated and fixed. The increase was reversed dramatically after just a few days, and by 4 April minimum night flows were back down to pre-thaw levels.

Across England and Wales, the event left more than 200,000 customers without water for more than four hours[12]. We managed the event without any material disruption to our services and with no customer experiencing any supply interruption that lasted longer than three hours. This was achieved through:

- prior investment (including our water grid)
- by forward planning in advance of the cold weather and communications with customers
- staff who were willing to go the extra mile for customers following the activation of our adverse weather continuity plan
- the active involvement of the executive team, in particular through chairing the incident response team.

Enhanced leakage management in drought

Pressure management is a central to our leakage management strategy. Our network has been divided into 1,000 individually pressure managed areas, and we continue to upgrade and optimise our pressure management through a continual improvement programme based on near real time monitoring and hydraulic modelling.

During extended dry weather conditions i.e. upon reaching the Level 1a we would enhance our leakage management programme through maximisation of existing ALC resources (Enhanced Leakage control level 1a). An overall reduction in leakage could be achieved by increasing staff overtime and night working and undertaking more work in the highways as ‘same day emergency works’ (under Traffic Management Act 2004) rather than giving a period of notice to the Highways Authorities and road users. By doing this we estimate we could reduce leakage by up to 0.6 Ml/d across a year. This change in approach would however result in greater traffic disruption and the increased staff working hours.

As part of activity in Level 1a we would also consider and prepare for further leakage reduction activities with longer lead times that could be implemented, in case the resource position declined into Level 1b. Level 1b actions are likely to involve utilising additional external staff resources and more active pressure management and review and prioritisation of our supply pipe policy. These actions might save an additional 0.9 Ml/d cumulative across a year.

[12] Ofwat (2018) Out in The Cold: Water companies’ response to the ‘Beast from the East’.

Where practical we will focus leakage detection in areas of environmental concern (which may vary between droughts). However, this should not detract from ensuring that overall leakage is minimised.

2.1.3 Temporary Use Bans (TUBs) and Non-Essential Use Bans (NEUBs)

Wessex Water seeks to avoid imposing any restrictions on customer water use in the event of dry weather. We have not implemented a Temporary Use Ban (hosepipe ban) for 44 years having last imposed restrictions during the drought of 1975/76.

Investment in our supply system in recent years means that it is resilient to maintain secure supplies unless the weather is drier than that experienced in the drought of 1975/76. Should such a drought develop, then restrictions on domestic/household water use form part of this Drought Plan that would likely be triggered from Level 2 (for TUBs) and from Level 3 for NEUBs, in particular during the summer period when they are likely to be most effective.

Temporary Use Bans

The Flood and Water Management Act (2010) gave new powers to water companies to implement a wider range of temporary water use restrictions during a drought without requiring a Drought Order, including the provision to apply restrictions to all or part of a company's supply area. This updates the legislation on temporary water use restrictions, substitutes the previous section 76 of the Water Industry Act (1991) and therefore supersedes the previous hosepipe ban powers.

The Water Use (Temporary Bans) Order 2010 supplements the Flood and Water Management Act and set out the categories of water use that companies can restrict without the need to apply for a Drought Order.

In the development of this Plan, we have considered each of the potential water use restrictions outlined in the Code of Practice and Guidance on Water Use Restrictions that was updated in 2013 to incorporate lessons learnt from the 2011/12 drought that affected parts of the UK (UKWIR, 2013). We would consider restricting all uses of water that we are empowered to do so under the Water Use (Temporary Bans) Order 2010, which includes:

- Watering a garden using a hosepipe
- Cleaning a private motor vehicle using a hosepipe
- Watering plants on domestic or other non-commercial premises using a hosepipe
- Cleaning a private leisure boat using a hosepipe
- Filling or maintaining a domestic swimming pool or paddling pool
- Drawing water, using a hosepipe, for domestic recreational use
- Filling or maintaining a domestic pond using a hosepipe
- Filling or maintaining an ornamental fountain
- Cleaning walls, or windows, of domestic premises using a hosepipe
- Cleaning paths or patios using a hosepipe
- Cleaning other artificial outdoor surfaces using a hosepipe.

See appendix H for further information on each restriction.

The demand savings associated with imposing restrictions on domestic use is difficult to quantify – not least as our customers have not experienced restrictions for over 45 years and so we do not have data specific to our area. We can however draw upon the experiences of other companies that have imposed restrictions more recently and have consulted UKWIR guidance as well as with other companies' drought plans.

In April 2012, seven water companies implemented Temporary Use Bans (TUBs), and an analysis of the water savings was published in Understanding the Impacts of Drought Restrictions[13]. The study examined the incidence of high-flow water use events for metered households in the Thames Water and Anglian Water region and inferred a 30-36% reduction in hosepipe use during the evening period (6pm – 11pm). Further analysis has been undertaken of drought demand savings during the 2005-06 drought, both by individual companies and in the 2007 UKWIR report[14]. Even where restrictions have been implemented, estimated demand savings are uncertain given the range of factors influencing demand, and the difficulty of isolating the impact of restrictions.

Based on the review of the available evidence we estimate the savings associated with TUBs restrictions in our region would amount to 5% of demand, which is consistent with our previous drought plan. This figure has been arrived at reflecting the characteristics of Wessex Water's customer base, in particular:

- the number of metered customers in our region (>67%) who have a lower propensity for high-volume continuous use related to hosepipes and sprinklers (identified by our Tariff Trial research[15])
- customer research regarding attitudes towards water use during dry weather that indicated that 32-42% of households never use a hosepipe and their discretionary outdoor use would be unaffected by a TUB, although it's possible the measure may affect their water use as they seek to be less wasteful / more efficient in other ways (see Appendix L).

Consistent with Environment Agency Drought Planning Guidelines[16] we would expect to implement TUBs between 1st April and 1st October – the general period of peak seasonal demand – prior to the application for drought permits.

Drought Order - Non-essential use bans

[13] UKWIR (2013) Understanding the impacts of drought restrictions (UKWIR reference: 14/WR/01/13)
[14] UKWIR (2007) Drought and Demand: Modelling the impact of restrictions on demand during drought (UKWIR reference: 07/WR/02/3
[15] Wessex Water 2019 Business Plan Appendix 1.1.AC - Metering tariff trial
[16] Environment Agency (updated December 2020) Water Company Drought Plan Guideline version 1.2

This section outlines the restrictions that we may impose on non-domestic customers through Ordinary Drought Orders should the drought situation worsen. As per the guidance, we would only apply for a Drought Order once all appropriate demand measures have been implemented.

The Drought Direction 2011 supplements the Water Resources Act 1991 and sets out categories of water use that companies can restrict with a Drought Order. We would consider restricting uses of water where an application to the Secretary of State for a Drought Order is required. These are as follows:

- Watering outdoor plants on commercial premises using a hosepipe
- Filling or maintaining a non-domestic swimming or paddling pool
- Filling or maintaining a non-domestic pond using a hosepipe
- Cleaning a non-domestic premises using a hosepipe
- Cleaning a window of a non-domestic building using a hosepipe
- Operating a mechanical vehicle washer
- Cleaning any vehicle, boat, aircraft or railway rolling stock using a hosepipe
- Cleaning industrial plant using a hosepipe
- Suppressing dust using a hosepipe
- Operating a cistern in any building that is unoccupied and closed

It is difficult to quantify the expected savings associated with a Drought Order as, relative to the implementation of TUBS, there is limited data available, particularly since concessions have been available to commercial customers. Following review of UKWIR guidance we have estimated that a non-essential use ban would lead to a further 2% reduction in demand.

Consultation and communication prior to implementing restrictions

Under legislation, we are required to advertise impending restrictions prior to their implementation and allow an appropriate amount of time for representations to be received from stakeholders for consideration by the water company.

As per legislation, it is our expectation that we would run an advertorial in at least two local newspapers, and give notice on our company website. In addition, we would give notice on social media channels and make a press release on the proposed restriction. The information provided would include details of how and when customers and other stakeholders can make representations. We would also expect to make particular use of our established stakeholder liaison panels (including the Wessex Water Customer Challenge Group and Catchment Panel) for discussion and dissemination of information at such times. A ‘reasonable’ period to allow for the representations is likely to be at least one week and no more than one month but may vary between these timescales depending on the time of year and our specific resource situation. We would seek to provide nearer one-month lead time to allow time to deal with a larger response, and prioritise internal resources to deal with this, should it arise.

During a consultation, we would pay particular attention to the needs of customers in vulnerable circumstances. Any temporary water use restrictions imposed would only include external 'hosepipe' water uses and would not affect 'internal household' water use. However, we recognise the importance of reassuring customers who might consider themselves high water users or have specific needs for water, such as in-home dialysis, that these restrictions will not affect such use. We would consult our WaterSure Plus and Priority Services customer databases to target communication to customers who may be in vulnerable circumstances during the consultation period before implementing any restrictions.

As part of the consultation period prior to implementing any water use restrictions, we would liaise with our neighbouring water companies (see Section 5.2.3), other licensed water suppliers and retailers to ensure that information provided to customers is clear and attempts to avoid confusion for customers particularly those close to the boundary between companies. Additionally, we have two bulk supply agreements with Leep Utilities who are the licensed water supplier for two developments within our area, one near Salisbury and one near Dorchester. The agreements state that Leep Utilities will take all steps necessary to impose upon its customers a hosepipe ban or other restrictions on the use of water as may from time to time be applied to Wessex Water's customers in the area surrounding Leep Utilities' area of appointment. It is hoped by both Wessex Water and Leep Utilities that this approach will minimise confusion for all customers.

Representations will be considered by an executive Director and a non-executive Director. If appropriate, we will be happy to discuss issues with individuals and organisations before they submit their representations to clarify any queries they may have. We will also consult with other water companies, and particularly neighbouring companies, on the representations we receive with the aim of agreeing consistent approaches where possible.

It is likely that during a drought in our region, other parts of the country, including our neighbouring companies, will similarly be experiencing drought conditions and may have already imposed restrictions, so there will potentially already be significant media attention and public awareness of the drought situation. Further, we would anticipate the potential for confusion for customers, both surrounding the nature of what is banned and what is not[17], but also where bans would apply across our region if other companies had already imposed restrictions. To aid in clear communication, and to help provide a clear message about the resource situation, we would seek to implement TUBs without phasing to avoid further ambiguity. However, based on the consultation responses, we would consider phasing of TUBS, particularly following consultation with customers who may be in vulnerable circumstances.

The timescale for implementing a Drought Order is much longer than for that of a Temporary Use Ban. The UKWIR CoP states that four companies applied for Drought Orders in 2006 and the process from advertising to receiving notice of the order took around 3 months. We have assumed a 3-month lead time for implementation.

[17] See for example lessons learned from Cape Town 2018 (Section 2.3).

To demonstrate to customers, stakeholders and the government that our implementation is proportionate and reasonable we will make clear in our communications the resource position that has led to the need to implement restrictions, and the actions taken prior to implementation on both the supply and the demand side.

Once a decision was made to lift drought restrictions during the end of drought (Section 6), we would tell customers of lifting of restrictions through advertisements on social media, our company website, local newspapers, and through contact with retailers. We would also use our WaterSure Plus and Priority Services customer databases to target communication to customers who may be in vulnerable circumstances to inform them of lifting of restrictions. This would also likely be supported by local media and television interviews.

Compensation for and enforcement of restrictions

Under the conditions of Wessex Water's appointment from the Secretary of State[18], compensation is payable where customers have their water supply interrupted because of a drought order.

Where water supply to a Household Premises is interrupted, the appointee (Wessex Water) must pay or credit an amount to the customer that is equal to £10 per day that the water supply is interrupted. The maximum compensation entitlement is equal to the company's average household bill for the previous year.

Where water supply to premises other than a household is interrupted, the appointee (Wessex Water) must pay or credit an amount to the customer that is equal to £50 per day that the water supply is interrupted. The maximum compensation entitlement is equal to the amount of water charges which were payable in respect of those premises by the customer who is liable to pay such charges for the Charging Year preceding the date of the interruption.

The Appointee is not required to pay or credit (as the case may be) any amount if it can demonstrate that it took all reasonable steps to avoid the circumstances which gave rise to the making of the drought order.

In general, we will rely on voluntary support, peer pressure and goodwill from our customers to enforce temporary water use restrictions. However, we anticipate that there would be some notification of contraventions of the restrictions from neighbours which will be followed up, initially with a reminder of the importance of the restriction and if necessary a warning. For continued and flagrant contraventions, we would consider using our powers to prosecute on a case-by-case basis. It is an offence to contravene a temporary use ban and the maximum penalty for each offence is £1,000. It is also an offence to contravene a Drought Order, the penalty for which is a fine not exceeding the statutory minimum on summary conviction, and an unlimited fine on conviction of an indictment (Section 80(4) of the WRA 1991).

[18] Wessex Water Licence (ofwat.gov.uk)

2.2 Supply-side actions

2.2.1 Operation of stream support

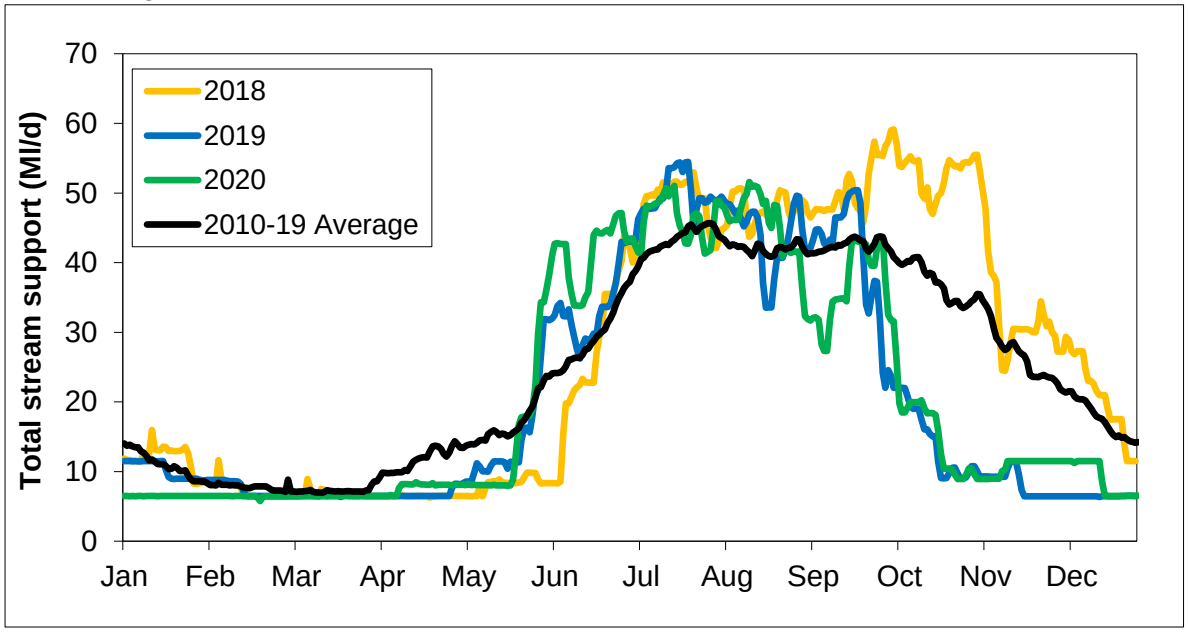
We operate 19 stream supports where we pump water from an underground aquifer and discharge it into a watercourse to maintain flow in the stream throughout the year at specified thresholds. Doing this mitigates the impact of our abstractions for public water supply on the local watercourses. For three of the stream supports, operating them to comply with our licences, can also mean the amount of water available for public water supply is reduced.

We monitor stream flows on a daily basis to ensure we are providing the correct support to each watercourse. Figure 2-1 illustrates the significant quantities of stream support that we discharge to the environment. Stream support provision exceeded 55 Ml/d in Autumn 2018 out of the maximum augmentation possible of 88 Ml/d. Stream support provision remained higher than average in the latter part of 2018 due to the dry weather in summer and early Autumn which saw record levels of soil dryness. This meant the recharge season started later than normal.

We have a further 17 sources where, rather than discharging water as stream support to maintain flows in a river, we reduce our abstraction rate for public supply when river flow falls below a given threshold, to minimise the impact of our activities on the environment.

As well as the above licence requirements, we have also voluntarily agreed to restrict our abstraction at two sources as part of Abstraction Incentive Mechanism (AIM) schemes. When stream flow or groundwater level triggers are reached, we restrict these sites in order to minimise our impact on flows, a scheme supported by the Environment Agency and local groups.

Figure 2-2-1: Total daily stream support provided in 2018, 2019 and 2020 compared to 2010-2019 average



2.2.2 Transfers with neighbouring water companies

We have bulk water supply arrangements with six neighbouring companies. We have liaised with neighbouring companies regarding the reliability of imports and exports during drought periods in the development of our Drought Plan. The transfer volumes are as per our Water Resources Management Plan and any issues relating to reliability are detailed in Table 2-6.

Table 2-6: Existing bulk supply transfers and their reliability in a drought*

Company	Name	Annual average (Ml/d)	Peak (Ml/d)	Drought reliability
Bristol Water	Bath	11.37 / 4.40	11.37 / 4.40	Existing agreement (1973) is for 11.37 Ml/d average and peak, with reduction to 4.4 Ml/d depending on regional drought coherence
	Marshfield	0.04	0.05	No expectation that these transfers will be reduced in the event of a drought.
	Ashcott	0.29	0.36	
Thames Water	Malmesbury	0.01	0.06	No expectation that reduced transfer volumes would be requested by South West Water during a drought
South West Water	Lyme Regis	0.04	0.05	No expectation that reduced transfer volumes would be requested by South West Water during a drought
	Wellington	<0.01	<0.01	
Veolia Water Projects	Tidworth	0.18	0.22	High degree of resilience; unlikely to be impacted, even in a severe drought.
	Leckford	2.74	3.00	
Southern Water	Biddesden	0.04	0.04	No expectation that reduced transfer volumes would be requested by South West Water during a drought
	Ludgershall	0.29	0.36	
Total		**15.00 / 8.03**	**15.51 / 8.54**	

*As stated in WRMP19 planning tables

<u>Bristol Water</u>

We have five small exports to Bristol Water, which supply discrete areas within Bristol Water's supply region. We also have two small imports that are typically less than 0.5Ml/d. Both Bristol Water and Wessex Water would not envisage needing to reduce these transfers during a drought. We would be liaising closely with Bristol Water as part of the West Country Regional Group drought management process and the reliability of these transfers under a specific drought would be closely monitored.

We also have a new bulk supply agreement in the Malmesbury area for up to 1.5 Ml/d from Wessex Water to Bristol Water. This transfer supports wider abstraction licence changes and will be used when groundwater levels in the Inferior Oolite aquifer are low. It will enable Bristol Water to reduce their abstraction from the aquifer by the same amount to ensure that their abstraction, alongside Wessex Water's abstractions for stream support, and private abstractions can all be met sustainably. The pipeline was completed in 2018. The transfer

hasn't been used since completion (apart from operational flushing flows) as groundwater levels in the Inferior Oolite have not reached the trigger levels.

In addition to these transfers we have a more significant import into the supply system near Bath. We have an agreement with Bristol Water that they will provide up to 11.37 Ml/d. It is the stated in both companies' current published Water Resources Management Plans that the dry year annual average transfer volume is currently 11.37Ml/d, reducing to 4.4 Ml/d from 2025. Bristol Water's Drought Plan identifies a reduction in the import to Wessex Water as a supply side drought action, triggered in their plan on entering Drought Management Zone 3 – prolonged dry weather, with a reduction to 4.4Ml/d identified in Bristol Water's design drought and a more extreme 60% LTA rainfall event. The variation in the import is in part dependent on the available water abstracted ultimately from the River Severn and the likelihood of the River Severn drought order being implemented.
Bristol Water have also indicated in their plan the possibility of the bulk transfer to Wessex water reducing to zero. In developing our plan we liaised with Bristol Water to understand the drought scenarios under which a reduction in the transfer may occur; under none of the drought events we have simulated, including 1 in 500 extreme droughts, has the transfer been reduced to zero, which would be extremely unlikely in the event of drought.

Whilst both companies are vulnerable to multi-season droughts, Bristol Water is primarily annual average constrained and Wessex Water also critical period constrained during peak demand periods when groundwater levels are low. As part of our drought communication plan (Section 5.2.2), we would be in regular contact with Bristol Water to discuss the best operation of the transfer to meet regional water needs on an annual average basis and during critical peak periods, as triggered by either company forecasting a lower Drought Management Level.

We have incorporated variations in the Bristol Import into our drought trigger testing (Appendix E). In this section we have also undertaken some initial analysis with our regional stochastic dataset which indicates the likelihood of both company's regions (and the River Severn region) being under extreme drought conditions has a very low likelihood.

Thames Water

We have one small import from Thames Water, which supplies water to an area of Malmesbury. We would not expect this supply to be restricted during a drought.

Veolia Water

We receive two imports from Veolia Water into the east of our supply area. The current agreement for the larger of the two bulk supplies states that the maximum daily transfer can be reduced on a proportional basis. Veolia have confirmed that these supplies would be resilient in the event of severe drought. As part of our communication plan we would be in regular communication with Veolia Water. The current contract between companies for the transfer is currently under negotiation. Any updates to the drought plan as a result of the revised contract will be made to the final plan.

South West Water

In the west of our region, we have two small imports from South West Water (SWW). Liaison between the two companies has verified that we would not expect these transfers to be restricted during a drought.

Additionally there is a bi-directional resilience connection between both companies in the Poole/Bournemouth area. The transfer can be operated in either direction in the event of a sudden or planned source outage or other operational problem. The option can be used to transfer water in either direction in the event of supply difficulties arising from dry weather and drought (Section 2.2.7).

Southern Water

We receive two imports from Southern Water on the eastern side of our boundary near Andover. Liaison with Southern Water has verified that in the event of a drought we would expect these supplies to be secure during a drought, but would be in regular communication with each other to discuss relative resource positions and the need for flexibility with transfers should the need arise. It may be that pressures to accommodate more constraints on Southern Water abstractions in Hampshire may increasingly restrict these transfers during droughts in the future.

2.2.3 Implement Resource Saving Strategy – Level 1a and Level 1b

Under normal water resource conditions, we expect to operate our supply system as cost-optimally as possible. A cost optimal strategy is one that typically seeks to maximise the output from sources with the lowest energy requirements for pumping and treatment (while still operating within the conditions of all our licences) and so is generally a strategy with a smaller carbon footprint.

An extended period of dry weather can impact upon water supplies from some of our more cost optimal sources e.g. storage in Clatworthy Reservoir (West). To conserve supplies at these sources we take a phased approach as we move away from a purely cost optimal strategy towards a resource saving strategy.

Potential Level 1a actions

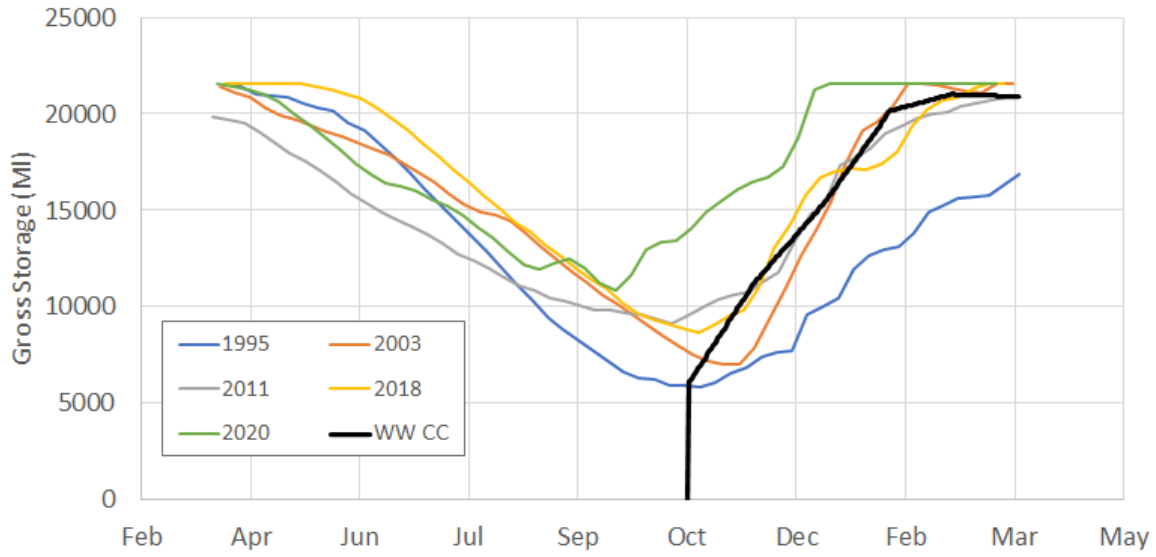
At this stage, resource availability issues are likely to be localised and so some, but probably not all, of the actions listed below may be implemented:

- Reduce abstraction from groundwater sources.
- Increase the use of reservoirs that are proportionally more full or overtopping and reduce the output from reservoirs that are proportionally less full.
- Increase pumped storage within the conditions of our abstraction licences as appropriate – the combined design capacity of all our pumped storage facilities totals 35.5 Ml/d (excluding Wimbleball's 150 Ml/d facility – see box: Wimbleball pump storage).
- Balance abstraction from sources that are constrained by annual licences with those that are not, using the integrated grid. In particular, this would mean Chitterne and Brixton

Deverill near Warminster and Corfe Mullen, Empool, Milborne St Andrew and Sturminster Marshall near Dorchester.

Wimbleball Reservoir and pumped storage

Up to 150 Ml/d can be pumped from the River Exe at Exbridge into Wimbleball Reservoir between 1 November and 31 March, providing flow in the River Exe exceeds minimum limits measured at the Thorverton and Exebridge gauging stations. Wessex Water and South West Water monitor Wimbleball storage relative to a control curve, which alongside Miser model simulations, is used to decide whether to operate the pumped storage facility. Since the scheme was licenced in 1995, pumps have operated in 12 years, which are shown in the inset figure. Operation of the scheme helps us to conserve water in Clatworthy Reservoir by increasing the water available for abstraction from Wimbleball reservoir, once we switch to a resource saving strategy.



Potential Level 1b actions

At this stage, resource availability issues are likely to be more widespread and so it is likely that all of the potential actions listed for Phase 1 would be implemented, and in addition:

- Reversal of flow in the Somerset spine main – under normal circumstances water is transferred from sources on Exmoor through Somerset, feeding several demand areas and delivering water to Yeovil. If storage in Clatworthy and/or Wimbleball is particularly low, demands from the Somerset spine main can be fed by groundwater sources in Wiltshire. This action requires careful planning as there will be an increase in the hardness of the water supplied to customers in Somerset and so advanced notification would be required to manage customer contacts. The spine main was last reversed for a sustained period during the winter of 2003/04 following the dry summer and autumn in 2003. Depending on the availability of water resources across the supply system, this action may be undertaken in conjunction with winter drought permit options to help conserve reservoir storage (Section 2.2.8).

The actions described here have been developed from model outputs and direct operational experience of their implementation during recent periods of dry weather (2016, 2011, 2003/04 and 2018/19).

2.2.4 Review planned outages for small maintenance schemes

As a period of dry weather develops and as part of our business as usual water resource tactical planning, we would review the appropriateness of planned outages and maintenance as all sites. Reducing planning outages will increase available supplies at a particular time, though the exact yield benefit depends on the specific outages. Delaying planned works in this way needs to be balanced against potential increases in risk to sources and parts of the distribution network where the work was required, and the drivers for this work (e.g. water quality). These actions will be discussed as our weekly and monthly meetings with Operations, and continue via the Emergency Planning and Tactical group, when formed.

2.2.5 Standby source

In the North of our region Wessex Water owns Monkswood reservoir, a small concrete lined reservoir that is not normally used for potable water supply, as spring flows that entered the reservoir are now diverted around the reservoir for treatment at Washpool Water Treatment Works. To supplement lower spring flows the reservoir could be brought back online and provide an additional 150Ml of water to help meet peak demands during a hot, dry summer period based on 30 days production at 5Ml/d. The volume of water available is a conservative estimate based on the total reservoir capacity. Pre-treatment is needed to the raw water abstracted from the impounding reservoir to allow it to be blended with catchment spring water prior to treatment at Washpool WTW. We undertook a planning exercise in summer 2020 to show that we could mobile and commission this drought option within a 3 to 6-month timescale.

We are currently in the process of applying for an abstraction licence from the Environment Agency to enable Monkswood Reservoir to be used as an emergency standby source.

2.2.6 System Optimisation

In addition to reviewing planned outages for small maintenance schemes, as we move through Level 1 actions and potentially require further actions to mitigate potential drought impacts, we will review all activities possible within sources and the supply network to maximise supply availability. The set of available activities will depend on the specific circumstances at the time, but we anticipate this would include a review of:

- We currently have 63 water treatment works in use, and we would review the utilisation and capacity of each of them to identify any that are not performing as expected or have water resources we can’t exploit.
- We would look to understand the root cause of any underutilisation of the source which may be inadequate pump capacity, constraints of treatment, demand area constraints.

- We would then look to see what interventions are possible to release extra water such as lower borehole pumps, installing bigger borehole pumps, upgrading treatment processes, rezoning the network to maximise demand areas.

This activity will be a continuous activity, building on strategy meetings and BAU activities in operations, as we progress through drought management levels, and will be closely related to monitoring of borehole groundwater levels and yields at individual sites against our modelling of hydrogeological yield constraints.

The exact yield benefits of system optimisation are uncertain and will change depending on the status of existing site assets and the network configuration at the time of implementation. We therefore conservatively estimate additional savings of up to 2Mld from these activities.

2.2.7 Additional transfers from neighbouring companies

Liaison between South West Water (SWW) and ourselves for the preparation of this Plan has confirmed that when resource availability reaches Level 1b, particularly in relation to our reservoir storage and annual licence trigger metrics, we would discuss relative water resource needs and availabilities for the coming months, and discuss potential operation of the bi-directional transfer to help with the regional water resource position. We would likely expect to take the water later in the drought management level if it is confirmed as available. This would include looking at changes in Bournemouth Water source mix if that could help release water to Wessex Water. It is possible that SWW may approach us earlier than this for a transfer of water in response to the triggers defined in their own Drought Plan.

Bournemouth-SWW's supply system is peak demand constrained, and therefore they plan on the basis of a critical period demand, and drought triggers are demand based. These triggers are most likely to be crossed in the summer period, and so transfer availability is more likely during the winter period or outside holiday periods.

SWW will look to transfer up to 10Ml/d on average subject to short term peak demands and resource availability. This option will be discussed, and where possible, implemented prior to TUBS or DPOs. In the lifetime of this Drought Plan SWW will have built new WTWs in Bournemouth. This can handle higher flows with poor raw water quality. Subject to water resource availability SWW will look to increase transfers above 10Ml/d once the works is operational and if water quality standards can be met.

As demonstrated in the drought event testing (Appendix E), the implementation of the transfer during drought is triggered to help conserve reservoir storage and prior to the application for drought permit options on the river Stour to help conserve reservoir storage. As explained above, based on SWW-Bournemouth's drought supply constraints, we expect this potential transfer to be available during the winter months. We have timed the drought bands and engagement with SWW so that should the option not be available, we can consider bringing forward the application of our drought permit options to provide the resilience benefit to reservoir storage.

2.2.8 Drought permits and orders

Drought permits and drought orders are drought management actions that increase the flexibility of a water supply system.

- Drought permits are granted by the Environment Agency to increase water supply during a drought by altering existing or new abstraction licence conditions temporarily.
- Drought orders are granted by the Secretary of State and can both increase supply and restrict certain uses of water temporarily (that are beyond the power of water companies to restrict under the Flood and Water Management Act 2010).

The Environment Agency can apply for drought orders if they judge that the environment is suffering serious damage because of abstraction during a drought. The Environment Agency's Wessex Drought Action Plan does not specify any drought orders that could affect any of Wessex Water's abstractions. However, the EA may be able to apply for a drought order to restrict abstraction from the Gloucester and Sharpness Canal in order to protect freshwater flow in the River Severn. Such restrictions could potentially have knock-on impacts on the import we receive from Bristol Water into Bath, as Bristol Water's abstraction from the Gloucester and Sharpness canal is one of their main sources. As part of our regular liaison with the Environment Agency and Bristol Water during drought (Section 5.2) we would discuss this potential issue.

There are several factors that must be demonstrated prior to and as part of an application for a drought permit or order:

- There has been an exceptional Shortage of Rain (see Section 3.3.1).
- Justification of need exists, including the timing of the risk to public water supply.
- Appropriate drought actions have already been implemented, where we must demonstrate that demand has been reduced through voluntary savings through communications with customers, leakage reduction, operational changes to the distribution network, and depending on the time of year and environmental impact of options, temporary use bans. Enough time needs to have been given for these actions to have had a measurable impact on supply.

These factors are considered further in 0. Our overall ordering of drought actions has been ordered such that we would implement seasonally appropriate demand-side actions, and optimisation of our existing supply system before applying for drought permit options.

Temporary Use Bans (or TUBs; See Section 2.1.3) need to be in place for drought permits or order application between 1st April and 1st October. Outside of these dates the Environment Agency does not expect them to be in place prior to applying for a drought permit or order when the demand savings are estimated to be minimal, and there is no proven or assessed environmental impact from the permit or order, when mitigation is accounted for.

Prior to drought permit application, and on the basis that a drought permit application requires preparation, we would first expect to engage with the Environment Agency in and

other relevant bodies and enter the pre-application stage with the Environment Agency. The exact timing of entering this stage depends on each drought permit option, and it's scheduling in each drought management level reflecting potential environmental impacts of the options. The earliest we would expect to enter these discussions is Drought Management Level 1b for our least environmentally damaging drought permit options.

We have identified ten drought permit options for inclusion in this Drought Plan. Each option is a drought permit, as opposed to a drought order, as they each relate to the suspension or modification of conditions on existing abstraction licenses held by Wessex Water. The drought permit options included in the plan include 5 drought permit options that were included in our previous plan, and 5 new drought permit options (**Error! Reference source not found.**).

For each of the drought permit options an Environmental Assessment Report (EAR) has been produced, which considers both the individual effects of each option and in-combination effects of options where more than one option impacts on a specific catchment. The EARs have therefore been grouped on a catchment basis. Further details of these assessments can be found in Section 4. The drought options shown in **Error! Reference source not found.** are ordered by the EA level category, reflecting the order of likely implementation, and in turn, the potential environmental impact of the option. The exact order of implementation will also reflect the specific conditions of the drought event.

For security reasons the remainder of Section 2.2.8 is redacted and not available in the version of this document published on our website.

2.2.9 Drought Permit application readiness

EA guidance requires that our drought plan shows we are application ready for our most frequent drought permit sites for implementation. Whilst there is no specific guidance as to the definition of a frequently used drought option, our pre-consultation response from the EA suggests a 1 in 200 benchmark could be used to identify the most frequent sites.

To aid in drought permit application readiness we have prepared Environmental Assessment Reports for all drought permit options including in the drought plan (except our extreme drought measures - Section 2.3), and will consult on these during drought plan consultation.

Based on the outcomes of the Environmental Assessments, the need to trigger our least environmentally damaging drought permit options earliest, and the likely ordering of drought option implementation in a drought, the most likely drought options we would apply for are those drought options to help conserve reservoir storage by increasing annual licence availability during the winter/spring months leading into a drought (See Appendix E). These are the River Stour Annual licence and Empool Annual licence options. Implementing these least environmentally damaging drought options early delays the need to implement potentially more environmentally damaging options later, during drought conditions.

For drought application readiness, key requirements alongside the Environmental Assessment Report are a demonstration of exceptional shortage of rainfall as part of a

drought application supporting document. During development of this drought plan we have liaised with the Environment Agency and developed an exceptional shortage of rainfall template document to support a drought permit application. Preparation of the template has followed the EA drought planning guideline (in particular appendix D), and the Hydrological guidance for the assessment of an Exceptional Shortage of Rain (ESoR; Draft received November 2020). We have received final guidance on ESoR from the EA in March 2021, alongside the final Drought Permit Application Readiness Guidelines, and will incorporate this into our drought permit application readiness.

To ensure we have this information available at the time of a drought application, we have developed automated procedures to calculate the relevant rainfall metrics to demonstrate ESOR. As described in Section 3.3.1 we will begin to analyse these data as we enter drought management level 1b, to put the current rainfall situation in the longer historical context. This analysis is will be used to understand whether we are near to or approaching the time we have experienced an exceptional shortage of rainfall, and will inform our communications with the Environment Agency leading into a drought.

As discussed with the Environment Agency, we will continue liaison with them during the spring and summer of 2021 to identify the correct geographic extents over which to calculate exceptional shortage of rainfall for different drought permit applications.

Based on EA guidance, we have developed a drought permit application template, and to help demonstrate application readiness, have created a checklist of requirements, identifying the appropriate internal and external data sources and lead times to gather and present this information (see template document). The checklist lead-times for developing the application have fed into and are accounted for in the lead times for drought plan testing (Appendix E).

We will work with our local Environment Agency and undertake a drought permit application exercise during 2022 and 2023, using one of our test drought events and most likely drought permit options (River Stour Annual Licence Options) to help ensure on an ongoing basis the readiness of our drought permit options.

The template documents can be found in Appendix I.

2.2.10 River Tone and Yeo drought permit options

During development and consultation of the plan, the potential impact of the River Tone and River Yeo drought permit options (see **Error! Reference source not found.**) on the Somerset Levels and Moors RAMSAR site was raised by Natural England, who were unable to concur with the conclusion of no adverse effect on site integrity on the basis of the information presented.

Wessex Water met with NE and the EA in Autumn 2021 to discuss the issue; it was decided that the Tone and Yeo options would be retained in the plan on the basis that a satisfactory management arrangement can be agreed upon between Wessex Water, NE, the EA, and the Internal Drainage Board (IDB), to ensure the integrity of the designated sites, and therefore satisfy the requirements of the HRA.

Wessex Water is committed to engaging with NE, the EA and the IDB to develop the satisfactory management arrangement to help ensure the integrity of the designated sites, and agree the timelines and scope for further baseline monitoring. The steps to be undertaken are as follows:

1. By November 2022 – attempt to establish whether a satisfactory management arrangement can be established between Wessex Water, NE, the EA and the IDB.
2. November 2022 decision-point:
    a. If a management arrangement can be agreed, move onto step 3: development of baseline monitoring requirements.
    b. If a management arrangement cannot be agreed, consider removal of the options from the final drought plan.
3. January 2023 – agree scope of monitoring requirements so Wessex Water complies with the requirements laid out by NE to prevent a breach of Habitats Regulations.
4. February 2023 – begin necessary monitoring requirements to establish baseline understanding for continued development of EARs.

The Somerset Levels and Moors system is complex system, with impacts occurring on the water levels and flows in and through the designated sites that are beyond the control of Wessex Water. The timeline presented above reflects that we may not be able to arrive at a satisfactory management arrangement in the near-term, in which case we will review whether to remove these options from the plan.

As demonstrated in this plan, these options are not triggered under the range of droughts, and extreme droughts used to test the plan.

2.3 Extreme Drought Measures

Consideration of extreme drought measures is a new part of our drought plan. In the drought planning guidelines the Environment Agency have asked water companies to identify and plan for actions we could implement in an extreme drought after implementing non-essential drought bans, and to delay the need for implementing Level 4 severe drought restrictions (e.g. emergency drought orders that authorise stand pipes or water tanks). Our extreme drought measures were identified following Drought Permit Option screening. Building on the Drought Permit Options in Section 0, some of which would only be applied for in extreme droughts themselves (See Appendix E). Table 2-4 shows the extreme drought options included in this plan. Level 4 restrictions would be entered on or before our reservoirs enter Emergency Storage. We therefore do not anticipate using emergency storage prior to Level 4 (e.g. as an extreme drought action).

We discussed the environmental assessment report requirements for extreme drought options throughout the pre-consultation period with the EA on developing this plan. These options have been included in the necessary HRA and SEA reports for this drought plan.

Table 2-4 Extreme Drought Actions

Type of Action	Summary	Trigger for action being used	Likely benefit/ saving (Mld)	Barriers	Timescale	Priority Order
Demand	Water Efficiency – Phase 3	Low groundwater or reservoir levels within drought management level 3	Up to 40Mld	Customer acceptability of the need for more severe reductions in demand	1-week lead time	1
Demand	Enhanced Leakage Control – Phase 3	Low groundwater or reservoir levels within drought management level 3	Up to 0.86Mld over a year	DWI standards, resourcing to achieve significant savings.	Upto 1-month lead time	2
Supply	Reduce Stream support	Low groundwater levels drought management level 3	0.86	Environmental Assessment	3-month lead time	3
Supply	Abstraction from Nutscale reservoir	Severely low reservoir storage within drought management level 3	1-2	DWI standards to bring abstraction into supply	6-month lead time	4

Water efficiency campaign – Level 3 (Extreme drought engagement)

In the event of extreme drought, in addition to the imposition of the Level 2 Temporary Use (Hosepipe) Ban we would launch a high-profile water efficiency campaign asking people to take even greater restraint in their water use at home. At this time, drought conditions are likely to be widespread across the UK leading to keen media and customer interest.

Our campaign would likely encourage customers to pick from a portfolio of suggested water saving actions to reduce their water use by ~40 to 50 litres a day which for customer with an average water use of 140 litres a day would represent around a 30-35% change. Savings arising from the campaign would be highly uncertain but targeting large reductions would have significant impact on water availability in peak periods even if only partially effective.

The campaign would be run to engage with as many customers as possible making use of social media channels (organic and paid for promotions), our website, radio adverts and print media advertorials. We would also engage with local news stations to participate in radio and television interviews and work with partners to spread the message to encourage uptake of water saving behaviours – see section 5.2 for more details on our communications and engagement plan. Table 2-6 shows the range of actions customers would be encouraged to uptake depending on their circumstances and existing water saving behaviours. The table also provides four example customers of how the actions could collectively make large savings. Example D highlights the significant savings that could come from fixing a leaking toilet, although their pre-action consumption would be starting from a higher baseline.

Table 2-5: Level 3 Water efficiency campaign action portfolio and examples of how customers might take some of these up

Action	Saving (litres per day)	Reducing from 140 l/h/d to ~100 l/h/d			Reducing from 220 l/h/d to ~75 l/h/d
		Example A	Example B	Example C	Example D
Hosepipe ban (Level 2)	7.5	7.5	n/a	7.5	7.5
1 less toilet flush per day	5	5	n/a	n/a	5
2 less toilet flushes per day	10	n/a	10	10	n/a
Fix leaking a toilet	92	n/a	n/a	n/a	92
1 min shorter shower	9	n/a	n/a	n/a	n/a
2 min shorter shower	18	18	n/a	18	n/a
3 min shorter shower	27	n/a	n/a	n/a	27
Short shower instead of bath	20	n/a	20	n/a	n/a
Shallow bath rather than deep bath	10	n/a	n/a	n/a	n/a
1 less load of washing per week	3.5	-	3.5	3.5	3.5
Wash veg in a bowl not under running water	2	2	2	2	-
Re-use water from cooking to water plants	2	2	-	2	-
Being conscious of using less water when cleaning	2	2	2	2	-
Reusing bath/shower water for garden pots or to flush toilet	4	-	4	4	-
Not washing car or windows, even with a bucket	2	2	-	2	2
Daily saving from actions		**38.5**	**39.5**	**51.0**	**132.0**
Resulting PCC l/head/d		**101.5**	**100.5**	**89.0**	**88.0**

Some actions might be sustained for longer than others, there is significant uncertainty in how householders will react to this type of campaign given that no water company in the UK has previously rolled out this type of activity.

Wessex Water has not had to impose hosepipe bans for 45 years, and so there is no recent experience of dealing with extreme drought circumstances to inform the most effective methods of engaging with customers to help them to make larger reductions in demand. However, there are more recent international examples that may be drawn from to guide the best approaches to customer messaging

In 2017/18 the municipality of Cape Town, South Africa, ramped up both its price and non-price related mechanisms (drought actions) to encourage people to save water in response to drought, including a water conservation campaign which included information about the threat of "Day Zero", when domestic supplies would be turned off (e.g. Level 4 restrictions). A communication campaign took place through radio, print and social media[19]. This conservation campaign built on restrictions already imposed on garden watering, filling outdoor pools and washing cars. Smart meter and billing data from the city points to a significant success in customer response to drastically revise their consumption patterns over a relatively short period of time[20]. Evidence suggests some interventions were more effective than others in leading to this demand reduction.
Qualitative research[21] has identified that water restrictions based on clear messaging about how much water households were supposed to use per day played an effective role in encouraging households to save water during the crisis. In particular, the study showed that households were able to learn new ways of using water to keep clean, a primary driver of water use, and that increased greywater use for toilet flushing was the most common change in water use practices. This work is supported by work elsewhere that non-pricing measures have had a greater impact on water consumption decisions compared to pricing measures[22].

Quantitative research coupling smart meter data with social media and internet search use, suggests that the largest customer response was observed when the level three disaster plan was instigated, warning customers of disastrous outcomes, suggesting users responded more strongly to the threat of supplies running out, than to levels of water restrictions imposed[20]. This may have also related to the clearer messaging surrounding the "Day Zero" campaign, in contrast to frequently changing and confusing changes in restriction levels for water usage[23].

[19] Department of Water and Sanitation, City of Capetown (2018) https://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/Water%20Outlook%202018%20-%20Summary.pdf
[20] Booysen, et al (2019) Temporal Case Study of household Behavioural response to Cape Town's "Day Zero" using smart meter data, Water Research, 149, 414-420
[21] Matikinca et al (2020) Drought response impacts on household water use practices in Cape town, South Africa, Water Policy, 22, 483-500.
[22] Tortajada et al (2019).Water demand management strategies for water-scarcecities: the case of Spain.Sustainable Cities and Society, 45, 649–656. doi:10.1016/J.SCS.2018.11.044.
[23] Parks et al (2019) Experiences and lessons in managing water from Cape Town, Grantham Institute Briefing paper No 29. Resources | Grantham Institute – Climate Change and the Environment | Imperial College London

Enhanced Leakage Control – Level 3

In extreme circumstances prior to Level 4 restrictions, we would seek to identify locations where extreme pressure management reductions could be implemented over and above our existing pressure management programme, based on our understanding of locations of critical infrastructure (e.g. hospitals). These actions would target District Meter Area (DMAs) and consider drought risk in the area and the make-up of demand in each DMA, seeking to avoid DMAs containing critical supplies for hospitals, care homes and other vulnerably customers. These actions may save an additional 0.9Mld across a year, although this estimate is uncertain. As a drought progresses, part of our activity in Phase 2 of the enhanced leakage control programme will be to undertake DMA screening for potential sites, supplementing existing system understanding.

Through implementation of this option for pressure reduction, we would maintain close liaison with local fire authorities and local resilience forums to help mitigate the impact of pressure reductions on the need for firefighting as per Part 5 of the 2004 Fire and Rescue Services Act, should the need arise in a particular DMA targeting with pressure reductions.

Reduce stream support

We have two options to reduce stream support requirements at two abstraction sites in the north of our supply zone associated with existing abstractions. A conservative reduction of these requirements by 50% each would lead to an additional 0.86Mld into supply.

For security reasons the remainder of Section 2.3 is redacted and not available in the version of this document published on our website.

2.4 Compensation for implementing drought management actions

People who suffer loss or damage as a result of a drought permit are entitled to compensation. The rules for compensation are set out in Schedule 9 of the Water Resources Act 1991. Those who may claim are the owners of the source, and all other persons interested in the source or injuriously affected by the taking of the water. The water company, as applicant, is liable to pay this compensation. Claims must be made within six months of the date of expiry of a permit.

We have not had to implement any of the drought permit options included in this plan, and do not expect to implement any specific compensation payments to third parties. However, as above, compensation payments may therefore be applicable in the event of Wessex Water implementing any of its drought permit options.

2.5 Support for non-public water supply sectors

Across the West Country Region there are people, business and farms that rely on their own water sources for essential use such as drinking and watering livestock. During a drought these sources may be affected and could even fail. To improve our understanding of this area of water use, the WCWR Group has commissioned a piece of work to assess the water demand for mining, agriculture and private water supply across the West Country Region.

This work is underway as part of the development of our draft Regional plan. and will be completed in spring 2021 to inform the development of the draft Regional Plan. We will use the outputs from this work to identify the support that the WCWR Group may be able to provide other abstractors should they be affected during a drought.

3 Drought triggers

Drought plans should contain drought triggers to help identify when specific drought actions could be implemented, as we lead into a drought, through to its end. Triggers can be developed at different spatial levels, depending on the complexity of the Water Resource Zone, and be based on a range on a range of weather (e.g. rainfall), hydrology (groundwater levels, river flows) or system based metrics (e.g. reservoir storage).

We have developed drought triggers based on three key metrics of resource state in our supply system reflecting the balance of reservoir storage, annual licence use, and hydro-geological constraints on water availability during drought (Section 3.1).

For each of these metrics we have defined triggers based on five drought operational levels to reflect the continuum of actions and changes we can make to our water supply system as a period of dry weather develops (Section 3.2). The operation levels have been developed, and named, to be consistent with the Environment Agency's Level 1 to 4 definitions for drought actions.

Crossing into a new drought level does not automatically trigger a set of specific actions; in the first instance forecasting that we may enter a new drought trigger means that we will undertake further, more detailed analysis, incorporating up-to-date hydrometric and system data on the specific situation to feed into model forecasting and the decision-making process. To aid in the drought decision-making process, a range of hydrometric variables are monitored (Section 3.3) and model forecasting is undertaken (Section 3.4). Our monthly model forecasting is particularly useful as it provides early warning as to when we may enter a new Drought Management Level.

The drought triggers have been developed and tested using drought event simulations with our Miser water resources system model, simulating historic drought events and more severe extreme drought tests. Further details of drought event testing is shown in section Appendix E.

3.1 Drought Trigger Metrics

Since the development of our last drought plan, we have undertaken a review of our drought triggers and metrics that trigger our drought actions. The starting point for this review was to consider the key factors that constrain water availability, and therefore the factors which may lead to supply difficulties during drought. The main drought-related factors that constrain supply availability in our supply system are:

- **Reservoir Storage** - Water available from reservoirs, as controlled by natural catchment inflows and pump storage availability. During drought reservoir inflows will be lower, and lower river levels will restrict available pumping to storage.
- **Groundwater Yield** - Hydrogeological constraints on water availability from groundwater sources when groundwater levels become low during drought.
- **Licence Volumes** - Licence constraints on the total available abstraction throughout the year. During a drought, high demands during peak-summer periods and

constraints on hydro-geologically constrained sources mean more abstraction from licence constrained sources.

The importance of these different factors varies spatially across our supply system during a drought and varies between sources. Figure 3-1 shows key sources across our supply system, and for each of those, what the key drought-related constraint is. Reservoir storage is the main constraint on abstraction in the West of our supply system, which is surface water source dominated. In the East and South of the area, which is groundwater dominated, hydrogeological constraints and licence constrained sources are the main constraints on water availability during drought. In the North of our supply area, sources are mainly hydro-geologically constrained. During a drought, abstraction from different sources needs to be balanced based on these constraints through use of the integrated supply grid (Section 1.2.2).

For security reasons Figure 3-1 is redacted and not available in the version of this document published on our website.

Figure 3-1 Location of key source types with different drought related constraints and observation borehole locations, plotted alongside main grid connections*

Based on the constraints considered above, three triggers metrics are therefore used to trigger our drought actions:

1. Combined reservoir storage from five surface reservoirs.
2. Combined annual licence remaining from annual licence constrained sources.
3. Groundwater level at Woodyates observation borehole

The locations of reservoirs that combine for the drought trigger, and the location of annual licence sources that combine for the annual licence trigger are shown in Figure 3-1. The observation borehole groundwater level at Woodyates borehole, which is situated in the Chalk aquifer, is used as the trigger to indicate hydro-geological constraints on water availability. This approach reflects the approach we take to source yield assessment in our current Water Resources Management Plan, where available deployable output at each hydro-constrained source is modelled by its relationship to the key observation boreholes of Woodyates and Ashton Farm. Analysis of the records of these boreholes shows a high degree of correlation such that using a single borehole is a suitable overall drought trigger.

3.2 Drought Management Levels

For each drought metric we have developed triggers based on five management levels (Table 3-1) to reflect the continuum of actions and changes we can make to our water supply system as a period of dry weather develops. The emergency plan is shown here for completeness but is not part of this drought plan. The management levels have been developed, and named, to be consistent with the Environment Agency's Level 1 to 4 definitions for drought actions. Level 1 has been divided into two management levels to provide appropriate triggers for different Level 1 actions as a transition occurs during drought from normal operation through to Temporary Use Bans.

Table 3-1 Summary of Drought Management Levels

Drought Management Level	EA Level	Operational Strategy and Actions
Normal Operation		Normal Operation and cost saving strategy. Background Water Efficiency, metering and leakage activity. Normal season water efficiency messaging to customers and retailers.
Level 1a	Level 1	Move towards resource saving strategy Review of outage programme. Increase water efficiency campaigns and leakage controls.
Level 1b		Enhanced water efficiency campaign and leakage control. Additional transfers from neighbouring companies and use of standby sources coupled with further system optimisation.
Level 2	Level 2	Least environmentally damaging drought permit options Temporary Use Bans
Level 3	Level 3	Non-essential use bans and high profile water efficiency campaign Moderate/All Environmental Impact drought permit options
Emergency Plan	Level 4	Emergency drought orders (e.g. standpipes)

The individual trigger metrics capture the need to balance abstraction from different source types across our supply system based on their different constraints, and how those vary through the timescale of a drought. To gain an overall supply area view, these three trigger types are combined into a matrix to provide an overall view of the company's resource position at a given point in time, which is then supplemented by further information, depending on the resource position (Figure 3-2).

Figure 3-2 Example trigger matrix for the Wessex Water supply area

Drought Trigger	Reservoir Storage	Annual Licence	Groundwater level Woodyates
Drought Management Level	Level 1b	Normal Operation	Level 2

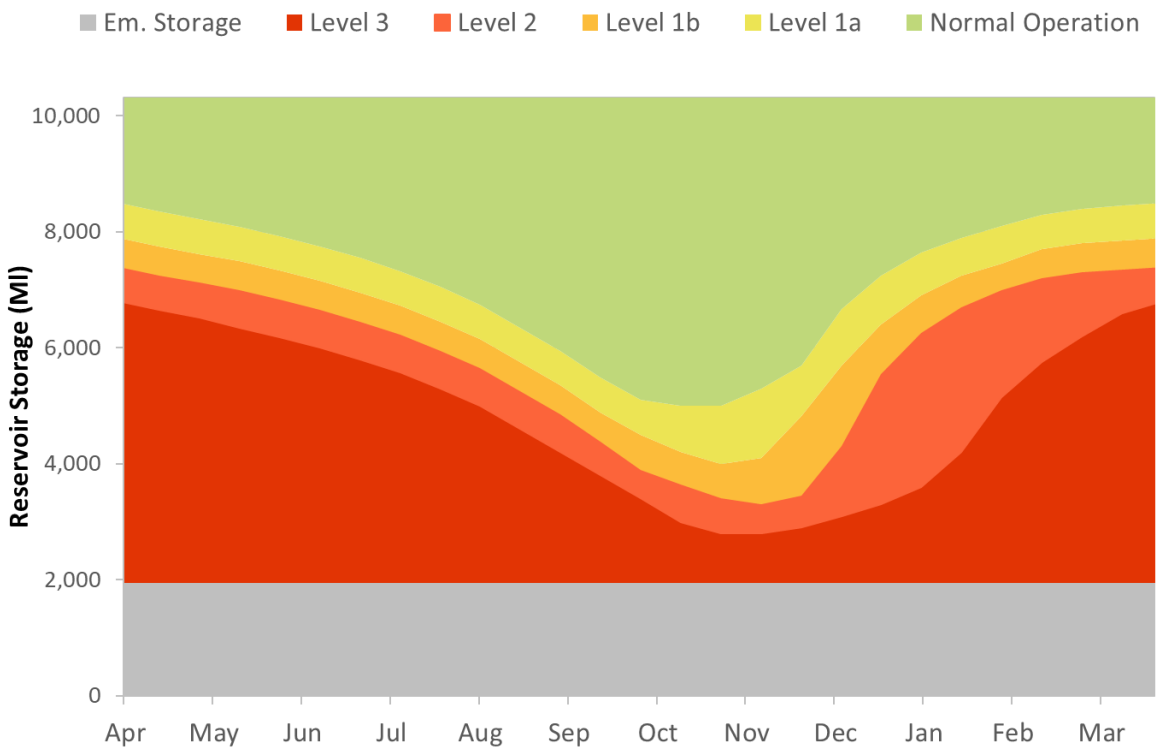
Individual Drought Management Levels may trigger actions that are trigger metric or constraint specific, or actions which may apply at the company level (e.g. water efficiency or leakage). The extent to which these are targeted at specific areas, or applied at the company level (e.g. adaptive communications or temporary use restrictions), will be determined during the drought event, with recourse to further hydrometric and model forecasting, and the wider regional resource position.

For the development of this plan we have not directly considered environmental stress triggers to trigger our overall drought actions. The environmental assessment of this drought plan is included in Section 4, in particular regarding the operation of our drought permit options, and the monitoring and mitigation measures that may be triggered prior to and during their application to monitor and mitigate the impacts of implementing the drought plan.

3.2.1 Combined Reservoir Storage Trigger

Water supply in the west of our supply system is dominated by supply from reservoirs. The trigger metric is therefore calculated as the sum of total reservoir storage, excluding Wimbleball reservoir (Figure 3-3). Wimbleball is excluded from this calculation because our abstraction from this source is licence constrained, and its large capacity obscures understanding of resource availability in the other reservoirs, potentially hindering understanding of when timely actions need to be taken. Additionally, the pump storage facility makes this a reliable source of water (see section 2.2.2).

Figure 3-3 Combined Reservoir Storage control curve and triggers



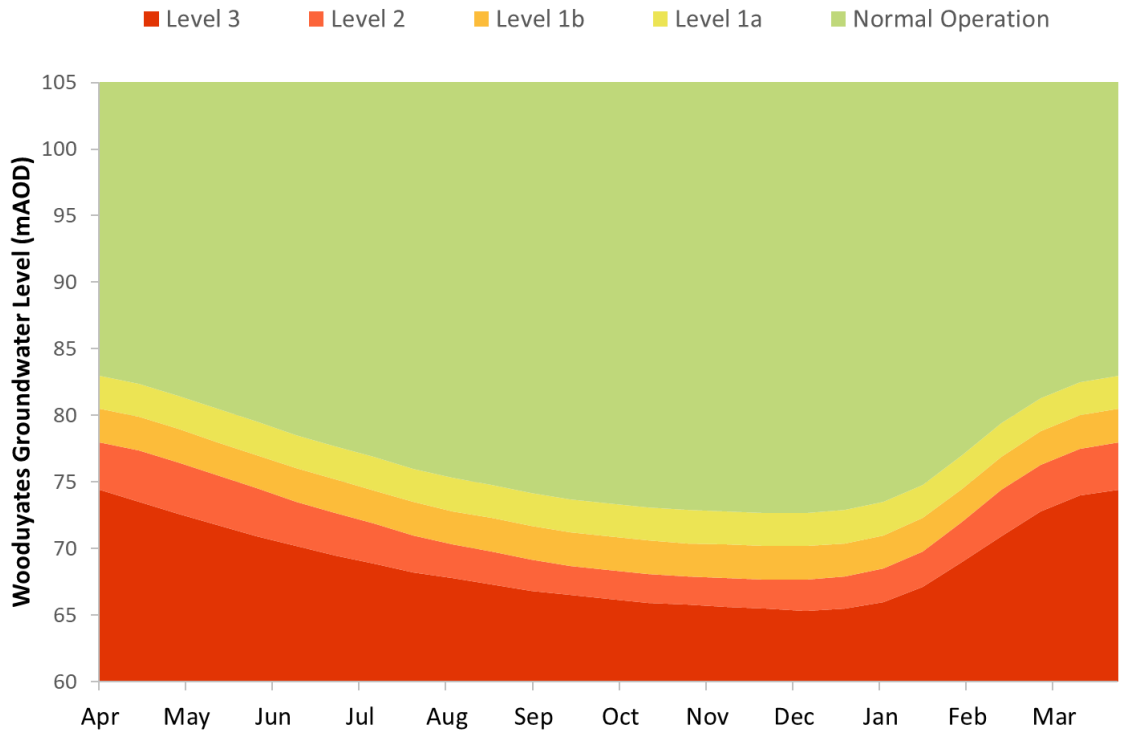
The trigger curves have been placed reflecting the typical reservoir drawdown profiles observed seasonally. In most years (April start) observed historically reservoir storage is within 5% of full following recharge over the winter period. Reservoirs are then drawn down over the summer period when demand is typically higher and inflows are lower. Minimum resource storage is typically observed during early Autumn prior to the arrival of the wettest months of the year (October-January) that lead to reservoir recharge. The relationship between upstream catchment area, geology, and reservoir capacity means reservoir storage can respond rapidly to rainfall.

The triggers have been placed to provide early warning for two main patterns of dry weather that may lead to supply difficulties. First, if our combined reservoir storage has not re-filled following a dry winter period, which may then pose a supply security risk for the following summer period to satisfy summer demand, particularly if the summer is hot (e.g. in the droughts of 1933/34 and 1975/76). This pattern is reflected in the increase in the reservoir storage volume required to trigger entering each Drought Management Level over the winter period to trigger actions if typical winter recharge does not occur. Second, a delay in autumn and winter rainfall following a dry summer (e.g. that occurred in the 1921 drought). Our Drought Management Levels are wider in the Autumn and Winter period to provide time to take actions to mitigate against continued drying if winter rainfall and recharge does not occur. During this time, reservoir response to single winter storms can be rapid. For example, in November 2016, following a dry summer and autumn, reservoir storage recovered by 3,000Ml in response to Storm Angus over a two-week period. During such times we would pay careful attention to weather and model forecasts to inform decision-making.

3.2.2 Groundwater Level Trigger

The observation borehole at Woodyates is situated in the Chalk aquifer, and this groundwater level is used as the trigger metric to reflect hydrogeological constraints at hydrogeologically constrained sources. Relationships between the groundwater level at Woodyates (and Ashton Farm), and source yield at individual boreholes are used in our system modelling to simulate the hydrogeological constraints on source output. Trigger curves for Woodyates are shown in Figure 3-4.

Figure 3-4 Trigger curves for Woodyates Groundwater Level



Groundwater level changes throughout the year in a similar pattern to reservoir levels, reflecting changing seasonal rainfall and groundwater recharge. Groundwater levels are typically at their highest following winter rainfall and groundwater recharge, and decline during the summer as groundwater baseflow into local rivers plus evapotranspiration is greater than incoming rainfall and recharge. Groundwater levels typically increase in the autumn and wintertime when significant rainfall returns. The response of groundwater level to rainfall is typically slower than for our reservoirs, reflecting the time for soil moisture deficits to be satisfied prior to recharge.

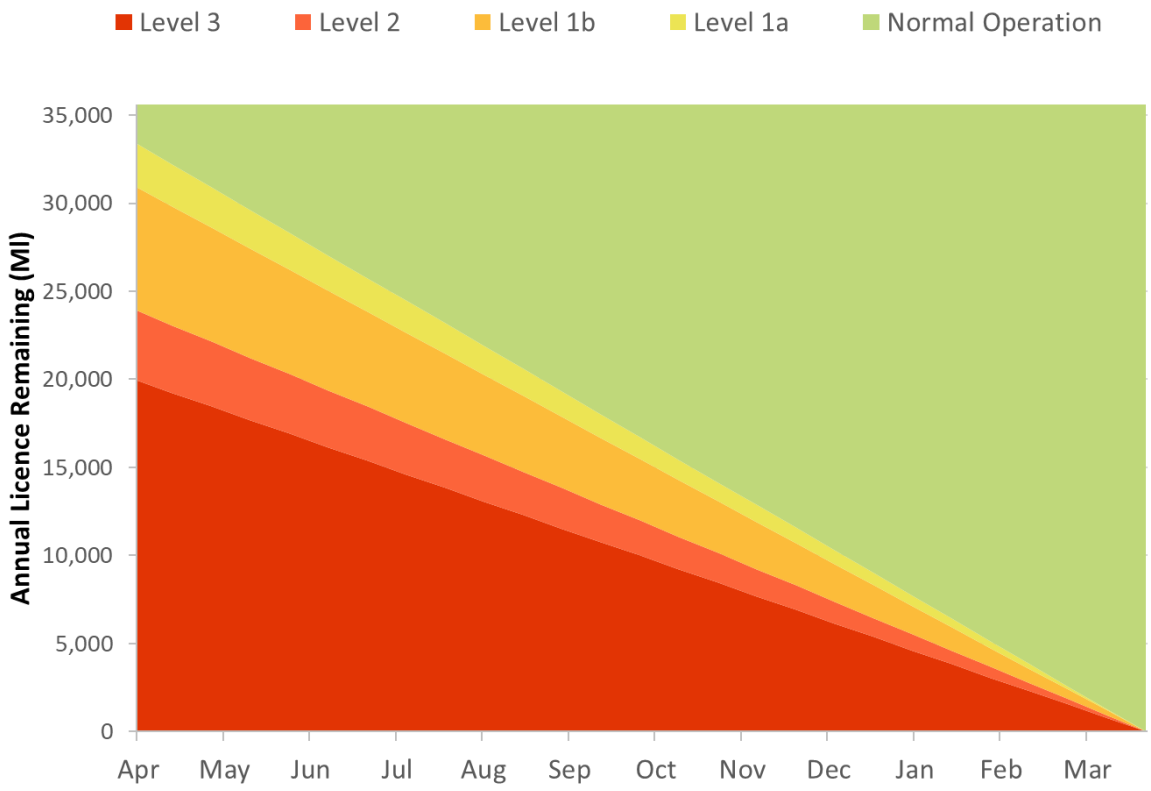
The groundwater level trigger is used to provide warning of potential constraints on the instantaneous availability of water to meet demand. Low groundwater levels will provide a yield constraint when coupled with high demand, which will occur during the summer months associated with a summer heat-wave from May to August (see Section 1.2.1). The groundwater level triggers have therefore been set to reflect both changing groundwater levels and demand patterns across the year.

Starting in the autumn and winter, we would typically expect groundwater levels to increase during the wetter parts of the year (October to January). The groundwater level required to trigger entering each Drought Management Level increases during the winter and spring to trigger drought actions should this typical groundwater recharge not occur. We would typically expect groundwater recession to start from mid to late spring. Therefore should we start at this time with low groundwater levels, the Drought Management Levels will trigger actions to mitigate against potential yield difficulties later in the summer, should lower groundwater levels coincide with a summer heat-wave in the summer months, leading to peak demands. The shape of the trigger curves continues to decline during the autumn as we do not expect supply difficulties to meet autumn and winter demands based on low groundwater levels, as these are typically 70Ml/d, or 20% lower than the potential summer peaks.

3.2.3 Annual Licence Trigger

Available annual licence remaining (April to April) requires careful management in our supply system to ensure sufficient supplies are available to reach the end of the licence year. Abstraction from licence constrained sources requires management as these sources are typically abstracted from more than in a normal year during drought to balance meeting demand with sources that are hydro-geologically constrained. Abstraction from these different source types is managed through our integrated grid. Figure 3-5 shows the combined annual licence drought triggers, based on the combined annual licence remaining from 11 key sources distributed across our grid (as shown in Figure 3-1).

Figure 3-5 Combined Annual Licence Remaining Drought Trigger



The typical season pattern of annual licence drawdown reflects the demand patterns observed across the year, with slightly greater annual licence drawdown observed from April to September during the warmer months of the year when seasonal demands are higher (Section 1.2.1). During a dry, hot summer, as experienced during drought conditions, this drawdown will be larger during the summer period, particularly as hydro-geologically constrained sources will have lower source output, and so demand that is typically met from those sources will be met from annual licence constrained sources via the integrated grid. The triggers have been positioned to capture potential early drawdown of annual licence following the higher demand portion of the year (April to September), to give time to instigate potential actions to help manage annual licence to the end of the licence year (March). Demand related drought actions triggers by other metrics – e.g. triggering water efficiency activities and customer restrictions due to low groundwater levels – will lead to a reduction in demand, and an improvement in the annual licence resource position.

3.3 Hydrometric monitoring

Given the complexity of drought, a range of metrics can provide information about the current state of our system. We collate hydrometric and climatic data from a range of sources (**Table 3-2**) in order to closely monitor our resources position all year round.

Table 3-2 Hydrometric and climatic data collected routinely

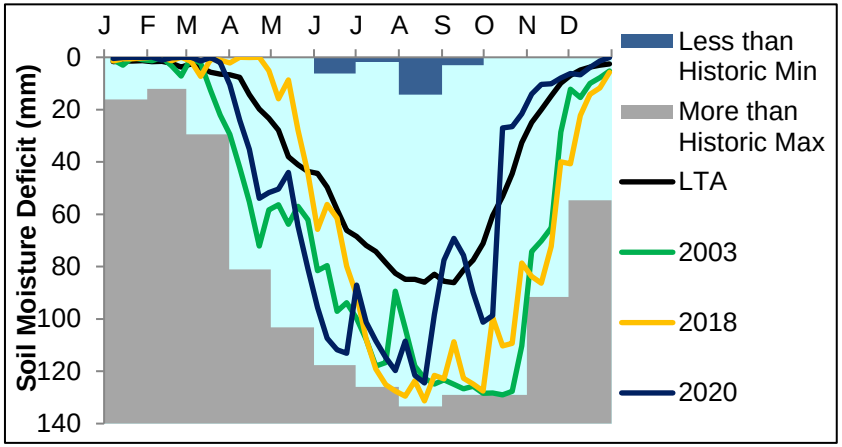
Parameter	Source	Definition and Use
Soil moisture deficit (mm)	Met Office MORECS data	Weekly average soil moisture deficit for 40 km^2 grid squares. Provides an indication of when groundwater recharge may occur.
Temperature (ºC)	Met Office MORECS data	Weekly average temperature for 40 m^2 grid squares. Used to compare against demand.
Rainfall (mm)	EA	Daily rainfall totals for a range of gauges across the region, and monthly totals across EA hydrological areas. Compared against the LTA.
River flows	EA & WW	Daily mean flow data from EA and WW-owned gauging stations. Used to determine stream support requirements and abstraction restrictions.
Groundwater levels (mAOD)	EA & WW	Daily mean groundwater levels from EA and WW-owned boreholes. Compared against the LTA.
Reservoir Levels (Ml and %)	WW	Manual weekly readings and continuous telemetry to monitor draw-down of all surface water reservoirs. Regularly compared against reservoir storage curves, used to determine any pumped storage requirements.

As well as the above retrospective data, we also receive forecast information from the Met Office on a regular basis. A five-day hazard forecast is provided three times a week for 18 areas within the Wessex region. A bespoke fortnightly outlook is also provided as part of a consultancy with the Met Office.
We communicate key aspects of this data to our Operations Team on a regular basis (Figure 3-6). During the summer, weekly hydrometric and licence restriction updates are sent to Operations and the wider business, and these updates continue on a less frequent basis all year round. A monthly hydrometric report is distributed both internally as well as externally to the EA. Our website is also updated weekly in the summer and monthly throughout the rest of the year in order to keep customers informed of our water resources position.

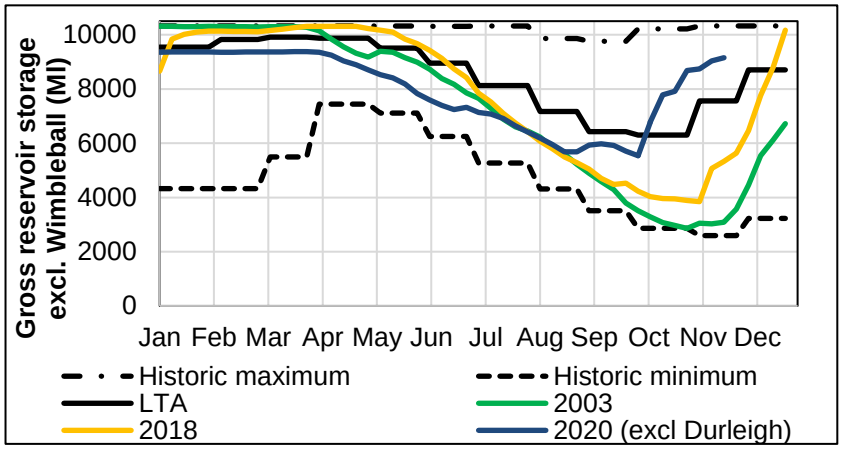
During a drought we will monitor closely the relationship between observation borehole groundwater level and individual source groundwater level and abstraction as a drought progresses, compared to our modelled relationships on which our system simulation and drought triggers are developed.

Figure 3-6 Example presentation of hydrometric data

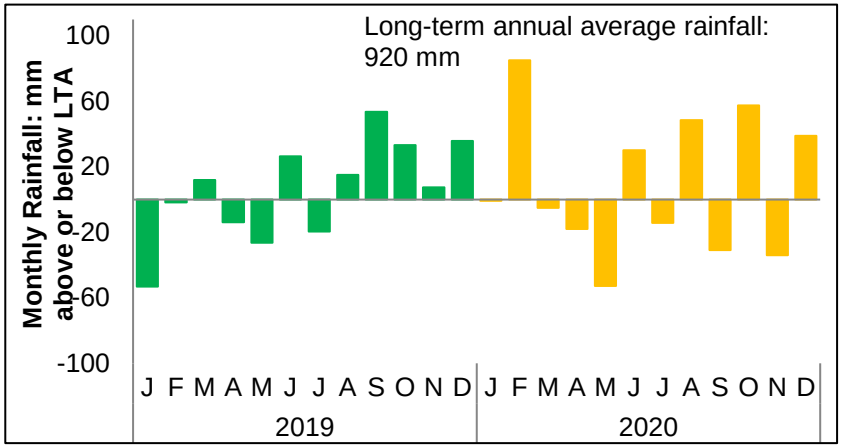
A. Soil moisture deficit in key years compared to the LTA, historic minimum and historic maximum



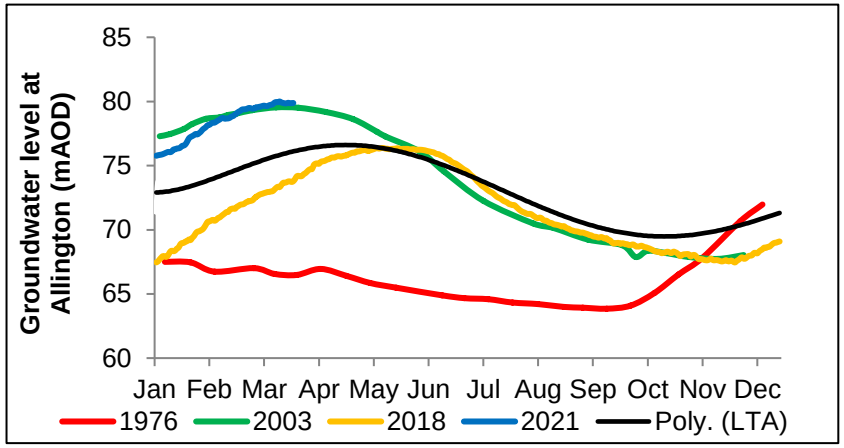
B. Gross reservoir storage for key years compared to the LTA, historic minimum and historic maximum



C. Monthly rainfall for the Wessex region in key years compared to the LTA



D. Groundwater level in Allington BH for key years compared to the LTA



3.3.1 Exceptional shortage of rain monitoring

In addition to the broader suite of hydrometric data monitored, data is also received from the Environment agency on monthly rainfall totals for each hydrological area in the Wessex region. These data are combined with historical monthly data going back to 1891 from HadUK/DRT dataset, and used to calculate the following metrics for the current rainfall situation over different monthly durations:

- Standardised Precipitation Index
- Rainfall probability and rank
- Cumulative rainfall totals

In preparation for drought permit options and the need to demonstrate exceptional shortage of rain, we will begin to analyse these data as we move through Drought Management Level 1a, to put the current rainfall situation in the longer historical context. This analysis is used to understand whether we are near to or approaching the time we have experienced an exceptional shortage of rainfall and will inform our communications with the Environment Agency leading into a drought.

3.3.2 Data sources and arrangements

Monitoring our current resource availability in each zone against the Drought Management Levels requires data on reservoir storage and abstraction data for selected sources. The following information is collated by us on a regular basis:

- reservoir draw-down readings are taken by operational staff on a weekly basis and supplied to the Water Resources Team for data management
- daily abstraction data for every source are automatically uploaded via telemetry to our WRIMS database every day – the Water Resources Team manually verify these data at least twice per week.

There are numerous data exchanges between Wessex Water and the Environment Agency that take place at various frequencies. The majority of exchanges are undertaken regardless of the current water resource position and are not specific to drought monitoring; they are however essential to the 'business as usual' management of resources and licence compliance. Tables 3-1 and 3-2 summarise these data exchanges.

Table 3-3 Data transfers from the Environment Agency to Wessex Water

Data item	Frequency	Use / reason
River flows (instantaneous spot readings for 29 sites)	Daily	To determine stream support and abstraction restriction requirements
River flows (mean daily flows for 46 sites)	Weekly	To inform resources strategy and hydrometric reporting
Groundwater levels (11 sites - manual dips and / or mean daily levels from telemetry)	Weekly	To inform resources strategy, Miser modelling and hydrometric reporting

Data item	Frequency	Use / reason
Rainfall (daily totals for 67 gauges)	Weekly	To inform resources strategy and hydrometric reporting

Table 3-4 Data transfers from Wessex Water to the Environment Agency

Data item	Frequency	Use / reason
Reservoir storage	Weekly	For EA to make their own assessment of the region's resource position.
Stream support status	Daily & Weekly	EA Hydrometry & Telemetry teams are notified of changes to stream supports when they are made so they are aware of potential changes in flows at the gauging stations. Environment Officers are notified weekly of the stream support being provided at each site.
Hydrometric report	Monthly	To provide general overview of hydrometric position.
'Drought position'	Monthly or weekly	Shared during regular EA-WW meetings to confirm resource availability and updates on relevant actions. These meetings increase in frequency during the summer.
Daily source abstraction data	Monthly	Licence compliance monitoring
Daily demand data	Monthly	For visibility of demand patterns throughout the year.

3.4 Forecasting

During a period of dry weather, the changing resource position is monitored closely against the Drought Management Levels and triggers which help guide our decision making regarding when to implement drought management actions.

In addition to monitoring the 'live' situation against drought trigger metrics, we also undertake a number of forecasts from the current resource situation to supplement the information from the drought triggers when informing the decision-making process. This is an important aspect of our drought management as a given set of static drought triggers derived offline using historic or modelled historic data can never fully reflect the current live system situation. This is because all droughts will evolve differently, and the exact distribution of planned and unplanned outage across the system cannot be known ahead of time. Regular forecasting is therefore an essential tool to capture as up-to-date information as possible to understand and manage drought risk.

Our Miser system modelling is our main forecasting tool (Section 3.4.1). Our process of in-house modelling is, however, one of continued iterative development as we look to improve our methods for both short and long-term forecasting. Since the publication of the last drought plan we have incorporated hydrological models to provide improved Miser model inflow sequences reflecting current initial hydrological conditions (Section 3.4.2), developed sub-zonal supply-demand balance models to provide higher-level system information to the business (Section 3.4.3), and undertaken collaborative research to investigate the potential use of seasonal weather forecasts to improve system operation (see case-study box).

Investigation of the benefit of seasonal hydrological forecasts for water resource management

In collaboration with Bristol University, we undertook a pilot study to investigate the use of seasonal hydrological forecasts for improving water resources management, based on two conjunctively used reservoirs in our supply system. We sought to explore how the seasonal ensemble forecast could be used to improve the trade-off between resource availability and energy cost by providing more information on future conditions to inform when and when not to run reservoir pump-storage.

The main finding of the work was that improvement in operational performance could be found when we moved away from deterministic scenarios to running ensemble simulations to better account for forecast uncertainty, whether derived from season forecasts or ensemble predictions derived from historical weather data.

We are currently developing stand-alone reservoir models driven through ensemble historical forecasts, which provide more information on uncertainty in future conditions, to help move towards more risk-based drought plan decision-making.

HESS - Assessing the value of seasonal hydrological forecasts for improving water resource management: insights from a pilot application in the UK (copernicus.org)

3.4.1 Miser system modelling

We use our Miser modelling software to forecast forward from the current position. Up-to-date information on actual reservoir storage, groundwater levels and current annual licence use are input to the model as initial conditions, and 11 to 24 month scenarios simulated. The model simulations also includes our current planned and unplanned outage situation.

We typically forecast a repeat of our WRMP19 design event, the multi-season 1975/76 drought, which is the worst drought experienced in the historic record, with low reservoir and groundwater levels during the summer. To complement this, we also simulate the 1921/22 drought, which is a dry summer followed by a dry winter.

These simulations are undertaken monthly, and model results plotted on our drought trigger levels and presented during monthly tactical planning meetings between Water Resources and Operations to help inform source abstraction management and outage planning. As we move through our Drought Management Levels, the frequency of this forecasting will increase to weekly or fortnightly.

Where deficits or issues arise, further modelling is undertaken to investigate the cause of the issue, including rescheduling future planned outages to improve headroom network optimisation. These simulations therefore inform our planned outage programme (Section 2.2.4).

3.4.2 Hydrological Modelling

To simulate a particular scenario, Miser must first be updated with the appropriate corresponding inflow sequence. This ensures any recent weather has been account for, in our modelled inflows, and that our initial model conditions for forecasting a repeat of key

historic droughts reflect the impacts of recent rainfall on soil moisture and groundwater recharge.

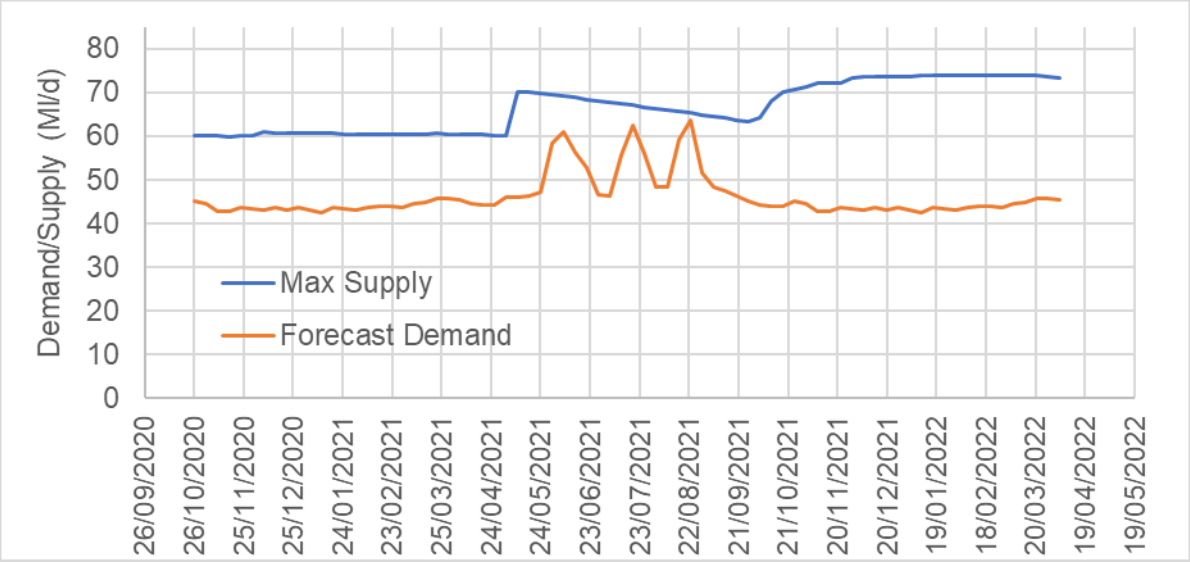
To achieve this, we use a series of hydrological models to model the key catchments round the Wessex region that provide inflow sequences to the Miser model. A burn-in period of the most recent five years of weather is used to ensure each catchment is as close to the initial conditions of the modelling start date. Once this is known, the timeseries of rainfall and potential evapotranspiration from the given drought scenario is modelled to provide inflows to the Miser model for the given scenario to be modelled.

3.4.3 Supply-demand balance modelling

In addition to using the Miser model to inform our monthly supply-strategy meetings we have recently developed supply-demand balances that help to better synthesise distributed system and model information to develop a shared understanding across the business of headroom around the network. These balances take forecast information on groundwater and river levels alongside licence information, outage and works capacity data (as also fed into Miser) to predict maximum yield available at each source over time. These supply-demand balances are calculated at six sub-supply area zones to provide a summary view of our supply position across the company. These are compared to our planning demand to so we can easily visualise and communicate available headroom across the system, identify where surpluses and issues are to inform our supply system optimisation.

An example supply-demand balance is shown in Figure 3-7 for the South WRSZ under a 1975/76 drought scenario. The example shows how our tactical planning demand profile considers three different potential demand peaks to reflect the uncertainty during a given hot, dry summer in the timing of when we might see a heat-wave related demand peak. This example includes a demand peak in May, reflecting lessons learned from Spring 2020 (Section 1.4.2).

Figure 3-7 Example SDB chart for the South WRSZ under a 1975/76 scenario



4 Environmental impacts

Our region contains a wide range of important landscapes and habitats and we are committed to playing our part in their protection at all times. Appendix F.2 contains maps showing our designated and non-designated sites of conservation importance, including Special Protection Areas, Special Areas of Conservation and over 450 Sites of Special Scientific Interest.

The main way of ensuring our water supply activities do not have an unacceptable impact on the environment is through abstraction licensing. Our licences specify the maximum amount of water that can be taken each day and each year and in some cases link abstraction rates to flow thresholds in local watercourses.

At some sources, concerns have been raised that the existing licences do not adequately protect the environment, and in response we have worked in partnership with the Environment Agency and Natural England to investigate issues and identify mitigation measures where appropriate. Several investigations have resulted in unacceptable impacts and changes have been required to licence conditions or other mitigation measured made. We are also currently undertaking several investigations at a number of sources as part of the Water Industry National Environment Programme (WINEP). Further details of past and current investigations can be found in our Water Resources Management Plan[24].

In accordance with the drought planning guidelines, we have undertaken environmental assessments of the effects of our planned drought management activities upon the environment, including the effects of potential drought permits, and assess the environmental sensitivity of the affected areas. Further, we have also undertaken the required Habitats Regulations Assessment (HRA), Strategic Environmental Assessment (SEA) and Water Framework Directive (WFD) assessments. An overview of these assessments is provided here, with full assessments in Appendix F. During drought plan pre-consultation, we consulted with the Environment Agency, Defra, Natural England, the Canal and Rivers Trust, Historic England, and local catchment partnerships on the Environmental Assessment Methodology, SEA and HRA scoping.

The outcome of these assessments has informed the order of implementation of our drought management actions, from least (Level 1) to most environmentally damaging (Level 2). Our drought event testing has shown that many of the more environmentally damaging drought permit options may not be required except under extreme circumstances (Appendix E).

4.1 Environmental Assessments (EARs)

Each of our supply side drought management actions outlined in Section 2.2 were reviewed to identify their potential environmental impacts, and in particular which actions are over and above ‘normal’ supply activities, as per our Water Resources Management Plan, and therefore which of our activities form part of the drought plan. An Environmental Assessment Report (EAR) has been prepared for each of the drought permit options in Section 2.2.8, in line with the EA’s supplementary guidance for environmental assessment

[24] The next 25 years in water, the Wessex Water Resource Plan

for water company drought planning. Information from these assessments has subsequently fed into the HRA, SEA and WFD assessments. The outputs of individual EARS are designed to be “application ready”, setting out the impacts that apply to each option individually, as well as cumulatively by catchment, so that the impacts associated with any combination of options can be clearly understood.

A summary of each EAR is shown in Table 4-1. For Environmental Assessment the hydrological assessment was undertaken against the 1921, 1975/76 and an extreme 1975/76 drought (1 in 500), as used in drought trigger testing. The assessment was also applied to the options over the maximum potential range of implementation during a drought to ensure adequacy of the assessments for supporting drought permit application readiness. The summary hydrological impacts, both in the table below and reports apply to the maximum impact of each option on flows e.g. at the peak of the hydrological drought; however, the options would have lower impact if implemented earlier during a drought.

For security reasons Table 4-1 is redacted and not available in the version of this document published on our website.

Table 4-1: Summary of environmental effects of drought permit options, with option references for cross-reference to relevant Environmental Assessments (EAR, SEA, WFD, HRA)

4.2 Habitats Regulations Assessment (HRA)

A HRA determines whether there will be any “likely significant effects” on any European site as a result of a plan’s implementation, and if so, whether there will be any “adverse effects on site integrity”. The HRA assessment has included a screening of all proposed drought plan options, and appropriate assessments for those European sites that may be significantly affected by one or more options (alone or in combination), or where the effects are uncertain.

Of the drought plan supply options, those options listed in **Error! Reference source not found.** were taken forward to the appropriate assessment stage. The appropriate assessments concluded that there would be no adverse effects on the integrity of any European sites as a result of options implementation.

For security reasons Table 4-2 is redacted and not available in the version of this document published on our website.

With regard to the Somerset Levels and Moors Ramsar site, there are potentially notable residual uncertainties relating to the effects of the Drought Plan options on the invertebrate assemblage in combination with other activities.

These uncertainties are due to (a) the declining baseline water quality within the ditches associated with nutrient enrichment (hence unfavourable declining condition assessment) and the potential effects of this on the resilience of the invertebrate assemblage to additional stress; (b) the limited information available on the precise management of water levels within the Levels under various scenarios (particularly in relation to competing water requirements) and the flows / turnover through the system (which is beyond the control of Wessex Water)

and (c) the consequent difficulties of creating a robust model that can be used to estimate the additional effects of the Drought Plan options.

Whilst the effect of the drought options on water quality within the ditches is likely to be weak, and the invertebrate assemblage is adapted to the fluctuations in environmental condition over various spatiotemporal scales (since it is typically associated with often transient floodplain waterbodies), these uncertainties ensure that it is difficult, at this point, to reach a 'no adverse effects' conclusion through either quantitative analysis of the anticipated environmental changes (as there are variables that cannot be quantified), or by identifying option-level mitigation that can be relied on to obviate these uncertainties.

The options affecting the Ramsar site are not triggered under the range of droughts and extreme droughts used to test the plan. However, Wessex Water has committed to including the options in the final plan only if a satisfactory management arrangement can be agreed between Wessex Water, NE, the EA, and the Internal Drainage Board (IDB), to ensure the integrity of the designated sites under all scenarios (including drought scenarios; see section 2.2.10).

4.3 Water Framework Directive Assessment (WFD)

We have undertaken WFD assessments of all our supply-side actions, drawing on the baseline data and results of the hydrology, water quality and ecology assessments presented in the Environmental Assessment Reports (EARs). A summary of the WFD assessment is shown in **Error! Reference source not found.**. Of the 13 drought options assessed, seven would be compliant and six would be potentially non-compliant. For the Hele Bridge option, which has been assessed at the maximum potential abstraction, sub-options may be WFD compliant. Modifications to the planned operation of drought options (e.g. conjunctive use impact), as set out in the EARs, may reduce the impacts and the number of non-compliant options.

For security reasons Table 4-3 is redacted and not available in the version of this document published on our website.

A review of the programme measures included in the South West and Severn RBMPs shows that none of the options would compromise the implementation of the measures, and the results of the protected area assessment shows that the options would not have a negative impact on WFD protected areas.

In addition to these main assessments, high level screening WFD assessment has also been undertaken for the extreme drought options, which indicates for option ED01: Tucking Mill and Washpool, the options is potentially non-compliant with WFD on the local water bodies, but unlikely to see any significant impacts on the River Avon. For ED02 Nutscale reservoir, although potential release of water from the reservoir may provide additional benefit to the water course, resulting in a minor level of impact, impact on Nutscale reservoir is not clear, and so a precautionary medium level of impact has been assigned.

In certain circumstances a temporary deterioration in status of a water body is allowed. Regulation 18 of the WFD applies where there is a temporary deterioration in the status of a

water body resulting from “natural cause” or “force majeure” which is “exceptional” or “could not reasonable have been foreseen”. This includes prolonged or acute droughts. In the drought testing, the drought options with an assessed medium level of impact would only be required in extreme drought.

4.4 Strategic Environmental Assessment (SEA)

An SEA has been undertaken for the Drought Plan, which is required for plans and programmes that are likely to have a significant effect on the environment, including cumulative effects with other plans and programmes. The purpose of the SEA is to:

- Identify potentially significant environmental effects of the drought plan
- Help identify appropriate measures to avoid, reduce or mitigate adverse effects, and enhance benefits associated with implementation.
- Give statutory SEA bodies and stakeholders the ability to see and comment on the effects that the Drought Plan may have on them.

The SEA consists of five key stages from scoping, developing and refining alternatives to preparing environmental reports and consultation on the draft plan, culminating in a post plan adoption (SEA) statement and a monitoring plan for environmental effects. The scoping report was consulted on in summer 2020, and the assessment approach amended, as appropriate, to reflect consultation comments received. The effects of the drought management measures contained in the Drought Plan were assessed using the revised assessment framework.

For security reasons the remainder of Section 4.4 is redacted and not available in the version of this document published on our website.

4.5 Environmental monitoring plan

Based on the findings of the Environmental Assessment Reports, a Environmental Monitoring Plan (EMP) has been produced, in line with guidance in the Environment Agency’s Water Company drought plan guidance, and supplementary guidance for environmental assessment for water company drought planning.

The draft version of the EMP outlined an appropriate scope of monitoring based on the findings of the EARs. Further consultation with regulators and stakeholders took place during draft drought plan consultation to refine monitoring requirements and details for the Draft Final Plan.

The Environmental Monitoring Plan will be reviewed annually with The Environment Agency to assess baseline conditions and further actions required.

The guidance recommends applying a Before-After-Control-Impact (BACI) approach to environmental monitoring using pairs control and impact sites monitored before, during and after drought option implementation. The type and frequency of monitoring proposed for each drought option will vary depending on the anticipated impacts, with more intense monitoring proposed at sites where there is greater potential for environmental impacts.

Impact of abstraction downstream on the River Tone

During discussion with the EA and CRT on 14th September 2017, it was agreed that we would investigate the potential impacts of reduced water volume in the River Tone on dilution of discharge from Taunton Ham sewage treatment works. The water quality of the River Tone upstream of Taunton Ham sewage treatment works (STW) during extreme drought conditions can be estimated using the SAGIS-Simcat model.

The SAGIS-Simcat model for the Tone catchment is being developed and updated as part of a wider WINEP investigation. Canal flow data and water quality sampling collected May 2019 to April 2020 as well as other flow and quality data collected by Wessex Water and the Environment Agency between May 2015 and April 2020 have been used to develop a SAGIS-Simcat model. The model had been updated include an abstraction from the River Tone to the Bridgwater and Taunton Canal.

Flow and water quality calibration is being understand by Atkins in March 2021 representative of the period May 2015 and April 2020 period. Using flow statistics for an extreme drought event, such as 1975/76, the model can then be calibrated adjusted to represent the hydrological conditions of such an event. Features within the SAGIS-Simcat model for the River Tone can also be updated to represent drought conditions, by changing the flows and effluent concentrations of STWs that discharge into the river.

Once a representation of the River Tone, during an extreme drought has been created, it will then be possible to simulate variations in the Firepool Lock abstraction from the Tone, in conjunction with varying the effluent quality at Taunton Ham STW. This will enable decision makers to devise strategies to mitigate poor water quality as a result of increased abstraction at Firepool Lock. It is envisioned that temporary improvements in effluent quality could be utilised to mitigate the effects of lower dilution downstream of Taunton Ham STW as a result of increased abstraction at Firepool Lock. The SAGIS-Simcat model can be used to propose mitigation discharge permits and explore the implication of increased abstraction at Firepool Lock on downstream water quality. Drought modelling can commence as soon the SAGIS-Simcat models are calibrated, this is anticipated to be at the end of March 2021 with modelling completed by the end of April 2021. The outcomes of this work will be incorporated into updated assessments as we revise the Tone and Yeo drought permit options and supporting environmental assessments, once a decision has been made about the status of these drought permit options in November 2022 (See Section 2.2.10)

5 Management and communications strategy

5.1 Management structure and responsibilities

Wessex Water's water resources and supply strategy is actively controlled as a 'business as usual' activity by teams and staff with specific responsibilities across the business. Figure 5-1 shows Wessex Water's supply and drought management organisational structure. Table 5-1and Table 5-2 show, respectively, the main group roles and responsibilities and main communication channels between groups.

The Water Resources and Supply Strategy Team have responsibility for monitoring hydrometric variables, licence compliance and the overall water resource position, and as described in Section 3, forecasting potential scenarios. This information is then communicated through three main channels in the business:

- With the supply optimisation team through monthly supply strategy meetings, weekly lookahead meetings and irregular communications. It is through this communication channel that supply-side drought actions will be discussed (Section 2.2).
- With the Customer participation and comms working group through monthly team meetings and regular communications. It is through this communication channel that demand-side drought actions will be discussed (Section 2.1)
- Upwards communication of water supply risk to the business through the Risk Management Group and the Board, primarily through a monthly board report.

Supply Strategy meetings are held on a monthly basis (regardless of the 'drought position') to discuss and agree target source outputs for the coming month and other strategic issues such as source outage planning and maintenance scheduling. These meetings are integral to ensuring the appropriate use of resources, monitoring actions and communicating issues to all relevant personnel. They occur in addition to weekly lookahead meetings to ensure visibility of emerging issues across teams, and regular email and verbal updates between teams.

As a period of dry weather intensifies and we enter a drought, the following management actions may be taken:

- Water resource position update papers, prepared by the Water Resources and Supply Strategy Team, would be submitted to the monthly Risk Management Group meetings, which are attended by senior managers from all departments of the Wessex Water Services business. A Tactical Plan is in place that is reviewed to reflect the conditions in autumn and winter and would form the basis of any actions that would be taken. This management response would likely be triggered when entering Level 1b or if the forecast resource position trajectory were to enter 1b within the next 3 months.
- The formation of a Drought Management Team to oversee our response to the dry weather at a senior level. This group would form as part of the company's existing Emergency Planning Tactical Group (EPTG), chaired by the Director of Risk & Investment, whose role is oversee management and responsibility for upwards communication of the emerging risks and issues across the business to the Executive Leadership team (ELT). Management roles and responsibilities may change during

drought and vary slightly for certain staff from their regular day-to day responsibilities. Table 5-3 aims to clarify responsibilities. It is likely that this team would be formed as we entered Level 1b and they would meet fortnightly.

- Externally the formation of the WCWRG – Drought Working Group alongside Bristol Water and South West Water. We would liaise with the group on our relative resource positions as we move through Level 1a and seek to form the group on entering Level 1b.

Figure 5-1 Wessex Water Drought Management Structure. Dashed lines indicate temporary management structure during worsening drought

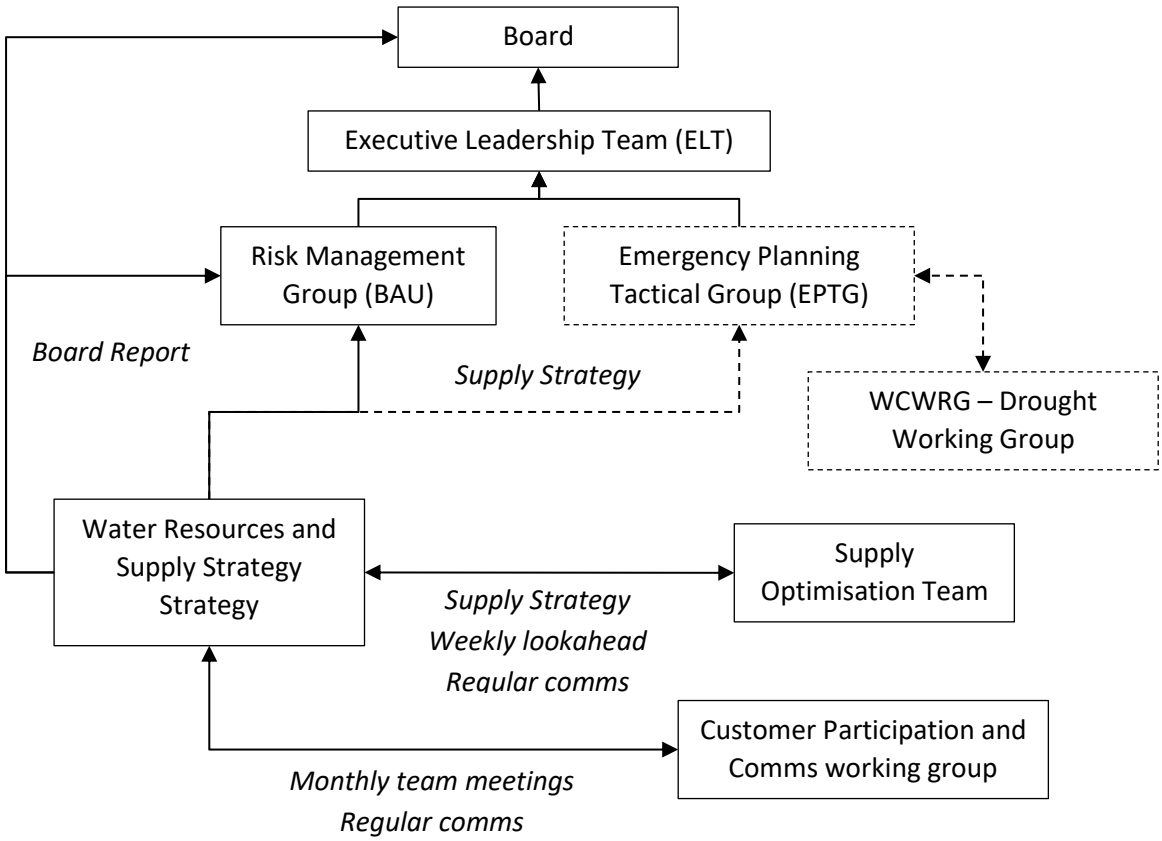


Table 5-1 Group Roles and Responsibilities

Group	Roles and Responsibilities
Water Resources and Supply Strategy	• Monitoring hydrometric variables, current water resources position and licence compliance. • Forecasting the potential water resources situation, and forecasting of hydrometric variables • Propose the source usage strategy to mitigate drought risk and annual licence management at monthly Supply strategy (tactical planning) meetings • Escalating strategy issues and decision-making.
Supply optimisation team	• Implementing the agreed strategy for source and network operation taking account of recommendations from the Water Resources & Supply Strategy modelling and planned outages.

Group	Roles and Responsibilities
	• Highlighting key issues that may lead to source output changes and output/network issues to include in model forecasting (these are then logged by Water Resources and incorporated into assessments).
Customer Participation and Comms Working Group	• Joint team monthly meeting to review business as usual delivery of customer engagement programmes as per planned strategy. • Water resource situation and Drought Management Level information provided by Water Resources and Supply Strategy team for review by this group to allow early sight of impending drought conditions and enable programme amendments as appropriate. • Responsibility for overseeing the delivery of demand side drought management actions if triggered.
Emergency Planning and Tactical Group	• Permanent group supporting the Executive Leadership Team (ELT) in decision-making. • Group membership is flexible depending on emerging risks and will change reflecting the developing drought and dry weather situation. • The Group will take over responsibility for upwards communication of the emerging situation to more senior management (ELT). • As dry weather and drought develop, the group membership will change, depending on level of drought severity, and consist of: ○ Head of Water Resources and Supply Strategy ○ Water Resources Strategy Manager ○ Director of Assets and Compliance ○ Director of Supply Networks and Leakage ○ Director of Water Production ○ Supply Optimisation Manager ○ Head of Communications ○ Director of Customer Policy and Engagement ○ Head of Customer Insight and Participation
Risk Management Group	○ Business as usual holistic view of company business risk and risk investment decisions ○ Informed of emerging drought risk by Water Resources and Supply Strategy
Executive Leadership Team (ELT)	○ Decision making on more extreme drought management actions – hosepipe bans, drought permit options and rota cuts, as advised by the Emergency Planning and Tactical Group. Meeting frequency will change to reflect emerging drought situation.

Table 5-2 Main Communication Channels between groups

Communication Channel	Details/Purpose	Frequency
Supply Strategy (Tactical planning)	Supply strategy (tactical planning) presented at monthly meetings and agreed with the supply optimisation team on target source outputs for the coming month and other strategic issues such as source outage planning and maintenance scheduling to incorporate into model forecasting. Strategy presented to drought management group during drought conditions.	Normal operation/Level 1a and 1b: Monthly Level 2 and Level 3: Weekly

Communication Channel	Details/Purpose	Frequency
Weekly lookahead	Supply Strategy attend the weekly lookahead meeting to discuss ongoing issues, source outage planning and scheduling.	Weekly
Regular comms	Regular communications on specific emerging issues between teams	As required
Board report	Summary of current water resources situation, and emerging risks	Monthly

Table 5-3 Key responsibilities of staff during a drought

Drought management role	Performed by	Key responsibilities	Supported by
Drought Manager	Head of Water Resources & supply Strategy	To oversee company's overall response to and management of drought. Preparation of internal briefing notes for senior management.	Water Resources Planning Manager; Water Resources Strategy Manager
Drought Co-ordinator – Technical Lead	Water Resources Strategy Manager	Implementation of Drought Plan. Resource position monitoring and forecasting. Technical communication with Environment Agency.	Water Resources Modeller Water Resources Analyst Water Resources Planning Manager
Drought Co-ordinator – Operational Lead	Director of Water Production; Director of Supply Networks & Leakage	To agree and implement operational drought actions.	Supply Optimisation Manager Operations Supply Planner Strategy & Services Manager Distribution System Manager Divisional Supply Managers (North, South & West) Regional Quality and Science Manager
Public Relations Lead	Head of Communications	Communication with media, customers and staff	PR and Campaigns Manager Social Media Manager Media & PR Officer Internal Communications Officer
Customer Services Representative	Director of Customer Policy and Engagement	Develop customer engagement strategies and policy	Head of Customer Insight and Participation Customer Insight and Engagement Manager Customer Participation Strategy Manager

Drought management role	Performed by	Key responsibilities	Supported by
			Water Efficiency Analyst Head of Customer Policy

5.2 Communication and engagement plan

This section sets out how we will communicate with customers and stakeholders during a drought. It begins by describing the need for flexibility and agility in our approach and then sets out the key communication channels we will use to engage with customers, followed by information relating to the specific engagement plans for neighbouring water companies, private water supplies and the Environment Agency. The final section summarises the overall communication plan for each stakeholder group by drought level.

5.2.1 Agile approach to communications and engagement

Engaging with customers and stakeholders is an important part of our day-to-day demand management programme even outside of periods of dry weather. As described in section 2.1.1 we promote water efficiency and metering all year round and regularly adapt our leading messages depending on various external influences. For example, during periods of wet weather we can still encourage water efficient behaviours by focussing on shower use and the links between hot water and energy use. Indeed, our long-term vision is to encourage all citizens to value and conserve water at all times and not just during periods of dry weather.

Section 2.1.1 and 2.3 outlined how our water efficiency engagement activities will be ramped up as a drought develops and we cross level triggers. However, it is important to recognise that our communications strategy needs to remain flexible and agile, being guided not only by our resource position but also by certain other factors; namely near future temperature forecasts, seasonality, the wider drought position of neighbouring companies and our local environment and the responsiveness of customers. We will take these additional factors into consideration when determining the appropriate core messages to communicate and the channels to use.

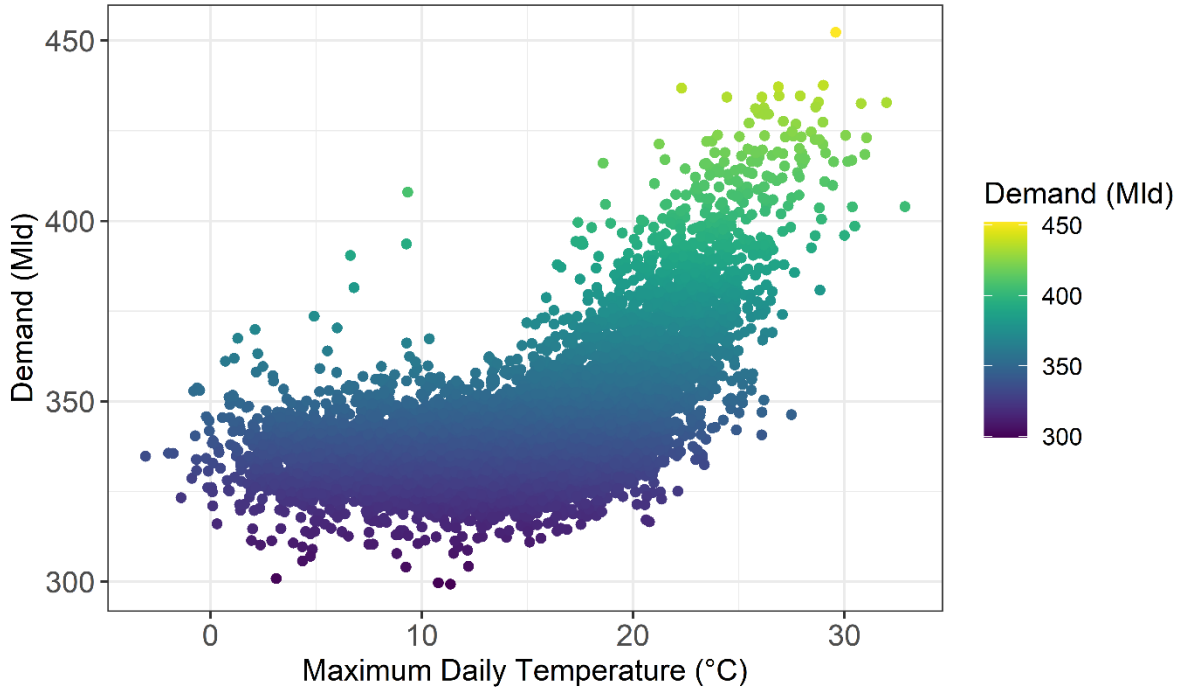
Temperature

If we begin to experience, or a period of high temperatures are forecast, it may be appropriate to take the opportunity to strengthen our water efficiency messaging beyond that based on our resource position alone. Figure 5 2 shows that up to approximately 19°C demand is largely un-influenced by increases in temperature. Once the maximum daily temperature exceeds around 20°C, we begin to see noticeable increases in demand and, in heatwave type conditions of the high 20s or above, demand can be some 30% higher than on cool days. Given that much of this demand is linked to changing water use behaviours on such days it is timely to enhance our water efficiency engagement at these times even if the overall water resource position good.

Conversely our campaign strategies are typically flexible enough that we can delay the timing of planned engagements should a short period of cooler wet weather occur in an

otherwise very dry period to ensure the messages land with appropriate timing. This is perhaps particularly the case with our social media channels which can be used in a very agile way when required.

Figure 5-2: Relationship between maximum daily air temperature and average daily demand



Seasonality

Seasonality can also influence demand and therefore our communication approach during dry weather. Customer water use behaviour often changes during bank holiday weekends, school holidays and as a result of local significant events and/or tourism influences. These are often timely moments to be agile with our communications approaches and ramp up our messaging to try to moderate the expected demand increase, and/or simply engage with people at a time they might be contemplating their water use behaviours, to improve the effectiveness of messaging.

Wider drought situation

Our communications strategy needs to sit in the context of the wider drought situation in our region and beyond to ensure the clarity of message, particularly for customers and stakeholders near the boundary of our region. Section 5.2.3 sets out how we will liaise with neighbouring water companies and Section 5.2.5 sets out how we will liaise with the Environment Agency on these issues. It may be particularly important for water companies and the Environment Agency to be in liaison should the dry weather manifest with differing severity in terms of impact on the local environment and impact on water resource availability. Our engagement plan will also be mindful of and responsive to media and political interest in the dry weather.

Customer response to messaging

It is a business as usual approach for us to evaluate customer uptake and feedback in relation to our communications and promotions. The uptake of free water saving devices to

customers through our GetWaterFit online calculator tool described in section 2.1.1 can be easily monitored through the standard weekly reporting provided to us by our partner SaveWaterSaveMoney. Promotional approaches can be adjusted to target the planned uptake if necessary. The uptake of behavioural advice to customers is of course harder to measure but we can and do monitor engagement with social media posts (e.g. reach, likes, shares, click-throughs and comments) to assess how well messages are landing. Again, it is a straightforward and business as usual approach for us to make agile adjustments as campaigns progress to target maximum effectiveness. Monitoring customer uptake and engagement with our communications also helps us to be agile in our communication channels should we identify the messages are not reaching the right target audience and/or having the expected impact.

5.2.2 Stakeholder groups and communication channels

Our communications plan is set out to deliver clear, consistent and timely communications to stakeholders during a period of dry weather.

To help guide our communications strategy in periods of low rainfall and drought, we have considered the outputs of three pieces of research:

- Consumer Council for Water's (CCW) 'Understanding drought and resilience' report.
- Waterwise's Water Efficiency and Drought Communications report produced following recent drought conditions in 2012 (WW).
- Our own customer survey (CS) "Saving water and drought", conducted to understand customers' water use during, and attitudes towards drought (see also Appendix K).

We found consistencies across this research in terms of customer attitudes and key issues for communication during periods of low rainfall and drought. A key theme that has emerged across the reports is a need to improve general public understanding about periods of low rainfall and drought. This is required in order to address the perceptions of different customers and customer types, and develop a good background understanding in advance of future periods of dry weather, which will help when communicating about both the water resources situation, and water efficiency messages. Some key issues identified and how we can address these through communication, are shown in Table 5-3.

Table 5-3 Communication issues

Issues identified	How to address issue
Language of "drought" – drought is associated with arid climates, and that this term is over-used to describe conditions in the UK - a "wet" country with lots of water (CCW; CS)	Use other language such as "water shortage" and "low water levels" more appropriate (CCW). Improve background understanding of public water supply and hydrology (WW).
Hosepipe bans "framing" drought – customers only see a drought as occurring when there are restrictions; customers who do not have hosepipes fail to see how drought restrictions might impact on them (CCW); customers view hosepipe bans with suspicion, given buckets can still be used.	Communicate wider issues of periods of low rainfall, and have clear messaging on water efficiency earlier on during period of low rainfall so that customers know there are other activities they can do to be more water efficient (CS; WW).

When to communicate – customers feel that the only communication is when companies want customers to do something (hosepipe ban; CCW).	Communicate early during periods of low rainfall so customers are aware of the situation (WW).
Customer suspicion – customers feel like onus is on them during drought with hosepipe bans (CCW); customers not sure what the company is doing too to help prevent drought; customers perceive reason for drought as water company leakage (WW)	Ongoing awareness of actions to improve resilience of supply system, drought planning, and how this links to levels of service; clear messaging during drought of water company activities.
Business use during drought – businesses often feel customers do not understand how their restrictions differ to customers (CCW).	Educate customers on different levels of restrictions, and inform businesses so they can inform their customers.

Table 5-4: Key stakeholder groups and their communication needs during a drought

Stakeholder group		Particular communication needs
Customers	Household	• Clear, consistent information. • Notification of whether the drought will affect the water services they receive. • Understanding of the extra work we are doing during a drought. • How can they help as per the water efficiency campaigns described in section 2.1.1. • Consideration of customers in vulnerable circumstances and our priority services register. • Impact of drought on the environment in their area – dry weather often generates queries about current abstraction rates and low flows.
	Retailer	• Clear, consistent information – see Appendix K. • Notification of whether the drought will affect wholesale water services. • When dry weather conditions are escalating. • If we are considering restricting water services.
	Business water users (via Retailer)	• Clear, consistent information. • Notification of whether the drought will affect the water services they receive. • Clear understanding of potential drought restrictions. • How can they help – water efficiency advice. • Consideration of essential services.
Regulators and external organisations	Environment Agency	• Regular resource position and forecast updates. • Discussion and exchange on (potential) actions being implemented, environmental impacts, and broader drought context. • EA drought plan update. • Regular and early consultation on communications activity by both the EA and WW. • Regular telecalls as drought worsens.

Stakeholder group		Particular communication needs
		• Engagement on drought permit application pre-application, and during application and implementation, particularly regarding environmental monitoring and impact. • Discussion over the end of a drought. Liaison with natural England and other members of the Defra family.
	Ofwat	• Regular resource position updates. • Actions being implemented.
	CCW	• Regular resource position updates. • Understanding of the extra work we are doing during a drought • How actions being implemented may affect customers.
	Water UK and national drought group	• Regular resource position updates – for circulation and briefing to Defra Ministers. • Actions being implemented.
	Other water companies (and West Country Water Resources Group)	• Regular resource position updates and implications of the resource position to inter-company transfers and shared resources. • Liaison and consideration of alignment of drought demand-side drought actions and communications.
	Media	• Clear, consistent and timely information. • Impact of drought on the environment – dry weather often generates queries about current abstraction rates and low flows.
	Environmental stakeholders – Natural England, RSPB, WWF etc.	• Clear, consistent information. • Impact of drought on the environment – dry weather often generates queries about current abstraction rates and low flows.
	Local Resilience Forums	• Briefing of resource position and potential for emergency water distribution. • Impact of water availability for firefighting.
	Canal and River Trust	• Notification of requirement to control water intake to the Bridgwater and Taunton Canal, in particular in relation to the Durleigh pump storage drought permit option.
Wessex Water	Internal staff	• Clear briefing notes. • Particular attention to briefing staff that are customer facing.
	Liaison panels – Environment, Customer and Communities, Services and Planning, Business Customers and Sustainability	• Regular resource position updates. • How actions being implemented may affect customers, the environment and other stakeholders.

Under all resource positions we make use of a wide range of communication channels to keep stakeholders aware of our activities and services.

Our social media channels can be used to engage with customers on a sub-daily basis. We similarly manage the content of our website to be up to date and relevant to changing circumstances. We also use our twice-yearly customer magazine and radio advertising to engage with customers on strategic campaigns.

As a drought escalates and we reach each subsequent trigger it is likely that we would use external media channels more heavily – for example it would be likely in Drought Management Level 1a we would proactively seek to provide information to customers and other stakeholders via local radio interviews. Should our resource position enter Drought Management Level 2, leading into and during the summer period, it is likely that we would work with local radio and television.

In Drought Management Level 2 and 3 we may also seek to proactively engage with customers and local interest groups on a one-to-one basis i.e. at Parish Council meetings to answer and questions they have.

We can also bring our water resource situation web page to the fore on our website (www.wessexwater.co.uk) and via social media. Information on reservoir storage, groundwater levels, river flows stream support and recent rainfall is presented alongside calls to action to use water wisely.

To enhance the clarity of our communications with a number of stakeholder groups we will update and distribute a ‘resource situation statement’ during periods of dry weather. The statement will provide information on impounding reservoir levels, groundwater levels, river flows, rainfall, stream support and any pertinent issues such as concerns raised about particular watercourses by individuals or specialist interest groups. An example of a ‘resource situation statement’ is provided in H.

It is difficult to quantitatively measure the effectiveness of our communications during a drought as it is difficult to separate the impact of our communications to customers and other stakeholders from those of others (e.g. national and local media) that may or may not be acting to promote the same messages as us. However, it is important for us to gauge qualitatively the success of our communications. To do this we propose the following:

- Monitoring of the level of water we put into supply to assess whether the overall trend was upwards, stable or downwards.
- Monitoring the type and volume of customer contacts – if the same query was being raised by multiple customers we would likely update our website with the required information, put out a press release or run an advertorial depending on the nature of the issue.
- Through direct engagement with our customer liaison panels, regulators and other stakeholders, we can request feedback on how well our communications are meeting their need.

- By using a social media communication channels, such as Twitter and Facebook, we are able to respond to questions from customers with relative immediacy and receive feedback as to whether our communication was helpful. There are a variety of standard metrics available to us to measure overall levels of engagement with our social media posts (reach, clicks, likes, shares and comments). Monitoring of these metrics will form part of our evidence base for Drought Permit Applications to demonstrate the level of customer engagement.

This information will inform our drought permit application process to demonstrate the level of activity and engagement undertaken as part of the application process.

5.2.3 Neighbouring water companies

We recognise the importance of taking into consideration the position of other water companies. We will liaise regularly with neighbouring companies to ensure that:

- We are aware of their water resource position.
- Customer communications do not significantly conflict with each other, which could lead to confusion.

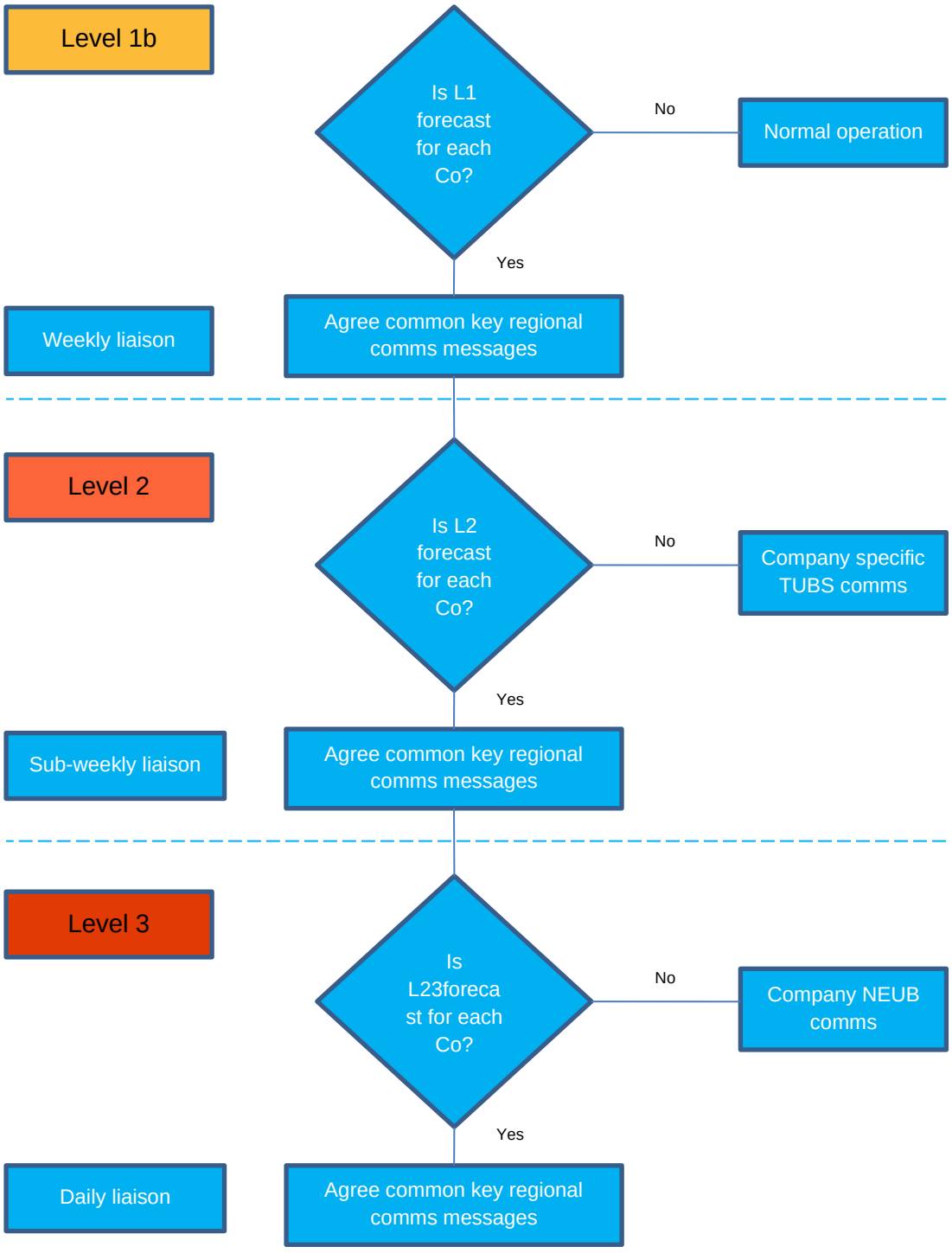
We are aware of potential water use restrictions in neighbouring areas and how they might impact on us.

Liaison with our neighbouring companies, in particular South West Water and Bristol Water, will occur as part of the West Country Water Resources Group, with a working group formed as we enter dry weather conditions (Level 1; Figure 5-1). Liaison with Water Resources South East will also occur via the working group. Given that each company has different drought triggers and different supply vulnerabilities, the process outlined in Figure 5-3 will be used to understand each companies' resource position through their current drought management level, and forecast position, to help align communications.

With the other water companies in our regional group, we have a shared customer base - i.e. where Bristol Water or South West Water provide water supply services and we provide waste services. If restrictions are imposed by neighbouring companies while they remain unnecessary in our region, we will re-confirm the position for our customers to reduce concern and to minimise customer contacts. Customer-facing staff will also be kept up to date with changes in neighbouring supply areas in preparation for responding to customer queries.

The frequency of contact between Wessex Water and Neighbouring companies is also shown in Figure 5-3. This shows that as we enter Level 1b, Level 2 and Level 3, our communications frequency will increase through to daily meetings in Level 3 to ensure awareness of each companies' resource position, timescales and communications strategies.

Figure 5-3 Proposed approach for communications alignment as part of the West Country Water Resources Group



These region wide communications will be in addition to company specific communications between Wessex Water and Bristol Water regarding operation of the import from Bristol Water near Bath, and with South West Water regarding the potential operation of the resilience transfer. We would contact Bristol Water on entering Level 1a, and would seek weekly updates on their resource position through the duration of the drought, to understand the likelihood of a reduction in the transfer, and to discuss best operation of the transfer –

e.g. potential reductions in the transfer volume earlier on during a drought – to best manage the regional water resource situation.

During the dry weather in 2011 and 2012 Wessex Water proposed to Water UK that it would be helpful for companies and regulators if each water company prepared a “snap shot” statement of its water resource position on a fortnightly basis that could be shared around the industry to improve communication and awareness. The suggestion was welcomed and for a few months Wessex Water hosted the co-ordination of this activity which is now managed by Water UK itself.

If either Wessex Water or Bournemouth Water were to experience drought conditions requiring calls for reductions, or restrictions, in customer use, we would look to align messaging across the Bournemouth Poole Christchurch Unitary Authority Area, a popular tourist destination, so customers received a common agreed communication from the two service providers.

5.2.4 Private water supplies

The following information may be useful to farmers and others that are not customers of Wessex Water but have their own private water supplies:

- Anyone with a private water supply that is affected by dry weather conditions (i.e. exceptionally low groundwater levels) should initially seek advice from their Local Authority.
- The Drinking Water Inspectorate (DWI) provides guidance on “The provision of alternative supplies in emergency and non-emergency situations” and “Legislation of private water supplies and drought”
- We liaise regularly with the NFU and CLA and will provide assistance to private water supplies as required by Local Authorities.

5.2.5 Environment Agency

Our communications with the Environment Agency are a vital part of our drought plan process to ensure we can implement drought actions in a timely manner, and also protect the environment. In addition to regular data exchanges, which happened regardless of the current water resource position as part of our business as usual process for management of resources and licence compliance (Section 3.3.2), we undertake regular monthly or weekly meetings to confirm resource availability and updates on relevant actions. These meetings increase in frequency during the summer.

During drought development the nature of our regular meetings will include additional discussion of drought actions and implementation of these in relation to our resource position and current Drought Management Level. As we approach the time to implement drought permit options, this will include contact to confirm the commencement of drought permit application pre-consultation, and for drought permit applications themselves.

During a drought, and in particular during the implementation of drought permit options, we will also share additional environmental data with the Environment Agency that is collecting during permit option implementation to monitor the effects of implementing the drought options, in addition to data sharing in relation to drought permit applications themselves, including assessment of the effectiveness of drought demand-side measures, and demonstration of exceptional shortage of rainfall.

Further details relating to data exchange between the EA and Wessex Water will be undertaken as part of drought permit option monitoring, as detailed in the Environmental Monitoring Plan (Appendix F).

5.2.6 Communication plan

The tables that follow outline how our communication plan is linked to drought trigger levels, and how for various stakeholder groups, our messages and communication channels are tailored for each audience.

Table 5-5: Communication plan for Normal operation

Drought Level	Stakeholder & trigger point if applicable	Messages / information	Channels	Timing
Normal Operation	**Household customers**	Promotion of water efficiency and metering as per our WRMP and Business Plan strategies to deliver water savings for our water efficiency performance commitment and strive towards PCC reductions. Seasonal wise use of water messages e.g. garden watering in spring/summer and pipe lagging to prevent leaks in winter. Current water resource position. Background educational information on low rainfall, drought and the value of water.	Social media Website Local print media Customer magazine Direct mail Radio advertising Education services Local events	Regularly throughout the year.
	Retailers (for business water users)	Business as usual retailer engagement	Website Information leaflets One-to-one account management and communication	Regularly throughout the year.
	Environment Agency	Regular data exchanges – see Section 3.4 (including resource position updates) Annual review of Water Resources Management Plan.	Technical spreadsheets and email Conference calls Water Resource Prospects Report Summary report.	Weekly, monthly, as required. Annually
	Ofwat	Standard annual reporting (Regulatory Return)	Data tables and commentaries.	Annually
	CCW	Quarterly reporting of resource position and activities, including on PCC and leakage	Standard reports and meetings	Quarterly
	Water UK, other water companies and regional planning groups	Resource position updates and water efficiency activities discussed with other companies at Water UK Water Resources and Water Efficiency Network meetings, as well as updates in relevant West Country Water Resources Group meetings.	Email and verbal communications	Quarterly Ad hoc WCWRG (monthly)

Drought Level	Stakeholder & trigger point if applicable	Messages / information	Channels	Timing
	Media	Resource position updates, water efficiency advice and information on our activities to improve the resource position.	Press releases Social media Website	As necessary and on request
	Environmental stakeholders	Resource position updates and information on our activities that are of general interest to environmental stakeholders	Press releases and water situation reports	As necessary and on request
	Internal colleagues	Supply strategy meetings to discuss and agree target source usage. Resource position summary discussed every other month at Services Management Team meetings. Overall company resource position.	Meetings and email Reports, papers and meetings Intranet, Source TV and Yammer	Monthly Every other month Monthly
	Stakeholder panels e.g. Catchment Panel, Catchment Partnerships	Resource position updates and general water resource management activities being undertaken.	Briefing notes, water situation report and meetings.	As necessary and on request

Table 5-6: Communication plan for Level 1a

Drought Level	Stakeholder & trigger point if applicable	Messages / information	Channel	Timing
Level 1a	**Household customers**	Water efficiency campaign - Phase 1 – encouraging shorter showers, less garden watering and to fix indoor plumbing leaks (e.g. toilets). Increased information regarding current water resources situation in relation to recent rainfall. Increased information about the actions we're taking to maintain supply security – including leakage reduction and control and supply side resource saving measures.	As per Normal Operation, but more extensive to include: Increased social media activity Newspaper advertorials	Regularly throughout the year – being mindful of seasonality and other influencing factors – also see text on 'Adaptive Comms'.
	Retailers (and business water users)	Increased information regarding current water resources situation and potential impacts on businesses, what we're doing to manage supplies, how businesses can help. See Appendix K.	As per Normal Operation	As per Normal Operation

Drought Level	Stakeholder & trigger point if applicable	Messages / information	Channel	Timing
	Environment Agency	As per Normal Operation plus: Increased communication regarding current resource position, model forecasts and the national picture.	As per Normal Operation	As per Normal Operation
	Ofwat	As per Normal Operation	As per Normal Operation	As per Normal Operation
	CCW	As per Normal Operation	As per Normal Operation	As per Normal Operation
	Water UK, other water companies and regional planning groups	As per Normal Operation, but liaison with other companies triggered based on monthly forecasting (see Section 5.2.3)	As per Normal Operation	As per Normal Operation
	Media	As per Normal Operation	As per Normal Operation plus: Radio interviews	On request
	Environmental stakeholders	As per Normal Operation	As per Normal Operation	As per Normal Operation
	Internal colleagues	As per Normal Operation	As per Normal Operation	As per Normal Operation
	Liaison panels	As per Normal Operation	As per Normal Operation	As per Normal Operation

Table 5-7: Communication plan for Level 1b

Drought Level	Stakeholder & trigger point if applicable	Messages / information	Channel	Timing
Level 1b	**Household customers**	Water efficiency campaign – Phase 2: encouraging shorter showers, less garden watering and to fix indoor plumbing leaks (e.g. toilets). Increased information regarding current water resources situation. Increased information about the actions we're taking to maintain supply security – including leakage reduction and control and supply side resource saving measures. Possible advertising of impending temporary water use restrictions – should the position move into Level 2.	As per Level 1a but higher profile: Enhanced social media activity More radio airtime More newspaper advertorials	As appropriate throughout the year – being mindful of seasonality and other influencing factors – also see text on 'Adaptive Comms'.
	Retailers (and business water users)	As per Level 1a, see Appendix K.	As per Level 1a plus: Letters and flyers Telephone and personalised meetings offered.	As appropriate throughout the year – being mindful of seasonality and other influencing factors – also see text on 'Adaptive Comms'.
	Environment Agency	As per Level 1a plus weekly reporting of resource availability and drought management actions being implemented via telecall, and need to enter pre-consultation stage of drought permit application process.	As per Level 1a	Weekly contact
	Defra	Notification of formation of drought management team (requirement of the Security and Emergency Measures Direction).	Email, briefing notes, water situation report, tele-call	On formation of drought management team
	Ofwat	Resource position updates and activities being undertaken	Email, briefing notes, water situation report	At least monthly
	CCW	Resource position updates and activities being undertaken	Email, briefing notes, water situation report	At least monthly

Drought Level	Stakeholder & trigger point if applicable	Messages / information	Channel	Timing
	Water UK, other water companies and regional planning groups	As per Level 1a, but liaison with other companies triggered based on monthly forecasting (see Section 5.2.3)	As per Level 1a	At least monthly
	Local Resilience Forums	Update of resource position	Email, tele-call	At least monthly
	Media	Resource position updates and promotion of customer water efficiency campaigns	Press releases and advertorials Radio interviews	As necessary and on request
	Environmental stakeholders	As per Level 1a	As per Level 1a Discussion of partnering for media interviews to strengthen water saving messages	At least monthly and on request
	Internal colleagues	Advise customer facing staff of potential for greater volume of queries. Increase in frequency of internal meetings – see Section 5.1.	As per Level 1a Meetings and/or conference calls	As per Level 1a From monthly to fortnightly From every other month to every month
	Stakeholder panels	Resource position updates and activities being undertaken	Email, briefing notes, water situation report	At least monthly
	Canal and River Trust	Potential to modify flows into Bridgwater and Taunton Canal	conference call	As necessary

Table 5-8: Communication plan for Level 2

Drought Level	Stakeholder & trigger point if applicable	Messages / information	Channel	Timing
Level 2	**Household customers**	Intensive campaign building on Water Efficiency Phase 2 (in Level 1a) depending on the season in which Level 2 is triggered a Temporary Use (Hosepipe) Ban may be implemented.	As per Level 1b plus: Television – interviews on local news Radio – interviews on local stations Meetings with local interest groups i.e. Parish Councils	At any time during year
	Retailers (and business water users)	As per Level 1b, see Appendix K.	As per Level 1b plus: Letters and flyers Telephone and personalised meetings offered.	At any time during year

Drought Level	Stakeholder & trigger point if applicable	Messages / information	Channel	Timing
	Environment Agency	As per Level 1b plus weekly reporting of resource availability and drought management actions being implemented, and liaison regarding drought permit options	As per Level 2b plus: Conference calls / meetings	Weekly contact.
	Local Resilience Forums	Update of resource position, and potential for emergency water distribution	Email, briefing notes, water situation report, tele-call	At least monthly
	Ofwat	As per Level 2	As per Level 2b	At least monthly
	CCW	As per Level 2b, plus additional information relating to hosepipe ban restrictions – timing and locations	As per Level 2b	At least weekly
	Water UK and other water companies	As per Level 2b	As per Level 2b	At least monthly
	Media and environmental groups	As per Level 2b	As per Level 2b	As necessary and on request
	Environmental stakeholders	As per Level 2b	As per Level 2b	As per Level 2b
	Internal staff	Advise staff of potential for greater volume of customer queries	As per Level 2b	As per Level 2b
	Stakeholder panels	As per Level 2b	As per Level 2b	As per Level 2b
	Canal and River Trust	As per Level 2b	As per Level 2b	As per Level 2b

Table 5-9: Communication plan for Level 3

Drought Level	Stakeholder & trigger point if applicable	Messages / information	Channel	Timing
Level 3	**Household customers**	Intensive water efficiency campaign. Further increased promotion of free device giveaways and discounted water efficiency devices. Possible advertising of impending temporary water use restrictions.	As per Level 2 plus: Television – interviews on local news Radio – interviews on local stations Meetings with local interest groups i.e. Parish Councils	At any time during year

Drought Level	Stakeholder & trigger point if applicable	Messages / information	Channel	Timing
	Retailers (and business water users)	Intensive water efficiency campaign. Further enhanced promotion of water efficient behaviours to tourism sector Further promotion of increased support for water use audits in schools and SMEs. Possible advertising of impending temporary water use restrictions	As per Level 2 plus: Conference calls / meetings	At any time during year
	Environment Agency	As per Level 2 plus weekly reporting of resource availability and drought management actions being implemented.	As per Level 2 plus: Conference calls / meetings	Weekly contact.
	Local Resilience Forums	Update of resource position, and potential for emergency water distribution.	Email, briefing notes, water situation report, tele-call	At least monthly
	Local Fire Authorities	Location of operation of pressure management reductions should the need arise in a particular DMA targeting with pressure reductions.	Email and tele-calls as required	As required, but at least weekly
	Ofwat	As per Level 2	As per Level 2	At least monthly
	CCW	As per Level 2	As per Level 2	At least monthly
	Water UK and other water companies	As per Level 2	As per Level 2	At least monthly
	Media and environmental groups	As per Level 2	As per Level 2	As necessary and on request
	Environmental stakeholders	As per Level 2	As per Level 2	As per Level 2
	Internal colleagues	Advise staff of potential for greater volume of customer queries	As per Level 2	As per Level 2
	Stakeholder panels	As per Level 2	As per Level 2	As per Level 2
	Canal and River Trust	As per Level 2	As per Level 2	As per Level 2

6 End of Drought

A drought is defined to end when normal conditions have resumed, and the risk to the security of supply and environment from drought are no greater than they would be during a normal year. As we move towards the end of a drought we will go through a process of stopping our drought actions, triggering the end of drought conditions, communicating the end of drought with customers, and reviewing performance during the drought.

6.1.1 Determining the end of drought

It can be difficult to define the end of a drought, and will depend on:

- the specific resource position for the time of year relative to our drought management levels.
- resource position of neighbouring companies and the national picture
- the specific nature of the drought event and the time of year in which drought conditions are ceasing from the perspective of our resource position.

As described in Section 3, we monitor a number of hydrometric variables alongside our drought trigger metrics to understand drought risk, both going into and leaving a drought. To inform when we leave a drought, we will monitor the following indicators in particular:

- Our current resource position relative to our drought management levels and trigger metrics;
- Soil moisture deficit and groundwater levels;
- Hydrological modelling of reservoir inflow catchments and observation boreholes to understand hydrological drought recovery;
- Our forecast position for the coming months using our Miser model under a range of scenarios (See section 3.4).
- Observed groundwater level responses within our operational boreholes.

Following a cessation of dry weather conditions, we would expect demand to respond most rapidly, with a reduction in peak demands, but the immediate response of our resources to rainfall (and therefore reservoir and groundwater storage) will likely be slow as we would expect soil moisture deficits to be high. These deficits will need to be satisfied prior to experiencing significant recharge of surface reservoirs and groundwater aquifers.

The purpose of monitoring the above indicators is to best understand how this transition from dry to normal conditions progresses. Once significant recharge starts to occur, we would see a response in our groundwater and reservoir storage, leading to change in drought management level status.

We will review each of the above indicators against the historic record and drought management levels to assess their current position relative to normal conditions. The process for ceasing to implement each drought management measure will be to review the situation upon approaching and leaving each Drought Management Level in which the measure was implemented, and for the respective trigger that led to implementation. Once

drought conditions are forecast to Leave Drought Management Level 2 and 3, this will trigger discussion with the Environment Agency and with the West Country Water Resources Group before ceasing to implement a Drought Management Level 2 and 3 actions, and declaring the end of a drought.

A key factor will be in considering consistency of customer messaging in the region as we leave a drought period. We would only declare the end of a drought after confirming with the Environment Agency that the water resource situation and associated threat to public water supply has returned to normal. We would declare the end of drought no later than when all drought triggers have returned to Normal Operation.

Changes to drought actions that occur are likely to occur in a phased manner from the point that our resource position move through Level 1b to Level 1a. Examples of how we would cease drought actions under test drought events is shown in Appendix E. This phasing will be informed by our Miser model forecasting and the impact that stopping drought management actions will have on our resource position.

We will communicate to customers that we have reached the end of drought conditions in our area using the same media channels as we would upon entering Level 1a and Level 2, particularly through local and national media channels. Upon reaching the end of a drought, it is important to consider the national picture, particularly if other companies are still experiencing drought conditions, and if there is a chance of re-entering drought conditions (re-entering drought management level 2 or 3) in the upcoming months. At a particular time it may therefore be preferrable to wait before declaring the end of a drought to avoid confusion with customers.

We would have clear messaging on our own communication channels (social media and website), to help avoid confusion with the national picture. Further, we would consult with the Environment Agency and the West Country Water Resources Group to agree on appropriate and clear messaging.

6.1.2 Post drought review

Following the end of a drought, we would undertake a timely review of our Drought Plan to consider its effectiveness. We will be collating data throughout the drought event and aim to produce a ‘drought report’ within 3-6 months of leaving drought conditions. The report will include the following:

- Lessons learnt and recommendations for future changes to the Drought Plan.
- Environmental impacts of the drought – baseline, during and post drought environmental data series will be analysed and compared, alongside analysing the effectiveness of drought mitigation measures.
- The effectiveness and cost of drought management actions.
- Assessment of estimated reductions in water demand against actual reductions for different drought management actions.
- Individual source yields during the drought – were expected outputs achieved and/or do any yields need to be re-assessed or investment be planned?

- Review of whether the drought triggers were effective at identifying when to implement and cease drought actions.
- Comparison of demands during the year with the dry year demand forecast used for the Water Resources Management Plan.
- Effectiveness of communications with regional companies as part of the West Country Water Resources Group.
- Effectiveness of communications with customers, in particular reflecting on the consistency of drought messaging with neighbouring companies and potential confusion.
- How longer-term improvements can be incorporated into our Water Resources Management Planning process.

Furthermore, we would anticipate liaison with the Environment Agency and other organisations such as Natural England and WWF to explore the wider impacts of droughts on catchment and ecosystem resilience in our area with particular reference to their ability to recover from drought.

In addition to our own review we anticipate participating in follow-up projects alongside other companies, for example as part of WaterUK or UKWIR, to share and review our understanding of the drought. This might include capturing our understanding of demand patterns during drought and the effectiveness of restrictions on demand. We would aim to incorporate the outcomes of these projects in the drought report, time depending.

Depending on the outcomes of the review process, and the timing of the review relative to subsequent drought plan preparation, we will discuss the need to update the drought plan with the Environment Agency to reflect the “lessons learned” from the drought.

In addition to reviewing the drought plan following a drought (e.g. entering drought management levels 2 and 3), we will enter our earlier drought triggers more often (drought management level 1). We will continually review the frequency with which we enter these levels, and compare drought triggers to ongoing improvements to modelling and forecasting, in particular as part of preparations for WRMP24.

7 Conclusions and summary of plan

This document sets out our tactical and operational response to extended periods of dry weather. We are required to prepare and maintain a Drought Plan under Section 39B and 39C of the Water Industry Act (1991), as amended by the Water Act (2003). This plan has been developed in accordance with the guideline published by Defra and the Environment Agency in December 2020[25], Defra's drought plan direction (2020), and government expectations for drought planning letter (April 2020).

We manage water resources against five drought management levels reflecting the level of resource available in the supply system. Our supply system requires careful management to balance water use across the supply system based on different constraints on available water at different times of the year; combined reservoir storage, groundwater level and annual licence remaining are used to identify which Drought Management Level we are in.

We typically operate in "Normal Operation" and move to a lower Drought Management Level as a period of below average rainfall progresses and resource availability declines. The management levels are used to trigger further analysis and inform the order and type of actions that will be implemented at different stages of dry weather to strengthen our resource position.

Drought Management Level	Operational Strategy and Actions
Normal Operation	Normal Operation and cost saving strategy. Background Water Efficiency, metering and leakage activity. Normal seasonal water efficiency messaging to customers and retailers.
Level 1a	Move towards resource saving strategy and review of outage programme. Increase water efficiency campaigns and leakage control.
Level 1b	Further enhance water efficiency campaign and leakage control. Additional transfers from neighbouring companies and use of standby sources coupled with further system optimisation.
Level 2	Least environmentally damaging drought permit options Temporary Use Bans
Level 3	Non-essential use bans and high-profile water efficiency campaign Moderate/Most environmentally damaging drought permit options
Emergency Plan	Emergency drought orders (e.g. standpipes/rota cuts)

The actions we take during drought have been ordered to minimise impact on customers and the environment through optimisation of our existing system in the first instance, followed by actions to reduce demand, and then implementation of the least environmentally damaging drought actions first.

[25] Environment Agency (Updated December 2020) Water Company Drought Plan guideline, December 2020 (Version 1.2). See also: https://www.gov.uk/government/collections/how-to-write-and-publish-a-drought-plan

For this drought plan we have increased the number of drought permit options from 5 to 10 to increase the range of options to help maintain supply security in the event of drought. These additional options may help to meet demand during peak periods when demand is high and groundwater levels are low, and help to conserve reservoir storage during the winter. As per changes in guideline requirements, we have also included potential extreme drought options in the plan that may be implemented immediately before (and hopefully to avoid the need for) the Level 4 restrictions of standpipes and rota cuts.

In developing this drought plan we have worked towards being “application ready” for the drought options we are most likely to implement during drought. We will continue to work with the Environment Agency to develop and test our drought application readiness.

For each of our drought plan options we have undertaken appropriate Environmental Assessments to understand the potential impact of implementing the options in the environment. The environmental assessments have helped to inform the ordering of drought option implementation. We would implement the least environmentally damaging drought options first, and based on our scenario modelling, would only expect to implement the more environmentally damaging options in extreme droughts, beyond those seen within the historic record. Such options therefore have a low likelihood of use. In addition, some of the new drought permit options have a lower environmental impact, thereby reducing the need to implement some our previous and more environmentally damaging options.

As we move through Drought Management Levels as a period of dry weather intensifies, our management structure internally changes, including an increase in the frequency of supply strategy meetings and the formation of a Drought Management Team to oversee our response to dry weather, including the implementation of supply-side, demand-side actions and our communication plan. Our communications with regulators, customers and neighbouring companies as part of the West Country Water Resources Group will increase to ensure awareness and where possible alignment of customer communications and drought actions.

Despite periods of dry weather in the recent historical record, notably in 1991, 1995, 2003, 2012, and the dry hot summer of 2018, we have not had to impose restrictions on customer water use, apply for drought permits or drought orders for 45 years, since 1976. We have simulated our supply system performance to a range of historic and more extreme droughts to position of Drought Management Levels. Their position also reflects the new requirement to implement demand restrictions including Temporary Use Bans (hosepipe bans) ahead of application for drought permit options and to have those restrictions in place long enough to observe a measurable impact on demand prior to drought permit application (in the summer months). These changes, in addition to our new stochastic dataset analysis, mean we would expect to implement Temporary Use Bans once in every thirty years on average (i.e. entering Drought Management Level 2 in the summer months).

Appendix A Drought plan checklist

See document: WessexWater_DroughtPlan_EARequirementsChecklist.xlsx

Appendix B Pre-Consultation

B.1 List of consultees

Table 7-1 List of consultees engaged with during pre-consultation

Consultee	Consultation topic
Environment Agency	Pre-consultation letter; Environmental Assessment Methodology and SEA/HRA scoping; Drought permit option screening.
Defra (Secretary of State)	Pre-consultation letter; Environmental Assessment Methodology and SEA/HRA scoping.
Natural England	Pre-consultation letter; Environmental Assessment Methodology and SEA/HRA scoping.
Ofwat	Pre-consultation letter
Bristol Water	Pre-consultation letter
South West Water	Pre-consultation letter
West Country Water Resources Group	Pre-consultation letter
Thames Water	Pre-consultation letter
Cholderton Water	Pre-consultation letter
Southern Water	Pre-consultation letter
Canal and River Trust	Pre-consultation letter; Environmental Assessment Methodology and SEA/HRA scoping.
Leep Utilities	Pre-consultation letter
Internal Drainage Board – Parrett	Pre-consultation letter
Veolia Water	Pre-consultation letter
Bristol Avon Catchment Partnership	Pre-consultation letter; Environmental Assessment Methodology and SEA/HRA scoping.
Dorset Catchment Partnership	Pre-consultation letter; Environmental Assessment Methodology and SEA/HRA scoping.
Hampshire Avon Catchment Partnership	Pre-consultation letter; Environmental Assessment Methodology and SEA/HRA scoping.
Somerset Catchment Partnership	Pre-consultation letter; Environmental Assessment Methodology and SEA/HRA scoping.
Historic England	Environmental Assessment Methodology and SEA/HRA scoping.

Appendix C Drought Management Actions

C.1 Demand side actions

Option	TRIGGER or preceding action	DEMAND SAVING (Ml/d)
Background water efficiency campaign	BAU Activity under Normal operation	At least 1Ml/d for each yr of AMP7 (PC target) Included in our baseline demand forecast and so **no additional demand saving**.
Ongoing leakage management strategy	BAU Activity under Normal Operation	Our leakage performance commitment for is a reduction of ~10Mld in the 2019/20 to 2024/25 window based on the new three-year average performance commitment. Included in our baseline demand forecast and so **no additional demand saving**.
BAU metering campaign	BAU Activity under Normal Operation	Included in our baseline demand forecast and so **no additional demand saving**.
Normal spring / summer domestic customer water efficiency campaign	BAU Activity under Normal Operation	Normal annual activity included in our baseline demand forecast – **no additional demand saving**.
Water Efficiency Campaign - Level 1a	Within Level 1a	In combination we estimate that the level 1 water efficiency campaign could save in the range of 0.49 to 0.81 Ml/d over the year. The month with the highest savings would depend on when the campaign is triggered – in the spring scenario it would be August with a total in-month saving of 0.15 Ml/d, in winter it would bin in October with 0.11 Ml/d.

Option	TRIGGER or preceding action	DEMAND SAVING (Ml/d)
Enhanced Leakage Control – Level 1a	Within Level 1a	We estimate that demand savings of **a maximum of 0.6 Ml/d.**
Water Efficiency Campaign - Level 1b	Within Level 1b	In combination we estimate that the phase 2 water efficiency campaign could save in the range of 0.91 and 1.52 Ml/d over the year in addition to the baseline. The month with the highest savings would depend on when Level 1b is triggered – in the spring scenario it would be July with a total in month saving of 0.3 Ml/d, in Autumn would be October with 0.25 Ml/d
Enhanced Leakage Control - Level 1b	Within Level 1b	We estimate that demand savings of **a maximum of 0.9 Ml/d** could be achieved by further active leakage control activities utilising additional external staff resources and more active pressure management, i.e. reducing pressures at night or in specific areas below company standards.
Temporary water use restrictions (TUBs)	Level 2 (in summer months (April to September)	Up to 5% of Demand, or up to ~21Mld on peak demand.

Option	TRIGGER or preceding action	DEMAND SAVING (Ml/d)
		Savings are difficult to quantify as we have no direct evidence of likely reductions for our own supply area as we have not imposed restrictions for over 40 years. See Section 2.1.3 for further discussion
		Restrictions would include restricting the use of hosepipes for watering gardens, cars and domestic recreational use.
Non-Essential Use Drought Orders	Level 3	Up to 2% estimated savings Restrictions would include uses of water that we are empowered to restrict under the WIA (1991) s76. This will include for example cleaning walls or windows of domestic premises using a hosepipe, filling or maintaining domestic ponds using a hosepipe etc..

C.2 Supply side actions

For security reasons Section C.2 is redacted and not available in the version of this document published on our website.

Appendix D Drought permit option screening

For security reasons this appendix is redacted and not available in the version of this document published on our website.

Appendix E Drought Event Testing

This appendix explains the drought scenarios simulated with the Miser system model to develop and test the Drought Management Level Triggers. Section E.1 explains the drought scenario generation used for drought development and testing, and the system model set-up for scenarios simulated and Section E.2 describes worked examples for the 1975/76 historic drought, for the 1975/76 extreme drought and for the 1921 extreme drought.

E.1 Drought scenario generation and system modelling

Section 1.3 describes the drought vulnerability assessment we have undertaken as part of our current WRMP, which has identified that we are resilient to a repeat of short duration "single season" drought events, but more vulnerable to multi-season droughts; notably 1921, 1933/34, and 1975/76.

To develop and test our drought plan triggers and options, we have undertaken system simulation modelling in our Miser system model of the performance of our current supply system under a repeat of key historic droughts, as well as more severe versions of these multi-season droughts. These droughts have been chosen because:

- 1975/76 is our design event, and the worse multi-season drought on the historic record, featuring a dry summer leading into a dry winter followed by a particularly dry and hot summer, with a duration of 17 months.
- 1921 whilst being a multi-season drought, is a dry summer followed by a dry autumn and winter period, with duration of 10 months.

E.1.1 Miser model setup

Our long-term planning system simulation model in the Miser modelling software has been run to develop and test the Drought Management Levels and trigger timing. The model has been developed and applied in Wessex Water since 1997 to simulate the supply system for both short-term tactical planning (Section 3.4.1) and long-term planning. The current version of the model consists of 122 demand nodes and simulated the conjunctive use of all 80 sources in our integrated supply grid and includes our existing licences. The model used for these scenario tests incorporates recent model changes including updated control curves for balancing reservoir and annual licence use across the supply system as part of development of our continuous simulation model towards WRMP24.

For each drought scenario run undertaken we have simulated the supply system using a demand pattern based on a dry year annual average of 343Ml/d and a critical peak period of 420Ml/d, to reflect heatwave conditions experienced during those historic droughts. The annual average demand is based on our Water Resources Management Plan Distribution Input for 2020/21 and 2021/22 and reflects in particular ongoing reductions in baseline leakage. The critical period demand used is based on the peak demand experienced during the record heat wave in summer 2018 (Section 1.4.1), and the peak experienced in May 2020 (Section 1.4.2). The Miser model also incorporates water balance components from our Water Resources Management Plan, including Treatment Works Operational Use, an allowance for headroom, which includes a 15Ml/d headroom allowance for peak period

demand uncertainty (e.g. associated with heatwaves), and outage from our WRMP19 annual average outage allowance.

The miser model set-up, including the control rules and curves for balancing source use across sources, therefore seeks to find an optimal use of existing sources and abstraction licences prior to then scheduling drought actions.

E.1.2 Bristol Import Modelling

In developing this plan, we have liaised with Bristol Water to align operation of the Bristol Import under different testing scenarios, to understand how the variation in the import may operate under different droughts, both from the historic record and under more severe droughts.

Whilst both companies are most vulnerable to multi-season drought events, the worst historical drought events for both companies is different, reflecting variability in spatial rainfall coherence; Bristol Water's worst drought on the historic record was the 1933/34 event, whereas for Wessex Water it is the 1975/76 drought event. This means that that the most severe droughts that may affect the transfer volume available between companies are not necessarily spatially coherent across the region.

Bristol water's drought plan testing shows a reduction in the import to 4.4M/d under their design event 1933/34+ (1 in 200 drought) and under a more severe 60% LTA rainfall event, with triggering of the import reduction likely to begin during the winter and spring, leading into a dry summer period. These scenarios reflect potential reductions in available water from Bristol Water's abstraction, ultimately from on the River Severn, which may be restricted as part of the River Severn Drought Order.

We have undertaken some initial analysis from our newly developed regional stochastic dataset to understand the likelihood of both companies facing low rainfall concurrently over a multi-season rainfall period of 18 months starting in April (e.g. reflecting the dry summer-winter-summer pattern of the 1933/34 and 1975/76 design events). The likelihood of both company regions experiencing at least a 1 in 200 rainfall deficit of 18-month duration (~65% LTA rainfall) is approximately 1 in 450, and the likelihood of both companies experiencing greater than a 1 in 500 rainfall deficit of 18-month duration (~60% LTA rainfall) is less than 1 in 1000.

In addition, assessment undertaken by Bristol Water as part of WRMP19 on the likelihood of the River Severn drought order also being implemented at the time of Bristol Water's sources being under severe stress (i.e. a 1 in 200 year return period drought), is considered very low.

For the purposes of the drought plan testing, we have assumed a reduction in the Bristol Import up to 4.4Ml/d under different testing scenarios as provided by Bristol Water. Based on the analysis above, and the likelihood of the Wessex Water, Bristol Water and River Severn areas each being in extreme drought concurrently these scenarios may be considered extreme, and of very low likelihood.

Further work on regional drought coherence will be undertaken in our work towards draft WRMP and regional plan submission in October 2022.

E.2 Drought event tests

For security reasons Section E.2 is redacted and not available in the version of this document published on our website.

Appendix F Environmental Assessment Reports

F.1 Environmental reports

For security reasons this appendix is redacted and not available in the version of this document published on our website.

F.2 Designated and non-designated sites of conservation importance

For security reasons this appendix is redacted not available in the version of this document published on our website.

Appendix G Temporary Water Use Restrictions

G.1 Temporary water use restrictions

In the development of this plan, we have considered each of the potential water use restrictions outlined in the UKWIR (2013) report – Code of Practice and Guidance on Water Use Restrictions 14/WR/33/6. For clarity for our customers we have categorised them into two groups (as shown in Table 8-1) which we would expect to implement in the order below:

- Temporary Use Restrictions: we would consider restricting all uses of water that we are empowered to do under section 76 of the Water Industry Act (1991).
- Non-Essential Use Drought Orders: we would consider restricting uses of water where an application to the Secretary of State for a Drought Order is required.

Preparation would be required before implementation. For those measures implemented under the Water Industry Act 1991 s76 preparation may take up to 1 month, for those which require application to the Secretary of State preparation is expected to take two to three months.

We have outlined in the tables below where we would make exceptions. In general, we would not make exemptions for the use of potable water for recreational activities, but would make them for the elderly and disabled and for small businesses where the use of a hosepipe is essential. There is a statutory exemption for the use of a hosepipe when it is required for health or safety reasons.

Table 8-7-2: Summary of activities covered by water use restrictions

Restriction Group	UKWIR Ref	Reference in current legislation	Activity / title
Temporary Use Bans (TUBs)	Figure F.1	WIA 1991 s76, 2(a)	Watering a garden using a hosepipe
	Figure F.2	WIA 1991 s76, 2(b)	Cleaning a private motor-vehicle using a hosepipe
	Figure F.3	WIA 1991 s76, 2(c)	Watering plants on domestic or other non-commercial premises using a hosepipe
	Figure F.4	WIA 1991 s76, 2(d)	Cleaning a private leisure boat using a hosepipe
	Figure F.5	WIA 1991 s76, 2(e)	Filling or maintaining a domestic swimming or paddling pool
	Figure F.6	WIA 1991 s76, 2(f)	Drawing water, using a hosepipe, for domestic recreational use
	Figure F.7	WIA 1991 s76, 2(g)	Filling or maintaining a domestic pond using a hosepipe
	Figure F.8	WIA 1991 s76, 2(h)	Filling or maintaining an ornamental fountain
	Figure F.9	WIA 1991 s76, 2(i)	Cleaning walls, or windows, of domestic premises using a hosepipe
	Figure F.10	WIA 1991 s76, 2(j)	Cleaning paths or patios using a hosepipe

Restriction Group	UKWIR Ref	Reference in current legislation	Activity / title
	Figure F.11	WIA 1991 s76, 2(k)	Cleaning other artificial outdoor surfaces using a hosepipe
Non-Essential Use Drought Orders (NEUDOs)	Figure F.12	Drought Direction 2011 Schedule para.2	Watering outdoor plants on commercial premises using a hosepipe
	Figure F.13	Drought Direction 2011 Schedule para.3	Filling or maintaining a non-domestic swimming or paddling pool
	Figure F.14	Drought Direction 2011 Schedule para.4	Filling or maintaining a pond using a hosepipe
	Figure F.17	Drought Direction 2011 Schedule para.7	Cleaning non-domestic premises using a hosepipe
	Figure F.18	Drought Direction 2011 Schedule para.8	Cleaning a window of a non-domestic building using a hosepipe
	Figure F.15	Drought Direction 2011 Schedule para.5	Operating a mechanical vehicle-washer using a hosepipe
	Figure F.16	Drought Direction 2011 Schedule para.6	Cleaning any vehicle, boat, aircraft or railway rolling stock using a hosepipe
	Figure F.19	Drought Direction 2011 Schedule para.9	Cleaning industrial plant using a hosepipe
	Figure F.20	Drought Direction 2011 Schedule para.10	Suppressing dust using a hosepipe
	Figure F.21	Drought Direction 2011 Schedule para.11	Operating cisterns in any building that is unoccupied and closed

Details of each measure are given in the following tables. All assumed savings are derived from the UKWIR Code of Practice report.

G.1.3 Restrictions Temporary Use Bans

Watering a garden using a hosepipe	
UKWIR Ref	Figure F.1
Trigger(s)	Consider for implementation in Drought Management Level 2 (TUBs).
Demand saving – Ml/d	Up to 5% of Distribution Input
Demand saving – Percentage reduction on peak	5% - lower end of the figure in the UKWIR report to reflect the higher degree of meter penetration in the Wessex Water area.
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start up to 1 month before implementation required
Permissions required	No permission is required but we would publish notices in two local newspapers and on our website. The notices will ask for representations.
Risks associated with option	Saving may be less than predicted saving as a result of increasing meter penetration – a risk supported by the interim results of the Wessex Water tariff trial. Risk of increased use during the advertising period but before the restriction comes into force.
Other	Wessex Water would have regard to the Guidance provided in the UKWIR Code of Practice. In particular we would exempt watering of lawns laid in the last 28 days, although these would be considered for restriction in NUEDOs We would also combine with the promotion of drought-resistant plants. A garden includes a park and gardens open to the public, and allotments. Sports pitches are included. We would expect to exclude the elderly or disabled who have a mobility or physical impairment given the potential difficulties they may have in using a watering can or bucket.

Cleaning a private motor vehicle using a hosepipe	
UKWIR Ref	Figure F.2
Trigger(s)	Consider for implementation in Drought Management Level 2 (TUBs).
Demand saving (Ml/d)	Included in saving for Figure 5.1
Demand saving (% reduction on peak)	Included in saving for Figure 5.1
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start up to 1 month before implementation required
Permissions required	No permission is required but we would publish notices in two local newspapers and on our website. The notices will ask for representations.
Risks associated with option	Saving may be less than predicted saving as a result of increasing meter penetration – a risk supported by the interim results of the Wessex Water tariff trial. Risk of increased use during the advertising period but before the restriction comes into force.
Other	Taxis, minicabs and public service vehicles are excluded. Key message is that it is permitted to wash cars using a bucket or at a commercial car wash.

Drawing water, using a hosepipe, for domestic recreational use	
UKWIR Ref	Figure F.6
Trigger(s)	Consider for implementation in Drought Management Level 2 (TUBs).
Demand saving (Ml/d)	Included in saving for Figure 5.1
Demand saving (% reduction on peak)	Included in saving for Figure 5.1
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start up to 1 month before implementation required
Permissions required	No permission is required but we would publish notices in two local newspapers and on our website. The notices will ask for representations.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	Wessex Water would have regard to the Guidance provided in the UKWIR Code of Practice. Recreational use includes domestic swimming and paddling pools.

	Customers would still be able to fill via a bucket; this would be particularly relevant for small paddling pools.

Watering plants of domestic or other non-commercial premises using a hosepipe	
UKWIR Ref	Figure F.3
Trigger(s)	Consider for implementation in Drought Management Level 2 (TUBs).
Demand saving (Ml/d)	Included in saving for Figure 5.1
Demand saving (% reduction on peak)	Included in saving for Figure 5.1
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start up to 1 month before implementation required
Permissions required	No permission is required but we would publish notices in two local newspapers and on our website. The notices will ask for representations.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	Wessex Water would have regard to the Guidance provided in the UKWIR Code of Practice. This category covers the watering, using a hosepipe, of plants which are in an outdoor pot or in the ground but under cover. We would expect to exclude the elderly or disabled who have a mobility or physical impairment given the potential difficulties they may have in using a watering can or bucket.

Cleaning a private leisure boat using a hosepipe	
UKWIR Ref	Figure F.4
Trigger(s)	Consider for implementation in Drought Management Level 2 (TUBs).
Demand saving (Ml/d)	Included in saving for Figure 5.1
Demand saving (% reduction on peak)	Included in saving for Figure 5.1
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start up to 1 month before implementation required
Permissions required	No permission is required but we would publish notices in two local newspapers and on our website. The notices will ask for representations.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	Does not include seaplanes or boats used in a business. Boats can still be washed by hand using a bucket. We would expect to exclude the elderly or disabled who have a mobility or physical impairment given the potential difficulties they may have in using a watering can or bucket.

Filling or maintaining a domestic swimming or paddling pool	
UKWIR Ref	Figure F.5
Trigger(s)	Consider for implementation in Drought Management Level 2 (TUBs).
Demand saving (Ml/d)	Average consumption of outdoor pools is between 30l and 150l per day per pool. Filling of paddling pools uses 3.6 to 4 litres per paddling pool per day.
Demand saving (% reduction on peak)	No information available
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start up to 1 month before implementation required
Permissions required	No permission is required but we would publish notices in two local newspapers and on our website. The notices will ask for representations.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	Pools could continue to be filled by bucket. Customers could be advised to use public swimming baths. We would expect to exclude pools subject to major repair or renovation

Filling or maintaining a domestic pond using a hosepipe	
UKWIR Ref	Figure F.7
Trigger(s)	Consider for implementation in Drought Management Level 2 (TUBs).
Demand saving (Ml/d)	UKWIR code of practice states that savings are expected to be relatively small, linked only to lower evaporative losses.
Demand saving (% reduction on peak)	No information available
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start up to 1 month before implementation required
Permissions required	No permission is required but we would publish notices in two local newspapers and on our website. The notices will ask for representations.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	Excludes ponds in which fish or other aquatic animals are reared or kept. Includes both natural and man made ponds. Ponds can still be filled by bucket.

Filling or maintaining an ornamental fountain	
UKWIR Ref	Figure F.8
Trigger(s)	Consider for implementation in Drought Management Level 2 (TUBs).
Demand saving (Ml/d)	UKWIR code of practice states that savings are expected to be relatively small, linked only to lower evaporative losses.
Demand saving (% reduction on peak)	No information available
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start up to 1 month before implementation required
Permissions required	No permission is required but we would publish notices in two local newspapers and on our website. The notices will ask for representations.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	Excludes fountains which are in or near a fish pond and whose purpose is to supply sufficient oxygen to the water in the pond to keep the fish healthy. We would expect to exclude fountains of religious significance.

Cleaning walls, or windows, of domestic premises using a hosepipe	
UKWIR Ref	Figure F.9
Trigger(s)	Consider for implementation in Drought Management Level 2 (TUBs).
Demand saving	1.4 to 2.7 l/building/day, 5l to 60l/window cleaner/day
Demand saving (% reduction on peak)	No information available
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start up to 1 month before implementation required
Permissions required	No permission is required but we would publish notices in two local newspapers and on our website. The notices will ask for representations.

Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	Cleaning may still be done using a bucket. We would expect to exclude small businesses reliant on window and building washing.

Cleaning paths or patios using a hosepipe	
UKWIR Ref	Figure F.10
Trigger(s)	Consider for implementation in Drought Management Level 2 (TUBs).
Demand saving (Ml/d)	No information available
Demand saving (% reduction on peak)	No information available
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start up to 1 month before implementation required
Permissions required	No permission is required but we would publish notices in two local newspapers and on our website. The notices will ask for representations.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	Customers can still sweep paths or patios and wash them by hand using a bucket. We would expect to exclude:: • Small businesses whose sole operation is the cleaning of hard standings • Business where dust suppression is a requirement of their commercial contract

Cleaning other artificial outdoor surfaces using a hosepipe	
UKWIR Ref	Figure F.11
Trigger(s)	Consider for implementation in Drought Management Level 2 (TUBs).
Demand saving (Ml/d)	No information available
Demand saving (% reduction on peak)	No information available
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start up to 1 month before implementation required
Permissions required	No permission is required but we would publish notices in two local newspapers and on our website. The notices will ask for representations.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	This includes timber decking, quays and outdoor paved areas. We would expect to exclude: • Small businesses whose sole operation is the cleaning of hard standings • Business where dust suppression is a requirement of their commercial contract

G.1.4 Restriction Non Essential Use Drought Orders

Watering outdoor plants on commercial premises using a hosepipe	
UKWIR Ref	Figure F.12
Trigger(s)	Consider for implementation in Drought Management Level 3 (NEUDOs).
Demand saving (Ml/d)	Up to 2 Ml/d total saving estimate from Non-Essential Use Drought Orders
Demand saving (% reduction on peak)	<1%
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start 8 to 12 weeks.
Permissions required	Application to the Secretary of State and notice required.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	Watering may still occur using a bucket We would expect to exclude small businesses who water plants using a hosepipe

Filling or maintaining a non-domestic swimming or paddling pool	
UKWIR Ref	Figure F.13
Trigger(s)	Consider for implementation in Drought Management Level 3 (NEUDOs).
Demand saving (Ml/d)	Average consumption of outdoor pools is between 30l and 150l. Public pools are required to add 30l of fresh water per person entering the pool.
Demand saving (% reduction on peak)	No information available
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start 8 to 12 weeks.
Permissions required	Application to the Secretary of State and notice required.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	Public swimming pools are not covered by the restriction. We would expect to exclude swimming pools serving industrial training.

Filling or maintaining a non domestic pond using a hosepipe	
UKWIR Ref	Figure F.14
Trigger(s)	Consider for implementation in Drought Management Level 3 (NEUDOs).
Demand saving (Ml/d)	Savings from banning this activity are expected to be relatively small, linked only to lower evaporative losses.
Demand saving (% reduction on peak)	< 1%
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start 8 to 12 weeks.
Permissions required	Application to the Secretary of State and notice required.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	

Cleaning non domestic premises using a hosepipe	
UKWIR Ref	Figure F.17
Trigger(s)	Consider for implementation in Drought Management Level 3 (NEUDOs).
Demand saving (Ml/d)	Savings estimated at 1.4 to 2.7 l/building/day
Demand saving (% reduction on peak)	<1%
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start 8 to 12 weeks.
Permissions required	Application to the Secretary of State and notice required.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	Buildings may still be cleaned by hand using water from a bucket. Does not include windows. An exemption would be offered to small businesses reliant on building washing but they would be encouraged to use non potable sources of water and/or make use of low water use technologies.

Cleaning a window of a non domestic building using a hosepipe	
UKWIR Ref	Figure F.18
Trigger(s)	Consider for implementation in Drought Management Level 3 (NEUDOs).
Demand saving (Ml/d)	Savings estimated as 5 to 60 l/window cleaner/day (assuming a water fed pole).
Demand saving (% reduction on peak)	<1%
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start 8 to 12 weeks.
Permissions required	Application to the Secretary of State and notice required.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	Windows may still be cleaned by hand using water from a bucket. An exemption would be offered to small businesses reliant on window washing but they would be encouraged to use non potable sources of water and/or make use of low water use technologies.

Operating a mechanical vehicle washer	
UKWIR Ref	Figure F.15
Trigger(s)	Consider for implementation in Drought Management Level 3 (NEUDOs).
Demand saving (Ml/d)	Savings estimated at approximately 6000 l/washer/day
Demand saving (% reduction on peak)	<1%
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start 8 to 12 weeks.
Permissions required	Application to the Secretary of State and notice required.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	Cars and other vehicles can still be washed using buckets or using other sources of water. An exemption would be offered for car washes that recycle water and for reasons of bio-security

Cleaning any vehicle, boat, aircraft or railway rolling stock using a hosepipe	
UKWIR Ref	Figure F.16
Trigger(s)	Consider for implementation in Drought Management Level 3 (NEUDOs).
Demand saving (Ml/d)	<1%
Demand saving (% reduction on peak)	No information available
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start 8 to 12 weeks.
Permissions required	Application to the Secretary of State and notice required.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	Washing using a bucket is permitted. We would expect to exclude: • small businesses reliant on washing these items using a hosepipe • the elderly and disabled

Cleaning industrial plant using a hosepipe	
UKWIR Ref	Figure F.19
Trigger(s)	Consider for implementation in Drought Management Level 3 (NEUDOs).
Demand saving (Ml/d)	<1%
Demand saving (% reduction on peak)	No information available
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start 8 to 12 weeks.
Permissions required	Application to the Secretary of State and notice required.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	Cleaning using a bucket is permitted.

Suppressing dust using a hosepipe	
UKWIR Ref	Figure F.20
Trigger(s)	Consider for implementation in Drought Management Level 3 (NEUDOs).
Demand saving (Ml/d)	<1%
Demand saving (% reduction on peak)	No information available
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start 8 to 12 weeks.
Permissions required	Application to the Secretary of State and notice required.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	Dust suppression would still be permitted by bucket; however this would only be applicable to small areas.

Operating a cistern in any building that is unoccupied and closed	
UKWIR Ref	Figure F.21
Trigger(s)	Consider for implementation in Drought Management Level 3 (NEUDOs).
Demand saving (Ml/d)	47 to 465 l/office/day
Demand saving (% reduction on peak)	<1%
Implementation area	At resource zone level as appropriate
Implementation timetable	Preparation to start 8 to 12 weeks.
Permissions required	Application to the Secretary of State and notice required.
Risks associated with option	Risk of increased use during the advertising period but before the restriction comes into force.
Other	A key message would be the waste of water and the cost to the customer as well as its requirement as a drought action. Exemptions would be offered to charities, churches and other not for profit organisations but they would be advised of the key message.

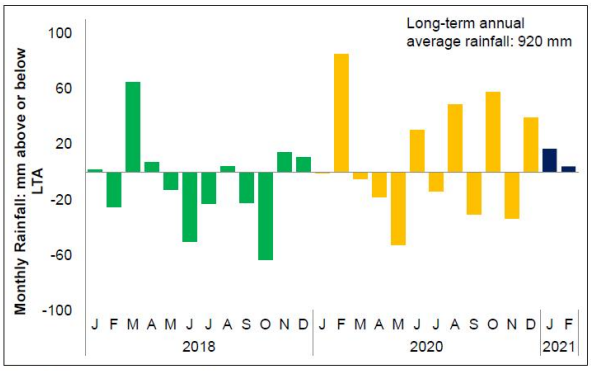
Appendix H Example Water Situation Report

Each month we produce a hydrometric report which we publish internally and to local EA colleauges. Selected screenshots are pasted below.

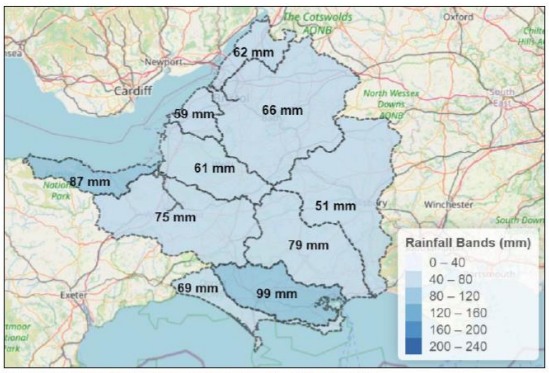
Rainfall

Wessex Water YTL GROUP

- December: 135% (141 mm)
- January: 119% (109 mm)
- February: 106% (70 mm)
- 6 month rainfall = 109% LTA
- 12 month rainfall = 105% LTA



Rainfall compared to the long-term average



Total rainfall in February for each catchment

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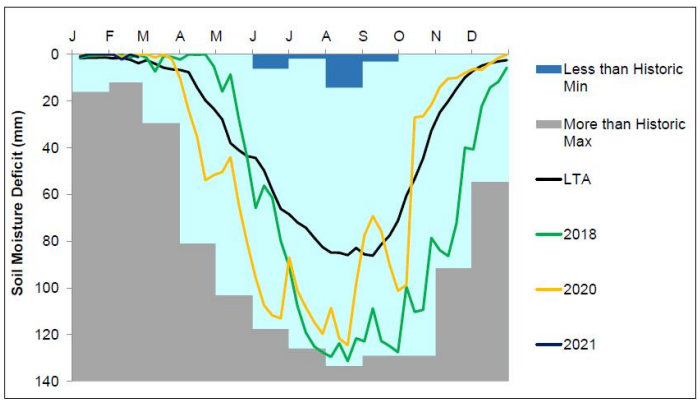
Soil Moisture Deficit

Wessex Water YTL GROUP

- There was no soil moisture deficit in February



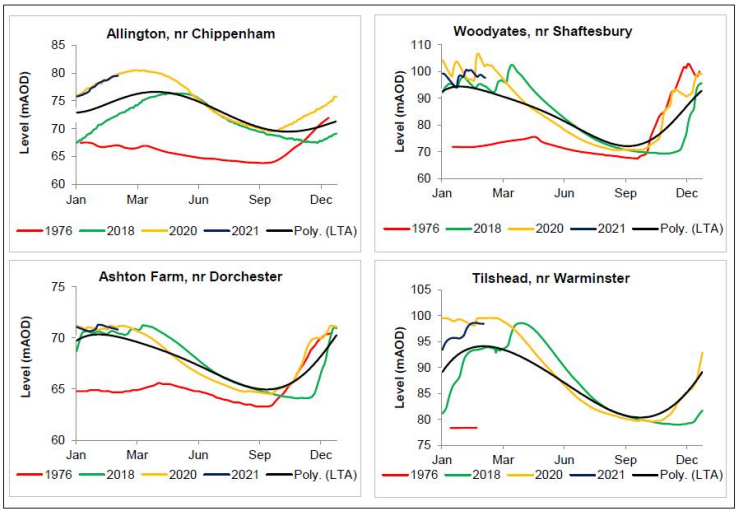
Soil moisture deficit compared to previous years, minimum, maximum and the long-term average.

5

Groundwater Levels

Wessex Water YTL GROUP

- Groundwater levels remained above average throughout February



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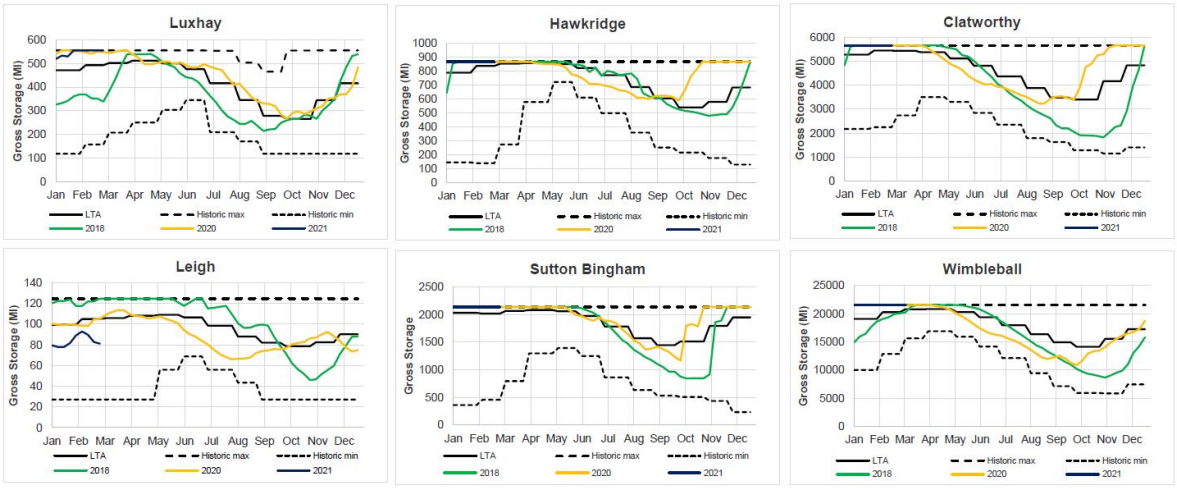
Reservoir Storage

Wessex Water YTL GROUP



Gross storage (Ml) for each reservoir at the end of February compared to previous dry years

8

Appendix I Drought Permit Application Readiness

For security reasons this appendix is redacted and not available in the version of this document published on our website.

Appendix J Non-household engagement

The outline engagement plan below indicates the type of material we will provide to retailers for their own information and to share with their business customers at each level of drought management actions while the Retailer Wholesaler Group Action Plan for water efficiency underway.

It summarises the information we will communicate to retailers via our Wholesale Service Desk. This outline plan should be viewed as indicative, we will adapt the specific details accordingly to take account of seasonality, wider media attention and the position of other wholesalers. Further relevant details are provided in the wider communications plan in Section 5.2.

The water resource position in the Wessex Water area:

- Recent rainfall
- Groundwater levels, reservoir levels, river flows
- Overall position summary and current drought level – give specific geographical issues if relevant and comment on the future lookahead should conditions remain dry
- Possible statements about drought and environmental impacts in other parts of the country to give context – being mindful that retailers may have customers across the UK.

What we're doing to help manage the dry weather:

- Summary statement about our baseline water resources management activities e.g. leakage management and water efficiency.
- Details of any specific supply or demand side drought management actions currently underway or about to be implemented.
- Relevant details of other engagement activities underway with regulators and other wholesalers.

How businesses can help

Level 1a

- We're asking all water users to be mindful how they use water
- We recommend fixing any leaking pipework and fittings on your site – if you need to find a plumber –https://www.wessexwater.co.uk/help-and-advice/your-water/plumbing/find-a-plumber
- Please consider sharing this link to our website with your staff – they can learn about their water use at home and order free water saving devices https://www.wessexwater.co.uk/help-and-advice/your-water/save-water/getwaterfit
- If you have any particular water saving initiatives you would like to discuss or dry weather needs please contact your retailer or Wessex Water on wholesaleservicedesk@wessexwater.co.uk

Level 1b

- We're asking all water users to be mindful to not waste water – please particularly consider the need for any discretionary forms of water use for example watering gardens with hosepipes and sprinklers, cleaning vehicles, windows or outdoor surfaces.

- We recommend fixing any leaking pipework and fittings on your site – if you need to find a plumber –https://www.wessexwater.co.uk/help-and-advice/your-water/plumbing/find-a-plumber
- Please consider sharing this link to our website with your staff – they can learn about their water use at home and order free water saving devices https://www.wessexwater.co.uk/help-and-advice/your-water/save-water/getwaterfit
- If you have any particular water saving initiatives you would like to discuss or dry weather needs please contact your retailer or Wessex Water on wholesaleservicedesk@wessexwater.co.uk

Level 2

- We require all water users to be mindful to not waste water.
- A Temporary Use (Hosepipe) Ban is in force for domestic/household customers. This restricts the following uses of water: Watering a) watering a garden using a hosepipe; b) Cleaning a private motor-vehicle using a hosepipe; c) watering plants on domestic or other non-commercial premises using a hosepipe; d) cleaning a private leisure boat using a hosepipe; e) filling or maintaining a domestic swimming or paddling pool; f) drawing water, using a hosepipe, for domestic recreational use; g) filling or maintaining a domestic pond using a hosepipe; h) filling or maintaining an ornamental fountain; i) cleaning walls, or windows, of domestic premises using a hosepipe; j) cleaning paths or patios using a hosepipe or k) cleaning other artificial outdoor surfaces using a hosepipe.
- Please play your part in conserving water where possible and particularly consider the need for discretionary water use for your business for any of the uses listed above that now apply to household customers.
- If you have any particular water saving initiatives or ways that you think you may be able to help the wider situation related to the way your business uses water or specific dry weather needs please contact your retailer or Wessex Water on wholesaleservicedesk@wessexwater.co.uk

Level 3

- It is essential that all water users seek to reduce their water use as much as possible.
- A Temporary Use (Hosepipe) Ban remains in force for household customers.
- A Non-Essential Use Ban is now in place. The Secretary of State has allowed us to temporarily ban the use of water in our wholesale supply region for the following uses: 1) watering outdoor plants on commercial premises using a hosepipe; 2) filling or maintaining a non-domestic swimming or paddling pool; 3) filling or maintaining a pond using a hosepipe; 4) cleaning non-domestic premises using a hosepipe; 5) cleaning a window of a non-domestic building using a hosepipe; 6) operating a mechanical vehicle-washer using a hosepipe; cleaning any vehicle, boat, aircraft or railway rolling stock using a hosepipe; cleaning industrial plant using a hosepipe; 7) suppressing dust using a hosepipe and 8) operating cisterns in any building that is unoccupied and closed.
- If you have any particular water saving initiatives or ways that you think you may be able to help the wider situation related to the way your business uses water or specific dry weather needs please contact your retailer or Wessex Water on wholesaleservicedesk@wessexwater.co.uk

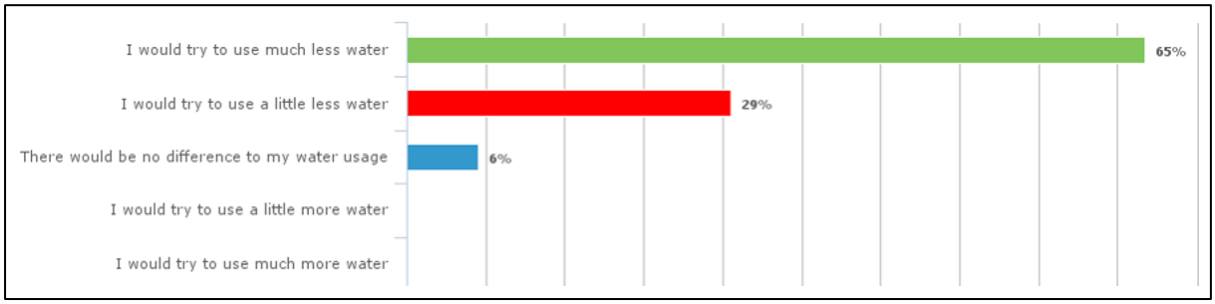
Appendix K Customer insight to inform water efficiency campaigns and communication strategies

Customer insight

To inform the development of our drought management water efficiency campaigns and wider customer communications (see Section 5.2) we have reviewed several sources of customer insight including outputs from our own research projects and external reports published by CCW and Waterwise.

Bespoke research with customers was undertaken using our 'Have Your Say' online customer panel in January 2017. Nearly 700 customers responded to the survey and although the demographics of this panel of customers is not precisely representative of our wider customer base, it does provide some useful insight. Key findings and how they have been used in this plan are described below.

Q: Imagine that a drought was happening, and water companies communicated that they need customers to use more water wisely. What impact do you think this would have on your water usage?



The figure above illustrates that customers would be supportive of campaigns during a drought to use water more wisely. Only 6% of customers felt there would be no change to their water use. The majority (65%) of customers would be prepared to try to use much less water. This is a very positive finding however, it is important to note that the respondents to this survey are perhaps more engaged in water issues than most customers are they form part of our regular survey panel. To most of our customers, we are a 'silent provider' in that only 10% of our full customer base have cause to contact us (offering us an opportunity for engagement) in any one year.

Q: Would you be prepared to do the following to reduce you water consumption, if asked by your water company?

Activity	Yes	No	Not applicable
Take shorter length showers	82%	12%	6%
Reuse bathwater/dishwater (eg, for watering plants)	78%	12%	10%
Wash my car less often	74%	3%	23%
Wash the windows of my home less often	74%	5%	21%
Stop using a hosepipe	73%	4%	23%
Flush the toilet less often	72%	26%	2%
Wash clothes less often	57%	42%	2%
Have fewer showers/baths	56%	43%	2%

These results suggest that there are several behavioural actions we could recommend during a drought that the majority of customers would be supportive of undertaking. Reducing shower length, flushing the toilet less often and reducing the use of hosepipes are actions for which it is pragmatic to ascribe volumetric savings that are consistent with our wider water efficiency programme – and so these are taken forward into our example campaign designs for Phase 1 (Level 1a) and Phase 2 (Level 1b).

Q: And for how long would you be prepared to carry out the activities, if asked by your water company?

	A week or less	2/3 weeks	1 month	2/3 months	Over 3 months
Wash the windows of my home less often	1%	2%	7%	23%	68%
Wash my car less often	1%	2%	11%	22%	63%
Stop using a hosepipe	2%	9%	16%	21%	52%
Reuse bathwater/dishwater (eg, for watering plants)	3%	7%	18%	21%	51%
Flush the toilet less often	8%	12%	17%	19%	45%
Take shorter length showers	5%	12%	24%	21%	38%
Have fewer showers/baths	8%	18%	22%	19%	33%
Wash clothes less often	8%	19%	27%	19%	27%

These findings suggest the majority of customers would be prepared to modify their water use behaviours for several months during a drought.

However, unprompted responses from some customers such as:

- “with the amount of rain the UK receives, we should never be in drought” and;
- “you should plan for such events”

alongside evidence from research reported by CCW and Waterwise (summarised below) this indicates the difficulty communicating water resource shortages effectively with customers; they might be prepared to take action in a ‘drought’ but what they define as a drought might be far more severe than we would consider an appropriate starting point to encourage customers to start taking action to reduce their water use.

The question below was asked to explore the potential impact on customers should a Temporary Use (Hosepipe) Ban (TUB, see 2.1.3) be implemented and these activities became restricted.

Q: How often do you do each of the following at home?

Activity	Regularly+ sometimes +rarely	Regularly	Sometimes	Rarely	Never	Not applicable
Watering a garden/plants using a hosepipe	61%	6%	25%	30%	32%	7%
Cleaning paths or patios using a hosepipe	49%	1%	12%	36%	43%	8%
Cleaning a car using a hosepipe	46%	5%	15%	26%	46%	8%
Cleaning other artificial outdoor surfaces using a hosepipe.	25%	1%	5%	19%	60%	15%
Cleaning walls, or windows, of your home using a hosepipe	17%	0%	4%	13%	73%	10%
Filling or maintaining a garden pond using a hosepipe	14%	1%	5%	8%	47%	39%
Filling or maintaining a swimming pool or paddling pool	8%	1%	2%	5%	47%	45%
Filling or maintaining an ornamental fountain	4%	0%	1%	3%	51%	44%
Cleaning a leisure boat using a hosepipe	2%	0%	1%	1%	50%	49%

These results indicate that the most common activities that customers undertake ‘regularly’ or ‘sometimes’ that would become curtailed during a TUB would be watering a garden with a hosepipe, cleaning paths and patios with a hosepipe and cleaning a car with a hosepipe. The imposition of a TUB would not impact on all customers as those that report ‘never’ undertaking those most popular activities ranges from 32-42%.