



Drought Plan 2022



Security Statement

This statement is to certify that this plan does not contain any information that would compromise national security interests.

It also does not contain any information that may be considered commercially confidential.

No information been excluded from this plan on these grounds.

November 2022

Contents

BASIS OF THE PLAN 5

1. INTRODUCTION 5

2. DROUGHT TRIGGERS 14

OPERATIONAL PLAN 20

3. DROUGHT ACTIONS 20

EVALUATION & MANAGEMENT OF THE PLAN 57

4. DROUGHT SCENARIOS 57

5. ENVIRONMENTAL ASSESSMENT 81

6. MANAGEMENT AND COMMUNICATIONS STRATEGY 87

7. GLOSSARY OF TERMINOLOGY 90

APPENDIX A: GROUNDWATER DROUGHT ACTION TRIGGER LEVELS 93

APPENDIX B: BOUGH BEECH DROUGHT TRIGGERS UPDATE 93

APPENDIX C: DROUGHT OPTIONS TABLES 94

APPENDIX D: COMMUNICATIONS PLAN 108

APPENDIX E: GROUNDWATER DROUGHT OPTIONS 118

APPENDIX F: RIVER EDEN MAY DROUGHT PERMIT EAR 118

APPENDIX G: RIVER EDEN SUMMER DROUGHT PERMIT EAR 118

APPENDIX H: HACKBRIDGE DROUGHT PERMIT EAR 118

APPENDIX I: KENLEY & PURLEY DROUGHT PERMIT EAR 118

APPENDIX J: OUTWOOD LANE DROUGHT PERMIT EAR 118

APPENDIX K: STRATEGIC ENVIRONMENTAL ASSESSMENT 118

APPENDIX L: STRATEGIC ENVIRONMENTAL ASSESSMENT NON-TECHNICAL SUMMARY 118

APPENDIX M: HABITATS REGULATIONS ASSESSMENT SCREENING REPORT 118

Non-Technical Summary

This plan is a revision of the Drought Plan published in May 2019, and is consistent with the Water Resources Management Plan we published in September 2019.

In this plan we set out the operational actions we will consider taking in response to drought events of different severities, guided by the position of reservoir and groundwater levels in relation to specified triggers. The aim is to identify a balance of measures, including restrictions on customers' use of water appropriate to the seriousness of the drought, to ensure that essential supplies are maintained in all but the most severe events. The plan includes an assessment of the environmental impacts that may result from the permitted abstraction of additional supplies, through the use of drought permits, from the River Eden and at three groundwater sources, and the mitigation measures that we could take to reduce these impacts. We have also completed a Strategic Environmental Assessment of the whole plan.

All droughts vary in terms of their duration and impact on the availability of water resources. This variation is caused by a number of factors, in particular the complex interactions between climatic variables, customer demand and surface and/or groundwater levels during the period leading up to a drought. Since it is an operational plan, we consider it important to demonstrate its robustness against real drought scenarios, including those we have experienced recently, but also simulated droughts of a severity we have not yet experienced which could plausibly occur.

Multi-season droughts (comprising two or more dry winters) have a large effect on groundwater resources, and as we rely on groundwater for approximately 85% of our supply, such droughts present the greatest potential threat to our overall resources.

In 2005-06, a severe two dry winter drought affected the South East, with groundwater sources in some cases reaching their lowest recorded water levels. In 2006, we were the only water company to take the step of introducing both hosepipe and non-essential use restrictions. In addition we reduced leakage and implemented a drought permit to abstract water from the River Eden outside our licensed winter period, with no significant adverse environmental impacts identified. We communicated extensively with customers and other stakeholders, highlighting information about water use and the water resources situation regularly. This suite of demand and supply side measures collectively contributed to the avoidance of the need to introduce emergency drought orders.

More recently, another two dry winters have been experienced across our supply area. We implemented Phases 1 and 2 of temporary use restrictions in April 2012. This was supported by extensive customer communication activities and liaison with regulators and other water companies in the south east of England, to facilitate a co-ordinated approach across the region particularly in respect of the implementation of temporary restrictions on water use. We were granted a drought permit to abstract water from the River Eden in May 2012. During this permit, we carried out an extensive monitoring regime to support future understanding of the potential impacts of this drought permit. Lessons learnt and feedback from customers and stakeholders during these drought events were incorporated into subsequent Drought Plans, including this one.

In 2010, a change in legislation led to an expansion of the scope of the temporary water use restrictions we are able to apply without approval from the Secretary of State.

Measures to restrict demand are taken seriously - we recognise the potential significant impacts on our customers - however they have been proven an effective means of conserving water supplies and avoiding more serious measures. Hosepipe bans have been estimated to save up 3.6% of average and 5.4% of peak demand. Building on experience and consideration of the benefits and impacts of restricting certain uses, we propose a phased approach, prioritising water saving measures subject to the severity of the drought conditions being experienced, the impact on customers, particularly small businesses, and reflecting regional drought impact and coordination of measures being implemented by water companies in the region. In this plan we have started to explore additional demand restrictions that may be needed in an extreme drought to further avoid the need for emergency measures. We base our plan on meeting set Levels of Service, which are:

- We will need to prohibit the use of hosepipes and unattended watering devices (Temporary Use Bans or TUBs) no more than once every 10 years on average – i.e. there is a 10% risk of a TUB being required in any year. This largely impacts on household customers.
- We will need to implement a non-essential use ban (NEUB) no more than once every 20 years on average - i.e. there is a 5% risk of a NEUB being required in any year. This largely impacts on non-household customers.
- We will require Emergency drought order measures (e.g. rota cuts, use of standpipes and phased pressure management) only in extreme droughts beyond a 1 in 200-year frequency or emergency situations, i.e. there is a 0.5% risk of an emergency drought order being required in any year.

A range of drought permit options have been identified as being available. We have assessed the mitigation measures needed before and during these permits so that we minimise and monitor impacts on the environment. We are now more resilient to drought events more severe than that experienced in 2004-06. The plan has been tested to a severe drought scenario, determined to be a frequency of once in every 200 years, which aligns with the level of resilience that the Water Resources Management Plan 2019 was based on. Moving forward, we will be increasing our resilience level to an extreme 1 in 500-year drought, so that we will need to use customer restrictions and apply for drought permits less frequently. This aligns with the Regional Resilience Plan currently being prepared for the south east region, and on which our next resources plan (in 2024) will be based. To prepare for these future changes, we have assessed our ability to deal with a 1 in 500-year drought scenario in this plan.

We are continuing to address metering, water efficiency and leakage, with a significant increase in demand management planned for this Business Plan period from 2020 to 2025. We also operate a highly pressure-managed network, which would allow phased pressure reduction measures to be implemented if a drought event were sufficiently serious to require it.

The risk of drought continues to be serious and proactive measures, such as those taken in the 2004-06 and 2011/12 droughts ensured that supplies were maintained. We are committed to continual improvement of our Drought Plan to enable effective management any droughts in our supply area, as we move our level of resilience to that of an extreme 1 in 500-year drought.

BASIS OF THE PLAN

1. INTRODUCTION

As the water supplier to a population of over 745,000 people, we have a duty to plan for droughts so that we can continue to provide a resilient, secure and wholesome supply of water. Equally important is the need to protect the environment against any potential damage from a drought, including from any measures we undertake.

The Drought Plan is linked to our Water Resource Management Plan (WRMP) in that both plans have the objective of maintaining water supplies to customers, at least for essential purposes, up to a defined drought severity or level of resilience. However, whereas the Drought Plan is a short-term (5-year) operational plan, the WRMP is long-term (currently 60 years) and assesses future demand against supply availability, and determines any measures needed to address a future gap in supplies.

In both plans our supply area is classed as a single Water Resource Zone (WRZ), the geographical unit of assessment used in water resources planning, and therefore any demand restrictions on customers would be implemented consistently and uniformly across the area.

This document is a revision of our previous Drought Plan published in May 2019, and incorporates the feedback received from public consultation of the draft plan in 2021. It sets out the how we will determine when a drought is triggered (Section 2) and how we will respond operationally in a timely manner, including the measures taken to mitigate the effects and monitor the impact of those actions, both during their implementation and afterwards. We have several options to maintain the supplies during a drought, which include:

- Appeal to customers to reduce demand
- Introduce restrictions on demand to household and non-household customers (Temporary Use Bans and Non-Essential Use Bans)
- Implement both long and short-term measures to increase available supplies (including drought permits)

These will be discussed in further detail in Section 0. The Environmental Assessment of drought permits is summarised in Section 5.

In this revision of the Drought Plan, we have aligned with the approach taken in the last WRMP (WRMP19) and have based our level of resilience to a 1 in 200-year drought. We have also updated our drought triggers, reference sources and tested to a wider range of drought scenarios (as detailed in Section 0) and the pro-active communications needed to reduce consumer demand effectively in accordance with the relevant guidance documentation issued by the Environment Agency (EA) and Defra. We have worked collaboratively with the other companies in our region (Water Resources in the South East (WRSE)) to share experiences and lessons learnt from managing droughts, as well as aligning our policies where practicable and beneficial.

No further droughts have occurred since the current Drought Plan was published but we have experienced high demand related to hot, dry weather in the summers of 2018

and 2020, with additional demand in 2020/21 related to the impacts of Covid-19 restrictions.

1.1. Guidance Documents

Water companies in England and Wales are required to prepare and maintain drought plans under Sections 39B and 39C of the Water Industry Act 1991, amended by the Water Act 2003, and in accordance with the Drought Plan Regulations 2005 the latest Drought Plan Direction.

This plan is compliant with the following documents:

- Drought Plan (England) Direction 2020, April 2020 – Secretary of State for the Environment, Farming and Rural Affairs (SoS, Defra)
- Government Expectations for Drought Planning, April 2020 – Defra
- Water Company Drought Plan guideline, December 2020 (Version 1.2) – EA

The following guidance documents issued from the EA since the current plan was published have been considered within this plan:

- Drought response: our framework for England, June 2017 (Known as the 'National Framework') - EA
- Environmental assessment for water company drought planning supplementary guidance – July 2020
- Exceptional shortage of rain (position statement) – January 2017, draft version of revised statement issued February 2021

Further details on the consultation process for this plan is given in Section 1.6.

1.2. Our water sources and demand

1.2.1. Sources

We rely on groundwater for approximately 85% of our supply from sources located within different aquifer resources units; the North Downs Unconfined Chalk, the North Downs Confined Chalk, the Mole Valley Chalk and the Lower Greensand, as shown in Figures 1.0 and 1.1. The North Downs and the Lower Greensand give rise to spring flows that support globally rare chalk rivers; the Rivers Wandle and Hogsmill, as well as smaller watercourses such as the Beverley Brook (all tributaries of the River Thames in the north of our area), and the River Darent whose catchment is located just on the eastern edge of our area near Westwood Water Treatment Works (WTW).

We also abstract groundwater from the Mole catchment, covering the south west and western areas of our supply area, with the river crossing the Wealden Clay, Upper Greensand, chalk and London Clay on its way north to join the River Thames.

Our single surface water source, Bough Beech reservoir, provides the remaining 15% of our supplies. It is a pumped storage reservoir, abstracting water from the River Eden during the winter period, normally September to April. Our licence permits abstraction from the river subject to certain conditions, including the maintenance of a Minimum Residual Flow (MRF) of 22 Ml/d downstream of the abstraction. The River Eden is part of the Medway catchment, part of which is located in the south eastern corner of our supply area.

Figure 1.0: Our Supply Area and Water Treatment Works

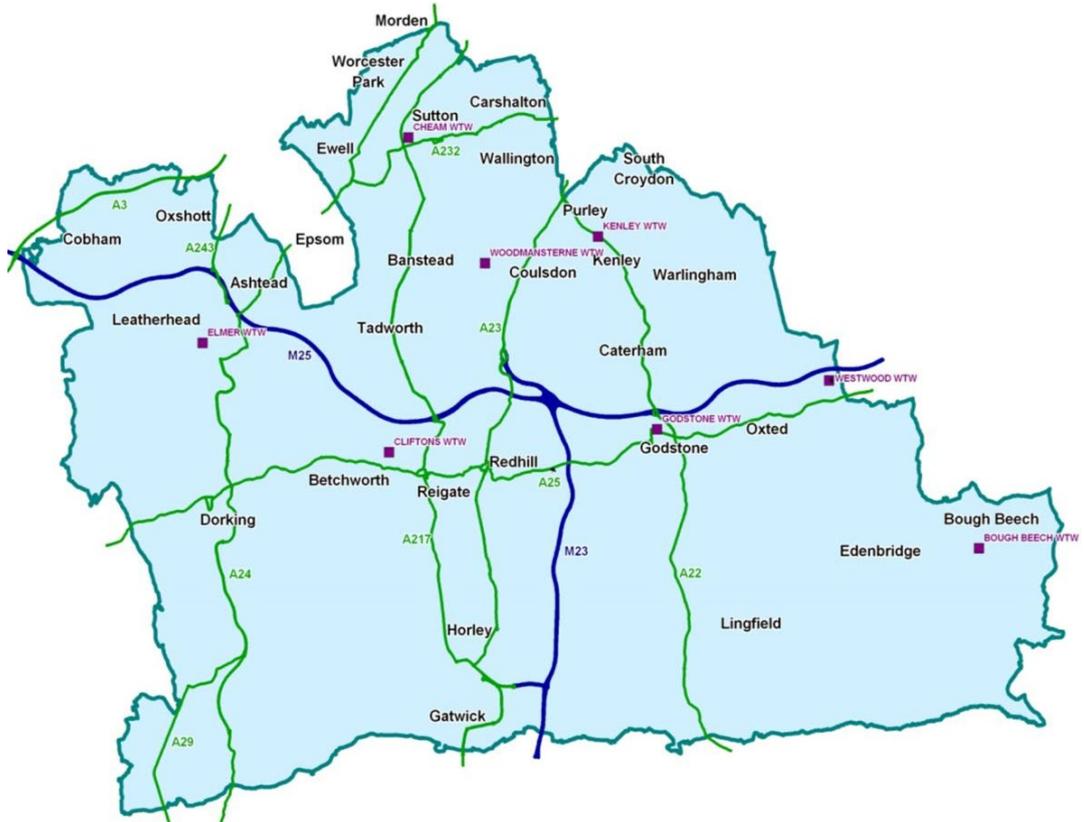
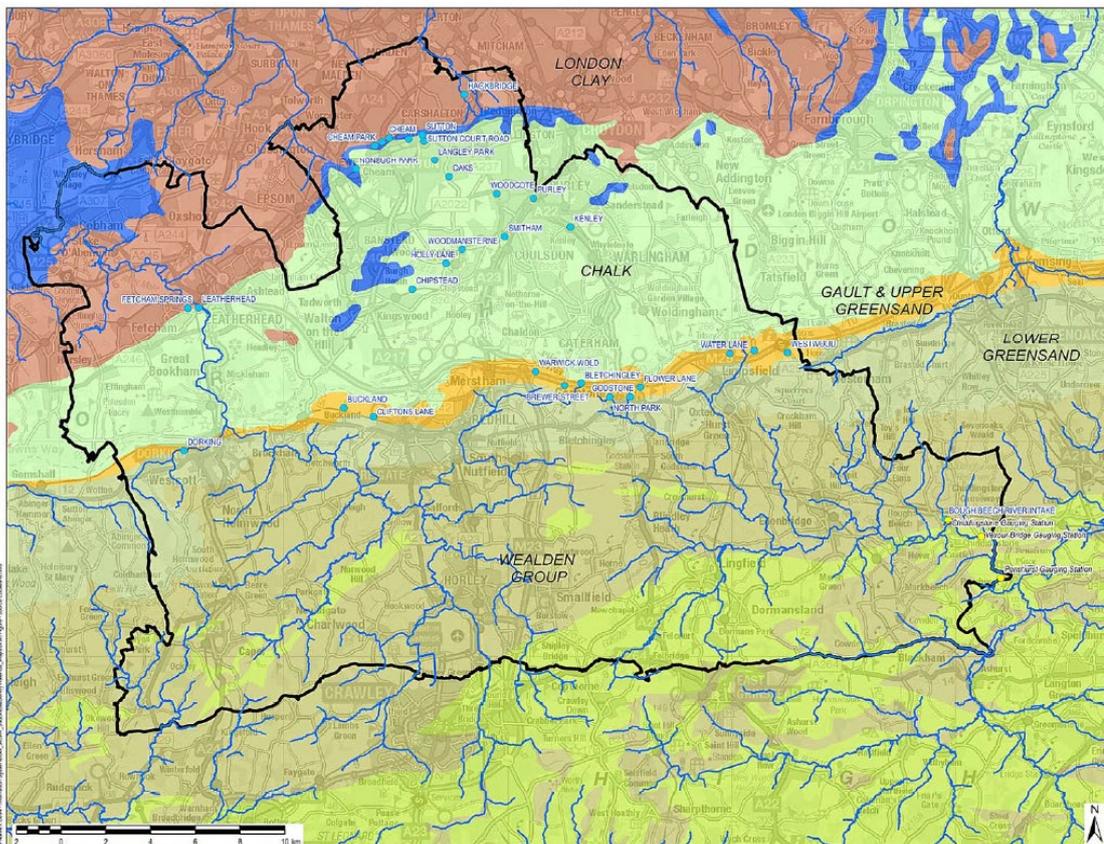


Figure 1.1: Geology of our Supply Area



Winter rainfall (defined as October to March) is of greatest importance as this normally recharges the aquifers from which we draw our supplies. Summer rainfall events (defined as April to September) are of limited benefit to groundwater reserves apart from reducing the demands placed on them due to reduced outdoor use and garden watering during these periods. Unless sustained over a long period of time, summer rainfall is evaporated, transpired by plants or absorbed in the soil and rock pore spaces above the water table and it therefore does not recharge the aquifers. This is known as 'ineffective' rainfall.

Critical drought issues are generally associated with multi-season droughts rather than a single dry season. A dry summer will result in an increase demand, whilst a dry winter can impact on our ability to fill Bough Beech in particular. Multi-season droughts have the potential to restrict the overall resource balance and our ability to meet this challenge is reviewed within this plan.

1.2.2. Demand

We supply water to approximately 745,000 consumers in 300,000 properties. Most of the demand, which was an average of 162 million litres a day (Ml/d) in 2021/22, is from households. The remaining demand from non-household properties is largely for supporting services such as schools, hospitals and offices, rather than industry. This leads to a high peak effect during dry late spring / summer periods, with domestic demand increasing significantly especially from May to July. This is largely the result of external use for garden watering and recreational purposes.

We also supply Gatwick airport including its surrounding hotels and support services, which contributes to a peak in demand during school holiday periods.

Approximately 68% of household properties and 86% of non-household properties (as at March 2022) within our supply area pay on a metered basis, excluding void (empty) properties. We are continuing to address demand management through universal metering, water efficiency programmes and leakage control, with significant additional investment planned in these areas from 2020 to 2025.

We have one Water Resource Zone covering our whole supply area, due to the interconnectedness of our distribution network which provides the capacity to move water around between areas to balance supply and demand. This aligns with the focus we have placed on supplying customers from more than one Water Treatment Works (WTW) to enhance resilience to drought and also other events including unplanned outages, flooding and bursts on strategic trunk mains. We can therefore issue communications across our area to all customers and stakeholders without having to differentiate according to their location.

1.3. Link to our Water Resources Management Plan (WRMP) & Business Plan

The WRMP comprises of an assessment of the supply-demand balance given stated Levels of Service (which relate to the frequency of implementation of demand restrictions), together with a review of the options available to manage the supply-demand balance, given environmental and other constraints and projected impacts of climate change.

This plan aligns with the WRMP we issued in 2019 (WRMP19). WRMP19 defined the work to be carried out during the five-year period commencing April 2020 in our

Business Plan, and also set out a plan for 2025 to 2080 of how to meet the forecast demand for water for this period. This plan focuses on reducing demand, although it assessed the need for supply-side options that may be needed in the future resources plans. The effects of this plan in drought planning terms are reflected in our assessment of demand-side savings from temporary use bans (TUBs). We have also accounted for changes to our treatment capacity since the last Plan was published, including upgrades at Bough Beech and Woodmansterne WTWs.

In WRMP19, two key design demand scenarios were considered, namely:

- Dry year average - representing the average year-round demand in a dry year
- Dry year critical period - representing the peak period demand in a dry year, usually experienced during summer

These demand scenarios are based on an analysis of historic weather conditions (temperature and rainfall, including recent drought events experienced in our supply area) and responses to these droughts in terms of increases/decreases in demand (distribution input, incorporating customer demand and leakage). This information has been used to inform the definition of a dry year and the critical period.

In the WRMP, these demands are balanced against groundwater and surface water yields that would be available under a range of drought conditions. These are called deployable outputs. In our WRMP19 we plan to be able to balance supply and demand during a severe drought, based on a 1 in 200-year drought return frequency. However, in any particular drought event, the actual supply-demand balance may not be exactly as that forecast in the WRMP and the extent of the drought will not be known until it is over.

In this Drought Plan we assess the risk of supply-demand imbalance under more extreme but plausible droughts, to accommodate variations from the design conditions used in the WRMP, and to outline the actions we would take in such circumstances. This required the use of stochastic weather data to generate the probability of drought that could reasonably occur over the planning period.

1.4. **Link to Water Resources in the South East (WRSE)**

Whilst this Drought Plan aligns with the current WRMP, we have also used data produced for the next round of resource plans which will be derived from the Regional Resilience Plan (RRP) currently being created for the south east region by WRSE. As part of the creation of this plan we have worked closely with the other five water companies and the EA, engaged with a wide range of stakeholders, and have been supported by a number of consultancies on the technical work required.

Alongside the RRP technical workstreams we have formed a sub-group to determine how we can align more closely on our drought plans. We have agreed on a joint statement that explains how we intend to continue working together to the benefit of our customers and the environment, as shown in the box below.

Water Companies in the South East Regional Drought Collaboration

The water companies of the south east of England recognise that as an industry we need to work collaboratively to share knowledge and best practice, co-ordinate and align communication to customers and stakeholders, and promote the efficient use of water resources. Therefore, we work closely with other water companies in our region as part of the WRSE and WRE groups. For example, we participate in the regular WRSE “dry weather” meetings which focus the risk of any potential future water shortages. In these meetings all water companies share information about their available water resources, weather forecasts, and any communication needed with customers about any emerging drought situation. These meetings are held all year round and stepped up in frequency when a risk of water shortages across the south east starts to emerge. The meetings facilitate collaboration between water companies and actions to ensure an effective regional response to a developing drought. By working together and following a joined-up approach to communication, we aim to reduce confusion so our customers clearly understand the pressure on water supplies and the environment during water shortages, what we are doing, how they can use water wisely, and what water restrictions may need to be, or are being, imposed.

The basis for the variability of responses to water use restrictions from water companies in South East England

In the South East region water companies source their supplies of raw water in the following ways:

- 1) River abstraction;
- 2) Reservoirs filled by river abstraction or impoundment of river water;
- 3) Groundwater abstraction from boreholes and springs.

The percentage balance of these varies from company to company, and even within company areas and this causes variability in drought resilience and response.

The impact of drought is felt in different areas and over different timescales. An agricultural drought affecting crop growth, for example, can occur after a few weeks of dry and sunny weather over the growing season causing unseasonably dry soil. In contrast, a water resources drought affecting the availability of water for potable supplies, take much longer to develop, after several months of below average rainfall, particularly winter rainfall which is critical for replenishing most water resources. The low groundwater levels, reservoir levels, and river flows that result from this type of dry period reduce the water available and poses a risk to a water company’s ability to supply its customers.

To manage this risk, water use restrictions are an important measure that water companies can use to reduce demand during drought. They not only enable companies to maintain essential supplies but also help to conserve water resources in periods of water shortages and reduce the environmental impacts of abstraction.

Water companies will only impose water use restrictions upon their customers if they are absolutely necessary, and in accordance with their Levels of Service for water supply. Water companies fully appreciate the confusion that can be caused when one company introduces restrictions but a neighbouring company does not. One of the reasons for this is the spatial extent of the drought: it may be very localised and not extend beyond the area served by an individual water company. Clearly from a customer point of view, if water use restrictions need to be imposed then a simple and consistent approach should be adopted across the South East.

At the regional level, one water company may need to impose water use restrictions earlier in a drought than its neighbours, while another water company is able to withhold the imposition of restrictions until much later or not at all.

The reasons why companies may have to react differently in terms of restrictions and their timing are explained below:

Differing levels of drought severity across the region: Whilst droughts across the South East will generally be caused by a regional trend of several months of below average rainfall, sub-regional

differences in rainfall amount may cause differing levels of water shortage across the region. In other words, the need to impose restrictions for one company may not equally apply to another.

Differing vulnerabilities at Water Resource Zone level: Due to the way the water supply system has developed over time, many water company supply areas are sub-divided into Water Resources Zones (WRZs). These are defined as the largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which customers experience the same risk of supply failure from a resource shortfall. WRZs can be divided into those dependent upon:

- River abstraction only;
- Groundwater abstraction only;
- Reservoirs filled by abstracting local river water or by impounding river water;
- Various combinations of the above.

This mix of WRZ types means that even if there were not a significant difference in drought severity across the region, WRZs will tend to react differently to the same drought, with certain zones experiencing higher levels of risk to potable supplies than others. That means in similar drought conditions, rivers, groundwater sources and reservoirs across the region can respond differently in terms of risk to supply. For example, a WRZ dependent on combined river abstraction and reservoir storage for supply may have a different level of risk to one based on groundwater abstraction. This difference in WRZ vulnerability has an impact both at the company level and regional level. A water company may need to introduce water use restrictions in its more vulnerable WRZs but not need to extend the ban to the remaining zones in its area of supply.

The introduction of the new powers in the form of the Temporary Use Ban (TUB) in 2011 provided an opportunity for the water companies in the South East to review their Drought Plans with a view to finding a clearer, more consistent and more unified approach to introducing water use restrictions across the region than in the past.

The water companies in the South East have had formal meetings to discuss the development of their plans and ensure that they are implementing the powers as consistently as possible. The companies are committed to working collaboratively during periods of water shortages. In this context they have worked together to align the drought levels in their plans and to align as closely as possible the restrictions and exemptions that would be imposed when a TUB and a Non-Essential Use Ban (NEUB) are implemented. However, due to the local differences highlighted above, the timing of drought plans and actions will vary across the region.

1.5. Levels of Service

Demand restrictions are one of the ways water companies can use to help manage the severity of a drought event. These restrictions can take different forms, and their implementation will depend on the particular drought event. Companies plan to be able to manage supply and demand so that they expect to require demand restrictions according to a certain return period. These return periods are termed 'Levels of Service' and are effectively a standard of service we aim to provide to our customers.

Our Levels of Service are:

- We will need to prohibit the use of hosepipes and unattended watering devices (Temporary Use Bans or TUBs) no more than once every 10 years on average – i.e. there is a 10% risk of a TUB being required in any year. This largely impacts on household customers.
- We will need to implement a non-essential use ban (NEUB) no more than once every 20 years on average - i.e. there is a 5% risk of a NEUB being required in any year. This largely impacts on non-household customers.

- We will require Emergency drought order measures (e.g. rota cuts, use of standpipes and phased pressure management) only in extreme droughts beyond a 1 in 200-year frequency or emergency situations, i.e. there is a 0.5% risk of an emergency drought order being required in any year.

Demand restrictions are implemented on a precautionary basis as a management response in preparation for a developing drought of unknown severity and therefore their frequency will not necessarily reflect the magnitude of the ultimate drought event. It is important to recognise that the Level of Service return period is not equivalent to the drought severity return period. Having said this, demand restrictions would not generally be expected during drought events with a return period of 1 in 10 years or less, but this depends on how the drought is defined.

As detailed in Section 2, trigger curves related to groundwater and reservoir levels are used to inform when it may be appropriate to implement demand restrictions, as well as supply-side measures. With a changing climate, the frequency and magnitude of droughts will change and therefore the trigger curves that currently define levels of service may be breached more frequently in the future and will therefore need to be reviewed in order to maintain our stated Levels of Service.

Under the requirements of the National Framework for Water Resources (EA, 2020) companies are required to 'explore how they can coordinate the use of TUBs' and 'review their planned frequencies for the use of TUBs and NEUBs in the light of the planned increase to drought resilience'. Within the RRP for the WRSE region we plan to achieve resilience to a 1 in 500-year (extreme) drought from 2040, and therefore we expect that our Levels of Service may change in subsequent Drought Plans to align with this. The WRSE has also set out its policy that 'the WRSE water company members will work towards a common planned frequency for the introduction of temporary use bans and also, potentially, Non-Essential Use Bans (WRSE, 2021).

To move towards this common goal, the ability of existing systems to support a change in level of service must be explored, as must the willingness of customers and interested parties to support the potential further investment required to achieve this goal. WRSE has published an insight into this in the draft Regional Resilience Plan published for consultation in January 2022.

1.6. Pre-draft and draft consultation details

For this Drought Plan, we have carried out pre-consultation with the Environment Agency (EA), although this has been particularly challenging with the shortened timetable for preparation. This has been in the form of quarterly review meetings and specific discussions at a regional level particularly in reference to the inclusion of drought options in the RRP. We submitted our pre-consultation letter to the EA in September 2020, setting out our key areas of focus for this plan. We have also shared technical assessments in advance of publication, although due to the short timescale required for this plan since finalisation of the guidance we have agreed to discuss feedback during the consultation period, i.e. post April 2021, and amend the plan as necessary during the revision stage. However, as we carried out a series of workshops with the EA and Natural England as part of the previous plan in 2018 and 2019, we would expect that there would be fewer areas for detailed discussion unless it relates to changes in requirements in the guidance.

During the consultation process for the 2019 Drought Plan, representations were received from six organisations, with concerns raised on a range of factors, including environmental assessment of drought permits, impacts on other abstractors and more details on scenarios. Our Statement of Response to this feedback was submitted to Defra in February 2018. We made amendments to the draft plan where we considered appropriate to address the representations received. Further revisions were made to the plan before its final publication to reflect the request from Defra for additional information regarding drought permits.

As part of the consultation on this version of the Drought Plan, we carried out additional measures to encourage more feedback from customers and a wider range of stakeholders, including a focus group and the use of an online form with set questions. This is similar to the approach taken for WRMP19, which led to more responses than the previous consultation as it was simpler and easier for customers and stakeholders to provide their views. The results are set out in our Statement of Response.

We also carried out a webinar with Retailers, with the WRSE group, to explore impacts on business customers. We will continue to work with Retailers, non-household customers and NAVs to encourage steps towards water efficiency and drought preparedness.

The consultation was based on the following steps:

1. Once approved for publication by Defra, we published the draft Drought Plan on the 'Publications' page of our website, alongside a supporting statement which describes the process for providing comments and when they must be received by (based on an 8-week consultation)
2. We produced an online form which contains set questions linked to the supporting statement. We will invited people to submit their responses to the questions on the form, which will be sent directly to Defra for review.
3. We sent a link to the draft plan on our website to all statutory consultees and other organisations/individuals that are interested in water resources and drought planning
4. Our Statement of Response (SoR) was published on the same website page
5. We informed those who made comments that the SoR was published on our website

This version of the Drought Plan is a revision of the draft published in 2021, and it includes a Strategic Environmental Assessment for consultation.

2. DROUGHT TRIGGERS

2.1. Drought Vulnerability

We continually monitor and record groundwater levels, river flows, surface water storage and rainfall within our supply area. Consequently, the risk of drought and its impacts on the catchment, water resource availability and our customers can be effectively assessed and appropriate drought measures can be implemented in good time to maintain supplies and meet our Levels of Service. We can also take early action to protect habitats that depend on spring and river flows, especially in the north of our area where the chalk river sources are located.

We monitor water levels at Bough Beech reservoir, whilst groundwater levels are monitored at several observation boreholes (OBHs) in the chalk and greensand aquifers that we abstract from to determine whether drought triggers have been crossed relative to the time of year. The triggers are used to identify what action needs to be taken, including supply-side actions (drought permits/orders) and demand-side actions (TUBS/NEUBs) as detailed in Section 0.

We assess the drought triggers at Bough Beech and groundwater separately in the sections below. The drought trigger levels are intended to support decisions as part of a framework for drought management. It is important to note that the trigger levels act as guidance to required action but should be seen within the context of the time of year, water level trends, and a range of other factors. How we assess the two datasets in combination, alongside other factors including customer demand, is discussed within Section 0, Drought Scenarios.

In Section 3.5 of our WRMP19 ([SES Water's Water Resources Management Plan | SES Water](#)) we carried out an assessment of our vulnerability to droughts and concluded we should assess our vulnerability to both the worse drought on historic record and a 1 in 200-year drought, to test which was the most challenging. As stated in Section 1, this plan is based on being resilient to droughts up to a severity of 1 in 200 years. When this level is close to being breached, it is expected that more serious demand restrictions and actions with the highest level of environmental impacts are carried out. This is known as 'More Before 4', in reference to the final stage of the Plan - Level 4 – the point at which emergency actions such as standpipes and rota-cuts are needed because the availability of supplies is so low.

For WRMP24 we will update our vulnerability to droughts that are more severe, to a level of 1 in 500 years. We will apply the UKWIR Drought Vulnerability Framework (17/WR/02/12) using frequency analysis from the WRSE weather sequences.

2.2. Rainfall Data

Rainfall data is not used to determine which drought level we are in operationally but is used as evidence to support the application for restrictions or a drought permit.

Daily rainfall data is collected from 10 sites across the supply area, including at Bough Beech WTW, Cheam WTW, Kenley WTW and the Redhill Head Office. In the current Drought Plan, a comparison of this rainfall data against long-term averages was considered sufficient to demonstrate that the 'Exceptional Shortage of Rain' criteria was

met before submitting a drought permit application, as required in the EA supplementary guidance on this area.

For this plan, we will calculate precipitation indices in the vicinity of our drought permit sites to enable us to meet the requirements of the Exceptional Shortage of Rain assessment. We will use data from the HadUK-Grid (Met Office et al., 2018) rainfall sites that have been used to underpin the WRSE stochastic climate datasets and the hydrological and hydrogeological modelling being done for the WRMP24 so that the two plans will be consistent. This areal data, which is also being used by the EA, is more robust than using data from individual rain gauges as it is more representative and less prone to changes at one site. The company rainfall data will be used as supporting evidence.

We would work with the local area EA team to determine the most relevant period of time to assess, for example successive dry winters, before placing an application for a drought permit.

2.3. Groundwater Drought Triggers

We commissioned our framework consultants Atkins to review the groundwater triggers used in our previous Drought Plan to determine if the reference observation boreholes should be amended and also to revise the trigger levels that identify actions to be taken in sequence as a drought progresses. Full details of their analysis are given in Appendix A, with the results summarised here.

2.3.1. Chalk Sources

Previously the Well House Inn (WHI) observation borehole was used as our reference borehole for the chalk aquifer (and Lower Greensand aquifer). However, analysis has shown that the rate of groundwater level recession at this borehole was not as high during extreme droughts as expected and therefore it may not be representative of the wider aquifer. The EA has already moved its long-term North Downs monitoring to nearby Chipstead OBH which shows a good correlation with WHI but exhibits greater recession during extreme droughts. Although there are some data limitations at Chipstead, we propose to also adopt the site as the reference observation borehole for our chalk groundwater sources. This was considered in our previous Drought Plan and also in our WRMP19.

We also asked Atkins to review whether there was a need to establish a reference borehole in the Lower Greensand aquifer unit, from which we abstract at a number of sources. A review of alternative OBH options identified that Riverhead OBH near Westerham was likely to be best location.

In addition to the Levels set out in the EA guidelines – from Level 1 to Level 4 - we have introduced trigger Level 0, representing the point at which environmental stress may be occurring, with particular reference to the chalk river catchments. A summary of the trigger levels and frequency that they are likely to be triggered, based on our target Levels of Service, is given in Table 2.0. The Drought Actions associated with each level, detailed further in Section 3.1, is also shown.

Table 2.0: Groundwater Drought Triggers

Drought Return Frequency (approx.)	Drought Level	Drought Actions
1 in 4 years	0	Environmental stress – awareness
1 in 8 years	1	Media campaign
1 in 10 years	2	TUBs, drought actions with minor environmental impacts
1 in 20 years	3a	NEUBs, drought actions with moderate environmental impacts
1 in 50 years	3b	'More Before 4' drought actions with significant environmental or customer impacts
1 in 200 years+	4	Emergency drought plan

Appendix A gives a detailed analysis of the drought triggers used at the WHI observation borehole in the current Drought Plan, which was based on a lumped parameter model and the 15,000-year stochastic data used for the WRMP19. It also compares the results of WHI with the new updated model and the WRMP24 stochastic dataset of 19,200 years. The annual frequency of breaching the triggers was calculated and compared to the Levels of Service and adjusted until the requirements were met. The charts of trigger levels have been produced by plotting the maximum or minimum of the average monthly levels.

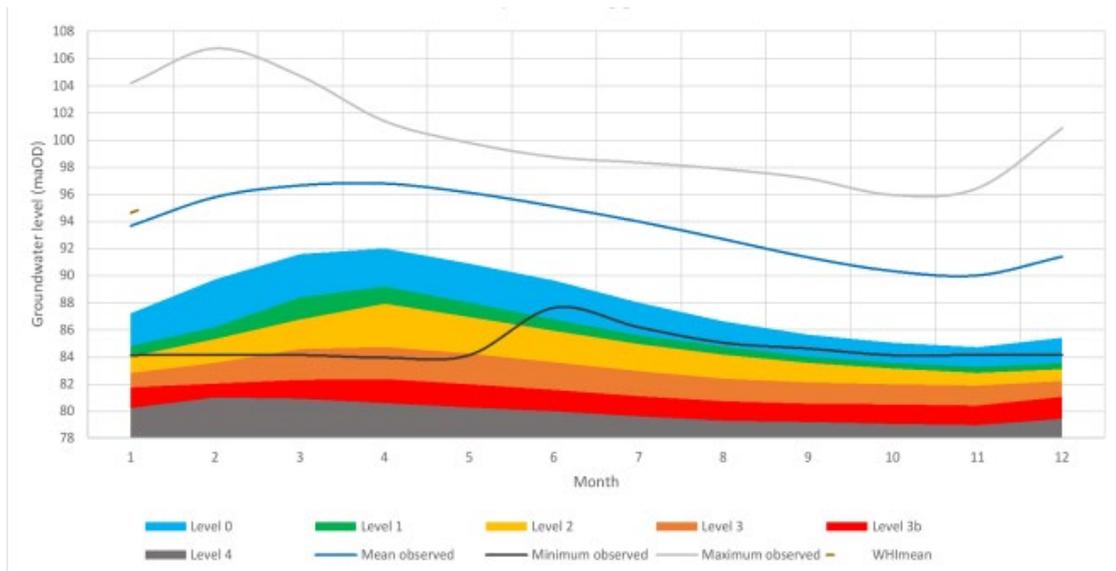
It was found that the WHI drought triggers using the revised dataset resulted in a lowering of the triggers. Previously any reduction below the mean groundwater level resulted in Level 1 being triggered. The season impacts remain similar, with less change over the year with the more extreme droughts. A comparison with the historic record showed the frequency in which the levels are reached over a 70-year period.

Trigger levels for Chipstead were generated in a similar way to WHI using a lumped parameter model and statistically analysing the full 19,200-year record. The triggers are shown in Figure 2.0 alongside mean, minimum and historical observed groundwater levels.

As with WHI, we tested the impact of the triggers through a comparison of the historic record, which for Chipstead was from 2002 to 2020. This showed Level 0 is entered 1 in 4 years, Level 1 & 2 – 1 in 9, Level 3a - 1 in 18 years. Neither Level 3b or 4 are triggered in the short 18-year record.

We also tested the triggers using stochastically generated groundwater levels to assess a 1 in 200-year and 1 in 500-year event. It showed that the 1 in 200-year example drought just touched Level 4, whereas the 1 in 500-year event dipped more significantly into the emergency level.

Figure 2.0: Chipstead Drought Triggers



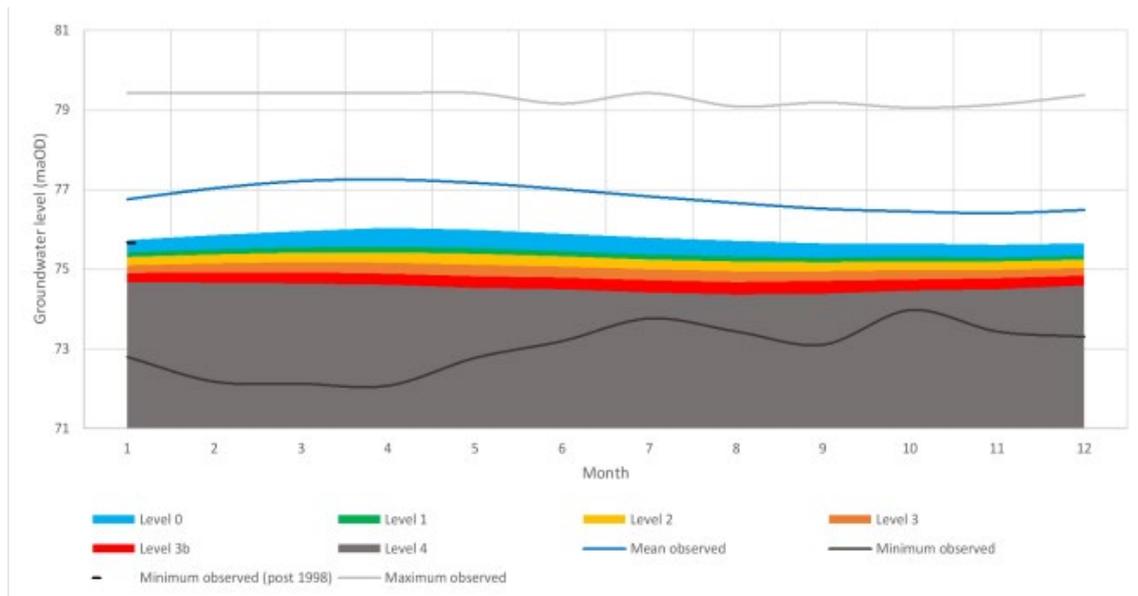
2.3.2. Lower Greensand Sources

We abstract 15-20% of our raw water from Lower Greensand sources supplying Godstone, Westwood and part of Elmer WTWs. Trigger levels for Riverhead OBH, close to Westwood WTW, was also generated using the same methodology as for WHI and Chipstead. However, there was low confidence in the pumped parameter model, especially in replicating the 1990s droughts, which may at least in part be due to changes in abstraction from Thames Water lower down the Darent catchment. This meant data needed to be excluded in order to produce expected drought trigger curves at the higher zone boundaries, as shown in Figure 2.1.

Whilst these triggers should therefore be treated with caution, and may require revision once tested operationally, the inclusion of Riverhead as a reference source alongside Chipstead is regarded as an improvement to the robustness of the plan as it is a better representation of Lower Greensand sources. As the aquifer has a higher storage level it is relatively stable across the seasons.

Testing of the proposed triggers against the historic record concluded that the more severe drought action triggers are breached more frequently than our target Levels of Service, but that this is likely to be due to the issue identified with low groundwater levels in the 1990s not being accurately represented, as well as the relatively short duration of the record. Comparisons of the example droughts for 1 in 200 and 1 in 500 from stochastically derived data produced expected results, with a small difference in levels between the drought events.

Figure 2.1: Riverhead Drought Triggers



2.4. Surface Water Drought Trigger - Bough Beech Reservoir

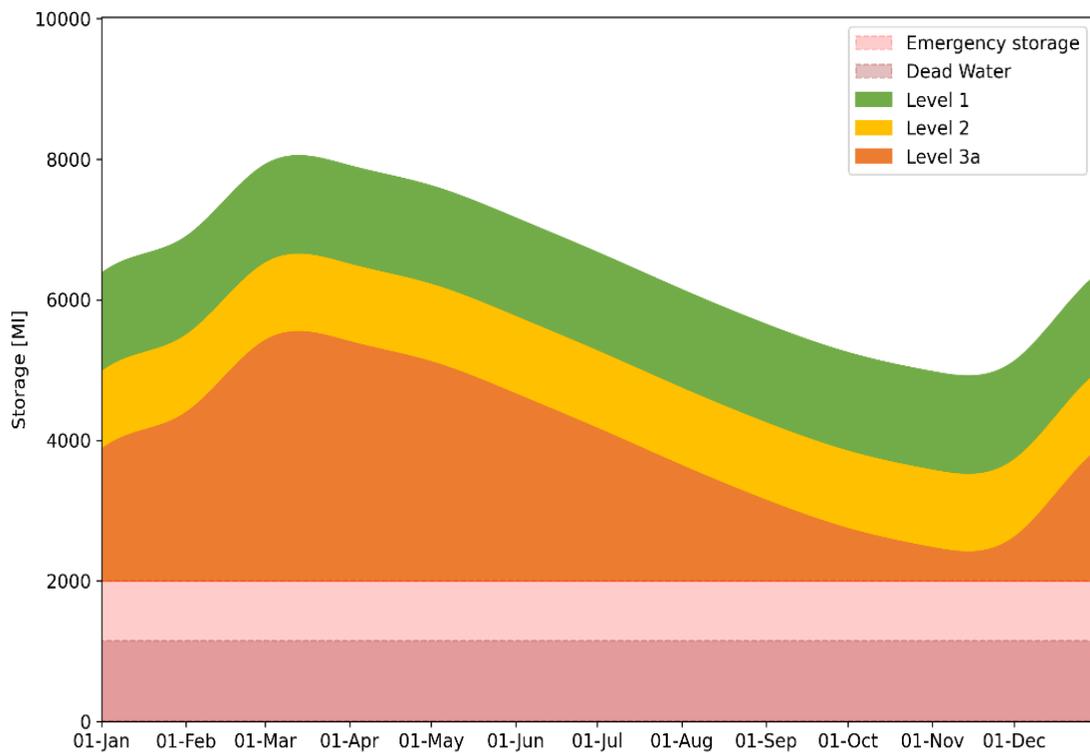
As with groundwater triggers, for this plan we have updated our methodology to use the full stochastic inflow series (19,200-year timeseries) to test the impact of more extreme drought events. This showed that the triggers needed to be updated to match our target Levels of Service. Full details are shown in Appendix B.

We have switched to using a Pywr model to test new curve options and to calculate deployable output (DO). This aligns with the method used to inform the Regional Resilience Plan. During testing we checked that we would be able to implement actions early enough to reduce the severity of events and be operational feasible.

We used the most recent observed storage data (from 1995 to 2020) to inform the optimisation of the drought triggers. This includes both wet and dry years so is considered representative. We have used the latest works capacity output of 55 MI/d in the model. The curve profiles were shifted using various factors and tested using the ‘Scottish DO method’ with the full stochastic timeseries until an optimum set were produced. This included testing DO with and without the benefit of demand savings from TUBs and NEUBs at different drought frequencies from 1 in 10 years to 1 in 500. We also calculated the number of days between trigger crossing to test that the minimum required time period between levels was achieved.

The new curve set for this plan, shown in Figure 2.2, increases the 1 in 200 DO benefit from demand savings from 0.2 million litres a day (MI/d) to 1.0MI/d. The maximum storage of the reservoir is just over 10,000 MI. The position of the Level 1 boundary is now significantly below the long-term average to not be triggered too frequently, at 1 in 9 years based on the historic data. Level 2 is crossed in 2 years out of the 25.

Figure 2.2: Bough Beech Reservoir Drought Triggers



2.5. Monitoring and Forecasting

Managing water resources continually requires consideration of existing supplies along with future climate and its potential impacts on groundwater and surface water. For the majority of time, when winter rainfall has been sufficient to replenish groundwater levels and Bough Beech Reservoir is full, no formal assessment is required. However, if there has been insufficient rainfall over the winter recharge period, groundwater levels are below average or there has been insufficient flow in the River Eden to fill Bough Beech reservoir, a more detailed analysis of potential scenarios and impacts is required.

Monitoring information is held by the Operations Statistician, including rainfall data, river flows, groundwater levels and demand. This is reviewed weekly by the Water Strategy Manager and reported to senior managers and operational leads at the same frequency.

In early 2017, following several months of below average rainfall, such an assessment of water resources for the remaining winter and spring was required to help anticipate any impacts on operations in 2017. Three scenarios were selected with rainfall between February and May 2017 at 100%, 80% and 60% of long-term average. Time series of rainfall and PET were run through groundwater and surface water models to identify the impact on groundwater deployable outputs and reservoir levels. The outputs indicated that groundwater levels were at risk of breaching trigger levels 3a and even possibly 3b at Well House Inn OBH but that surface water levels in Bough Beech reservoir were predicted not to breach either trigger level 3a or 3b. This exercise gave us advanced notice of possible issues with groundwater resources in 2017.

The use of scenario testing is discussed further in Section 4, Drought Scenarios.

OPERATIONAL PLAN

3. DROUGHT ACTIONS

In response to one or more drought triggers being crossed, we will consider the need for actions to be taken as set out in this section. Actions can be divided into those related to decreasing demand - including household and non-household use, leakage and operational (company) use - and those that increase supplies available, either raw or treated, usually in the form of drought permits. In addition, there are operational changes that can be implemented which can re-distribute resources to balance out areas where supplies are at a higher risk. The investment in resilience we have undertaken during the current and previous asset investment periods has improved the transfer of water across our area of supply.

We are strongly mindful of the need to minimise our impact on the local environment. Actions which reduce demand would be prioritised before those that involve abstracting more water, whilst if there is a need to implement a drought permit then those which are the least environmentally damaging would be selected first. Details of the options are tabled in Appendix C, with the sequencing of actions given in Section 0.

3.1. Demand-side actions

The demand-side measures taken will depend on the timing and severity of a drought. Since 2010, the legislation governing the powers available to water companies to impose water use restrictions to manage demand has been amended.

The following demand management measures are discussed in this section:

- Customer awareness
- Leakage management & Operational Usage
- Temporary water use restrictions on households (Temporary Use Bans)
- Restrictions on uses of water through an Ordinary Drought Order (Non-Essential Use Bans)
- Additional demand restrictions ('More Before 4')
- Emergency Drought Orders including phased pressure reduction, rota cuts and standpipes

In line with recommendations made in the EA Drought Plan Guideline and UKWIR Code of Practice and Guidance on Water Use Restrictions (UKWIR, 2011), we have discussed with other water companies in South East England regarding the potential for taking a joined-up approach to drought management. The benefit that results is there is a consistency of messages to customers regarding the need for water conservation and introduction of a new scope of demand restrictions. While it has been recognised that it is not feasible to implement identical drought plans due to the different circumstances of individual companies, whenever practical we have aligned our approach to that of neighbouring water companies in the WRSE region. This includes exemptions from TUBs and NEUBs and their enforcement.

3.1.1. Customer awareness

Communicating clearly with customers is one of the most important parts of the drought management process, with early engagement laying the foundation for achieving good co-operation should the drought progress further. To achieve a reduction in demand during a drought period it is essential that we gain the full co-operation and engagement of our customers, both household and non-household. However, even with a well-managed customer awareness programme the uncertainty of estimated savings is high. The efficacy of the communications during a drought event and the nature of the event in terms of timing and geographical extent will affect the impacts. Therefore we have decided not to include any customer communications savings in our plan so that we do not over-estimate the benefits. Details of our Communications Plan is given in Appendix D.

We support the new requirement in the guidance to have a communication plan that is 'agile' - adaptive and flexible to the situation and using a range of channels. We would focus on having a proactive media communications campaign to improve customer awareness of the level of drought and the details of the actions being taken. We would take account of local conditions, for example we recognise it is challenging to explain impending drought conditions if there has been recent flooding in the area. We would work with regional and national groups to co-ordinate messaging.

We will utilise different channels of communication including our website, social media, leaflets with bills, electronic newsletters and printed magazines, as well as media publicity on a regional level including radio and television and working with third parties. This will build on our existing water efficiency and consumer education campaigns such as the schools education programme, home water efficiency visits, behavioural change campaigns, water use calculator and free water-saving packs.

Information needs to be accurate, up to date, transparent, clear and consistent. Communication methods will be designed to encourage water saving behaviour and communicate the need for, likely duration and frequency of demand management measures, as well as the terms of any concessions. Where possible, communications will be designed so that it is relevant and understandable to different groups of consumers (UKWIR, 2016). We will seek assistance from our stakeholders including environmental groups and those representing vulnerable groups to identify the best way to get the information to consumers and explain the link to the local environment. Local community groups will also be engaged since residents are more likely to trust messages from these representatives.

In the event of a drought which is triggered in the winter period, whether single-season or multiple-season, communications will be focussed on reducing leakage, through the promotion of campaigns such as *Wrap Up For Winter*.

For non-households, communications will be primarily directed to the Retailers operating in our area of supply with the intention that they make their customers aware of the need to be more water efficient. Specific messages will be directed to different sectors, with support sought from the relevant organisations. Full details are detailed in the Communications Plan.

3.1.2. Leakage management, Pressure Control and Operational Usage

Our record on leakage is one of the best in the industry and we have consistently met Ofwat performance targets. This has been achieved this by the implementation of a comprehensive, telemetry linked District Metering system reaching approximately 97% of properties, optimised pressure management throughout the network, the use of a data analysis system to provide 'real time' estimation of leakage, and the implementation of an industry leading performance-based leakage detection contract.

Due to our effective and proactive approach to leakage management, it is not expected that leakage can be reduced significantly during drought periods. However it is an important issue to customers and proactive reduction of leakage reinforces the message that water needs to be conserved, particularly during periods of drought when wetland and river ecosystems are likely to be under stress.

The options available to reduce demand from leakage and operational usage are:

- Increase resources on leakage detection
- Reduce leak repair 'run times' on company apparatus
- Increased focus on leak repairs of customers' supply pipes
- Increase awareness of the need for customers to repair leaks on internal plumbing systems
- Additional pressure management within District Metered Areas that are pressure controlled, to reduce leakage and customer consumption
- Restrict mains flushing activities to essential operations only (for example as part of the commissioning of a new water main)
- Restrict service reservoir cleaning operations to essential operations only (for example due to a sample failure)
- Postpone or cancel planned outages at water treatment works

During last significant drought, in 2006, we implemented increased active leakage control. Additional leak detection staff were employed and the response time for repairing visible leaks was improved. We estimate that this initiative resulted in a temporary reduction in total leakage of around 0.3 Ml/d and a record low end-of-year leakage figure of 24.01 Ml/d. Our leakage reduction strategy will continue to be reviewed in the event of the Level 1 trigger levels being activated, in order to assess the need for any further leakage reduction measures.

During 2016-2018 we carried out a programme of installing critical pressure point (CPP) loggers at the extremities of each District Meter area. The pressure at the inlet to a District Meter area can then be controlled based on the data from these CPP loggers. This optimises pressure control so that service levels are met but leakage and usage is minimised. During a drought period the scope for additional controls can be investigated.

Estimated savings from and the scheduling of leakage, pressure management and operational usage restrictions is detailed in Table 3.4 and Section 3.1.7 respectively.

3.1.3. Temporary use bans

The Flood and Water Management Act 2010 amended the Water Industry Act 1991 to update the legislation on temporary use bans (TUBs). Supporting information, definitions and exemptions for each water use activity covered by the legislation are detailed by The Water Use (Temporary Bans) Order 2010.

These restrictions cover the outdoor use of water for household purposes. We will give consideration to implementing TUBs when levels at one or both reference sites cross trigger level 2. TUBs can be introduced quickly – seven days after an advert has been placed in newspapers in the area.

Water companies can grant exceptions from these restrictions for customers and businesses. These exceptions aim to minimise the impact on vulnerable customers and the economy. There are two types of exceptions to these restrictions which can be applied by water companies:

- Statutory Exceptions – activities/water uses which are exempt from the legislation;
- Discretionary Exceptions – activities/water uses which are not covered by a statutory exception but water companies can grant the use of a hosepipe under certain circumstances. Discretionary Exceptions can be further split into two categories:

‘Universal’ – these exceptions have been agreed by all companies who signed up to the Drought Code of Practice (a document which aims to ensure a common approach to drought management by UK water companies). Such exceptions do not require customers to write or make representation to the water company to obtain permission; and

‘Other concessions’ – these are exceptions which individual water companies can choose to offer customers, depending on the particular circumstances. These exceptions do require customers to write or make representation to the water company to obtain permission.

To align with other companies in the region, we have reduced the number of phases of TUBs in our area from 3 to 2. Both phases would be brought in, in sequence if necessary, after trigger level 2 is crossed.

Phase 1:

- Watering a garden using a hosepipe

Phase 2:

- 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 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

Details of the restrictions and the exemptions, which are aligned across the WRSE region, are given in Tables 3.1 and 3.2.

Table 3.1: Inclusions and exemptions from Phase 1 temporary use restrictions

Restricted uses of water	Exemptions from restrictions
<p>Watering a garden <u>using a sprinkler, unattended hosepipe or equivalent</u>, including the following definitions of “a garden” (The Water Use (Temporary Bans) order 2010, Clause 4(2)):</p> <ul style="list-style-type: none"> a) a park; b) a lawn; c) a grass verge; d) an allotment garden, as defined by section 22(1) of the Allotments Act 1922(a); e) any area of an allotment used for non-commercial purposes; f) gardens open to the public; g) any other green space. 	<p>Watering a garden <u>using a sprinkler, unattended hosepipe or equivalent</u>, including the following definitions of “a garden” (The Water Use (Temporary Bans) order 2010, Clause 4(2)):</p> <ul style="list-style-type: none"> a) an area of grass used for sport or recreation, noting that the exemption only applies to the active strip/playing area, not the entire ground.
	<p>Watering a garden <u>using a handheld hosepipe</u>, including the following definitions of “a garden” (The Water Use (Temporary Bans) order 2010, Clause 4(2)):</p> <ul style="list-style-type: none"> a) a park; b) gardens open to the public; c) a lawn; d) a grass verge; e) an area of grass used for sport or recreation; f) an allotment garden, as defined by section 22(1) of the Allotments Act 1922(a); g) any area of an allotment used for non-commercial purposes; h) any other green space.
	<ul style="list-style-type: none"> a) Watering a garden using automatic irrigation systems, provided that they comply with all of the following conditions: b) The water supply to which the device is connected must be one which is charged to the user by reference to volume by meter belonging to SES Water plc; c) No part of the system may be handheld; d) The system must incorporate a pressure reducing valve; e) The system must incorporate a time clock control; f) The system must deliver water by means of a drip or trickle system;

Restricted uses of water	Exemptions from restrictions
	<p>g) The system must not disperse water through the air by means of sprinkler, jet, mister or similar device;</p> <p>h) The system must deliver water directly either on to the surface of the soil or under the surface of the soil; and</p> <p>i) The system must not cause any surface water run-off.</p> <p>Newly laid turf for the first 28 days since being laid</p> <p>Any person who has dispensation as a result a need arising from disability, medical condition or similar, to use a hosepipe for the prohibited purposes or to fill or maintain a domestic swimming or paddling pool or ornamental fountain or pond. This includes Blue Badge holders or customers who are registered on the SES Water Priority Services list due to a lack of mobility.</p>

Table 3.2: Inclusions and exemptions from Phase 2 temporary use restrictions

Included in restrictions	Exemptions from restrictions
<p>Watering a garden using a hosepipe, including using sprinklers, dripper hoses, automatic irrigation systems and similar devices, including the following definitions of “a garden” (The Water Use (Temporary Bans) order 2010, Clause 4(2)):</p> <ul style="list-style-type: none"> a) a park; b) a lawn; c) a grass verge; d) an allotment garden, as defined by section 22(1) of the Allotments Act 1922(a); e) any area of an allotment used for non-commercial purposes; f) gardens open to the public. 	<p>Watering a garden using a hosepipe, including using sprinklers, dripper hoses, automatic irrigation systems and similar devices, including the following definitions of “a garden” (The Water Use (Temporary Bans) order 2010, Clause 4(2)):</p> <ul style="list-style-type: none"> a) an area of grass used for sport or recreation, noting that the exemption only applies to the active strip/playing area, not the entire ground. <p>Automatic irrigation systems, provided that they comply with all of the following conditions:</p> <ul style="list-style-type: none"> a) The water supply to which the device is connected must be one which is charged to the user by reference to volume by meter belonging to SES Water; b) No part of the system may be handheld; c) The system must incorporate a pressure reducing valve; d) The system must incorporate a time clock control; e) The system must deliver water by means of a drip or trickle system; f) The system must not disperse water through the air by means of sprinkler, jet, mister or similar device; g) The system must deliver water directly either on to the surface of the soil or under the surface of the soil; and h) The system must not cause any surface water run-off. <p>Any person who has dispensation as a result a need arising from disability, medical condition or similar, to use a hosepipe for the prohibited purposes or to fill or maintain a domestic swimming or paddling pool or ornamental fountain or pond. This includes Blue Badge holders or customers who are registered on the SES Water Priority Services list due to a lack of mobility.</p> <p>Newly laid turf for the first 28 days since being laid</p>
<p>Cleaning a private motor-vehicle using a hosepipe</p>	<p>A ‘private motor-vehicle’ does not include (1) a public service vehicle, as defined in section 1 of the Public Passenger Vehicles Act 1981 (c), and (2) a goods vehicle, as defined in section 192 of the Road Traffic Act 1988 (d).</p>

Included in restrictions	Exemptions from restrictions
	<p>Users who clean private motor vehicles for remuneration as a service to customers in the course of a trade or business</p> <p>Any person who has dispensation as a result a need arising from disability, medical condition or similar, to use a hosepipe for the prohibited purposes. This includes Blue Badge holders or customers who are registered on the SES Water Priority Services list due to a lack of mobility.</p>
Watering plants on domestic or other non-commercial premises using a hosepipe	<p>Watering plants using a hosepipe that are:</p> <ul style="list-style-type: none"> a) grown or kept for sale or commercial use, or b) part of a National Collection or temporary garden or flower display. <p>Any person who has dispensation as a result a need arising from disability, medical condition or similar, to use a hosepipe for the prohibited purposes. This includes Blue Badge holders or customers who are registered on the SES Water Priority Services list due to a lack of mobility.</p> <p>Use of an approved drip or trickle irrigation system fitted with a pressure reducing valve and timer.</p> <p>To water newly laid turf for the first 28 days since being laid.</p>
Cleaning a private leisure boat using a hosepipe	<p>Cleaning of vessels using a hosepipe that are:</p> <ul style="list-style-type: none"> a) used in the course of a business; or b) are used as a primary residence; <p>Cleaning of any area of a private leisure boat which, except for doors or windows, is enclosed by a roof and walls</p> <p>Using a hosepipe to clean a private leisure boat for health or safety reasons, to prevent the spread of non-native species, where fouling is increasing fuel consumption or engines designed to be cleaned with a hosepipe</p>
Filling or maintaining a domestic swimming or paddling pool or pond	<ul style="list-style-type: none"> a) filling or maintaining a pool where necessary in the course of its construction b) filling or maintaining a pool using a hand-held container which is filled with water drawn directly from a tap

Included in restrictions	Exemptions from restrictions
	<p>c) filling or maintaining a pool that is designed, constructed or adapted for use in the course of a programme of medical treatment</p> <p>d) filling or maintaining a pool that is used for the purpose of decontaminating animals from infection or disease</p> <p>e) filling or maintaining a pool used in the course of a programme of veterinary treatment</p> <p>f) filling or maintaining a pool or pond in which fish or other aquatic animals are being reared or kept in captivity</p> <p>Any person who has dispensation as a result a need arising from disability, medical condition or similar, to use a hosepipe for the prohibited purposes. This includes Blue Badge holders or customers who are registered on the SES Water Priority Services list due to a lack of mobility.</p>
Filling or maintaining an ornamental fountain	<p>Filling or maintaining an ornamental fountain which is in or near a fish pond and whose purpose is to supply sufficient oxygen to the water in the pond in order to keep the fish healthy</p> <p>To operate water features with religious significance</p>
Drawing water, using a hosepipe, for domestic recreational use	<i>No exemptions relevant to this category</i>
Cleaning walls, or windows, of domestic premises using a hosepipe	<p>Users who clean walls or windows of domestic premises for remuneration in the course of a trade or business</p> <p>Any person who has dispensation as a result a need arising from disability, medical condition or similar, to use a hosepipe for the prohibited purposes. This includes Blue Badge holders or customers who are registered on the SES Water Priority Services list due to a lack of mobility.</p>
Cleaning paths or patios using a hosepipe	<p>Users who clean paths or patios for remuneration in the course of a trade or business</p> <p>Any person who has dispensation as a result a need arising from disability, medical condition or similar, to use a hosepipe for the prohibited purposes. This includes Blue Badge holders or customers who are registered on the SES Water Priority Services list due to a lack of mobility.</p>

Savings from Temporary Use Bans

For this Drought Plan we have reviewed data from previous droughts, both from company and industry data, and have taken account of factors that may result in a different customer response today. However, as stated in UKWIR (2007a), “the magnitude of reduction in any year depends on the demand that would have been expected in that year had restrictions and other measures not been imposed”. Therefore, the savings in any particular drought may not align exactly with those estimated, being dependent on temperatures experienced in the drought year and also factors such as the degree of preceding media attention at a local, regional or national scale, outside our own communications strategy.

The activity banned is primarily associated with garden watering by domestic customers. As customer garden watering is recognised as one of the key drivers of a summer increase in demand, restricting this activity is generally considered an appropriate step to take when resources may be insufficient to meet the projected summer peak.

Company-specific data regarding water savings achieved by sprinkler and fuller hosepipe bans was recorded during the implementation of demand restrictions between 1996 and 2007. No additional data on the effect of restrictions could be determined from the drought in 2011/12 since heavy rainfall occurred just days after the introduction of the hosepipe ban in April 2012, with the ban lifted in July 2012.

It was found that sprinkler bans (Phase 1) produced savings at both average and peak demand when accompanied by an intensive media campaign. Savings based on a dry year of up to 1.5% at average and 3.5% during peak periods could be expected, based upon the difference between actual demand and that expected based on the climatic conditions experienced in 2005/06.

From the same drought, it was found that the introduction of a full hosepipe ban (Phase 2) provided a further suppression of demand, and a dry year saving of up to 4% at average and up to 6% at peak could be expected, inclusive of savings from sprinkler bans. This compares to savings from other WRSE companies of between 2 – 5% as an annual average figure, based on their current Drought Plans.

We consider that the savings experienced during the 2005-06 drought event are the most applicable to use in our Drought Plan, because it reflects actual experiences with our customers. The replacement of ‘hosepipe bans’ with TUBs in 2010 when the Flood and Water Management Act 2010 was introduced has resulted in a change to the overall powers that water companies now have to restrict uses of water. The key change is that certain uses of water which have the potential to impact on the financial viability of some businesses are now included in the legislation without companies having to refer to the Secretary of State for a decision. However, companies do have the flexibility to allow exemptions and we have specifically exempted certain uses of hosepipes when they impact businesses. The proposed phasing of implementation of TUBs largely mirrors the former bans as follows:

- Phase 1 of TUBs is broadly equivalent to the former sprinkler and unattended hosepipe ban; and
- Phase 2 of TUBs is broadly equivalent to the former hosepipe ban.

As such, the changes in legislation are not considered material to the ongoing appropriateness of using 2005-06 demand savings data. Additionally, we recognise that the level of metering amongst its household customers has increased since the 2005-06 drought event: from 23% in 2006 (as reported in WRMP09) to 58% in 2019/20; furthermore we are targeting 90% household metering penetration by the end of AMP7 (2024/25), which is included in the period of this Drought Plan. The impacts of metering levels on demand and demand savings is discussed in the following section.

Impact of metering levels on demand and TUBs demand savings

Metered customers are likely to be more conscious about saving water, as there is a financial incentive to do so. Therefore, the higher the meter penetration in the company area, arguably the more effective drought restrictions may be.

It has, however, been reported that household metering can result in greater reductions in peak demand than average demand (UKWIR, 2003). A collaborative project commissioned by a group of English and Welsh water companies including SES Water was undertaken by Artesia (2020). This project explored the influence on demand of the hot dry weather experienced across the UK in the summer of 2018. As part of this project, the influence of metering on peak demands was explored. Artesia (2020) reported that during the hot, dry summer of 2018, both unmeasured and measured customers increased their water use, but measured customers increased their use by a lower amount (20%) than unmeasured customers (30%). This reduction in the average to peak ratio for measured customers indicates that there would be a smaller residual volume of water that could be influenced by drought demand restrictions during peak demand periods amongst measured customers.

Reflecting this analysis, and the increased levels of household metering compared to those during the 2005-06 drought, we have reduced our estimated peak period saving from TUBs by 10% for this Drought Plan. This results in an estimated peak period saving from TUBs of 5.4% of dry year critical period demand (DI minus leakage). The estimated dry year annual average demand (DI minus leakage) saving is 3.2%, the assumptions behind which are presented below in a discussion of the seasonality of demand savings.

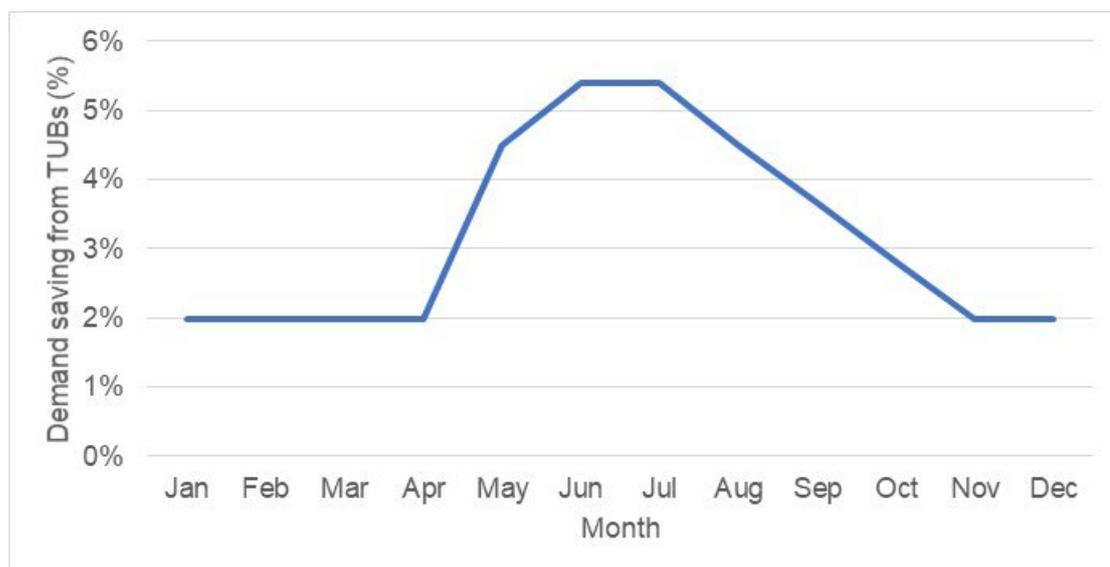
Seasonality of TUBs demand savings

Demand savings achieved from domestic water use restrictions, both voluntary and mandatory, will be higher in summer than in winter. This is because it is primarily the external uses of water that are targeted first, and furthermore, in summer periods the weather is generally hotter and drier, so drought is often more 'visible' to customers.

Consistent with this information, the EA (2020b) states that TUBs must be in place before a drought permit or order application with the potential exception of applications for drought permits/orders between 1st April and 1st October – although evidence of a range of other demand restraints are expected in all drought permit applications.

Additionally, UKWIR (2007a) reports that demand restrictions are anticipated to be less effective in spring than in summer, and even less pronounced in winter. As such, we have assumed a seasonal profile of demand savings, as shown in Figure 3.1.

Figure 3.1 – Seasonal profile of estimated demand (DI minus leakage) savings from TUBs



The maximum (5.4%) saving has been assumed over the months during which we have observed peak demands over the past few years (May to July inclusive). The saving in April (2%) has been calculated from the peak value based on the proportional difference between the peak saving and the April saving as reported in UKWIR (2007a), which states that TUBs are "anticipated to be less effective in spring than in summer, for example: for a full hosepipe ban, a maximum demand reduction of 11.5% could be anticipated for July, and a minimum demand reduction of 4.2% could be anticipated for April. Demand reductions are anticipated to be even less pronounced for the same measures applied in winter".

The same assumption is applied to savings in November (2%), and these low levels of savings are estimated to be maintained throughout the winter – if the TUB must be maintained over the winter period, there is still scope to save water from activities not related to garden watering, e.g. washing of vehicles, and additionally, we would promote water saving messaging appropriate to the time of year, perhaps focusing customers' attention on water savings in the home and identification of supply pipe leaks during the winter period.

3.1.4. Drought Orders (Non-Essential Use Bans)

Following the introduction of TUBs and if a drought continues to worsen, we will consider applying to the Secretary of State for the Environment to implement a Non-Essential Use drought order (or NEUB). This will be done when levels at one or both of our reference sites cross trigger level 3a, consistent with the latest water company drought plan guideline (EA, 2020).

NEUBs are governed by the Water Industry Act (WIA) 1991 and the Drought Direction 2011. NEUBs target non-domestic users and may only be implemented following approval of an Ordinary Drought Order by the Secretary of State.

Before applying for a Drought Order to restrict water use, water companies are expected to have made full use of their powers under the WIA 1991, as stated in the Explanatory Memorandum to the Water Use (Temporary Bans) Order 2010:

“By extending the water uses that water undertakers may prohibit under section 76(1) of the Act [WIA 1991], water undertakers may be able to delay or avoid the need for drought orders under the Water Resources Act 1991.”

The Drought Direction 2011 (which replaced the Drought Direction 1991) sets out the restrictions available under an Ordinary Drought Order, as allowed for under Section 73 of the Water Resources Act 1991 (WRA 1991). These are:

- Watering outdoor plants on commercial premises
- Filling or maintaining a non-domestic swimming or paddling pool
- Filling or maintaining a pond
- Operating a mechanical vehicle-washer
- Cleaning any vehicle, boat, aircraft or railway rolling stock;
- Cleaning non-domestic premises
- Cleaning a window of a non-domestic building
- Cleaning industrial plant
- Suppressing dust
- Operating cisterns

This legislation has been updated since the 2005-06 drought, the only time that we have implemented these restrictions. The previous legislation covering drought orders (the Water Resources Act 1991) stated that *“the power may be exercised in relation to consumers generally, a class of consumer or a particular consumer”*. Calls were made following the 2005-06 drought for further definition of the uses of water that would be restricted under a drought order, which led to the development of the UKWIR Code of Practice and Guidance on Water Use Restrictions (UKWIR, 2011 and 2013). There may be some slight changes to the types of uses that will now be covered when compared to those that were covered under our 2006 drought order, but the general principle that drought orders should restrict more non-domestic users of water is maintained. As such, and without further information to inform the savings that may be achieved through a drought order under the current legislation, we consider that the demand savings information collected during the 2005-06 drought remains plausible. Should any new information come to light to inform a revised assessment of demand savings, this will be incorporated into future iterations of our Drought Plan.

In order to grant a Drought Order under the WRA 1991 73(2), the Secretary of State must be satisfied that: *“By reason of an exceptional shortage of rain, a serious deficiency of supplies of water in any area exists or is threatened”*.

The potential timescales for introducing restrictions by recourse to a Drought Order are significantly longer than those for Temporary Use Bans under the WIA 1991, and the Secretary of State would typically require a public inquiry or hearing to be held if an objection were received.

Under Schedule 8, paragraph 3(c) of the WRA 1991, we must publish a notice of an application for a Drought Order to restrict water use, which shall state that objections

to the application may be made to the Secretary of State within seven days from the date on which it is served or published. *“If applicants follow and comply with the information ... and if the process goes forward with no delays whatsoever, then the Secretary of State will normally make a decision within 28 days. That is when there are no objections and/or a public inquiry or hearing is held. The minimum achievable timescale for an application to which there are no objections and no public inquiry or hearing is 10 days”* (EA, 2020b).

In our Drought Plan 2019, we estimated a time from inception to implementation for a NEUB of 2-3 months; up to 6 months with an inquiry or hearing. This timescale, based on current guidelines (EA, 2020b) does not seem inappropriate to maintain, particularly given that our own experience in 2006 took 6 months from inception to implementation.

We have been working as part of WRSE towards areas of consistency between the six companies in relation to implementation of NEUBs. WRSE produced a document that sets out the exceptions and the enforcement policy that WRSE companies would implement in 2021 if NEUBS were required (WRSE, 2021b). Given the potential to impact on businesses, we will implement any restrictions in a flexible, proportional and transparent manner that considers all affected users. Table 3.3 presents the exceptions and inclusions associated with NEUBs for this Drought Plan.

Assumed Savings from Non-Essential Use Bans

It is estimated that an additional demand saving of approximately 8.5% could be expected from a full NEUB being implemented (UKWIR, 2007a), over and above savings achieved by the temporary water use restrictions. This information was calculated as part of the UKWIR (2007a) study that modelled the effects of demand restrictions during droughts: company specific data from the 2005-06 drought quoted in this study suggested observed savings purely attributable to NEUBs of 8.5% at average and 13.5% at peak. This compares to savings from other WRSE companies of between 1.2% and 5% under average conditions.

These estimated savings should be taken as estimates only due to likely variance in temperatures and therefore antecedent levels of demand.

Non-household metering levels in our area were 86% in 2006 (WRMP09) and 87% in 2019/20. As metering levels amongst non-households have essentially not changed since the 2005-06 drought when the company implemented a NEUB, the expected savings are not considered likely to have changed.

Seasonality of NEUBs demand savings

NEUBs target largely non-domestic uses of water, some of which do not exhibit a significant seasonal pattern of use (e.g. vehicle washing, cleaning of buildings). However, there are some uses targeted by NEUBs (e.g. filling non-domestic swimming pools that are not open to the public, watering certain plants on commercial premises) which will show a seasonal pattern of higher consumption during summer months.

Our experience during the NEUB implemented during 2006 corroborated this, with peak savings of up to 13.5% of dry year critical period demand (DI minus leakage) and

average savings across the year of 8.5% of dry year annual average demand (DI minus leakage), indicative of lower savings during the winter period. There is no additional literature evidence available that would cause us to supersede these assumptions for this Drought Plan. Therefore, the seasonal profile of demand savings from NEUBs assumed by the company is shown in Figure 3.4.

Figure 3.4: Seasonal profile of estimated demand (DI minus leakage) savings from NEUBs

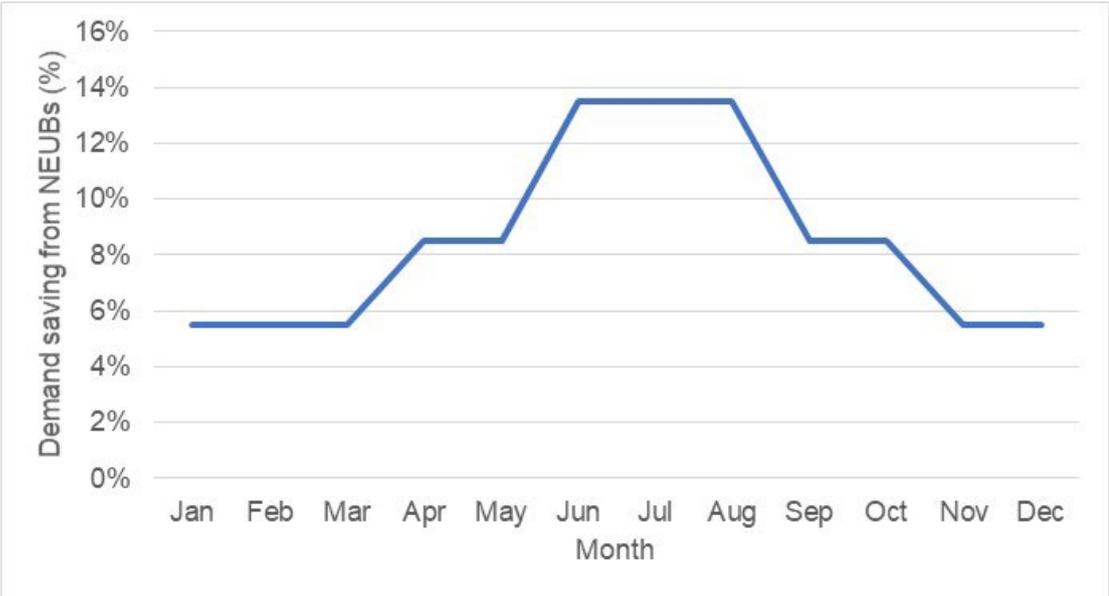


Table 3.3: Inclusions and exemptions associated with a Drought Order to restrict Non-Essential Uses of water

Included in restrictions	Exemptions from restrictions
	<p>It is not the intention to revoke, during a Drought Order restricting non-essential uses of water, the following exemption, which applied through Phases 1 and 2 of our temporary use restrictions:</p> <p>Any person who has dispensation from SES Water as a result of demonstrating a need, arising from disability, medical condition or similar, to use a hosepipe for the prohibited purposes or to fill or maintain a domestic swimming or paddling pool or ornamental fountain or pond. This includes Blue Badge holders or customers who are registered on the SES Water Priority Services list due to a lack of mobility..</p>
<p>Watering the following plants on commercial premises using a hosepipe:</p> <ul style="list-style-type: none"> a) plants which are in a pot or other container that is outdoors or under cover; b) plants which are in the ground under cover. 	<p>Watering plants on commercial premises using a hosepipe that are:</p> <ul style="list-style-type: none"> a) grown (i.e. cultivated or propagated) or kept for sale or commercial use; or b) part of a National Plant Collection or temporary garden or flower display; c) watered using an approved drip or trickle irrigation system fitted with a PRV and a timer that is set for use in the evening or night; or d) newly bought plants for the first 28 days after the implementation of the ban.
<p>Filling or maintaining a swimming or paddling pool other than a domestic swimming or paddling pool</p>	<p>Filling or maintaining a swimming or paddling pool other than a domestic swimming or paddling pool does not include:</p> <ul style="list-style-type: none"> a) filling or maintaining a pool that is open to the public (a pool is not open to the public if it may only be used by paying members of an affiliated club or organisation); b) filling or maintaining a pool where necessary in the course of its construction; c) filling or maintaining a pool using a hand-held container which is filled with water drawn directly from a tap; d) filling or maintaining a pool that is designed, constructed or adapted for use in the course of a programme of medical treatment; e) filling or maintaining a pool that is used for the purpose of decontaminating animals from infections or disease; f) filling or maintaining a pool that is used in the course of a programme of veterinary treatment; g) filling or maintaining a pool in which fish or other aquatic animals are being reared or kept in captivity; or

Included in restrictions	Exemptions from restrictions
	h) filling or maintaining a pool that is for use by pupils of a school for school swimming lessons
Filling or maintaining: a) a non-domestic pond; or b) a domestic pond	This does not include: a) filling or maintaining a pond in which fish or other aquatic animals are being reared or kept in captivity; or b) filling or maintaining a pond using a hand-held container which is filled with water drawn directly from a tap.
Operating a mechanical vehicle-washer, whether automatic or not	This does not include operating a mechanical vehicle-washer on biosecurity grounds.
Cleaning any vehicle, boat, aircraft or railway rolling stock using a hosepipe	This does not include cleaning any vehicle, boat, aircraft or railway rolling stock using a hosepipe: a) For health or safety reasons; or b) On biosecurity grounds.
Cleaning any of the following using a hosepipe: a) any exterior part of a non-domestic building other than a window; or b) a non-domestic wall.	This does not include: a) The cleaning of any exterior part of a non-domestic building or a non-domestic wall for health or safety reasons; or b) The removal of graffiti by applying to the wholesale supplier.
Cleaning a window of a non-domestic building using a hosepipe	This does not include: a) Cleaning a window of a non-domestic building using a hosepipe for health or safety reasons; or b) Small businesses whose sole operations are cleaning of windows using hosepipes.
Cleaning industrial plant using a hosepipe	Cleaning industrial plant using a hosepipe for health or safety reasons
Suppressing dust using a hosepipe	Suppressing dust using a hosepipe for health or safety reasons
Operating a cistern in any building that is unoccupied and closed	<i>No exemptions relevant to this category</i>

3.1.5. Level 3b ('More Before 4')

For this Drought Plan the concept of carrying out additional 'extreme' measures to delay or prevent the need for emergency action have been introduced by the EA. These actions can take the form of additions sources or further demand management measures. These are permitted under the Ordinary Drought Order legislation in the Water Industry Act 1991. Both types of measures are being explored within the WRSE drought planning sub-group.

With respect to demand management, at this level all exemptions to TUBs and NEUBs would be removed. Further consideration would be given to reducing pressure where possible, taking account on impacts on vulnerable groups and those within high-rise properties.

We have viewed the measures taken in other countries, such as Cape Town in 2018, to identify approaches that could be enacted to reduce demand further with hard-hitting measures and the use of language to demonstrate the seriousness of the problem. This would involve going beyond limiting discretionary external use to requiring customers to use up to a benchmark amount, with information provided on what this means to them in practice. This is detailed further in Appendix D, the Communications Plan.

Indicative savings of over 15% at average and over 20% at peak are suggested, in addition to savings from earlier restrictions. However we will continue to develop these enhanced water efficiency measures on a regional level and refine the estimated savings these measures would provide, as well as consider how they could be introduced and managed at scale in a fair and consistent manner.

3.1.6. Emergency Drought Order (Level 4)

Emergency drought orders, which permit the use of standpipes and rota cuts, would be the last resort in extreme droughts that would be taken under this Drought Plan. An extreme drought approximates to beyond a 1 in 200-year drought scenario. Implementation of an emergency drought order requires application and approval from the Secretary of State and it is expected that this process may take approximately 4 to 5 months.

Pressure reduction would be introduced first, most likely using a phased approach. Further measures in the case of an exceptional drought would be the introduction of standpipes and/or rota cuts or other measures as appropriate. We would work closely with neighbouring water companies, local authorities, Retailers and other stakeholders in planning the implementation of such measures. We would also consider the impact on specific customer groups, such as the elderly and vulnerable, and work with third party to provide assistance.

Drought actions beyond those outlined above relating to civil emergency are dealt with in our Emergency Plan. In such cases, we would work with other responsible emergency planning bodies, such as Local Authorities and Resilience Forums, to ensure security of supply in emergencies.

3.1.7. Summary of Demand-Side Savings

The savings and area of implementation of the demand-side measures, up to Level 3b, are given in Table 2.1. Note that the cumulative savings are calculated from the savings of each measure added to those previously implemented. Further details are given in Appendix C.

Table 3.4: Summary of estimated savings from demand actions

Action	Annual Average Saving	Peak Period Saving	Cumulative Annual Average Saving	Cumulative Peak Period Saving
Customer Awareness	n/a	n/a	n/a	n/a
Leakage Control	0.2%	0.2%	0.2%	0.2%
Pressure Management	0.1%	0.2%	0.3%	0.4%
Operational Usage Restrictions	0.01%	0.01%	0.31%	0.41%
Temporary Use Ban: Phase 1	1.5%	3.5%	1.81%	3.91%
Temporary Use Ban: Phase 2	1.7%	1.9%	3.51%	5.81%
Non-Essential Use Ban	8.5%	13.5%	12.01%	19.31%
Enhanced demand restrictions (More Before 4)	>15%	>20%		

3.2. Supply-side actions

Supply-side options involve abstracting water from existing or alternative sources, or the use of existing resources differently around the distribution network. It can also involve the bulk transfer of supplies from other water companies or third parties, or extreme measures such as tankering and temporary pipelines.

Both a drought permit and an ordinary drought order would allow a water company to modify or suspend conditions on an abstraction licence held by that company. A drought permit application is submitted to the Environment Agency under the WRA 1991 Section 79a (as amended by EA 1995), whereas an ordinary drought order is submitted to the Secretary of State under the WRA 1991 Section 74.

In the case of drought permits, the Environment Agency must be satisfied that a serious deficiency of supplies of water in any area exists or is threatened and the reason for the deficiency is an exceptional shortage of rain.

In the case of ordinary drought orders, the Secretary of State must be satisfied that either a serious deficiency of supplies of water in any area, exists or is threatened; or such a deficiency in the flow or level of water in any inland waterway to pose a serious

threat to any flora or fauna which are dependent on those waters, exists or is threatened; and that the reason for the deficiency is an exceptional shortage of rain.

We assessed the need for drought permits for both Bough Beech reservoir and at groundwater sources. We have not amended the existing permits for additional abstraction from the River Eden to fill Bough Beech reservoir. A screening of potential groundwater drought permits options, including those specified in the current plan, was carried out by Atkins and as a result we have updated our proposed drought permits. Their report is attached in Appendix E.

The potential benefits of each of the above measures are considered below. Appendix C contains Drought Options Tables summarising information on each drought management action in the format required by the Environment Agency in its guidance. This information includes the triggers, potential increases in supply or reductions in demand and environmental impact of the options.

For this plan we have not included any temporary bulk transfers, from either other water companies or third parties, and therefore we do not need to align with their Drought Plans in this respect. We also do not have any permanent bulk transfers in the current WRMP until the 2030's, beyond the point that this Drought Plan will be in use. In the next plan, we will summarise key information and assumptions from any bulk supply agreements that will be operational within its timeline, including the volumes specified under different drought events.

3.2.1. Changes in Use of Existing Licences / Internal Transfers

Transfers from Bough Beech WTW

Due to the improved connectivity developed within our supply network over the last ten years, up to 18 MI/d of potable water can be transferred from Bough Beech WTW and Elmer WTW to the Burgh Heath, Margery and Nork zones via the Buckland Pumping Station (PS).

Further work has been carried out in the 2015-2020 Business Plan to increase transfer capacity from Bough Beech WTW, with additional upgrade work planned for the current period from 2020 to 2025. This work includes mains reinforcements and upgrades to booster pumping stations in order to take full advantage of the uprating of Bough Beech WTW, currently at 55MI/d but increasing to 65 MI/d.

The overall scheme will provide the following benefits:

- Increased resilience to treatment works outages (by 2025 it will be possible to supply all customers from more than one WTW)
- Facilitates greater flexibility and conjunctive use of groundwater and surface water sources
- Improves peak deployable output across our area of supply

However, in a prolonged drought, the output from Bough Beech will have to be carefully managed, and there will still be a need for drought interventions such as drought permits.

Use of peak resources

We operate a number of relatively drought resilient ‘peak sources’ such as Hackbridge, Goat Bridge and Clifton’s Lane that are primarily used to meet peak demands. These sources draw groundwater from the confined Chalk (Hackbridge & Goat Bridge) and Lower Greensand (Clifton’s Lane) aquifers that take longer to respond to reduced recharge than the unconfined Chalk sources. The two confined Chalk sources are also part of our artificial recharge scheme that pumps surplus winter recharge from the unconfined Chalk into the confined Chalk aquifer and allows abstraction at higher sustained rates in the summer to meet peak demands. To maximise the benefit of the artificial recharge scheme, we can recharge the maximum allowable volume of 730 MI between November and March and then abstract the annual licensed Hackbridge/Goat Bridge volume of 3,920 MI at a continuous rate of 17.2 MI/d for 7.5 months between the two sources. We will carefully manage these sources when entering a drought period as initiated by the drought triggers.

Other internal conjunctive use/transfer schemes

We have the capacity to transfer water using the Kenley to How Green and the Buckland transfer schemes. These internal transfers can be operated within existing licences and infrastructure capacities, and therefore would have no outside impact on customers or the environment.

Planned Outage

We already carry out planned outage of treatment works and service reservoirs during non-peak demand period to minimise the risk of supply interruptions to customers. During a drought event (Level 2 and beyond) we would review the need for any planned outage, taking into account the need for maintenance and the potential impacts on source outputs.

3.2.2. River Eden Drought Permits

Bough Beech reservoir is refilled primarily via an abstraction from the River Eden which normally operates during the autumn/winter. The 2004-06 and 2011/12 droughts highlighted the vulnerability of our groundwater sources. As our only surface water source, Bough Beech provides us with an important source of supply during some groundwater droughts, particularly as it is now possible to distribute water from Bough Beech across our much of supply area.

In the past, we have applied for and been granted drought permits on the River Eden to support the abstraction that refills Bough Beech reservoir. Table 3.5 provides a summary of the current licence conditions (licence issued in April 2018) that govern the abstraction from the River Eden.

There are two types of potential drought permit relating to the River Eden abstraction that can be sought to maintain storage in Bough Beech reservoir, as follows:

- A drought permit to enable the winter abstraction from the River Eden to continue for an additional period of time; historically this has been into May, so this permit is often termed the May drought permit

- A drought permit to enable summer abstraction from the River Eden (after any May drought permit has ceased).

We recognise the importance of protecting the environment. It would therefore propose controls and mitigation measures if/when a drought permit for the River Eden is sought. We were granted drought permits to extend the winter abstraction period into May in 2005, 2006 and 2012.

Table 3.5: Summary of key licence conditions for the River Eden abstraction

Abstraction from the River Eden	Quantity
Annual licensed quantity subject to the following restriction: Abstractions are not permitted from May to August inclusive;	29,000 MI
Daily maximum licensed quantity subject to the following restrictions: <ul style="list-style-type: none"> • Abstractions are not permitted in September in any year when the flow as measured at Chiddingstone gauging station is at or below a local minimum residual flow (MRF) condition relating to the River Eden of 50 MI/d. • Abstractions are not permitted in October in any year when the flow as measured at Chiddingstone gauging station is at or below a local MRF condition relating to the River Eden of 25MI/d. • Abstractions are not permitted in the months of November to April in any year when the flow as measured at Chiddingstone gauging station* is at or below a local MRF condition relating to the River Eden of 22MI/d. <p>*The 'Chiddingstone gauging station' is the gauge referred to in Section 12(2)(a) (1) of the East Surrey Water (Bough Beech Reservoir) Order 1965 (ref 12) (at Chiddingstone).</p>	272.76 MI/d

Environmental Assessment Reports (EAR) were carried out in preparation for these drought permit applications and monitoring was undertaken during the operation of the drought permits. This assessment is summarised in Section 5.

Bough Beech reservoir provides an important alternative supply. Thus, we may seek to implement the Eden May drought permit when water levels in Bough Beech have breached the necessary trigger level, even if groundwater levels have not breached the same trigger level at Chipstead (unless they are at normal levels) and without implementing demand restrictions across the water resource zone. This is discussed further in Section 3.3.

We consider that an application for a summer drought permit on the River Eden would only be considered in an extreme drought (Level 3a/3b), after the introduction of a drought order to restrict the non-essential use of water and the granting of the River Eden drought permit for extension of the winter abstraction period into May (Level 3a). Therefore whilst the May permit is likely to be required approximately one in 20 years (5% chance in any one year) the summer permit is likely to be needed at a lower

frequency of between one in 20 years and one in 200 years (0.5-5% chance in any one year).

3.2.3. Groundwater Abstraction Drought Permit Sites

Priority abstraction licence groups identified as suitable for additional abstraction under drought permits are:

- Hackbridge /Goat Bridge (peak abstraction)
- Kenley / Purley (average abstraction only)
- Outwood Lane (peak and average abstraction)

As detailed in Appendix E, other sites were considered that they may be suitable for future use but are currently unwarranted.

Any of these drought permits could be required once Level 3a is triggered, i.e. around once in every 20 years or a 5% chance in any one year.

Hackbridge/Goat Bridge/Bishopsford Road

The Hackbridge licence is complicated due to the recharge component, which determines how much water can be abstracted in the following summer, and the aggregation with Wandle Laundry (previously referred to as Sunlight laundry). Previous drought plans, which assumed the maximum 730 MI had been recharged in the preceding winter, included options to:

- a) Increase the annual licence to allow for continued abstraction at 19 MI/d for the remaining 8 days up until recharge recommences; and
- b) Increase the daily and 30-day licence by 1.8 MI/d (the allocation of Wandle Laundry) to disaggregate Wandle Laundry.

We do not typically recharge the maximum volume, partly due to wasted water and energy when the benefit is subject to subsequent undetermined demand and partly to avoid recharging in the autumn when they may impact fish spawning. Therefore, the previous drought permit option is not suitable to how we now operate the Hackbridge source.

It is proposed that the drought option decouples abstraction from the volume recharged and allows abstraction to be maximised (19 MI/d) regardless of the volume recharged in the preceding winter. On the assumption that typically 250-350 MI/d is recharged, which permits a 15 MI/d abstraction in the following summer, this permit would generate 4 MI/d benefit. A condition of this permit could be a commitment that a minimum volume is recharged in the preceding and following winter, subject to the drought not continuing into a multi-year drought (in which scenario the water may not be available for recharge). The Hackbridge Group licence comprises three sources in the confined Chalk: Hackbridge (two operational boreholes), Goat Bridge (one operational borehole) and Bishopsford Road.

The group's average deployable output (ADO) and peak deployable output (PDO) are currently constrained by the licensed abstraction rates at 8.47 MI/d and 17.2 MI/d respectively (the peak licence is actually 19 MI/d but 1.8 MI/d is 'allocated' in the DO calculation to the aggregated licence of the laundry). The installed pump capacity is

approximately 19 MI/d which allows pumping at the full peak licence rate if the Wandle Road Laundry is not abstracting.

We also operate a Carshalton Ponds/River Wandle augmentation scheme whereby the outflow from Carshalton Ponds has to be maintained at greater than 4.5 MI/d before abstraction can take place at Hackbridge and Goat Bridge boreholes (and a number of the unconfined chalk sources). This operates by drawing water from the River Wandle at Goat Bridge and pumping it back up to Carshalton Ponds, i.e. it re-circulates the flow in the upper stretches of the Carshalton Branch when the natural springflow into the Ponds is less than 4.5 MI/d. If the re-circulated flow drops below 4.5 MI/d as a result of losses (e.g. evaporation and leakage), then there is an available mechanism to top up the re-circulated water by pumping from the confined Chalk utilising the Goat Bridge abstraction borehole that is normally used for the public water supply. The Wandle minimum flow requirement could be met by discharging from Goat Bridge abstraction borehole into the river in less than one day. This backup mechanism is assumed to provide sufficient resource to keep the augmentation scheme viable (although this has not been required to date).

Both the above drought permit options would be conditional on the continued operation of the Carshalton Ponds/River Wandle augmentation scheme; should this cease, for whatever reason, including mechanical failure, abstraction under the drought permit would stop. This would ensure that the outflow from Carshalton Ponds is maintained at greater than 4.5 MI/d while the drought permit abstraction is in operation.

The environmental impact of these temporary licence changes is summarised in Section 5.

Kenley Group (Kenley and Purley sources)

Kenley and Purley are licence constrained at MDO (22.79 MI/d). The PDO (41.28 MI/d) which is almost double that of the MDO, is constrained by pump capacity. Therefore, there is the potential for a drought option to increase the annual average licence such that the PDO could be sustained, generating up to 18.5 MI/d. The capacity at the WTW and pump capacity limits the potential to increase PDO further.

Previous drought plans also included a drought option at Kenley and Purley. The option sought to increase the annual licence to allow the pumping at the then PDO rate of 24.9 MI/d. The PDO has now significantly changed; in WRMP19 the PDO increased from 24.9 MI/d to 41.28 MI/d and has since been confirmed in WRMP24. There is therefore the potential for a larger drought option at Kenley and Purley than previously identified. However, this is not currently believed to be required. Whilst the results of the current round of water resource modelling are not yet available to clearly demonstrate this, initial modelling does not indicate larger deficits would be encountered than in previous plans. Therefore, it is assumed the volume of water provided by the previous drought permit/orders (9 MI/d) remains sufficient, and consequently no adjustment to Kenley and Purley option is required.

Outwood Lane

Outwood Lane DO is currently licence constrained (3 MI/d at MDO and PDO) and there is limited headroom within its group licence, the Woodmansterne Group. Previous drought plans included an option of increasing the source and group licence to

accommodate pumping at 8 MI/d for a maximum 6-month duration. This rate was taken from the 10-day constant rate test undertaken in 2008. However, given that the current pump capacity is 5 MI/d and that 8 MI/d may not be sustainable (water levels did not stabilise during the pumping test) it is suggested that 5 MI/d would be a more appropriate drought option. This drought option would therefore be to increase both the annual licence at Outwood Lane and the Woodmansterne Group to allow an additional 2 MI/d pumping from Outwood Lane for a maximum 6-month duration.

3.2.4. Level 3B Supply-side Measures ('More Before 4')

As discussed in Section 3.1.5, additional measures are now considered to reduce the risk of a Level 4 emergency being triggered. As part of the WRSE drought planning sub-group we are reviewing proposals from third parties on sea-tankering to determine their feasibility.

Other measures would include trades and transfers with third party abstractors and the use of non-potable supplies. We have several disused abstraction sites that we have previously made available for use by farmers and other customers that are able to collect and use these supplies, especially those that would normally rely on their own abstraction points which may have dried up by this point in the drought.

Level 3b would also be the trigger to use drought permits classified as having a significant environmental impact. As detailed in Section 5, all of our drought permits have been assessed as having a 'minor' environmental impacts and therefore we would not seek any further permits at this point.

3.3. Sequencing of drought management actions

When water levels fall below one of the trigger curves at Bough Beech reservoir and/or the Chipstead OBH, some or all of the following actions will be considered. For supply-side actions, the measures considered or taken will depend on the source group affected. Triggers and actions will be reviewed based on any experiences we gain through future drought events, and updated if required.

A proportional, phased approach to demand-side restrictions is encouraged by the EA Drought Plan Guideline and UKWIR Code of Practice, and legislation explicitly allows for flexibility in the implementation of restrictions. Building on experience and consideration of the benefits and impacts of restricting certain uses, we propose a phased approach, based on priorities for water savings and the impact on customers and particularly small businesses.

The impact of a particular drought on the supply capability within our WRZ is the starting point of our drought management decision-making process. Drought trigger levels at our indicator sites are the initial trigger for drought management actions, but there are other factors which might mean that the actions we would take in different droughts may vary slightly. The protocol that we use as the starting point for this decision-making is set out in Table 3.6. Our drought management actions which have time of year constraints are summarised in Table 3.7.

As part of our analysis of the scenario drought events described in Section 0, we have used the assumptions in Table 3.6 to test the sensitivity of our actions during droughts.

The sequence of actions is set out in the following sections. We have not included details of the actions taken in response to Level 0 being triggered in the groundwater catchments. We would work with relevant stakeholders to discuss potential joint messages that would be beneficial to protecting the environment, especially chalk river catchments, in these cases.

Table 3.6: Factors affecting decision-making around drought management actions

Variable	Options impacted	Description	Protocol
Time of year	Customer communications	Household uses of water vary between winter and summer; therefore, customers would benefit from seasonally appropriate water saving advice depending on the time of year.	Drought communications will be tailored to the time of year - e.g. leaks and water use in the home in winter, external use in summer.
	TUBs	TUBs are widely accepted to be less effective during winter months; the Environment Agency in its Drought Permits and Orders Guidance states that it will not expect companies to have put in place TUBs in advance of drought permit/order applications outside the period 1st April to 1st October.	If Level 2 triggers at either Chipstead or Bough Beech are crossed outside the period 1st April to 1st October, TUBs are not likely to be implemented. However, if levels remain below one or both Level 2 triggers at the beginning of March, the company will commence preparations to implement TUBs from at least the start of April when they are anticipated to have the greatest impact.
	Groundwater drought permit options	Under the conditions of the Hackbridge licence, abstraction rates and volumes are linked to the volume that SES Water has recharged during the preceding winter period, 1st November to 31st March inclusive. This recharge is normally commenced by SES Water in early January, so would likely take until the end of March to complete. As such, the permit would only be possible to implement during the normal licensed abstraction period, April to October.	The Outwood Lane and Kenley/Purley drought permits can be implemented at any time of year, for a maximum of 6 months. The Hackbridge drought permit is assumed only possible to implement between 1st April and 31st October for a maximum of 6 months.
	River Eden May drought permit	River Eden May drought permit is only available in May	Preparation of the River Eden May drought permit would need to have commenced by early March to feasibly be granted by the start of May. Therefore, if water levels at Bough Beech or Chipstead are below the Level 2 trigger by the 1st March, it is prudent to commence preparation of a May drought permit application. If levels have recovered

Variable	Options impacted	Description	Protocol
	River Eden summer drought permit	River Eden May drought permit is only available in summer (June-August)	<p>by the end of April, the May permit would not be implemented even if granted.</p> <p>Preparation of River Eden May drought permit would need to have commenced by early April to feasibly be granted by the start of June. However, if groundwater levels at Chipstead or reservoir levels at Bough Beech remain below Level 3a throughout May when the May permit is in place, an application could be made for the summer permit, which could be beneficial later in the summer (July/August) even if it is not possible to commence abstraction on 1st June.</p>
Positions of groundwater levels and Bough Beech reservoir storage levels relative to their respective drought trigger curves	All options	<p>Approximately 85% of SES Water's supply comes from groundwater sources are groundwater, therefore it could be suggested that the Chipstead OBH triggers should have more influence on drought management actions than the Bough Beech reservoir triggers. However, groundwater sources are more resilient to drought than Bough Beech reservoir: when moving from a 1 in 200 to a 1 in 500-year drought event, total MDO from groundwater sources reduces by 0.4% while Bough Beech ADO reduces by 16%. Therefore, the impact on actual supply availability of water levels at Chipstead relative to its drought triggers may be relatively small compared to the impact at Bough Beech. Therefore, equal weightings are proposed for each trigger site on the basis of associated risk to supply.</p>	<p>If a trigger is crossed at either of its indicator sites, SES Water will always consider water levels at the other indicator site before taking any action. It is important for the company to have a full understanding of the level of risk facing all its sources before making decisions about implementing drought management actions, particularly those that affect its customers and the environment.</p>

Variable	Options impacted	Description	Protocol
	All options	As will be demonstrated by testing of different drought scenarios, Bough Beech tends to be more vulnerable to single dry winter events than groundwater.	Based on our experience and modelled water levels, in the first year of a drought, Bough Beech water levels are likely to be impacted more than groundwater levels. Under these circumstances, it can be seen from the stochastic traces presented later in the scenario testing section that water levels at Bough Beech start to cross trigger curves during the winter, when refill of the reservoir has not been possible or has been delayed due to low river levels. Bough Beech reservoir can refill very rapidly when flows in the River Eden allow; so if triggers are crossed in early/mid-winter at Bough Beech, the company will undertake forecasting of potential refill scenarios using the company's water resources model of the reservoir system, to assess the probability of refill under a range potential rainfall scenarios (e.g. 60%, 80%, 100% of long-term average rainfall). On the basis of these results, the company would trigger its drought management actions as appropriate to the time of year.

Table 3.6: Availability of drought management actions throughout the year

Trigger level	January	February	March	April	May	June	July	August	September	October	November	December
Level 1	Customer awareness raising, increased leakage control											
Level 2				TUBs								
Level 3a	NEUBs											
	Outwood Lane drought permit (maximum of 6 months)											
	Kenley/Purley drought permit (maximum of 6 months)											
				Hackbridge drought permit (maximum of 6 months)								
					River Eden May permit							
					River Eden summer permit							

3.3.1. Level 1 Actions

Demand-side Actions

- Increase customer awareness of resource situation. This is to be achieved by use of the some or all of the following: social media (Twitter, Facebook) newsletters, press releases to local media, liaison with community and stakeholder groups, awareness raising programmes on local radio and providing regular updates on key sections of our website
- Communication and consultation with the fire services and other essential services about possible forthcoming drought measures
- Consider increased leakage activity
- Restrict operational usage to essential operations only
- Keep the EA, Local Authorities, the Consumer Council for Water (Thames Region) and neighbouring water companies in WRSE informed of the situation

Supply-side Actions

- Make preparations to bring peak sources such as Hackbridge/Goat Bridge and Clifton's Lane WTW online
- Make conjunctive use of resources, depending on the surface versus groundwater situation. During the winter, if there is a high confidence that Bough Beech reservoir will be filled, then this surface water can be transferred to the central and northern areas to supplement the groundwater. As the reservoir normally cannot be filled after 1 May it is unlikely that the water would be transferred from this point onwards.
- Transfer of supplies to the Northern area to supplement chalk borehole supplies, through the use of the transfer from Kenley WTW to How Green and/or Buckland PS.

3.3.2. Level 2 Actions

Demand-side Actions

- Implement Phase 1 of TUBs demand restrictions in all of our area of supply. Maintain communications programme to keep customers informed of the likely frequency and duration of temporary water use restrictions.
- If the situation is deteriorating, implement Phase 2 of demand restrictions in addition to Phase 1. This restricts all of the water uses listed in the temporary water use ban legislation, with specific exclusions under each category.
- Increase customer awareness of the resource situation and ask for support in reducing demand to avoid the need for restrictions. This is to build on the work undertaken in Level 1 with further communications with the media (e.g. interviews), additional advertising, and engagement with schools, Local Authorities, Housing Associations and with retail sectors such as gardening centres.
- Focus on reducing run times for visible and reported leaks, and increase focus on customer-side leakage
- Evaluate districts where further pressure management is feasible
- Liaise with the EA as to actions being planned or taken. Keep others informed such as Ofwat, Water UK, CC Water, South East Rivers Trust, neighbouring water companies in the WRSE and customers with special water needs

- Review the effectiveness of demand side measures in terms of the reduction on distribution input, leakage and household (per capita) consumption

Supply-side Actions

- Bring peak sources, such as Hackbridge/Goat Bridge and Clifton's Lane, into supply or increase their output, depending on abstraction in comparison to licenced quantities and the sources most at risk
- Increase the transfer of supplies from Kenley WTW to How Green service reservoir and Buckland PS. The maximum transfer level is currently 36.5 Ml/d. The transfer is bi-directional so can be used to support the northern or central areas.
- Make further conjunctive use of resources, depending on the surface versus groundwater situation. During the winter, if there is a high confidence that Bough Beech reservoir will be filled, then this surface water can be transferred to the northern area to supplement groundwater sources. As the reservoir normally cannot be filled after 1 May it is unlikely that the water would be transferred from this point onwards.
- If the situation is deteriorating and the time of year is appropriate, commence preparation of a drought permit application to enable the winter abstraction from the River Eden to continue into May.

3.3.3. Level 3a Actions

Demand-side Actions

- Further increase customer awareness of the resource situation and step up appeals for restraint in water use in order to reduce demand. This will build on the existing communications programme and involve additional engagement with local media, increased coverage and urgency of messages in the local press and radio and use of social media, leaflets and posters to convey the water conservation message.
- Consider applying to the Secretary of State for a Drought Order to restrict non-essential uses of water. We propose to implement restrictions on the categories of use provided for in the Drought Direction 2011 in a single phase to keep the message simple for customers.
- Write to Retailers, large commercial customers, Local Authorities, housing associations, fire authorities, hospitals and schools to engage their support in reducing demand
- Continue to focus on reducing leakage through increased resources on detection and repairs, consider offering free repairs on leaks to fittings within household properties
- Implement pressure reduction in districts where this is considered feasible
- Give formal notification to the fire and other essential services 72 hours before the implementation of any temporary water use restrictions
- Review the effectiveness of demand side measures in terms of the reduction on distribution input, leakage and household (per capita) and non-household consumption

Supply-side Actions

- If the situation is deteriorating and the time of year is appropriate, and after we have published notification of our intention to implement Level 3a demand restrictions to restrict the non-essential uses of water, we will apply for a drought permit to enable the winter abstraction from the River Eden to continue into May;
- We would also consider applying for one or more of the following groundwater drought permits, in the expected order shown below. As previously noted the order of implementation of supply-side management options in any particular drought event will depend factors including the time of year, the characteristics of the particular drought event, and whether our other sources are behaving as expected:
 - i) A drought permit for increased groundwater abstraction from Outwood Lane
 - ii) A drought permit for increased groundwater abstraction from Kenley Group
 - iii) A drought permit for increased groundwater abstraction from Hackbridge/Goat Bridge
- The permit applications would state that the planned start date of the permit would be once the Level 3a demand restrictions have been implemented
- A drought permit to enable summer abstraction from the River Eden would be considered after the River Eden May permit application and the groundwater drought permits listed above. It is expected that the Environment Agency would permit summer abstraction in monthly increments, i.e. initially permitting abstraction in June only.

3.3.4. Level 3b Actions

Consider the implementation of additional demand restrictions including the removal of exemptions on TUBS and NEUBs and placing limits on consumption down to 50 litres per person per day. These measures have been considered by the WRSE drought plan sub-group and determined to have potential benefits in an extreme drought.

These would generally be taken before any supply-side measures such as sea tankering, although we would make any non-potable supplies from disused sources available at the same time as the enhanced demand restrictions.

3.4. Summary Timeline of Drought Management Actions

Publication of notice and representations

Temporary water use restrictions

There are statutory requirements set out in the updated sets of legislation with which we will comply in terms of giving notice before implementing temporary water use. This involves the publication of formal notice in certain formats and allowing an appropriate period for representations to be submitted by customers and responded to by the Company where appropriate.

In addition, we may also use methods such as radio to communicate the notice more extensively to customers across the supply area. We will also take into account the numbers of customers affected and whether commercial customers are impacted by each phase of restrictions when deciding upon a proportionate period for

representations. This will be balanced with the relative urgency of implementing restrictions.

In considering representations or objections from individual customers or interested groups, we will seek to take a fair and even-handed approach. Complaints will be dealt with in accordance with our complaints procedure.

In revoking restrictions, including the partial lifting of restrictions, notice will be given in the same formats, but will take immediate effect on publication as representations do not need to be allowed for.

Drought orders

Drought orders must be prepared by the Company and submitted to the Secretary of State before they can be implemented, and may involve hearings or inquiries before they are approved. The application submitted must include evidence of the required advertisements in the media (local newspapers) and notice to the EA and local authorities affected. The application must also be publicly available and 7 days allowed for public representations to the Secretary of State.

Once the drought order has been approved, further time for providing notice of implementation in the required media formats must be allowed for before the restrictions are imposed. From our experience during the 2006 drought, the process from first advertising the intention to apply for a drought order to implementing that order took approximately six months, including a public hearing. Without a hearing, such as in 2012, it is estimated that it may take 2-3 months.

It should be noted that there may be circumstances where we may have to introduce more than one of the three phases of temporary water use bans simultaneously, and we will use the flexibility provided for in the legislation to respond proportionally to the drought conditions. This may affect the expected timeframes for implementation.

A programme indicating the approximate timescales between inception and implementation of drought management measures is provided in Table . These timescales are approximate because in some cases, the implementation time may become beyond our control such as in the case of a public hearing. In addition, it should be noted that as outlined above, we may progress one or more of these actions concurrently, in order to expedite management of the drought as may be required.

Table 3.8: Approximate timescales required for drought management measures

Drought management action	Estimated time required from inception to implementation
Customer awareness/media coverage	From 1 week
Conjunctive Use/Transfers	Less than 1 week
Water use temporary ban – Phase 1	From 1 week
Water use temporary ban – Phase 2	From 1 week
Leakage reduction / pressure management / operational usage restrictions	From 2 weeks

Drought management action	Estimated time required from inception to implementation
Drought permits	2-3 months
Drought order demand restrictions	2-3 months; up to 6 months with an public inquiry or hearing

3.5. Compensation

As required by the Drought Direction (2020), we are required to state whether we will consider compensation as a result of the implementation of drought management measures. This includes both drought orders and permits.

The factors affecting this assessment are as follows:

- Impact on customers, organisations and businesses of Temporary Use Bans, including loss of revenue from landscape gardeners, garden centres and the horticultural sector
- Impact on customers, organisations and businesses of a Non-Essential Use Ban, including loss of revenue from window cleaners and car wash businesses. This would also include impacts on Retailers.
- Exemptions given to usage restrictions which are designed to reduce their impact on customers, in terms of taking account of vulnerabilities (such as being a Blue Badge Holder) and financial impact (such as allowing watering of turf for 28 days and the use of trickle irrigation systems).
- The impact of our drought permits on river flows that may affect fisheries and anglers. This is considered in Appendix F, with the impact assessed as being low and temporary in nature.
- The impact of our drought permits on other abstractors. This is considered in Appendix F, G, H, I and J, with the impact assessed as negligible.
- The impact of our drought permits on recreation. This is considered to be negligible.

Taking into account these factors, it is concluded that compensation, either financial or otherwise, will not be considered in respect of the measures detailed in this plan.

3.6. Identifying the End of a Drought

Triggers

We will make a decision on ending the drought designation following analysis of multiple indicators.

Groundwater and surface water storage levels will be reviewed in the context of the time of year and degree to which they start to show a recovery. More specifically, the occurrence of sufficient winter recharge of our groundwater sources will be a key determinant. We can usually be confident that a drought will have ended when levels at one/both of our trigger sites (Bough Beech and Chipstead) rise above the relevant Level 2 trigger curve and stay above it for a reasonable period of time. This will usually need to have been demonstrated before we will consider removing drought management actions and resuming normal operations. In this way, we intend to assess

the resource situation as a whole and consideration will be given in particular to the potential recharge timescales relating to groundwater sources. We consider that this prudent approach will help ensure that demand restrictions are not lifted then reinstated in quick succession, as this would likely be unacceptable to customers, and may cause confusion.

In addition, we will consider using the EA's drought forecasts as a means of trying to ascertain the future outlook with respect to our resource situation, by the use of modelling forecast resource level at 60% (stress level), 80% (reasonable worst case) and 100% long-term average rainfall for the following 3-6 months.

Consultation and communication

Consultation with EA and neighbouring water companies at drought coordination meetings will be undertaken to confirm the wider water resources situation and outlook for the region before we declare to our customers that the drought is over. We propose that public announcements will be made jointly with the EA where appropriate.

On the demand side, legislation states that the lifting of any restrictions must be notified in two local newspapers and on our website. The change can then take immediate effect without need for consultation. The circumstances at the time will be assessed to determine whether a gradual withdrawal or one-step revocation of restrictions is most appropriate, taking into account the effect on customers. A wide press release would be sent to relevant parties to announce decisions and the media engaged. Customers will be thanked for their cooperation and understanding. Further detail is contained in the Communications Plan, Appendix D.

EVALUATION & MANAGEMENT OF THE PLAN

4. DROUGHT SCENARIOS

4.1. Selection of Drought Scenarios

All droughts vary in terms of their duration and magnitude and therefore their impact on the availability of water resources. All water companies operate different combinations of source types to supply their customers, and each will have varying response patterns to different drought events. In many cases this is due to differences in antecedent conditions, drought duration and demands placed upon the supply system during the drought. It is therefore essential that our Drought Plan is tested against a range of drought scenarios that could occur within our supply area.

The range of drought scenarios tested in this Drought Plan has been selected with reference to the Water Company Drought Plan Guideline and any feedback received from the Environment Agency during pre-consultation on our draft Drought Plan. The scenarios selected are based on actual historical drought events, the droughts which we plan to be resilient to in our WRMP and also, plausible more severe drought events derived from analysis of stochastic climate data. The scenarios we have tested demonstrate that our drought management actions are sufficiently robust to protect essential water supplies.

We operate a conjunctive use water resources system, meaning that our groundwater sources and surface water source work together as part of the same system. As part of the work we are undertaking for the WRSE Regional Resilience Plan 2022 and our WRMP24, we are moving towards expanding our water resources modelling capability to include our entire network. However, for this Drought Plan, our modelling is based on approaches developed as part of our WRMP19, but with updated datasets where available.

4.2. Historical Drought Scenarios

The following sub-sections set out the characteristics and observed impacts on our water resources system of drought events within the recent historical record and illustrate the actions we took to manage them based on the trigger levels that applied at the time. We also comment on the way in which our updated trigger levels for this drought plan would have impacted the actions we took.

4.2.1. Single season summer demand peak: 2018

Seasonal demand peaks are common and reflect increasing demand for water in the summer period. A significant proportion of the increase in domestic use can be attributed to external uses, including garden watering and filling of paddling pools. We have a history of managing these peaks effectively by developing 'peak' resources through long term operational investment plans, e.g. through planning for a 'critical period' scenario in our WRMP.

We have successfully managed seasonal peaks in demand over recent years, including most recently in 2018, when despite high and sustained peak demands, we did not

need to resort to implementing demand restrictions but instead were able to deploy peak resources around our area to meet demand. Phase 1 of works to upgrade the water treatment works at Bough Beech reservoir, allowing it to abstract from the reservoir, treat and distribute increasingly larger volumes of water to meet these peak demands, was completed in 2012. In 2018 we also increased the peak capacity at Woodmansterne WTW. Alongside this, recent and proposed improvements to our transfer capability will further improve our ability to manage seasonal peak events.

As well as being shown in our own demand data (see Figure below), the peak demand event we experienced in 2018 was explored in a collaborative study commissioned by water companies and undertaken by Artesia¹. 2018 provided a unique insight into unrestricted peak demands as there were no formal restrictions on demand. The Artesia report, informed by high-resolution household consumption data provided by South West Water, confirms the long-held belief that summer peak water use is largely a result of external consumption (uses outside the home, mainly in gardens for watering and leisure purposes). Additionally, the sample of 374 households showed that the external use in unmeasured households is higher - driven primarily by a higher volume per use, rather than a higher frequency of use. A relatively small number of households increased their external use, but this nonetheless had a high impact on overall household consumption for both metered and unmetered properties.

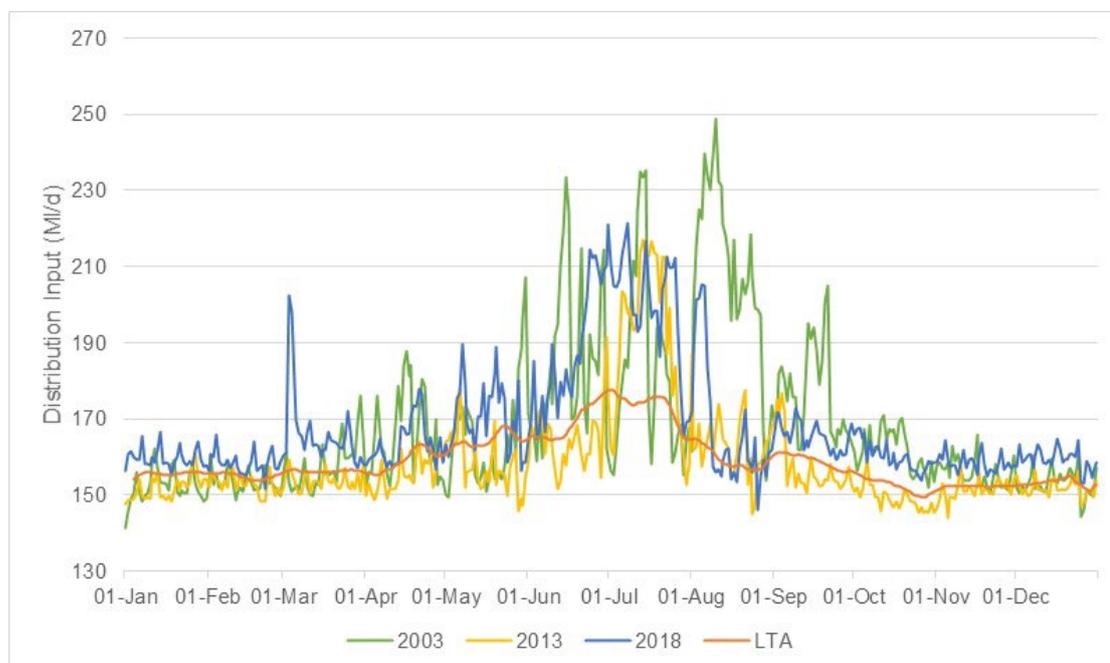
The collaborative study¹ also observed that peak demand is not just about the height of the peak but also about the duration of the peak: 2018 didn't show a particularly high peak day or peak week demand, but it did show a high total summer volume of demand relative to other years. The peak demand experienced in 2018 in our area occurred from June to mid-August. Demand in 2018 also occurred earlier in the year than in previous years due to the onset of hot/dry conditions in early June.

As part of the collaborative study¹, water companies agreed that the likelihood of longer duration events should be considered by moving away from the idea that critical periods are generally peak weeks. In our WRMP19, we used the profile of demand from 2013 to model the performance of our Bough Beech reservoir system using the Aquator water resources modelling software. Total demand (represented by distribution input, DI) for 2013 is presented against 2018 demand in Figure below, showing that the peak period for 2018 was of a longer duration, albeit of a similar magnitude (in terms of the highest peak) to that observed in 2013. For this drought plan, we have explored the use of a different demand profile for use in our water resources modelling. We identified that 2003 (also shown in Figure 4.0) demonstrated an even longer duration peak period than 2018 and therefore would be more appropriate to consider in the water resources modelling undertaken for this drought plan. To further substantiate the use of the 2003 demand profile, we calculated the total volume of June-August DI above the long-term average (LTA) for each of these key years: June-August demand in 2003 was 2,297MI higher than LTA, in 2013 was only 531MI higher than LTA and in 2018 was 1,615MI higher than LTA. Using the 2003 demand profile in our Bough Beech reservoir

¹ Artesia (2020) Water Demand Insights from Summer 2018 – Final Technical Report, Report No. AR1313

modelling for this drought plan will ensure that we are modelling an extended peak demand as standard.

Figure 4.0: Daily DI in 2003, 2013 and 2018 against LTA daily DI



The hydrological outlook for summer 2018 reported in April 2018 by CEH² was 'healthy'. March to May rainfall across much of England was well above the long-term average. Primarily as a consequence of this and the associated strong antecedent resource state, no TUBs were imposed. This demonstrates the importance of immediate antecedent conditions in influencing companies' responses to the subsequent peak demands - although it is noted that generally more than one dry winter is required to influence groundwater resources, as we are able to demonstrate later in this scenarios section. Responses to this short, sharp period of hot, dry weather on groundwater levels at the Chipstead OBH and Bough Beech storage levels are shown in Figure 4.1 and Figure 5.1.

Figure 4.1 shows that groundwater levels at Chipstead OBH were not impacted by the hot dry summer of 2018. The impacts of higher demands would not be seen at the OBH, as although abstracted volumes from our groundwater sources would have increased to meet this peak demand, this would not affect groundwater levels at the OBH which is purposely selected on the basis that it is up groundwater gradient and independent of abstraction influences.

² www.ceh.ac.uk/news-and-media/news/april-2018-hydrological-summary-uk

Figure 4.1: Groundwater levels at Chipstead OBH before, during and after the 2018 summer peak demand event

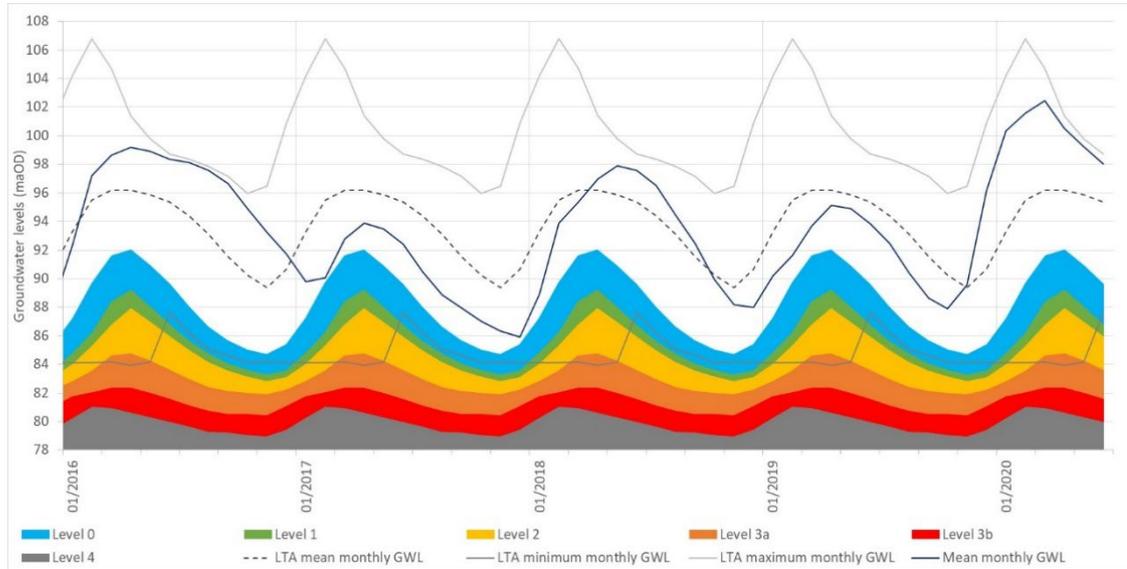


Figure 4.2: Storage levels at Bough Beech reservoir before, during and after the 2018 summer peak demand event

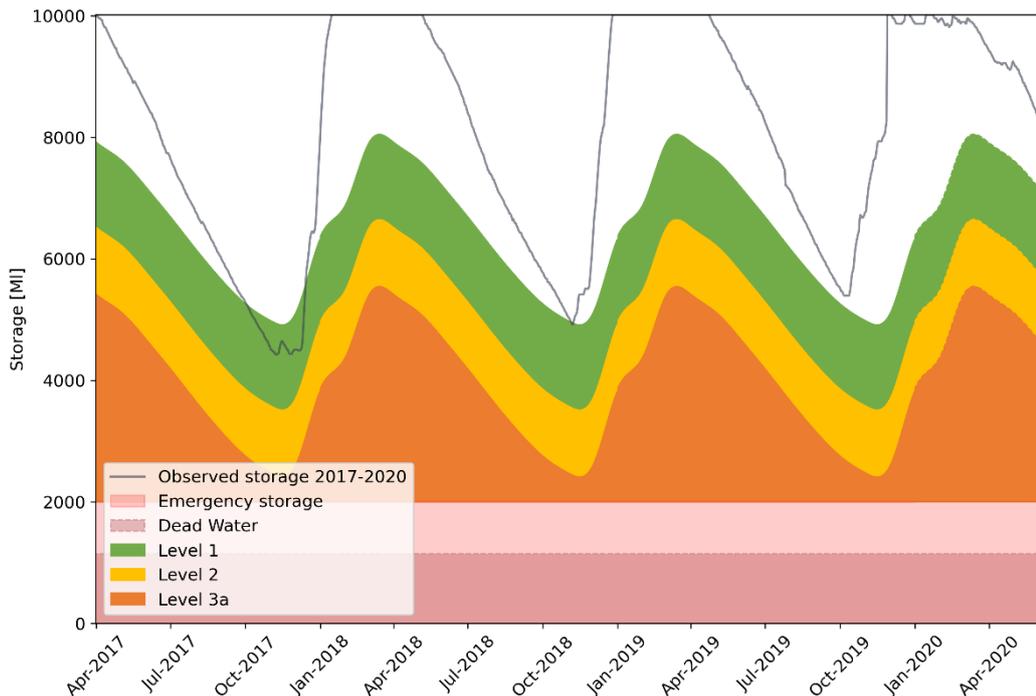


Figure 4.2 shows that storage levels in Bough Beech reservoir were drawn down during the summer of 2018 to but not across the Level 1 trigger (although it can be seen that levels in Bough Beech did cross the Level 1 trigger for a short period during the winter of 2017; however, because the time of year of the trigger crossing meant that customer communications regarding water saving would have been less effective, and the fact that levels started recovering before the end of December 2017, it was not cause for concern). The impact on Bough Beech of the hot dry summer was not significant

because the reservoir was refilled the preceding and following winters, made possible by sufficient rainfall and thus flows in the River Eden. We were able to meet the peak demand experienced during the summer of 2018 using our peak deployable output capability and without the need to deploy specific drought management actions.

With the capacity increases at the Bough Beech and Woodmansterne water treatment works (WTW), and our proposals to increase both the WTW and trunk main capacity further, we are developing a robust response to peak period demands. It can be said therefore that our supplies are resilient to a single summer season drought. The scenario presented in the following section explores a single winter season drought.

4.2.2. **Single dry winter: 2011/12**

Single dry winter events have been found from past records to predominantly affect Bough Beech reservoir. Bough Beech is considered a single season reservoir, primarily due to the constraints on refilling the reservoir. A single dry winter, which reduces the water available to refill the reservoir, has the potential to significantly affect the reservoir storage. Groundwater levels are generally more resilient to single dry winters due to the way that storage within aquifers tends to buffer the effects of reduced recharge, although they can also suffer from the effects of some single dry winters.

The refill of Bough Beech reservoir is predominantly via a pumped abstraction from the River Eden, along with rainfall onto the reservoir itself and other minor surface water runoff from its catchment. The River Eden abstraction licence (as shown earlier in Table 3.5) stipulates that a Minimum Residual Flow (MRF) of 50Ml/d must be maintained in the River Eden at the abstraction location (Chiddingstone) in September, 25Ml/d in October and 22Ml/d for the remainder of the abstraction period (November to April inclusive). During a winter of low rainfall and consequential low river flows, Bough Beech may not be able to be refilled sufficiently to meet demand the following year.

Flows in the River Eden and total demand leading up to and during the single dry winter drought event that we experienced in 2011/12 are shown in Figure 4.3 and 4.4 respectively.

Figure 4.3: River Eden average monthly flow at Chiddingstone against long term average monthly flow

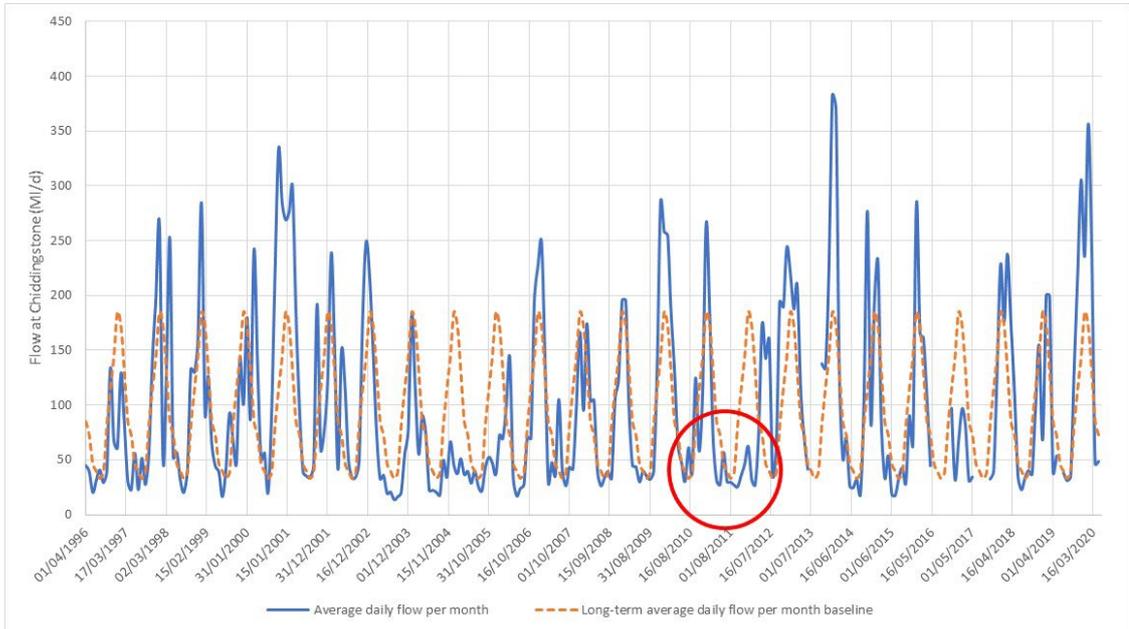
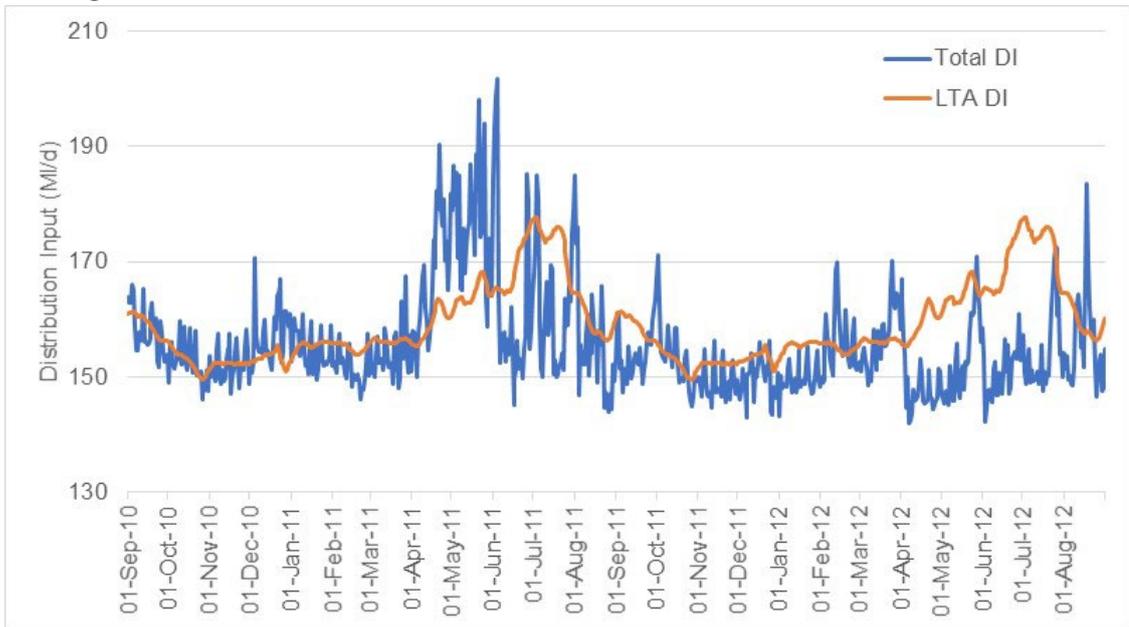


Figure 4.4: Total demand (distribution input) for the period 1 September 2010 to 31 August 2012



The consequent impacts on water resources of these antecedent hydrological conditions and levels of demand are shown in Figure 4.5 and Figure 4.6 below, in terms of groundwater levels at the Chipstead observation borehole (OBH) and storage levels in Bough Beech reservoir respectively.

Figure 4.5: Modelled groundwater levels at Chipstead OBH throughout the 2011/12 single dry winter drought³

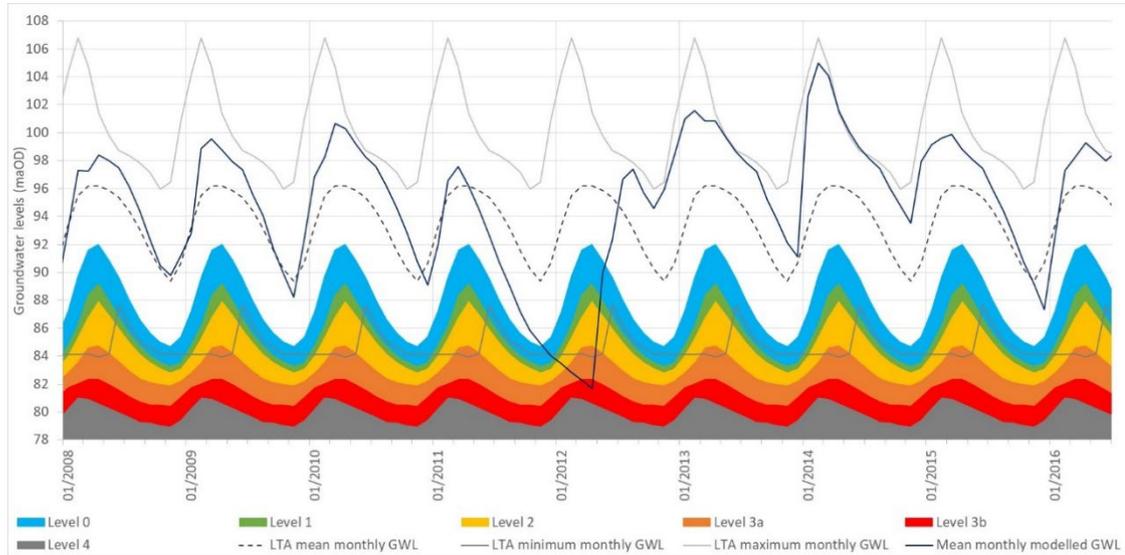
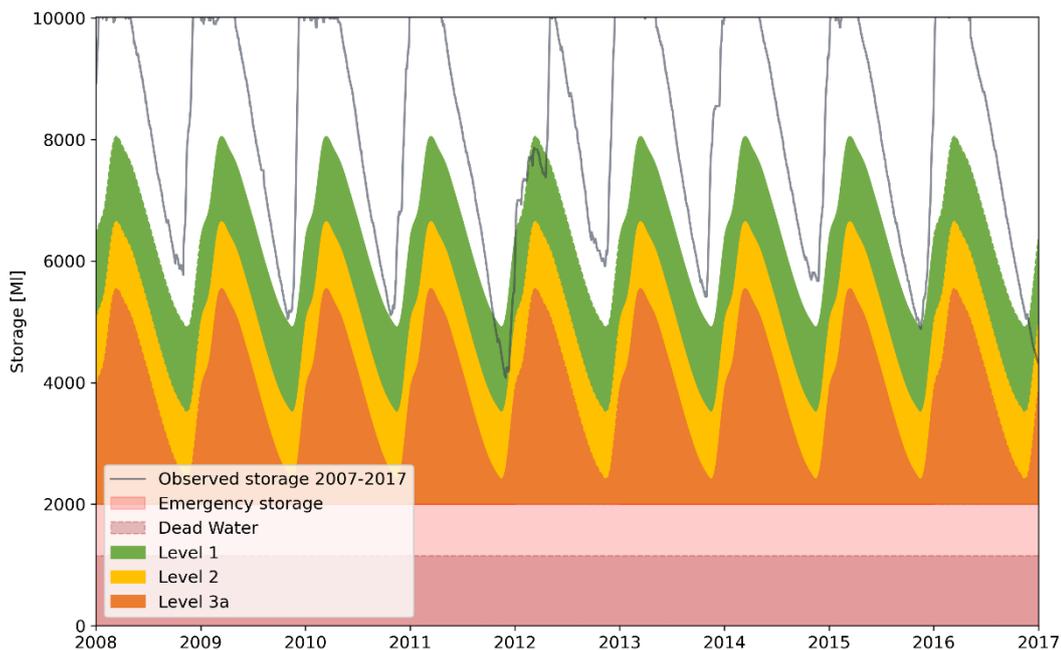


Figure 4.6: Storage levels at Bough Beech reservoir throughout the 2011/12 single dry winter drought against revised trigger curves



In our experience, single dry winter droughts do not impact our groundwater sources as much as multiple dry winter droughts, although this event did have an impact. This is demonstrated by modelled water levels at Chipstead OBH for this period, shown above in Figure 4.³ Normal levels of recharge did not occur during the winter of

³ Historical mean monthly water levels at Chipstead OBH shown in the figures in this report are modelled groundwater levels. This is due to the dewatering of the water level transducer during periods of drought in the historical record which is evident from the ‘flatlining’ of the LTA minimum monthly GWL timeseries line. Appendix A explains this more fully.

2011/12. Consequently, groundwater levels dropped below the Level 2 trigger in January 2012, the 3a trigger in February 2012 and the 3b trigger for a very short period in March 2012.

As described in our drought protocol in Table 3.6, the location of storage levels in Bough Beech reservoir in relation to its drought trigger curves is used in combination with groundwater levels at Chipstead OBH to guide our drought response actions. As occurred in 2011, it is not uncommon for refill of Bough Beech to be delayed by and hence trigger curves to be crossed during a dry autumn/early winter period, as occurred in 2011. The Bough Beech Level 1 trigger was crossed in November 2011 and Level 2 was just crossed in December 2011 for a short period of time.

As discussed in Section 2.3, for this Drought Plan, we are now using Chipstead OBH as our groundwater indicator borehole instead of Well House Inn OBH, which was used in previous iterations of our plan. It should therefore be noted that we were not using Chipstead OBH or the triggers proposed in this Drought Plan during the 2011/12 drought period. However, the response of groundwater levels at Well House Inn OBH to this drought event was similar to the response shown at Chipstead OBH, so we describe trigger crossings here in relation to Chipstead OBH for consistency across this Drought Plan.

The crossing of triggers at both Chipstead OBH and Bough Beech reservoir during the winter of 2011/12 meant that we considered appropriate drought management actions for the time of year (according to the protocol shown in Table 3.6). Despite groundwater and reservoir levels being below their Level 2 triggers in January 2012, we decided not to implement TUBs at that time due to their lack of effectiveness in reducing demand during winter. As the spring approached, however, we increased water saving communication activity and, despite some recovery in Bough Beech levels, because groundwater levels were by that point below the Level 3a trigger, we made the decision to implement a hosepipe ban on 5th April 2012 and applied for a River Eden May drought permit. This drought permit benefited the company with significant abstraction being achieved to support refill of the reservoir, as shown in Figure 4.7. Under normal licence conditions (when abstraction would finish at the end of April), recovery of the reservoir would not have been possible in spring 2012 without use of the May drought permit.

Groundwater levels were able to respond naturally to the wetter conditions experienced during the late spring and summer of 2012 and regained long-term average levels (which were subsequently exceeded) by mid-summer 2012.

Comparison of previous and revised trigger curves

Figure 4.7 and 4.8 show when the revised and previous Bough Beech trigger curves respectively would have been crossed during the 2011/12 drought event. A comparison between these two graphs shows that the previous and revised Bough Beech trigger curves would have been crossed at similar times, so the actions the company took in 2011/12 would still apply with the revised trigger curves.

Figure 4.7: Abstractions from the River Eden at Chiddingstone into Bough Beech reservoir (1996 - 2020)

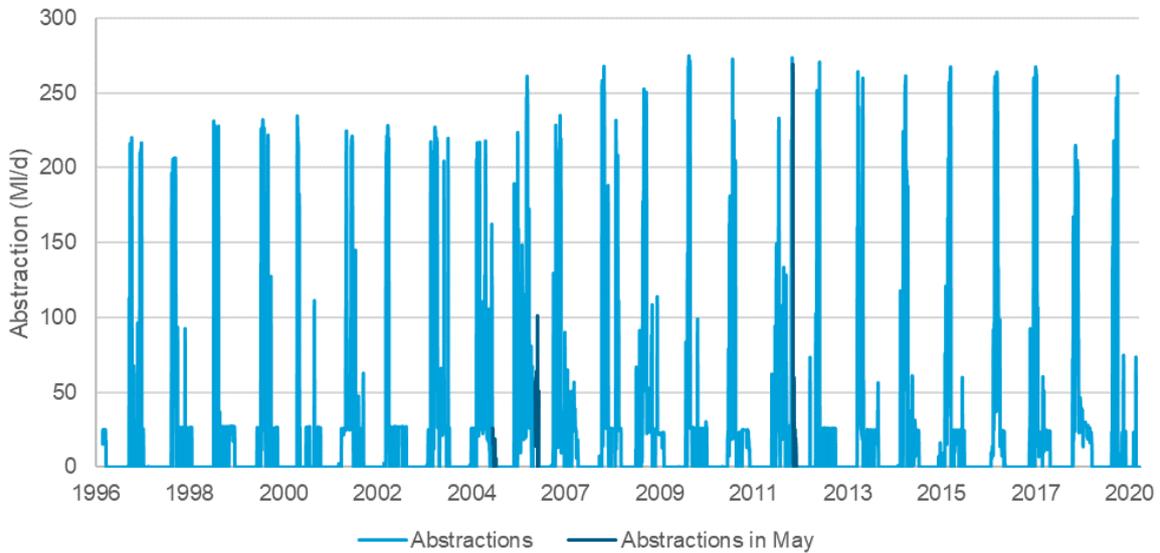
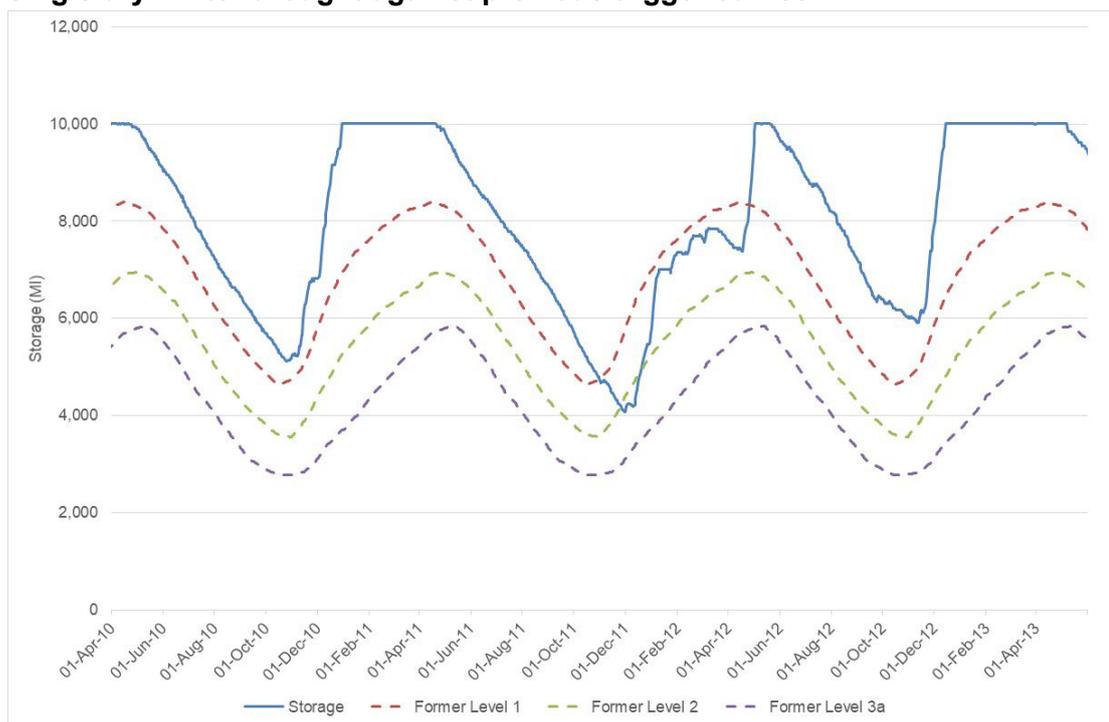


Figure 4.8: Storage levels at Bough Beech reservoir throughout the 2011/12 single dry winter drought against previous trigger curves



4.2.3. Two dry winters: 2005-07

Two dry winter droughts have a large effect on groundwater resources, and, as we rely on groundwater for 85% of our supply, such droughts present a significant potential threat to our overall resources. Recharge of our aquifers is dependent on adequate winter rainfall over a number of seasons. Consecutive dry winters are likely to lead to a situation where groundwater levels decline to extremely low levels and the groundwater resources available for abstraction are reduced towards the drought

deployable outputs or potentially even less for very extreme droughts. During the 2005-07 drought period, water levels at a number of our groundwater sources fell to their lowest recorded levels. This period of severe drought is considered the worst on record (though lower groundwater levels were recorded at Well House Inn OBH during 1944, they have been disregarded as having been artificially influenced by local abstraction at the time) and therefore the most appropriate historical period for testing the effectiveness of our Drought Plan. It was recently stated that the majority of multi-season droughts in the last 100 years have lasted for two winters (Marsh, 2007).

The following text and figures describe the antecedent conditions leading up to this drought event, the consequent impact on our water resources and the actions that we took to manage the drought.

In its November 2006 'Drought Prospects' report, the Environment Agency reviewed the status of water resources. It clearly states the importance of winter rainfall for water resources. Figures presented in the report showed that less than 75% of average rainfall fell within our supply area between October 2004 and April 2006, which had a clear impact upon the operationally important winter recharge of groundwater and surface water sources. It also presented data showing that observation boreholes within our supply area were 'exceptionally low'.

Figure 4.9 to Figure 4.13 illustrate rainfall at Bough Beech, flows in the River Eden, storage levels at Bough Beech reservoir and modelled groundwater levels at Chipstead OBH compared to long-term average trends observed within our supply area during the period of this drought event.

It can be seen that the majority of rainfall between 2004 and 2006 is below the long-term average. Rainfall that is able to recharge aquifers is known as 'effective rainfall'; that is, it does not run off or evaporate but percolates into the ground. Summer rainfall events are of limited benefit to groundwater reserves as much of the water evaporates or remains in the soil. However, it does help to restrict demand as garden watering reduces during these periods.

Figure 4.9 shows that River Eden flows recorded at Chiddingstone were visibly lower than the long-term average during the winters of 2004 to 2006.

Figure 4.11 and Figure 4.12, displaying Bough Beech storage levels against revised and previous drought triggers respectively, show very similar timings of trigger crossings, so our response based on our revised triggers would be very similar to our actual response in 2005-07 which was based on our previous triggers.

Figure 4.9: Monthly rainfall totals (January 2000-May 2011) and long-term average (1990-May 2011) rainfall at Bough Beech reservoir (Source: SES Water, 2013)

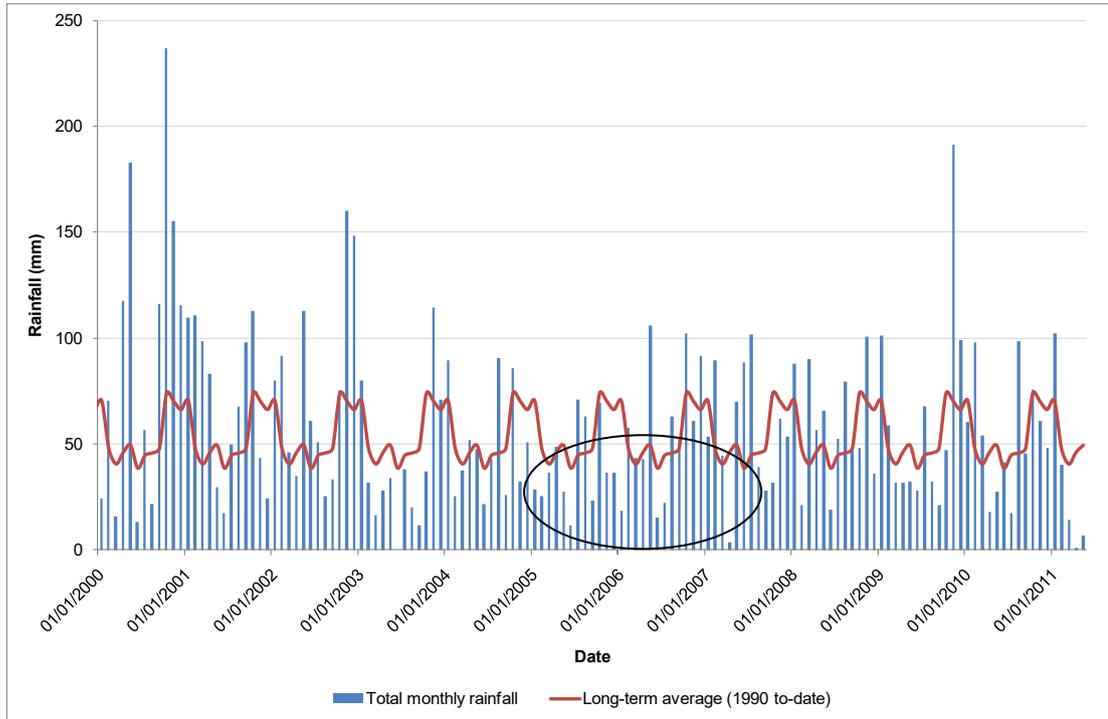


Figure 4.10: River Eden flows at Chiddingstone (April 1996-March 2020)

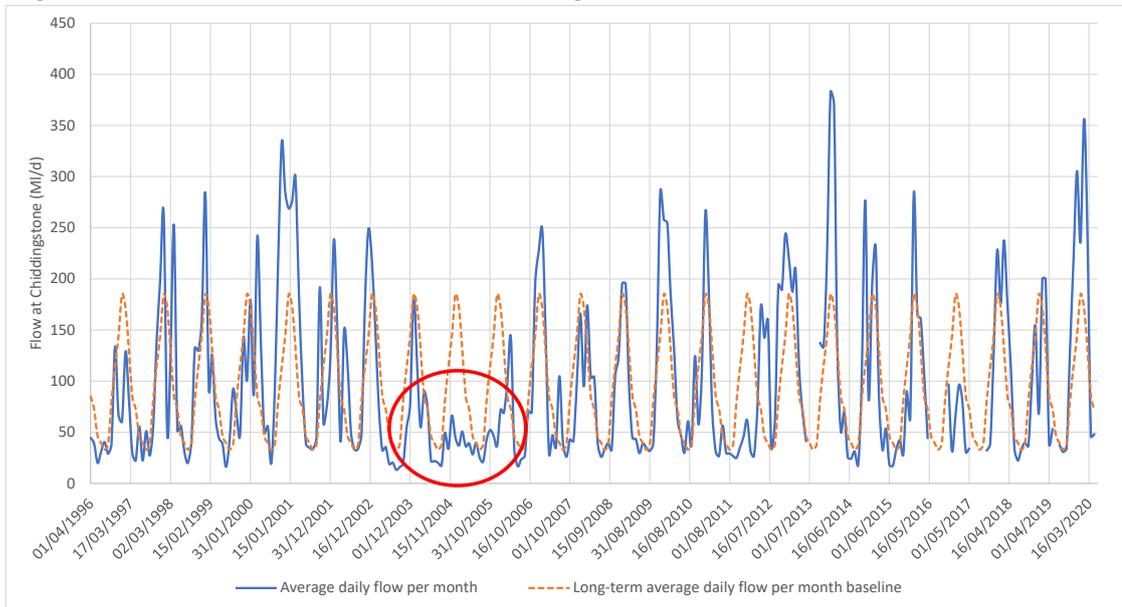


Figure 4.11: Storage levels at Bough Beech reservoir 2003-2009 against revised trigger curves

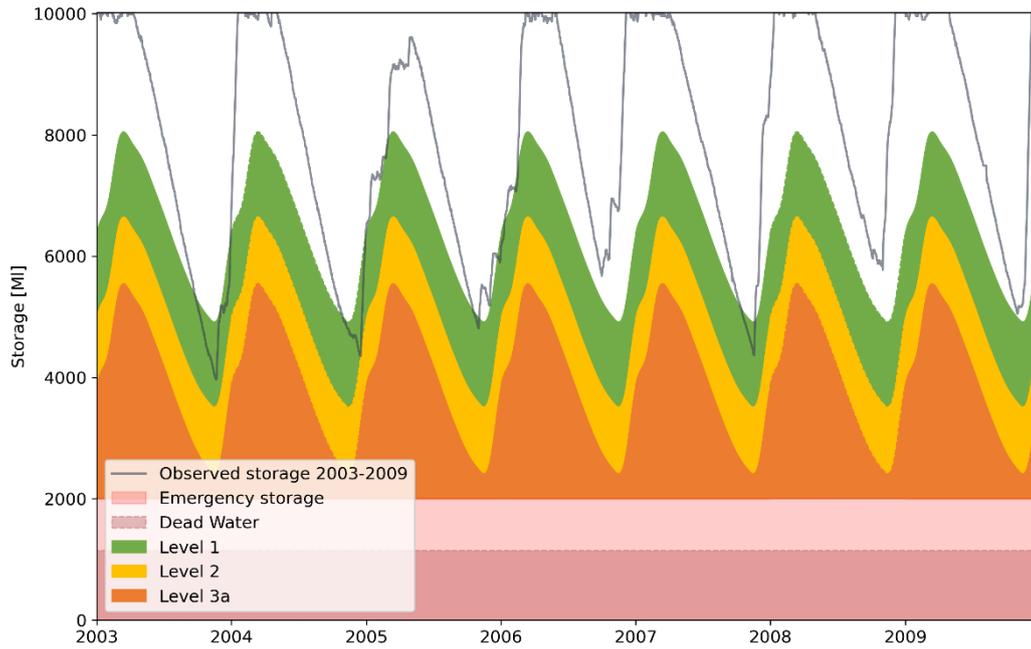


Figure 4.12: Storage levels at Bough Beech reservoir 2003-2009 against previous trigger curves

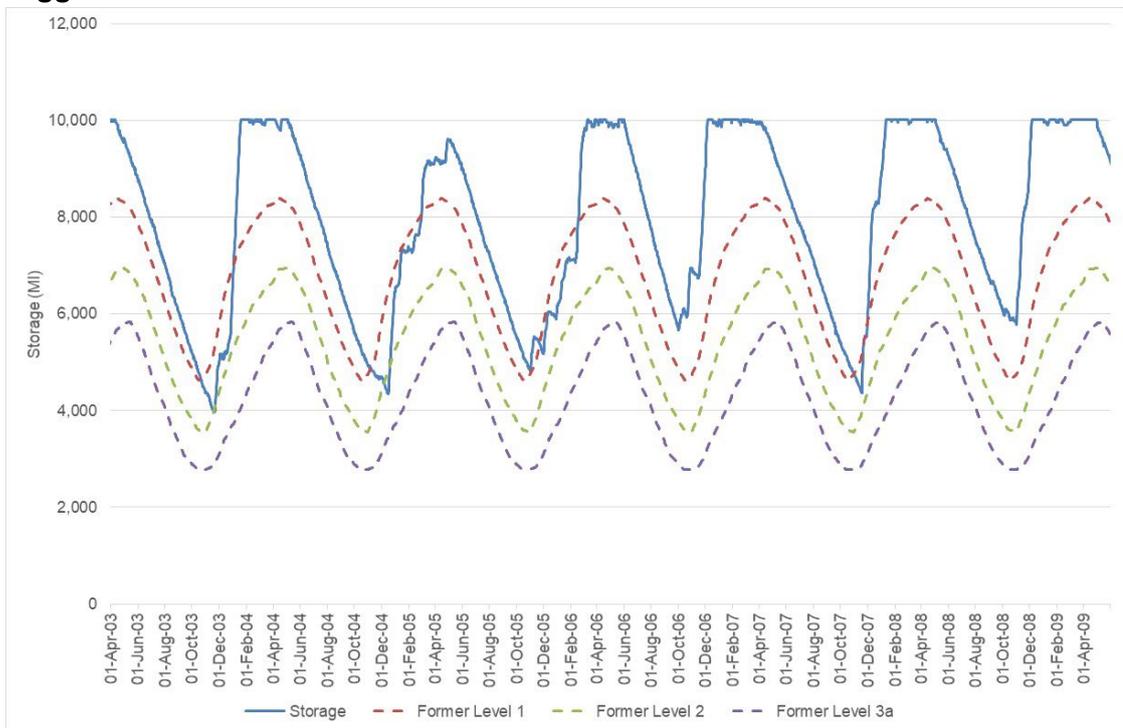


Figure 4.13: Modelled³ mean monthly groundwater levels at Chipstead OBH 2003-2009 compared to trigger curves and long-term average minimum, mean and maximum groundwater levels

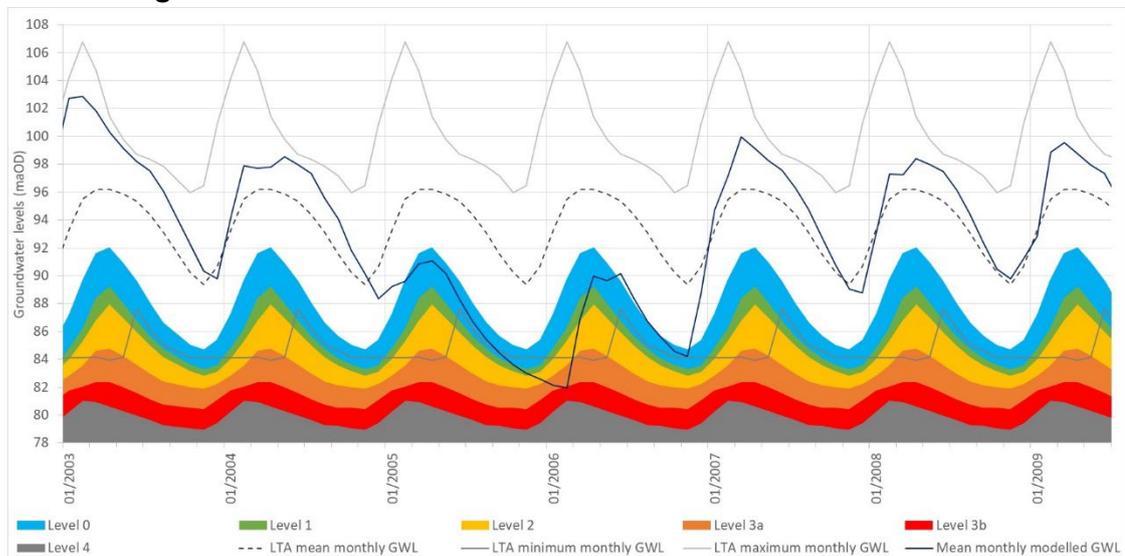


Figure 4.13 shows modelled groundwater levels at Chipstead OBH3. It can be seen that groundwater levels were well below the long-term averages at the Chipstead OBH between the winters of 2005 and 2007. Groundwater levels during the period 2003 to 2007 against our previous trigger curves are shown for our previous OBH, Well House Inn, in Figure 4.14. We have compared the timing of equivalent trigger crossings that would have occurred at Chipstead OBH with those that occurred at Well House Inn OBH during this drought event in Table 4.0 below.

Table 4.0: Timing of previous and revised groundwater trigger crossings 2005-07

Current trigger level (Drought Plan 2019 trigger level)	Month of trigger crossing based on previous triggers	Month of trigger crossing based on revised triggers
Level 1 (Level 2)	April 2005	October 2005
Level 2 (Level 3a)	October 2005	December 2005
Level 3a (Level 3b)	February 2006	January 2006

It can be seen that Level 1 and Level 2 crossings would have occurred slightly later if the revised triggers in this drought plan had been used during the 2005-07 drought. Some of the difference are attributable to the fact that we are now using Chipstead OBH rather than Well House Inn OBH. But more significantly, the revised trigger levels are generally slightly lower than the previous ones, because they have been derived using a recently generated 19,200-year stochastic dataset of water levels rather than

the more limited approximately 100-year historical water level record. As such, we are confident that although the timings of our response during the 2005-07 drought may have been slightly different if we had used our revised trigger levels, the same actions would have been initiated in line with our implementation of drought actions on a precautionary basis (because when we enter a drought, we do not know how severe it will end up being) aligned with our stated Levels of Service, despite having overall resilience to a 1 in 200-year drought as shown in our WRMP19. Using the stochastic data to inform our drought triggers and actions means that our overall understanding of drought risk is now improved. Our current understanding is that the 2005-07 drought event corresponds to a 1 in 35-year annual groundwater level minimum return period (see Appendix A).

Details of the actions that we took during the 2005-07 drought event are provided in Table 4.1, in accordance with the trigger crossings that occurred at Well House Inn OBH and Bough Beech reservoir. We did not consider it necessary to activate all drought management options available during the 2005-07 two dry winter drought; if the drought had been more severe, we may have considered applying for one/more groundwater drought permit(s). The phasing of demand restrictions, as well as the related implementation times, is shown with reference to the previous Well House Inn trigger curves during the 2005-07 drought in Figure 4.14. These demand restrictions are shown only in terms of strict breaches of the trigger curves. In reality, we could consider applying for these restrictions prior to the actual breach occurring so that we were ready to implement them when the breach occurred, particularly where, for example in the case of the drought order for non-essential use restrictions, the time from inception to implementation may inhibit potential achievable savings due to seasonality.

Figure 4.14: Well House Inn OBH historical groundwater levels and previous drought triggers and action zones from January 2003 to December 2007

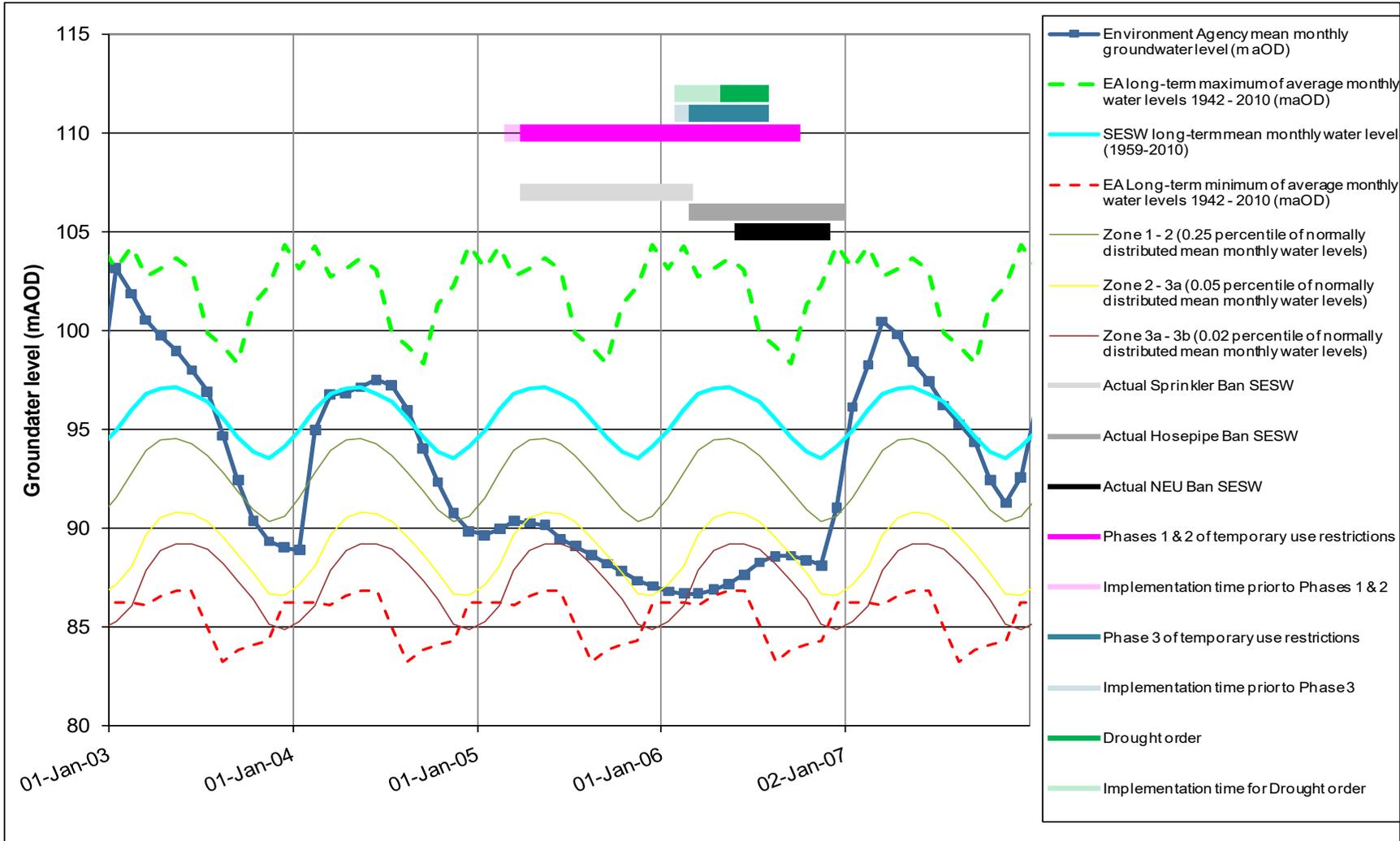


Table 4.1: Actions taken during the 2005-07 two dry winter drought

Trigger level (based on previous trigger levels)*	Action	Description
Level 2	Leakage reduction efforts	During 2006, we implemented increased active leakage control. Higher than normal numbers of leak detection staff were kept on and the response time for repairing visible leaks was improved. We estimate that this initiative resulted in a temporary reduction in total leakage of around 0.3 MI/d.
Zones 1-3a	Further increase customer awareness	Customer awareness was maintained through ongoing media coverage of the drought and press releases. The 2006 issue of the Company magazine had a number of features concerning the drought. Letters were also sent to every customer advising of the drought and asking for their assistance in economising their use of water. Appropriate banners were attached to all our vehicles advising of the restrictions imposed at that time. A major press conference with national television was held at our head office on 26 May 2006 in advance of implementing restrictions to non-essential use.
	Utilise Bulk Supply from Thames Water	We sent a request for the bulk supply from Thames Water in January 2006. It was granted by Thames Water and taken from 3 April 2006 to 6 September 2006, resulting in up to an additional 5 MI/d being available for use in the SESW supply area.
	Write to commercial customers to reduce demand	In 2005 we wrote to the Chief Executive or senior responsible officer of approximately 500 organisations who are the highest water users supplied by the Company. The letter asked for a sustainable approach to the use of water in the context of the restriction on domestic properties already introduced. In 2006, as the drought progressed, we wrote to every commercial customer advising of the drought and asking that they make every effort to economise in their use of water. This was repeated on introduction of the NEU ban in May 2006.

Trigger level (based on previous trigger levels)*	Action	Description
	Sprinkler and unattended hosepipe restriction**	A ban on sprinklers and unattended hosepipes (now Phase 1 of temporary use restrictions) was introduced on 22nd April 2005 across the Company area. We were the first water company in the UK to apply this ban. It is estimated that this saved approximately 1.5% of expected average and 3.5% of expected peak demand in that year.
	Hosepipe restriction**	<p>We introduced a full hosepipe ban (now Phase 2 of temporary use restrictions) on 1st March 2006 across the area; this was lifted on 18th January 2007. Before this, the last full hosepipe ban was in the East Surrey WRZ from April 1992 until December 1992. It is estimated that this saved approximately 4% of expected average and 6% of expected peak demand in that year, including savings already accumulated from the sprinkler ban.</p> <p>It is important to note that whilst demand restrictions obviously reduce the demand component of the supply-demand balance, they do not result in an increase in the theoretical deployable output of groundwater sources due to the way in which the latter are calculated. In reality however, the reduction in abstraction resulting from demand restrictions will have the effect of reducing the rate of depletion of the groundwater resource available for abstraction that in turn delays the point at which low pumping water levels become a constraint on output.</p>
	Drought permits to abstract from the River Eden ⁴	We successfully applied for drought permits to abstract from the River Eden during May 2005 and May 2006 and to remove the then operational autumn flush licence condition during the autumn of 2006. This resulted in an additional 320 MI being abstracted in May 2005, 927 MI in May 2006 and 2,078 MI in the autumn of 2006 (N.B. this is no longer a drought permit option), subject to conditions agreed with the EA to protect the environment, to support refill of Bough Beech reservoir.
Level 3b	Drought order to restrict non-essential	A drought order to restrict the non-essential use of water came into force across the area on 27th May 2006. This allowed us to ban the use of hosepipes for a range of activities including the watering of sports grounds and golf courses as well as the restricting the operations of mechanical vehicle washers, the topping up of private swimming pools and the washing of road vehicles,

⁴ Note that drought permits now fall within the former Level 3b zone of drought management actions, in this drought plan termed Level 3a.

Trigger level (based on previous trigger levels)*	Action	Description
	use of water**	<p>railway stock and aircraft. However, in order to assist our customers as much as possible, while fully protecting the integrity of the water supply, we did not implement all of the restrictions permitted by the drought order. We granted allocations of water for some of the non-domestic uses described above and made a free raw water supply available for tankering by customers from our abandoned Pains Hill source. In this way we consider that we implemented the drought order sensitively and progressively, as required by the Minister of State at Defra in the granting of the order. It is estimated that this saved approximately 10-17% of expected average and 20% of expected peak demand in that year, including savings already accumulated from the sprinkler and hosepipe bans. This drought order was lifted on 15th November 2006.</p> <p>Part of the decision-making process that led to removal of the drought order was that winter was approaching, and while we had previously largely had the support of our customers in the actions taken, there was a risk that moving into the winter period would reduce in customers' views the clear justification for the restriction; maintaining customer support for actions was a clear driver in this case.</p>

* Trigger levels in this table are based on the Drought Plan 2019 trigger zones. It should be noted that for this drought plan, the trigger zones have been renamed, see Section 2.

** The normal procedure has been a sprinkler/unattended hosepipe ban (Phase 1 of the temporary use ban powers) to be implemented first; then if levels do not see a significant improvement, this is followed by a full hosepipe ban (Phases 2 and 3 of the temporary use ban powers). The prolonged exceedance of the Level 3a trigger level from April 2005 to August 2006 is an example of when the situation did not improve for an extended period and groundwater levels approached their all-time minimum. In fact, Level 3b was breached in February 2006. As a result, we were the first to apply for and the only to implement a non-essential use ban throughout its supply area. This was in place from 27 May to 15 November 2006. Savings from the Temporary Use Bans and Non-Essential Use Bans are given in Sections 3.1.4 and 3.1.6. The sprinkler and hosepipe bans were removed in January 2007.

4.2.4. Stochastic Drought Scenarios

The following sub-sections set out the characteristics of drought events of specified return periods identified from the 19,200-year stochastic record that is being used to develop our WRMP24. We elected to utilise this stochastic record, superseding the stochastic data upon which our WRMP19 was based, because it represents the best available information available at the time of writing this Drought Plan, and additionally because this data has formed the basis for our revised groundwater and Bough Beech reservoir trigger curves as presented in Section 2.4 and detailed in Appendices A and B of this Drought Plan.

In our WRMP19, we demonstrate that we are resilient to a 1 in 200-year drought event. Through our ongoing work with WRSE developing the South East Regional Resilience Plan 2022, which will underpin our WRMP24, we will be demonstrating again that, with any necessary investment over the planning period, we will be resilient to a 1 in 200-year drought event until 2039/40 and to a 1 in 500-year drought event thereafter. The maximum period covered by this Drought Plan is the 5 years from 2022-2027, therefore a 1 in 200-year drought event is the applicable planned level of resilience. However, we demonstrate the efficacy of our drought management actions through both 1 in 200-year and 1 in 500-year stochastic drought events in the following sub-sections, in order to demonstrate the actions we would take in such severe events based on our current drought plan.

The 19,200-year stochastic climate dataset developed for the WRSE Regional Resilience Plan 2022 has been used to produce a 19,200-year flow series for the River Eden using Catchmod, for use in the Pywr water resources model of the Bough Beech reservoir system. The same stochastic climate dataset for the appropriate location in our supply area has been run through the lumped parameter model of Chipstead OBH to generate a 19,200-year groundwater level sequence. From this data, particular return period drought events can be selected.

The drought events presented in the sub-sections below have been selected based on:

- The percentile approach to monthly groundwater level statistics at Chipstead OBH, consistent with the method used to derive the revised trigger curves; and
- Ranking of annual storage minima for Bough Beech reservoir.

As has been touched on earlier in this section, the severity of the groundwater and surface water response to the same low rainfall event can vary. It is therefore perhaps unsurprising that in some cases, a specific return period drought event for groundwater may not correspond to the same return period drought event in surface water, although our drought management protocol (Table 3.5) ensures we consider a number of factors prior to implementing particular drought management actions when triggers are crossed at our two indicator sides, with the aim of not exceeding our levels of service. We demonstrate our ability to respond to both groundwater- and surface water-driven 1 in 200-year drought events in Sections 4.2.5 and 4.2.6 respectively.

Each pair of Chipstead OBH/Bough Beech reservoir charts illustrate the same stochastic drought period as each other and have been assigned an arbitrary date range of 1953-1960; however, it is important to note that these are not the actual

historical events that occurred during that period. The dates from the stochastic traces (between 1950 and 1997) are stated in the figure titles.

4.2.5. 1 in 200-year stochastic drought at Chipstead OBH

The first stochastic drought event that we present here in Figure 4.15 is a 1 in 200-year annual minimum groundwater level drought at Chipstead OBH, exhibiting two dry winters. Storage levels at Bough Beech reservoir during the same stochastic event are as shown in Figure 4.16.

Figure 4.15: Groundwater levels at Chipstead OBH during a 1 in 200-year stochastic annual minimum groundwater level drought (stochastic trace no. 262, 1990-96)

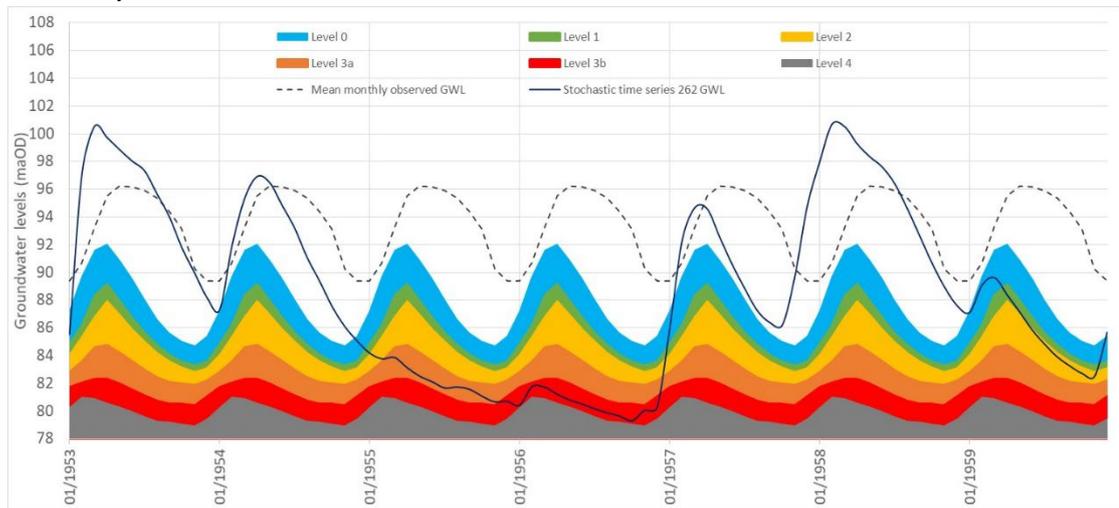
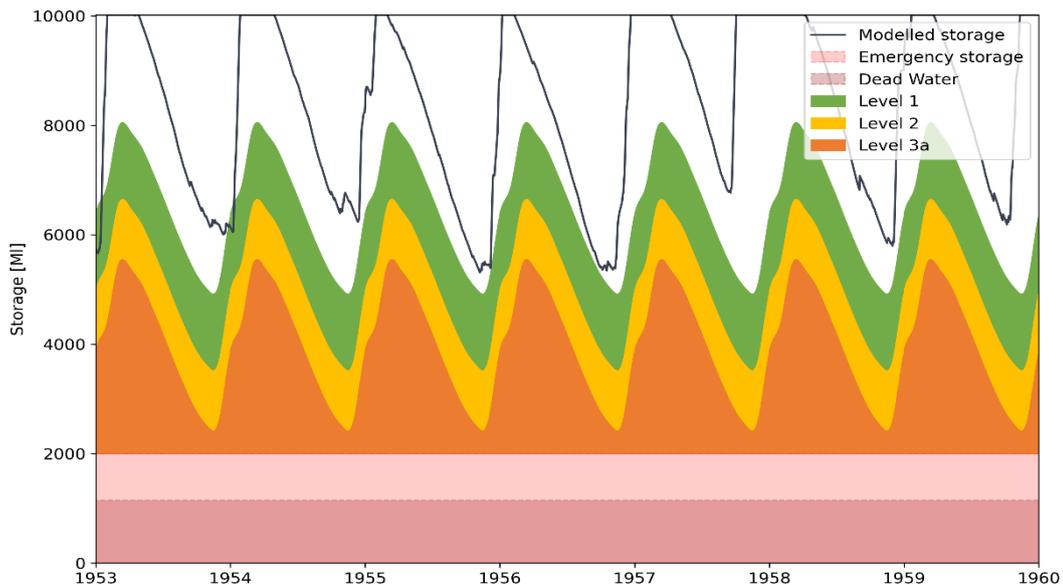


Figure 4.16: Storage levels at Bough Beech reservoir during the 1 in 200-year stochastic groundwater drought (stochastic trace no. 262, 1990-96) (with demand savings on)



It can be seen that during this drought event, groundwater levels at Chipstead OBH are severely affected, but Bough Beech reservoir levels do not even cross the Level 1 trigger. As discussed earlier, the intention of having surface water and groundwater

trigger curves is to enable use of Bough Beech reservoir to augment the available resources within other water supply zones during times of potential shortage, and vice versa. Transmission capacity exists to transfer some Bough Beech reservoir water into other supply areas. These transfers would only be made when the reservoir contains more water than is required to meet supply requirements within its own area. As a general rule, overdrawing of Bough Beech reservoir is considered whenever the groundwater levels fall below the normal operating curve for the Chipstead OBH and the amount of transfer from Bough Beech should increase if the groundwater levels fall into Zones 2 or 3a. If groundwater levels are below the normal operating curve but are increasing, consideration is given to stopping any further transfer from Bough Beech reservoir. In this way, information from the different drought trigger sites is combined.

Under the above scenario, it is likely that due to the prolonged breach of the Level 3a trigger at the Chipstead OBH, we would have implemented a TUB and NEUB, followed by one or more of our drought permits during '1955' and '1956' as indicated on the graph.

4.2.6. 1 in 200-year stochastic drought at Bough Beech

The stochastic event presented in Figure 4.17 is a 1 in 200-year event based on Bough Beech reservoir storage level minima. The corresponding groundwater levels at Chipstead OBH for the same stochastic event are shown in Figure 4.1.

Figure 4.17: Storage levels at Bough Beech reservoir during a 1 in 200-year hydrological drought at the reservoir (stochastic trace no. 77, 1969-75) (with demand savings on)

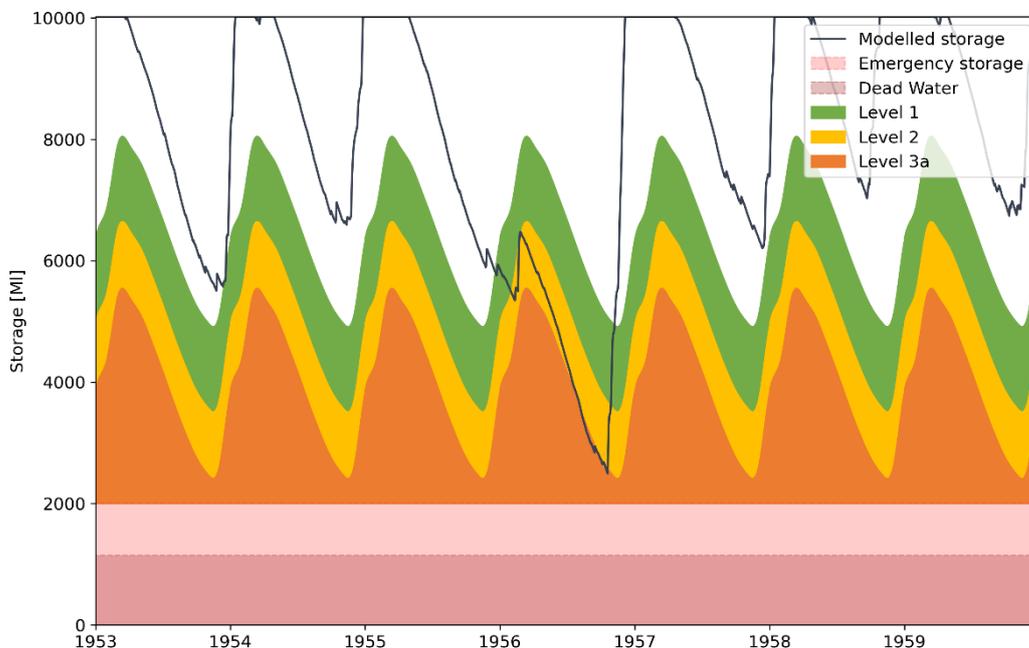
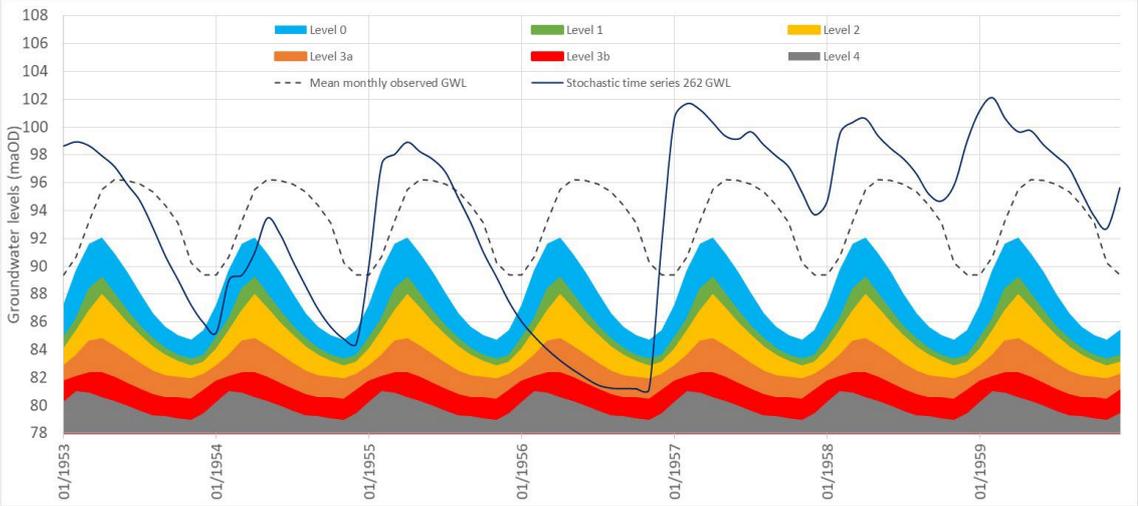


Figure 4.1: Groundwater levels at Chipstead OBH during the 1 in 200-year Bough Beech reservoir drought (stochastic trace no. 77, 1969-75)



During this drought event, there is a response, Level 3a is crossed at Chipstead OBH in March '1956' but the same trigger at Bough Beech reservoir is not crossed until July '1956'. Under these circumstances, it is likely that with the majority of our drought management actions providing benefit during the spring/summer months, we would have taken action on the precautionary basis of the groundwater level triggers, because if we had waited for storage levels at Bough Beech reservoir to also cross its Level 3a trigger, we would have missed the opportunity to implement TUBs during the most effective part of the year and to implement the River Eden May drought permit, part of the River Eden Summer drought permit and part of the Hackbridge drought permit. The drought can be seen to end at the same time (November '1956') at both trigger sites.

There is sufficient time between crossing of triggers at both Chipstead OBH and Bough Beech reservoir during this drought event to implement our drought management actions.

4.2.7. 1 in 500-year stochastic drought at Chipstead and Bough Beech

We have identified a 1 in 500-year stochastic drought event to be a plausible more extreme scenario than we have planned to be resilient to over the period of this Drought Plan. Groundwater levels at Chipstead OBH and storage levels at Bough Beech reservoir during this event are shown in Figure 4.19 and Figure 4.20 respectively.

This 1 in 500-year drought event can be seen to have a significant impact on both groundwater levels and reservoir storage levels, although the timings of the most serious impacts do vary. Bough Beech reservoir does not refill during the winter of '1954/55' and groundwater recharge is lower than LTA. Bough Beech levels therefore cross down through its Level 1, Level 2 and Level 3a drought triggers during the winter of '1954/55'. Chipstead OBH groundwater levels, however, do not cross down into Level 1, 2 and 3a until the winter of '1955/56'. Under these circumstances, it is likely that we would take certain drought management actions in spring/summer '1955' based on the crossing of our Bough Beech triggers, e.g. implementing TUBs and applying for

Figure 4.19: Groundwater levels at Chipstead OBH during a 1 in 500-year annual minimum groundwater level drought (stochastic trace no. 218, 1953-59)

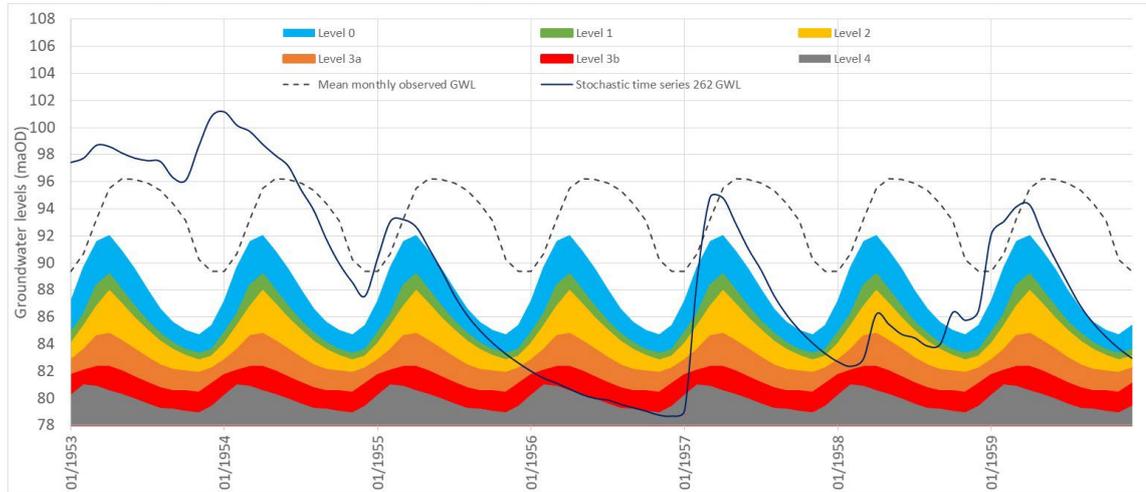
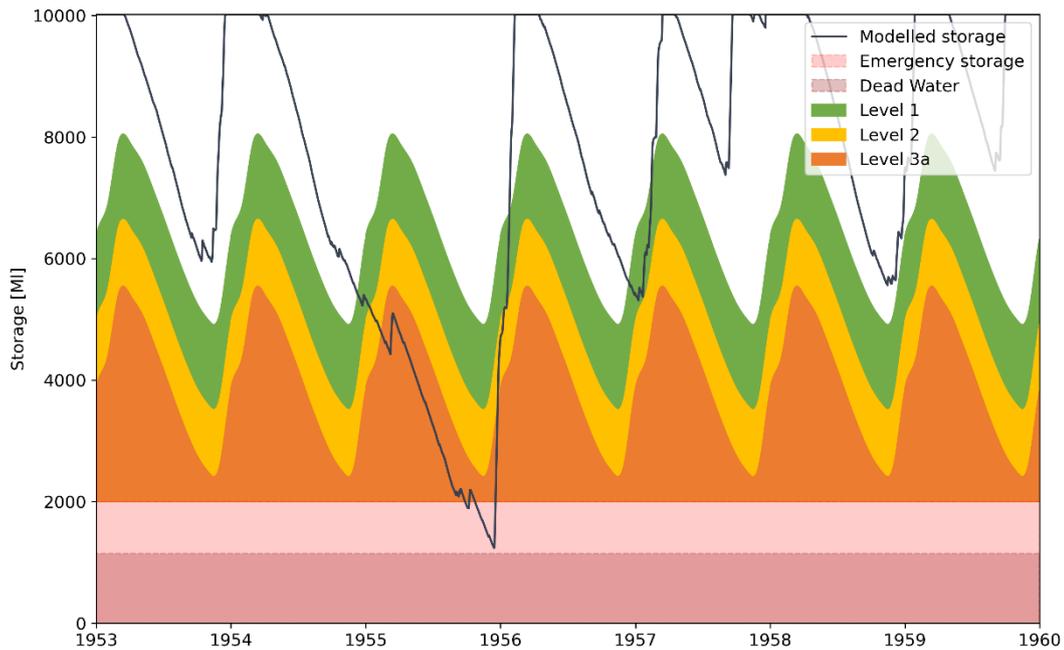


Figure 4.20: Storage levels at Bough Beech reservoir during a 1 in 500-year annual minimum groundwater level drought (stochastic trace no. 218, 1953-59) (with demand savings on)



both River Eden drought permits to give the reservoir the best hope of recovery during the spring/summer of '1956'. However, because groundwater levels were not at that time below Level 2 or 3a, it is likely we would not have considered a NEUB or groundwater drought permit. However, as the drought progressed and groundwater levels fell below Level 2, 3a and then 3b during the winter of '1955/56', we would expect under these circumstances to consider implementing a NEUB and the Outwood Lane and Kenley/Purley drought permit options, as well as applying for the River Eden May and Summer drought permits again during the spring of '1956'. Storage levels at Bough Beech reservoir did in fact recover during '1956', but due to the ongoing very low

groundwater level situation, it is likely that we would aim to maximise abstraction from the reservoir to reduce pressure on groundwater sources, therefore would still benefit from the River Eden drought permits.

If we were to experience a 1 in 500-year drought during the period of this Drought Plan, it is expected that we may also need to rely upon 'More Before 4' actions, as set out in Section 3.1.5.

5. ENVIRONMENTAL ASSESSMENT

5.1. Strategic Environmental Assessment

Strategic Environmental Assessment (SEA) has been carried out on our Drought Plan as per the requirements of The Environmental Assessment of Plans and Programmes Regulations 2004. It is the purpose of SEA to provide for a high level of protection to the environment and to contribute to the integration of environmental considerations into the preparation and adoption of Plans. As such, SEA considers a range of environmental issues in the context of the Plan area and assesses options within the Drought Plan against a series of SEA objectives that reflect environmental issues and opportunities.

Full details of the SEA process and the findings made can be found in the SEA Environmental Report provided as Appendix K (Non-Technical Summary) & L (full report).

While some moderate adverse effects are identified through the SEA, no adverse effects are anticipated to be permanent in nature. Mitigation (embedded and additional) is included to alleviate effects of the Drought Plan where feasible. It is also the case that options would typically be implemented in a phased, sequential manner. It is the intention that such measures will act to reduce pressure on water resources by reducing demand for water and as such, reduce the need for abstraction, treatment and onward pumping. This will have beneficial effects across a number of environmental issues and act cumulatively across the Plan area and into nearby / linked resource areas.

It should also be noted that drought monitoring plans which comprise pre-drought, in-drought and post-drought (recovery) stage monitoring and assessment are included in the Plan. This, in addition to suggested ongoing monitoring discussions made in the SEA, as well as annual updates to the EARs, will ensure that adverse effects can be readily identified and mitigated should they arise.

5.2. Habitats Regulations Assessment

The Conservation of Habitats and Species Regulations 2017 (Amended) and the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 require that any plan or project which is likely to have a significant effect on a European site (either alone or in-combination with other plans or projects) and is not directly connected with, or necessary for the management of the site, must be subject to an HRA to determine the implications for the site in view of its conservation objectives.

The Environment Agency's 2020 Drought Plan Guidance⁵ specifies that a water company must ensure that its Drought Plan meets the requirements of the Habitats Regulations. Responsibility for undertaking the Habitats Regulations Assessment lies with SES Water as the Plan making authority. The Environment Agency's 2015 Drought Plan Guidance⁶ advises companies to consult the UK Water Industry Research (UKWIR, 2012) report 'Strategic Environmental Assessment and Habitat Regulations Assessment - Guidance for Water Resources Management Plans and Drought Plans' in preparing its HRA. The UKWIR report recommends that all drought plans should be

⁵ Environment Agency (2020) Water Company Drought Plan guideline, April 2020

⁶ Environment Agency (2015) Habitats Directive: Risk definitions and matrices Supporting Document 890_11

subject to the first stage of HRA, i.e. screening for potential Likely Significant Effects (LSE) on European designated sites.

As an integral part of developing our Drought Plan, SES Water has carried out a Habitats Regulations Assessment (HRA) screening to assess the potential implications of the Plan on the following nationally and internationally important nature conservation sites:

- Special Areas of Conservation (SAC)
- Special Protection Areas (SPA)
- Ramsar sites.

All sites designated under these laws are referred to collectively as ‘European sites’ (noting that the Ramsar Convention reflects international rather than exclusively European sites).

Since the drought actions contained within this Drought Plan were previously consulted in the 2021 draft plan, regulatory feedback on that draft plan has been used to inform the HRA screening. Where necessary, updated actions, baseline information, legislation and guidance have been taken into account.

The Drought Plan HRA Screening Report is provided in Appendix M.

5.3. Environmental Assessment Reports

5.3.1. Context

This Drought Plan sets out the range of measures that we will consider implementing in managing drought conditions, taking account of statutory legislation and regulatory requirements. These measures include a number of potential drought permits that we may apply for to enable additional water to be abstracted from the water environment. Such applications are made in accordance with the Water Resources Act 1991, as amended by the Environment Act 1995, the Water Act 2003 and the Water Act 2014.

In accordance with the Environment Agency’s updated drought plan guidance published in December 2020, water companies are required to prepare Environmental Assessment Reports (EARs) to accompany an application for a drought permit. EAR requirements are set out in earlier July 2020 supplementary guidance for water company drought planning environmental assessment and this guidance informed preparation of our drought permit EARs. A pre-prepared ‘shelf copy’ of the EAR should be developed outside of a drought event so that any material environmental issues can be identified and addressed in advance of any application during a drought event.

The EAR identifies any potential environmental issues associated with implementation of the drought permit. The overall scope of the environmental assessment is intended to meet the requirements of the updated guidance, specifically, Sections 3, 4 and 5 of the Environment Agency’s ‘Environmental assessment for water company drought planning supplementary guidance’. The environmental assessment, associated mitigation actions and details from the Environmental Monitoring Plan (EMP) form the basis of the EAR.

In accordance with the Environment Agency's guidance, the environmental assessment comprises the following components:

- An assessment of the hydrological or hydrogeological effects of the proposed drought permit.
- An assessment of the environmental sensitivity of the identified affected areas.
- Identification of mitigation or compensation measures for impacted features.
- Development of an environmental monitoring plan, where required.

The environmental assessment focuses on the potential changes to water availability (levels and flows) and any consequent implications for geomorphology, water quality, ecology and other relevant environmental receptors, for example, landscape, navigation, recreation and heritage.

This report will be periodically reviewed to ensure the conclusions and recommendations remain valid.

Full EARs for each of our drought permits are provided in Appendices D & E to this report. A summary of the EAR findings is presented in the following sections.

5.3.2. Summary of hydrological/hydrogeological impact of drought permit

Surface water

The environmental assessment concluded that the effects of the surface water drought permits would be minor or negligible. It is anticipated that only the reach of the River Eden between the Bough Beech abstraction point and its confluence with the River Medway will be impacted. The greatest impact is expected to be on median to high flows, however these flows are not considered to be critical for environmental features of the River Eden during drought. Very minor impacts are expected on low flows and extreme low flows. These flows are ecologically critical in a drought but are protected by the minimum residual flow (MRF) condition.

Groundwater

The environmental assessment concluded that it is unlikely that the drought permits would result in any discernible groundwater level drawdown beneath the headwaters of the River Wandle. Low flows in the River Wandle are supported by the Carshalton augmentation scheme and storage in the Thanet Formation and superficial deposits and as a result the drought permits are not predicted to have a discernible impact on absolute flow of the River Wandle. However, it is noted that even small impacts on groundwater levels may prolong recover following drought, but this impact is believed to be short (less than one month), if discernible at all.

5.3.3. Summary of drought permit environmental impacts

Surface water drought permits

The Eden May and Eden summer drought permits were found to have a short-term minor impact on water quality. There is potential for reduced dissolved oxygen saturation, higher pH, concentrations of orthophosphate, biochemical oxygen demand

and total ammonia which are likely to occur because of increased algae/plant activity in conjunction with lower flows.

The impacts identified in relation to geomorphology were also found to be short-term minor impacts. Short-term impacts are expected on sediment dynamics, the river channel and/or the riverbank as a result of the hydrological and potential vegetational changes. These impacts are unlikely to lead to significant changes in wetted areas or the integrity of river function.

Whilst no impacts on internationally or nationally designated sites have been identified due to the absence of sites in the vicinity, short-term minor impacts on locally designated sites have been identified.

The drought permits were also found to have a short-term minor impact on aquatic macroinvertebrates, aquatic protected species, and other protected species. Water dependent priority habitats and terrestrial priority habitats were found not to be impacted by the drought permits.

Impacts on fish vary by species. For species with a low or medium tolerance to environmental disturbance, impacts have been assessed as being short-term and minor. However, impacts on fish which have a high tolerance to environmental disturbance have been assessed negligible.

The proposed drought permits do not create any new pathways through which invasive non-native species (INNS) could spread and it is considered unlikely that the drought permits will increase the risk of spreading INNS. However, we cannot be certain how natural drought, or the implementation of the drought action will affect the balance between INNS and the native species, therefore short-term minor impacts have been identified.

No adverse impacts are reported for navigation, landscape, recreation or heritage and archaeology. However, the drought permits will support and sustain the water-related recreation which take place within Bough Beech reservoir and therefore the drought permits provide a benefit to these activities.

Groundwater drought permits

The Kenley and Purley, Outwood Lane and Hackbridge groundwater drought permits were found to have no impact on groundwater quality. Short-term minor impacts were reported for the water quality of the River Wandle (Beddington branch, Carshalton branch and Lower branch) as there is potential for instances of higher Orthophosphate concentrations to occur if the drought permit was implemented.

The impacts identified in relation to geomorphology of the River Wandle were also found to be short-term minor impacts. Short-term impacts are expected on sediment dynamics, the river channel and/or the riverbank as a result of the hydrological changes. These impacts are unlikely to lead to significant changes in wetted areas or the integrity of river function.

The drought permits were found to have minor impacts on aquatic ecological communities (including aquatic macroinvertebrates, macrophytes and fish (including priority species), although the 'likely' impact varied from medium to low between the three branches of the River Wandle. Impacts on INNS were found to be short-term and negligible.

Impacts on designated sites in the Beddington branch and Carshalton branch of the River Wandle were found to be short-term and minor, whereas on the Lower branch impacts were negligible. Impacts on priority habitats were only applicable to the Carshalton branch and it was found the drought permits have a short-term minor impact.

The drought permits were found to have a short-term minor impact on landscape, navigation, amenity and recreation due to the impact on Waddon Ponds which is an important feature for recreation use in the area.

Water Framework Directive

Since the arrival of the WFD, the Environment Agency has been responsible for assessing the entire water environment. WFD monitoring, known as classification, is risk-based and focuses where there is likely to be a problem. It uses a principle of 'one out, all out' which means that the poorest individual result will define the overall assessment.

The drought permits are considered to have a minor impacts or negligible impacts on the features of interest and as such the risk of WFD status deterioration or prevention of achievement of WFD potential is considered negligible.

5.3.4. Mitigation measures

Surface water drought permits

To help alleviate the impact of the drought permits identified in Section 3, water quality mitigation measures have been identified. These would be managed by SES Water, with the input sought from other organisations such as the Environment Agency.

The water quality mitigation involves using dissolved oxygen as a trigger for ceasing abstraction. Dissolved oxygen will be monitored downstream of the abstraction and if more than two (15-minute) readings within a one-hour period indicate that dissolved oxygen has fallen below 50%, then abstraction shall cease until at least 12 hours have passed where dissolved oxygen levels are greater than 50%. SES Water will also undertake weed cutting, if necessary, around the two continuous water quality monitoring sites to ensure monitoring results are representative of the conditions in the River Eden channel.

These mitigation measures will also benefit:

- Locally designated sites;
- Aquatic protected species;

- Aquatic macroinvertebrates; and
- Fish.

For fish monitoring and mitigation proposals for the drought permit have been specified so that should it be implemented, the actual impact can be recorded, and any required adaptive mitigation management undertaken to safeguard the fish populations.

Groundwater drought permits

To help alleviate the impact of the drought permits identified in Section 3, mitigation measures have been identified. These would be managed by us, with the input sought from other organisations such as the Environment Agency. The normal operation of the Carshalton augmentation scheme throughout the period of the drought permit will mitigate effects on designated sites and priority habitats and species. This is because the augmentation scheme flows through the Carshalton branch of the River Wandle.

For surface water quality, mitigation involves monitoring of orthophosphate, total ammonia, dissolved oxygen and parameters causing WFD failures (in respective waterbodies) before, during and after the drought permit is in operation. Data collected should be routinely reviewed by a water quality expert and triggers which indicate the need for further action should be agreed.

For fish, a plan will be developed to monitor fish stress and initiate fish rescue/recovery should it be required.

5.3.5. Environmental data provision and monitoring plan

For all drought permits, two monitoring plans have been outlined, one prior to implementation of the drought plan (baseline) and one during implementation of the drought plan (drought). The drought monitoring plan will comprise pre-drought, in-drought and post-drought (recovery) stages.

Baseline monitoring can be used to gain an understanding of the natural variation in water quality, ecology, fisheries, geomorphology and biodiversity that occurs in the River Eden, River Wandle and groundwater under a range of hydrological conditions. It will predominantly cover 'normal' (i.e. non-drought) conditions but it will also continue during a drought event. When, if a drought permit application is expected/required, it would be supplemented by additional drought monitoring.

Full details on the monitoring can be found in Appendix F, Section 10.2.

We will produce a monitoring and environmental impact report following the period of the drought permit. This will review the impacts associated with the drought permit, based on evidence collected as part of the monitoring regime and mitigation actions, together with data provided by the Environment Agency as part of their ongoing monitoring programme.

6. MANAGEMENT AND COMMUNICATIONS STRATEGY

6.1. Management structure

We benefit from our relatively small size and by having a very clear straightforward management structure. All supply operations and drought management of water resources is undertaken by the Water Strategy Manager, with overall responsibility for the Drought Plan implementation with the Wholesale Services Director.

Throughout a drought period the situation will be continually reviewed through the management and liaison process outlined below:

- A Water Resources Group consisting of the Water Strategy Manager, Head of Production, Head of Communications, Water Quality Science Manager and the Wholesale Services Director (WSD) will be set up. The WSD will act as Chair of this group.
- The group will meet at least monthly once Level 1 has been triggered, moving to fortnightly for Level 2 and weekly in the case of Level 3a/3b/4.
- Additional members will be brought in as required, such as the Head of Supply and Asset Strategy Manager, should there be a need to introduce measures relevant to their area of responsibility
- Sub-groups of the Water Resources Group will include Demand Management (led by the Water Strategy Manager), Communications and Engagement (led by the Head of Communications), Resources (led by the Head of Production) and Water Quality (led by the Water Quality Science Manager). The frequency of these sub-group meetings will be aligned with that of the main group.
- Updates on demand and resource levels will be provided at least weekly by the Water Strategy Manager to the Water Resources Group
- The WSD will report on drought management as an item in weekly senior management meetings, with escalating severity as appropriate as a drought progresses. This will continue for the period that our resources remain in a sensitive condition. Our Board will be kept fully informed of the situation via the production of Board papers. In this way, management of a drought will be embedded in the day-to-day management of our operations.
- The Water Resources Group will take into account any representations received from customers prior to and during implementation of drought restrictions.
- Monthly drought meetings / telecons organised by the Environment Agency with representatives from the regional water companies. There are three levels of meetings which are Senior (Managing Director level), Technical, and Communication (Public Relations). At the Senior meetings representatives are also present from Defra, Ofwat, CCW and Natural England.
- Regular updates will be provided to Water UK and other water companies in the WRSE region.

We are committed to effective monitoring and management of its resource base throughout periods of drought. We will continue to take a proactive approach in

managing drought through implementation of our Drought Plan in order to conserve resources and minimise the risk of emergency measures.

6.2. Communications plan

We have, as part of our public relations activities, an ongoing programme aimed at promoting the careful use of water and increasing customer awareness of the environmental and other benefits which accrue from this, particularly during drought periods. A Communication Plan has been developed to specifically address potentially affected parties in the situation of a potential or actual drought, attached in Appendix D. This includes internal communications with employees and contractors.

Responsibility for implementation of the Communication Plan lies with the Water Strategy Manager, the Head of Communications, and the Chief Customer Officer.

The Communication Plan will be operated in a phased approach, with increasing communication being undertaken in line with the increasing severity of a drought situation.

6.3. Post drought actions

After the decision to end drought measures is taken, a review of the drought management procedure will be conducted. This will involve a review of the effectiveness and cost of all demand and supply drought management measures, together with the impact on customers. Disaggregating the impacts of any one measure on any reduction in demand observed is challenging due to the combination of drought communication measures to which customers are inherently exposed during a drought.

The drought management review will identify important lessons learnt from the process and use these to influence and improve future drought management procedures. This review will be published within six months of the end of the drought, with four months of this period allowed for data gathering and two months for feedback to be received on a draft version before the final version is produced.

The review will include the following:

- the effectiveness of drought management actions (including the effects of restrictions on water use, communications campaigns and leakage management)
- the impact on the environment from drought management actions
- the effectiveness of any mitigation measures
- how we can use lessons learnt to improve environmental assessments, monitoring plans and mitigation measures
- whether estimates of reductions in water demand matched actual reductions
- what longer term improvements to resilience may be needed in the next Business Plan and WRMP
- if our drought triggers are still appropriate and if they provide enough time to implement your drought actions

6.4. Lessons learned from previous droughts

Resource levels have remained in Level 1 or above normal since the publication of the current Drought Plan. However, we have experienced a number of high demand periods driven by hot, dry conditions (2018 and 2020) and Covid-19 restrictions (2020)

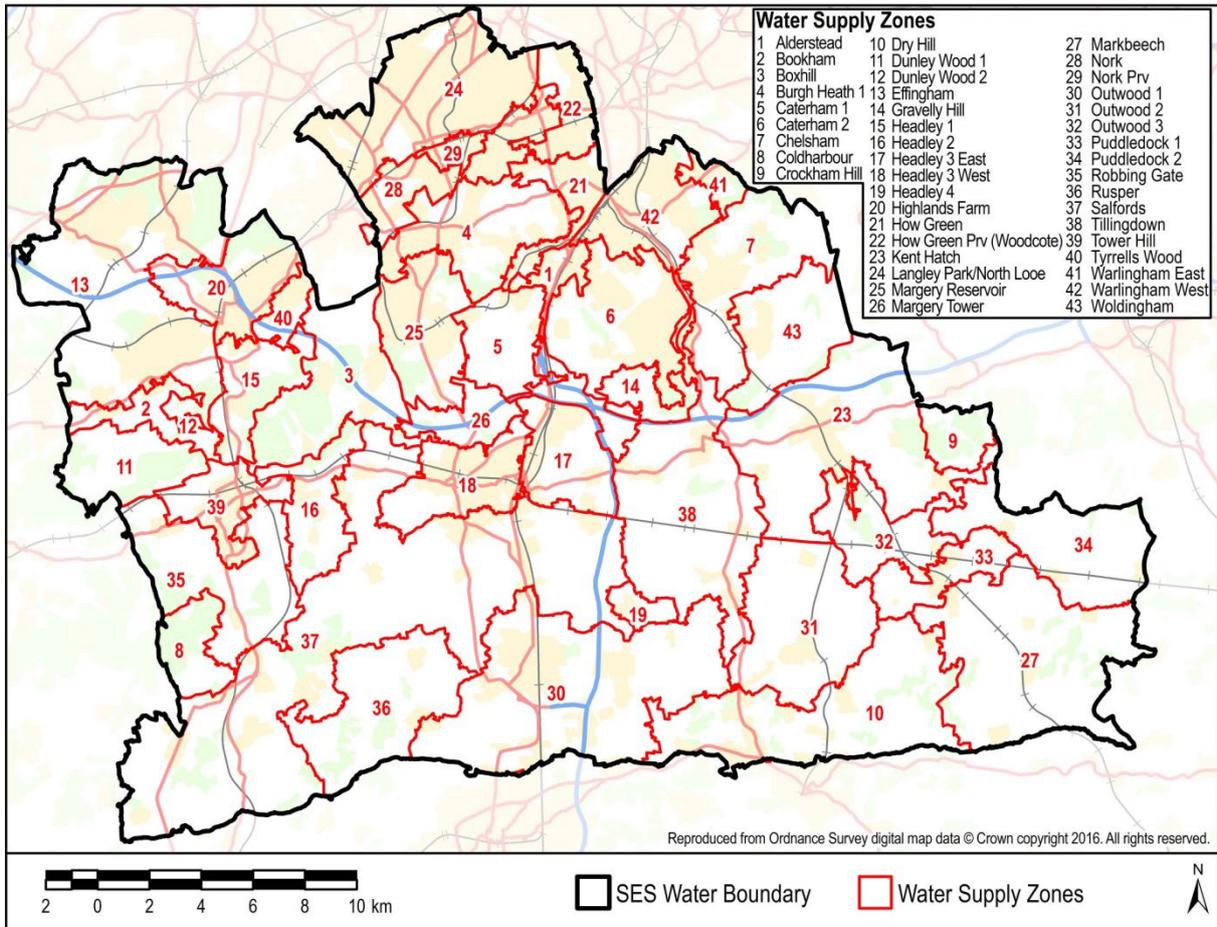
which has identified changes in peak and average demand usage patterns. We are currently evaluating the implications on these shifts in usage on future years.

7. GLOSSARY OF TERMINOLOGY

Term	Explanation
Abstraction	The removal of water from any source, either permanently or temporarily.
Abstraction licence	The authorisation granted by the Environment Agency (England) or Natural Resources Wales (for sites in Wales) to allow the removal of water from a source.
Baseline	Information on the environment that details conditions prior to implementation of a drought action.
Bulk transfers	A legal agreement for exporting and importing water between a donor and recipient operator.
Control curves	A diagram or graph presenting drought triggers levels.
Demand management	The implementation of policies or measures which serve to manage control or influence the consumption or waste of water.
Drought management zones	The area (within a resource zone) that a particular drought management action will apply to as specified.
Deployable output	The output of a commissioned source or group of sources or of bulk supply as constrained by: <ul style="list-style-type: none"> • environment • licence, if applicable • pumping plant and/or well or aquifer properties • raw water mains and/or aquifers • transfer and/or output main • treatment • water quality
Drought order	An authorisation granted by the Secretary of State (England) or Welsh Ministers (Wales) under drought conditions which imposes restrictions upon the use of water and/or allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.
Drought permit	An authorisation granted by the Environment Agency (England) or Natural Resources Wales (for sites in Wales) under drought conditions which allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.
Environmental assessment	An assessment of environmental sensitivity and likely impacts from implementing drought management actions.
Environmental monitoring plan	The plan of how the company will address: <ul style="list-style-type: none"> • gaps in the environmental assessment of the supply-side drought management action • baseline monitoring (including pre drought monitoring) • in- drought monitoring • post drought monitoring
Environmental report	The report that accompanies an application for a drought order or drought permit. It should be based on the information from within the environmental assessment and updated with any additional information.
Feature	A way of describing an ecological, chemical, habitat or morphological element to be assessed. For example a species of plant or animal, habitat type or sub-habitat type.
Government	In this guideline Government refers to central Government (Defra) and the Welsh Government.

Habitats Regulations	The Conservation of Habitats and Species Regulations 2010. The domestic legislation which transposes the EU Habitats and Wild Birds Directives into UK law and replaces the Conservation (natural habitats &c) Regulations 1994.
In-drought monitoring	Monitoring that is undertaken during the implementation of a drought management action.
Levels of Service	The standard of service that water company customers can expect to receive from their water company, commonly setting out the frequency of restrictions that a company expects to apply to its customers.
NNR	National Nature Reserve - designation to protect the most important areas of wildlife habitat and geological formations in Britain, and as places for scientific research.
Ramsar site	Internationally important wetland site.
Resource zone	The largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which all customers experience the same risk of supply failure from a resource shortfall.
RRP	Regional Resilience Plan
SAC	Special Area of Conservation - Designated under the European Habitats Directive (1991)
SPA	Special Protection Area - Classified under the European Birds Directive (1979)
SSSI	Site of Special Scientific Interest - A site given a statutory designation by English Nature or Natural Resources Wales because it is particularly important, on account of its nature conservation value.
Strategic Environmental Assessment (SEA) Directive	The Strategic Environmental Assessment Directive ensures significant environmental effects arising from proposed plans and programmes are identified, assessed, subjected to public participation, taken into account by decision-makers and monitored.
Water resource management plan (WRMP)	A water company long-term strategic plan for water supply and demand over at least 25 years.
Resilience options	Additional options to deal with plausible droughts worse than those in the recorded record. A case should be made for these in the drought plan but they should be included and funded through your next WRMP.
Habitats regulation assessment (HRA)	A HRA will identify whether or not your actions will have an adverse effect on a site's integrity. A HRA will identify whether or not your actions will have an adverse effect on a site's integrity.
RBMPs	River basin district (RBD) plans aim to protect and improve the water environment for the benefit of people and wildlife. The plans set out how organisations, stakeholders and communities will work together to achieve an improved water environment for each RBD.
Civil emergency	Civil emergency is defined in the water industry act section 208 (point 7). The Environment Agency or Natural Resources Wales is not responsible for emergency plans. You do not need to include what you would do to maintain supply during a civil emergency in your drought plan as this will be covered by your emergency plan.
Designated sites of conservation importance	Nature sites and areas of countryside can be 'designated', which means they have special status as protected areas because of their

	natural and cultural importance. You can search for designated sites here: https://www.gov.uk/check-your-business-protected-area
Business plans	The business plan sets out a water company’s business strategy and how they will provide value-for-money water and if applicable wastewater services to their customers.
Water resource zones	The largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which all customers experience the same risk of supply
Water Supply zone	Area of the network. Supply zones are sub-divided into areas supplied by the same service reservoir, as shown below.



Appendix A: Groundwater Drought Action Trigger Levels

See separate attachment.

Appendix B: Bough Beech Drought Triggers Update

See separate attachment.

Appendix C: Drought Options Tables

Demand-side drought management actions

Option Name	Customer Awareness	Leakage Management
Trigger(s) <i>or preceding actions</i>	Level 1 and beyond, therefore guided by storage levels at Bough Beech reservoir and groundwater levels at Chipstead OBH	Level 1 and beyond, therefore guided by storage levels at Bough Beech reservoir, groundwater levels at Chipstead OBH, and following customer awareness campaign
Demand saving <i>MI/d unless stated</i>	Savings not quantified due to dependency on design and extent of communication activities, contributing to high levels of uncertainty around volumetric savings	0.2% - Up to approximately 0.3MI/d, estimated based on the temporary reduction in total leakage achieved during 2006
Demand saving <i>% reduction on peak week demand</i>	Savings not quantified due to dependency on design and extent of communication activities, contributing to high levels of uncertainty around volumetric savings	Not known
Location <i>Area affected or whole supply zone</i>	Company Area	Company Area
Implementation timetable <i>Preparation time, time of year effective, duration</i>	1 week preparation. Regularly implemented / updated throughout pre-drought, drought period and post-drought. Effects expected throughout year.	In parallel to anticipating and implementing demand restrictions and for their duration
Permissions required and constraints <i>Including details of liaison carried out with bodies responsible for giving any permits or approvals</i>	None	None
Risks associated with option	None	None

Option Name	Pressure Management and Operational Usage Restrictions	Temporary water use restrictions – Phase 1
Trigger(s) <i>or preceding actions</i>	Level 1 and beyond	Level 2 – Guided by storage levels at Bough Beech reservoir and groundwater levels at Chipstead OBH. Following customer awareness campaign
Demand saving <i>% reduction on annual average demand</i>	0.1% Pressure Management, 0.01% Operational Usage Restrictions	When taken in combination with Phase 2 Temporary water use restrictions, a total of up to approximately 3.2% of dry year annual average demand (distribution input minus leakage) is estimated
Demand saving <i>% reduction on peak period demand</i>	0.2% Pressure Management, 0.01% Operational Usage Restrictions	When taken in combination with Phase 2 Temporary water use restrictions, a total of up to approximately 5.4% of dry year critical period demand (distribution input minus leakage) is estimated
Location <i>Area affected or whole supply zone</i>	Targeted to District Metered Areas where further pressure management is feasible. All operational usage (reservoir cleaning, flushing) should be reviewed to determine if essential.	Company Area
Implementation timetable <i>Preparation time, time of year effective, duration</i>	2 weeks. Reservoir cleaning only takes place from October to April.	1 week to advertise and implement; a further 2 weeks running concurrently with the start of restrictions to allow for representations. Most effective during summer months.
Permissions required and constraints <i>Including details of liaison carried out with bodies responsible for giving any permits or approvals</i>	None	None
Risks associated with option	Negative customer reaction to reduced pressure. Water quality considerations.	Negative customer reaction

Option Name	Temporary water use restrictions – Phase 2	Drought order - NEUB
Trigger(s) <i>or preceding actions</i>	Level 2 – Guided by storage levels at Bough Beech reservoir and groundwater levels at Chipstead OBH. Following customer awareness campaign and in addition to Phase 1 of restrictions	Level 3a - Guided by storage levels at Bough Beech reservoir and groundwater levels at Chipstead OBH Following customer awareness campaign and full implementation of Phases 1 and 2 of temporary water use restrictions
Demand saving <i>% reduction on annual average demand</i>	When taken in combination with Phase 1 Temporary water use restrictions, a total of up to approximately 3.2% of dry year annual average demand (distribution input minus leakage) is estimated	Up to approximately 8.5% of dry year annual average demand (DI minus leakage) in addition to the savings already achieved by temporary water use restrictions
Demand saving <i>% reduction on peak period demand</i>	When taken in combination with Phase 1 Temporary water use restrictions, a total of up to approximately 5.4% of dry year critical period demand (distribution input minus leakage) is estimated	Up to approximately 13.5% of dry year critical period demand (DI minus leakage) in addition to the savings already achieved by temporary water use restrictions
Location <i>Area affected or whole supply zone</i>	Company area	Company area
Implementation timetable <i>Preparation time, time of year effective, duration</i>	1 week to advertise and implement; a further 2 weeks running concurrently with the start of restrictions to allow for representations. Most effective during summer months.	Varies. Minimum 2-3 months with no obstacles; up to 6 months with inquiry.
Permissions required and constraints <i>Including details of liaison carried out with bodies responsible for giving any permits or approvals</i>	None	Application needs to be submitted to and granted by the Secretary of State for Defra. Public hearing / inquiry may be required.
Risks associated with option	Negative customer reaction	Application not approved. Negative customer reaction.

Option Name	Emergency drought order – pressure reduction, rota cuts and/or standpipes
Trigger(s) <i>or preceding actions</i>	In emergency only, after all other drought management actions have been taken
Demand saving <i>Ml/d unless stated</i>	Not known
Demand saving <i>% reduction on peak week demand</i>	Range but potentially large savings
Location <i>Area affected or whole supply zone</i>	Company area
Implementation timetable <i>Preparation time, time of year effective, duration</i>	Unknown as not implemented recently, but likely to be at least 5 months from inception to implementation. Likely to be undertaken in a phased approach, with 2 or 3 phases.
Permissions required and constraints <i>Including details of liaison carried out with bodies responsible for giving any permits or approvals</i>	Application needs to be submitted to and granted by the Secretary of State for Defra
Risks associated with option	Application not approved and potential for widespread customer dissatisfaction

Supply-side drought management actions

	Option Name	Level 1 Utilisation of peak resources such as Hackbridge and Clifton’s Lane	Level 2 Utilisation of peak resources such as Hackbridge and Clifton’s Lane
Option Implementation Assessment	Trigger(s) <i>or preceding actions</i>	Level 1 - Guided by storage levels at Bough Beech reservoir and groundwater levels at Chipstead OBH	Level 2 - Guided by storage levels at Bough Beech reservoir and groundwater levels at Chipstead OBH
	Deployable output of action	Range of potential outputs – max 17.2 MI/d	Range of potential outputs – max 17.2 MI/d
	Location <i>Area affected or whole supply zone</i>	Hackbridge / Goat Bridge – Langley Park SZ Clifton’s Lane WTW – Headley Supply Zone	Hackbridge / Goat Bridge – Langley Park SZ Clifton’s Lane WTW – Headley Supply Zone
	Implementation timetable <i>Preparation time, time of year effective, duration</i>	Hackbridge / Goat Bridge – from 1 week Cliftons Lane – 6 weeks	Hackbridge / Goat Bridge – from 1 week Cliftons Lane – 6 weeks
	Permissions required and constraints <i>Including details of liaison carried out with bodies responsible for giving any permits or approvals</i>	None required	None required
	Risks associated with option	None	None
Environmental Assessment	Risk to the environment <i>High, Medium, Low or Unknown</i>	Low	Low
	Summary of likely environmental impacts <i>Include details for features of moderate and major sensitivity and minor sensitivity features from designated sites</i>	None	None
	Baseline information used	n/a	n/a
	Summary of additional baseline monitoring requirements	None	None
	Mitigation measures	None required	None required
	Impact on other activities <i>e.g. fisheries, industry, etc.</i>	None	None

	Option Name	Level 1 transfer of potable water from Kenley WTW to How Green service reservoir	Level 2 transfer of potable water from Kenley WTW to How Green service reservoir
Option Implementation Assessment	Trigger(s) <i>or preceding actions</i>	Level 1 - Guided by storage levels at Bough Beech reservoir and groundwater levels at Chipstead OBH	Level 2 - Guided by storage levels at Bough Beech reservoir and groundwater levels at Chipstead OBH
	Deployable output of action	<7.5MI/d	<7.5MI/d
	Location <i>Area affected or whole supply zone</i>	Warlingham to How Green Supply Zones	Warlingham to How Green Supply Zones
	Implementation timetable <i>Preparation time, time of year effective, duration</i>	From 1 week	From 1 week
	Permissions required and constraints <i>Including details of liaison carried out with bodies responsible for giving any permits or approvals</i>	None required	None required
	Risks associated with option	Supplies are not guaranteed	Supplies are not guaranteed
Environmental Assessment	Risk to the environment <i>High, Medium, Low or Unknown</i>	None	None
	Summary of likely environmental impacts <i>Include details for features of moderate and major sensitivity and minor sensitivity features from designated sites</i>	None	None
	Baseline information used	n/a	n/a
	Summary of additional baseline monitoring requirements	None	None
	Mitigation measures	None required	None required
	Impact on other activities <i>e.g. fisheries, industry, etc.</i>	None	None

	Option Name	Level 1 transfer of potable water using the Buckland transfer main	Level 2 transfer of potable water using the Buckland transfer main
Option Implementation Assessment	Trigger(s) <i>or preceding actions</i>	Level 1 - Guided by storage levels at Bough Beech reservoir and groundwater levels at Chipstead OBH	Level 2 - Guided by storage levels at Bough Beech reservoir and groundwater levels at Chipstead OBH
	Deployable output of action	Up to 10 MI/d	Up to 10 MI/d
	Location <i>Area affected or whole supply zone</i>	Headley to Burgh Heath and Margery Supply Zones	Headley to Burgh Heath and Margery Supply Zones
	Implementation timetable <i>Preparation time, time of year effective, duration</i>	From 1 week	From 1 week
	Permissions required and constraints <i>Including details of liaison carried out with bodies responsible for giving any permits or approvals</i>	None required	None required
	Risks associated with option	Supplies are not guaranteed	Supplies are not guaranteed
Environmental Assessment	Risk to the environment <i>High, Medium, Low or Unknown</i>	None	None
	Summary of likely environmental impacts <i>Include details for features of moderate and major sensitivity and minor sensitivity features from designated sites</i>	None	None
	Baseline information used	n/a	n/a
	Summary of additional baseline monitoring requirements	None	None
	Mitigation measures	None required	None required
	Impact on other activities <i>e.g. fisheries, industry, etc.</i>	None	None

	Option Name	Level 1 conjunctive use of potable water from Bough Beech reservoir to augment groundwater in Chalk aquifers	Level 2 conjunctive use of potable water from Bough Beech reservoir to augment groundwater in Chalk aquifers
Option Implementation Assessment	Trigger(s) <i>or preceding actions</i>	Level 1 - Guided by storage at Bough Beech reservoir and levels at Chipstead OBH	Level 2 - Guided by storage at Bough Beech reservoir and levels at Chipstead OBH
	Deployable output of action	Up to 18MI/d, the current capacity of the transfer main	Up to 18MI/d, the current capacity of the transfer main
	Location <i>Area affected or whole supply zone</i>	Headley to Burgh Heath and Margery Supply Zones	Headley to Burgh Heath and Margery Supply Zones
	Implementation timetable <i>Preparation time, time of year effective, duration</i>	From 1 week	From 1 week
	Permissions required and constraints <i>Including details of liaison carried out with bodies responsible for giving any permits or approvals</i>	None	None
	Risks associated with option	Available supplies from Bough Beech are not guaranteed	Available supplies from Bough Beech are not guaranteed
Environmental Assessment	Risk to the environment <i>High, Medium, Low or Unknown</i>	None - would operate within existing Bough Beech licence	None - would operate within existing Bough Beech licence
	Summary of likely environmental impacts <i>Include details for features of moderate and major sensitivity and minor sensitivity features from designated sites</i>	None	None
	Baseline information used	n/a	n/a
	Summary of additional baseline monitoring requirements	None required	None required
	Mitigation measures	None required	None required
	Impact on other activities <i>e.g. fisheries, industry, etc</i>	None	None

	Option Name	River Eden May drought permit	River Eden Summer drought permit
Option Implementation Assessment	Trigger(s) <i>or preceding actions</i>	Level 3a - Guided by storage levels at Bough Beech reservoir and groundwater levels at Chipstead OBH	Level 3a - Guided by storage levels at Bough Beech reservoir and groundwater levels at Chipstead OBH
	Deployable output of action	0.1 MI/d modelled DO increase. Yield of the option will depend upon specific drought year flows in the River Eden, but potentially large additional volume to refill Bough Beech reservoir (up to 272MI/d allowed under licence, if water is available in the River Eden above the MRF of 22MI/d). Whilst having the potential to significantly support refill of the reservoir in particular drought events, the drought permit does not, however, significantly influence the DO of Bough Beech reservoir, due to the way in which this is calculated. Use of the additional abstracted volume to meet demand will be subject to the abstraction licence from the reservoir and the capacity of Bough Beech WTW to treat the water.	0.7 MI/d modelled DO increase. Yield of the option will depend upon specific drought year flows in the River Eden, but potentially large additional volume to refill Bough Beech reservoir (up to 272MI/d allowed under licence, if water is available in the River Eden above the MRF of 22MI/d). Whilst having the potential to significantly support refill of the reservoir in particular drought events, the drought permit does not, however, significantly influence the DO of Bough Beech reservoir, due to the way in which this is calculated. Use of the additional abstracted volume to meet demand will be subject to the abstraction licence from the reservoir and the capacity of Bough Beech WTW to treat the water.
	Location <i>Area affected or whole supply zone</i>	Bough Beech reservoir and zones supplied from it	Bough Beech reservoir and zones supplied from it
	Implementation timetable <i>Preparation time, time of year effective, duration</i>	Approximately 4 months from inception to implementation; only available during May and potentially June	Approximately 4 months from inception to implementation; only available during the summer (June/July to August inclusive)

	Option Name	River Eden May drought permit	River Eden Summer drought permit
	Permissions required and constraints <i>Including details of liaison carried out with bodies responsible for giving any permits or approvals</i>	Statement of Need and Environmental Report needs to be submitted to the EA. Approval of drought permit needs to be granted by the EA. If not approved, the Company will consider submitting a drought order application to the Secretary of State, Defra	Statement of Need and Environmental Report needs to be submitted to the EA. Approval of drought permit needs to be granted by the EA. If not approved, the Company will consider submitting a drought order application to the Secretary of State, Defra
	Risks associated with option	Drought permit not granted	Drought permit not granted
Environmental Assessment	Overall environmental impact <i>Minor, moderate, major or uncertain</i>	Minor	Minor
	Level of confidence <i>High, medium or low</i>	High	High
	Summary of likely environmental impacts <i>Include details for features of moderate and major sensitivity and minor sensitivity features from designated sites</i>	Limited impact: there are no designated conservation sites likely to be impacted by this drought permit; in addition the drought permit will likely be constrained by a MRF condition, to be agreed with the EA, which will act to protect the environment from low flow impacts	Limited impact: there are no designated conservation sites likely to be impacted by this drought permit; in addition the drought permit will likely be constrained by a MRF condition, to be agreed with the EA, which will act to protect the environment from low flow impacts
	Baseline information used	Environmental report which accompanied 2005 and 2006 drought permit applications	Environmental report which accompanied 2005 and 2006 drought permit applications
	Summary of additional baseline monitoring requirements	Monitoring of dissolved oxygen and temperature is proposed for duration of drought permit	Monitoring of dissolved oxygen and temperature is proposed for duration of drought permit
	Mitigation measures	As with the permits granted in 2005 and 2006, it is likely that a MRF would be proposed, to be agreed with the EA; in addition, if critical deterioration in dissolved oxygen levels occurs (i.e. they reduce to 30% saturation) abstraction would be stopped immediately	As with the permits granted in 2005 and 2006, it is likely that a MRF would be proposed, to be agreed with the EA; in addition, if critical deterioration in dissolved oxygen levels occurs (i.e. they reduce to 30% saturation) abstraction would be stopped immediately

Option Name	River Eden May drought permit	River Eden Summer drought permit
Impact on other activities <i>e.g. fisheries, industry, etc</i>	None expected	None expected

Option Name	Outwood Lane drought permit	Hackbridge drought permit	
Option Implementation Assessment	Trigger(s) <i>or preceding actions</i>	Level 3a - Guided by storage levels at Bough Beech reservoir and groundwater levels at Chipstead OBH	Level 3a - Guided by storage levels at Bough Beech reservoir and groundwater levels at Chipstead OBH
	Deployable output of action	Up to 1.98 MI/d (An increase in the daily licence of 2 MI/d and a 360 MI increase in the Woodmansterne Group annual licence to accommodate 6 months (180 days) of pumping at the higher rate)	Up to 4 MI/d (Decoupling the maximum abstraction from the volume recharged in the preceding winter to allow the full permissible abstraction at the licence rate of 19 MI/d over a 6-month (180 day) period.)
	Location <i>Area affected or whole supply zone</i>	Outwood Lane, part of the Woodmansterne Group	Langley Park Supply Zone
	Implementation timetable <i>Preparation time, time of year effective, duration</i>	Approximately 4 months from inception to implementation; assumed to operate for up to 6 months	Approximately 4 months from inception to implementation; assumed to operate for up to 6 months
	Permissions required and constraints <i>Including details of liaison carried out with bodies responsible for giving any permits or approvals</i>	Statement of Need and Environmental Report needs to be submitted to the EA. Approval of drought permit needs to be granted by the EA. If not approved, the Company will consider submitting a drought order application to the Secretary of State, Defra	Statement of Need and Environmental Report needs to be submitted to the EA. Approval of drought permit needs to be granted by the EA. If not approved, the Company will consider submitting a drought order application to the Secretary of State, Defra

	Option Name	Outwood Lane drought permit	Hackbridge drought permit
	Risks associated with option	Yields are theoretical based upon deployable output assessment and have not been verified under drought conditions	Yields are theoretical based upon deployable output assessment and have not been verified under drought conditions
Environmental Assessment	Overall environmental impact <i>Minor, moderate, major or uncertain</i>	Minor	Minor
	Level of confidence <i>High, medium or low</i>	Low	Low
	Summary of likely environmental impacts <i>Include details for features of moderate and major sensitivity and minor sensitivity features from designated sites</i>	Prolonging of drought conditions with resultant impact on environmental features	Prolonging of drought conditions with resultant impact on environmental features
	Baseline information used	Readily available data from Environment Agency, SES Water and Open source online systems	Readily available data from Environment Agency, SES Water and Open source online systems
	Summary of additional baseline monitoring requirements	Monitoring required to reduce uncertainty in assessment, with pre, during and post drought monitoring actions identified	Monitoring required to reduce uncertainty in assessment, with pre, during and post drought monitoring actions identified
	Mitigation measures	General options identified in recognition of the uncertainty in the assessment	General options identified in recognition of the uncertainty in the assessment
	Impact on other activities <i>e.g. fisheries, industry, etc.</i>	None identified	None identified

	Option Name	Kenley and Purley drought permit
Option Implementation Assessment	Trigger(s) <i>or preceding actions</i>	Level 3a - Guided by storage levels at Bough Beech reservoir and groundwater levels at Chipstead OBH
	Deployable output of action <i>MI/d unless stated</i>	Up to 2.1 MI/d (an increase of 380 MI in the annual licence limit to enable a 2.11 MI/d increase in MDO over a 6-month (180 day) period)
	Location <i>Area affected or whole supply zone</i>	Warlingham & Caterham Supply Zones
	Implementation timetable <i>Preparation time, time of year effective, duration</i>	Approximately 4 months from inception to implementation; assumed to operate for up to 6 months
	Permissions required and constraints <i>Including details of liaison carried out with bodies responsible for giving any permits or approvals</i>	Statement of Need and Environmental Report needs to be submitted to the EA. Approval of drought permit needs to be granted by the EA. If not approved, the Company will consider submitting a drought order application to the Secretary of State, Defra
	Risks associated with option	Yields are theoretical based upon deployable output assessment and have not been verified under drought conditions
Environmental Assessment	Overall environmental impact <i>Minor, moderate, major or uncertain</i>	Minor
	Level of confidence <i>High, medium or low</i>	Low

	Option Name	Kenley and Purley drought permit
	Summary of likely environmental impacts <i>Include details for features of moderate and major sensitivity and minor sensitivity features from designated sites</i>	Prolonging of drought conditions with resultant impact on environmental features
	Baseline information used	Readily available data from Environment Agency, SES Water and Open source online systems
	Summary of additional baseline monitoring requirements	Monitoring required to reduce uncertainty in assessment, with pre, during and post drought monitoring actions identified
	Mitigation measures	General options identified in recognition of the uncertainty in the assessment
	Impact on other activities <i>e.g. fisheries, industry, etc.</i>	None identified

Appendix D: Communications Plan

We have, as part of our overall communications strategy, an ongoing programme aimed at promoting the careful use of water and increasing customer awareness of the environmental and other benefits which accrue from this. During drought periods we initiate a specific drought communication plan which follows a phased approach, aligned with the severity of the drought event, which is designed to progressively reduce demand alongside any restrictions which may need to be or have been enacted.

This plan does not specifically include measures that would be taken in response to peak demand events when resources are healthy, although many of the measures are likely to be similar.

What are the objectives of the drought communications plan?

- Raise awareness of the drought situation with the public
- Explain why there is a drought – the link between rainfall, water resources and climate change
- Encourage domestic customers to reduce water use at home and in the garden, with consideration of the impact of measures / restrictions on specific groups such as the elderly and other vulnerable customers
- Encourage non-household customers to reduce water use, with consideration on the impact of the measures on specific sectors such as small businesses and those dependent on non-essential use
- To communicate restrictions on water use that are being implemented and what they involve (including exemptions)
- To work with other water companies, regulators, and stakeholders to provide clear and consistent messaging about the drought situation
- To communicate ahead of the implementation of environmental drought orders and permits
- To explain the other actions the company is taking to manage the drought and address long-term issues such as climate change
- To be agile so that we can adapt our plan in respond to the changing situation, customer and stakeholder feedback, and evaluation of its effectiveness

Our communication principles

We have, as part of our communications strategy, an ongoing programme aimed at promoting the careful use of water and increasing customer awareness of the environmental and other benefits which accrue from this, particularly during drought periods.

Underpinning this programme are the following principles to ensure our drought communications reach the right audience, at the right time with the right message in the right way. We will ensure, where possible, we are working in partnership with other water companies in the region to deliver a joined-up message.

- Timing of drought communication is aligned with the phase of drought we are in
- The drought situation is positioned in the context of climate change, which is likely to resonate more with customers
- Communication will be tailored to the channel being used and the stakeholders we are targeting
- All communication includes a clear and simple call to action for customers and stakeholders to encourage positive behaviour change and reduce their water usage,

taking account of customers that do not have access to digital channels so they are not excluded from receiving the same information

- Our communications will be responsive to the situation and be coordinated with other companies in the region
- As well as asking customers to reduce their water usage, we will explain what we are doing to manage the risk of drought, such as opening up unused treatment works, moving water around our network to use more plentiful sources and increased activity to find and fix more leaks
- We will measure the effectiveness of our measures as shown in the Evaluation section below, so that we can decide on the best future actions to take

Communication activity phases

Guided by these principles we will communicate in a phased approach, the message will be adapted, and the intensity of the communication will change in line with the severity of a drought situation. These phases are detailed below and correspond to the breaching of drought trigger levels:

Level 0 communication – below average

- In addition to business as usual water efficiency activities, including our water use calculator and home visit programme, we would place additional focus on increasing promotion through selected channels including our website
- Where necessary, start engagement with the Water Resources South East (WRSE) Communications Group and Dry Weather Monitoring Group on joint messaging.

Level 1 communication – impending drought

- Further promotion of water saving initiatives across all communication channels, including website, social media and local media outlets
- Raising awareness of impact on the environment (especially habitats such as chalk streams) and also links to potential future droughts due to climate change and increased population in the supply area
- Highlight recent rainfall levels and warn that continued low levels could result in the need for customer restrictions at a later date
- Collaboration with the Water Resources South East (WRSE) Communications Group to share learnings about past drought events and agree an effective joined-up approach and consistent messaging
- Early communication with key stakeholder groups about the severity of the situation and the outlook

Level 2 communication - drought

Continuation of Level 1 communication but addition of the following actions:

- Temporary use bans (TUBs) implemented and restrictions communicated through appropriate customer channels
- Encourage local government authorities and commercial users to minimise water use, including engagement with retailers, regarding their business customers
- Inform key stakeholders including local resilience forums, schools and hospitals of emerging risk of drought
- Scale up customer awareness campaigns about importance of saving water and reducing household consumption where possible

- Inform large users of water and vulnerable customers of potential impacts of drought
- Collaboration with WRSE group to align drought messaging across all customer campaigns and consider issuing joint press statement to highlight growing risk in the region. All agreed messages will feed into the National Drought Group
- Collaboration with representative bodies to help share messaging with specific customer groups e.g. National Farmers Union (NFU) to reach farming businesses (other examples here would include: the Horticultural Trades Association, Turfgrass Growers Association, Institute of Groundsmanship, the Royal Horticultural Society etc
- Increase visibility of drought messaging across all communication channels, including in-person presence at local events and community locations where possible

Level 3a and 3b communication – severe drought

Building on Level 2 communication but to include the following actions, which become more important as drought severity increases:

- Non-essential use bans implemented and restrictions communicated through appropriate customer channels
- Contacting customers directly (by letter and/or a different channel of their choice such as email or SMS) appealing for a reduction in water use, if necessary based on achieving a target level of consumption
- Activation of joint initiatives with the EA, English Nature, other local water companies and Water UK
- Seek to increase and inject urgency into local press coverage
- Explain intention to enforce bans to avoid emergency drought orders and highlight the penalties for non-compliance
- Explanation of demand side emergency drought orders, which may include standpipes and rota cuts
- Ensure the Company's crisis communication strategy is in place should it be needed
- Inform the Fire authorities and other local essential services at least 72 hours prior to the implementation of any demand restrictions

Post-drought communication

- Consultation with the EA to reach a joint decision regarding the withdrawal of water restrictions
- Make public announcements of the lifting of water restrictions through joint WRSE press statements
- Thank customers for their co-operation and understanding
- Carry out post drought measurement and evaluation of messaging e.g. collating feedback through our Voice of the Customer programme

Target audiences

There are several different audiences who need to be addressed during a drought, each requiring a different approach and specific information produced to meet their needs. The main audience groups for this drought communications plan are as follows:

Audience	Organisations	Overview
Household customers	<ul style="list-style-type: none"> • Private • Housing Associations • Vulnerable customers 	We will communicate with our customers at every stage throughout a drought, particularly in the run up to and any introduction of water restrictions. Activity could include:

		<ul style="list-style-type: none"> • Website updates • Social media alerts • Local media advertorials • Radio adverts • Attendance at local events/roadshows • Schools and community talks • Advertising in community locations • Direct mailing and SMS alerts • Bill inserts
Internal	<ul style="list-style-type: none"> • SES Water employees • Supply chain partners 	We want employees to be ambassadors for water efficiency and communicate with them regularly via internal channels including our intranet and weekly newsletter. It's also important that customer-facing staff particularly are able to share accurate messaging on the latest situation
Non-household customers	<ul style="list-style-type: none"> • Retailers 	Through our Wholesale Service Desk we will work closely with retailers to ensure consistent messaging and advice is provided to their customers during a drought. We will also arrange joint sessions with the WRSE group where relevant.
Regulators	<ul style="list-style-type: none"> • Environment Agency • Ofwat • Defra • Drinking Water Inspectorate • Natural England • Consumer Council for Water 	We will proactively communicate with our regulators through agreed mechanisms.
Environmental and other relevant interest organisations and groups	<ul style="list-style-type: none"> • Local wildlife groups and campaign groups • Friends of the Earth • South East Rivers Trust • WWF • RSPB • CPRE • Angling Trust • Local fisheries • Waterwise 	All of these groups will have an interest in the impact of a drought on the local environment and will be engaged with at an early stage of a developing drought and throughout as the severity increases.
Government representatives and Local Authorities	<ul style="list-style-type: none"> • Councils • MPs 	We will keep local authority representatives informed at every stage of a drought so they can also assist us with increasing the reach of our messages
Representative bodies	<ul style="list-style-type: none"> • e.g. Confederation of British Industry, NFU, Chambers of Trade and Commerce, Countryside Landowners and Business Association, Horticultural Association 	Collaboration with these bodies is key to ensure we can reach their membership and share our drought messaging across their channels, particularly since we do not have any direct business customers.

Community based institutions and organisations	<ul style="list-style-type: none"> • Parish Councils • Town Councils • Residents Associations 	Local councils will be kept up to date with the same messaging we share with our customers, across all communication channels.
Public services	<ul style="list-style-type: none"> • Fire Service • Health Authorities • Police Services 	Through Local Resilience Forums we will ensure we communicate with these groups early in a drought - working closer together will become more important as severity increases and if emergency planning stages are reached.
Press and media	<ul style="list-style-type: none"> • Newspapers • TV • Radio • Online • Influencers • Trade 	We will engage with media outlets at all stages of a drought and ensure all messaging is consistent with the other WRSE members and aligned with our regulators. At a national level this is likely to be managed by Water UK
Water companies	<ul style="list-style-type: none"> • All plus WRSE 	The WRSE members will be important to communicate closely with during the drought. In particular Southern, Affinity, South East and Thames Water, all of which we share supply borders with.
Sports and interest groups	<ul style="list-style-type: none"> • Angling clubs • Canoe clubs • Sailing clubs • Golf / cricket clubs 	All of these groups will have an interest in the impact of a drought on the local environment and will be factored into our engagement plan.
Waterways and navigation	<ul style="list-style-type: none"> • Canal & Rivers Trust • Canal authorities 	As above.

Communications Plan

The Communications Plan detailed here is separated into the main three levels of drought management actions that are represented earlier in this section. It is reiterated here that these levels relate to the groundwater and surface water triggers and associated drought management levels.

Level 1 Communication Plan – impending drought

Level 1 communications utilise our established communication channels and build upon our ongoing demand management activities to keep customers aware of the resource situation and further encourage the careful use of water.

Digital and online channels

Our website (www.seswater.co.uk) includes all drought related information made available to our customers and will be used to communicate the drought situation/restrictions in place at all stages.

- The 'Rainfall and resources' section of our website keeps customers abreast of water situation reports in our supply area relative to average conditions
- The 'Saving Water' section of our website, is used to promote and distribute water efficiency information, such as the water use calculator, further increasing customer awareness in times of drought
- We also use our website to keep customers updated on the progress we are making to save water against our leakage reduction strategy

We also use our Facebook and Twitter channels to give messages on the resource situation and measures that can be taken and will ramp this up accordingly in times of drought.

Customer campaigns

Water efficiency programme

As part of our performance commitment to reduce household consumption (per capita consumption), we provide customers with information about how to use water wisely under our 'Every Drop Counts' programme, alongside a wide range of water efficiency campaigns. We adopt a balanced approach between behavioural change and device measures. We encourage all our customers to use the water usage calculator on our website to find out how they can save water and money, as well as ordering free water saving devices. If resources were to come under pressure, we would incorporate awareness-raising of the resource situation into water efficiency activities.

Metering

Our plan is for all our customers to be metered by 2025 as this is one of the most effective ways of reducing the demand for water. Depending on the severity of the drought situation and the water sources affected, our metering programme may flex to prioritise different areas or speed up the roll-out and our communications would need to support this.

Local media and advertising

We maintain close contact and a good working relationship with local media outlets in our supply area. Campaign press releases and advertorials are regularly issued/placed with them, containing key water saving messages, and emphasise the need to use water with care.

Education and community programme

Our well-established education programme incorporates water efficiency and using water wisely messages. These are delivered either during school visits to our educational centre, or in schools as a 'Saving Water' talk and/or 'Saving Water' workshop. This would be stepped up with an emphasis on passing the message to parents.

We also have close working relationships with local community groups through our community giving programme and will ensure each organisation is kept up to date with the latest drought situation and the associated restrictions required at each stage.

Stakeholder engagement

- *Water Resources South East Group*
We are an active member of the WRSE Communications Group, which includes water companies from the South East of England together with the Environment Agency, CCWater and Waterwise. The purpose of the group is to work together to identify and achieve common aims within the remit of water resource/water efficiency communications. The group continues to meet on a regular basis regardless of drought and co-ordinate its activities. We would work together to deliver joint messages and actions during a drought situation.
- *Regulators*
We work closely with our regulators and during times of drought this close working relationship is particularly important. Our drought plan is available on the corporate website, together with information about resource levels – which is expanded and

updated more frequently as a drought progresses. At the appropriate drought trigger levels, we will notify the statutory consultees and others listed in the target audience table of any developing drought situation.

- *Local Authorities*

We have a continued dialogue with local authorities, including MPs and local councils, in order that they may fulfil their duties under the Local Government Act 2000, the Government's Climate Challenge programme and their commitments to environmental sustainability.

- *Fire Authorities*

There is ongoing correspondence with all of the fire services in our supply area to update them with the progression of our plans to implement drought measures. We will also advise of the foreseeable implications that those measures might have on the provision of adequate water supplies for operational firefighting. Opportunity for consultation will be provided at the initial planning stage of drought measures and thereafter.

- *Other essential services*

We will ensure ongoing correspondence with providers of essential services such as hospitals and schools, advising them of our plans to implement drought measures and of any foreseeable implications these measures may have on their activities.

Level 2 Communication Plan - drought

This builds on the work already undertaken in the Level 1 category with the addition of the following:

- Place greater emphasis on the water saving/conservation theme in all external campaign messaging, whether in statements for local press, all customer facing material or local community/school talks
- Increase engagement with local media outlets to ensure coverage across all channels (e.g. print, TV and radio) of the increased drought risk and highlight the simple actions people can take to reduce their water use and avoid further restrictions
- Consider writing to all customers appealing for their co-operation in reducing water use, prior to the introduction of restrictions
- If required, publicise notice to implement Phase 1 of temporary use restrictions on customers. Two weeks for representations will follow before implementation
- If required, publicise notice to implement Phase 2 of temporary use restrictions on customers. Two weeks for representations will follow before implementation
- Update all digital and online communication channels with alerts about any TUBs that have been implemented and outline the restrictions required
- Following their implementation customers are informed of the likely frequency and duration of the temporary water use restrictions
- Contact commercial organisations that use large volumes of water and those for whom water is essential to their business purposes to advise them of imminent and current drought measures and advise them on how they may be able to decrease their water demand. The same contact to be made with retailers, regarding their business customers

- Vulnerable customers on our Priority Services Register will be individually notified of any imminent restrictions on their water supply as a result of drought. We will try to ensure customers with mobility problems can easily get to a supply of water in the event of supply being cut off
- Liaise with the Environment Agency and the WRSE to agree collective action and messaging
- Update the Company's crisis communications strategy to ensure everything is in place should temporary water use restrictions have to be introduced

Level 3 Communication Plan – Severe drought

Build on the actions already taken for Levels 1 and 2 with the addition of the following Level 3a and Level 3b actions, which would be especially important during drought periods.

Level 3a Communication Plan

- Before applying for a Drought Order, we will contact the EA, Secretary of State (Defra) and Natural England. Upon submission of our application, we will formally publicise our intention to apply for a Drought Order to the EA and local authorities (except county councils)
- Formal notification will be submitted in writing to Fire Authorities at least 72 hours prior to the implementation of a Drought Order
- Formal notification will be provided in writing to providers of essential services such as hospitals and schools at least 72 hours prior to the implementation of a Drought Order
- Update all digital and online communication channels with alerts about any TUBs or non-essential use bans that have been implemented and outline the restrictions required
- Consider developing a stand-alone page on the website to address the increased risk of drought and set as the primary item on the homepage
- Activate joint initiatives with the Environment Agency, all the local water companies and Water UK. Consult with Natural England, Ofwat and CCW
- Inject urgency into all customer facing communications across press releases, website communications, social media channels and direct mailings
- Consider sending SMS to customers in hotspots where water usage is particularly high, urging them to reduce their usage in line with the restrictions applied
- At this point, it is expected there would be considerable and self-sustaining media interest in the developing situation and little if any further media stimulation would be required. The focus would therefore be on managing the coverage to ensure key messages are included such as:
 - The need for temporary use bans to reduce demand and avoid supply failure
 - Details and examples of how customers can save water
 - Explain intention to enforce bans and the penalties for non-compliance
 - Explain the areas covered by restrictions and how to find if within affected areas
 - The severity and impact that further restrictions would have on homes and businesses

Level 3b Communication Plan

- The message to customers at this point will focus on the rapidly deteriorating resources situation and the need for substantial reductions in consumption. We will

highlight the increasing probability of a water supply failure and indicate the areas that will be affected by supply cuts should they become necessary

- Further direct customer communication should be distributed via letters and SMS
- Use striking imagery in customer communication to really show the problem and highlight the limits on the amount of water each customer should be using per day to avoid emergency drought orders
- Explain the removal of exemptions to TUBs and NEUBs
- Explain intention to enforce bans and emphasise the penalties for non-compliance

Level 4 Communication Plan – Extreme drought

As this level would only be reached in the most exceptional circumstances, and it involves severe restrictions on daily life for our customers, we would have a substantial communications plan in place to explain how supplies would be available in each area, involving local networks, resilience forums, groups and authorities, as well as local media. Details on the timing and provision of supplies would be made available online and by the use of posters and leaflets. Care would be taken to ensure communications are clear and effective, especially to vulnerable groups.

Post Drought Communication Plan

A decision to withdraw water restrictions in a post drought situation will be taken in consultation with the Environment Agency. Public announcements will be made jointly where appropriate.

Announcements that restrictions are being eased or withdrawn will be made by sending out a joint statement through the WRSE Group to all national and local media, as well as direct communication to affected customers who will be thanked for their co-operation and understanding.

Throughout the drought we will have engaged with customers to see how well we are doing at communicating and empowering action. Following any drought we would then carry out an in-depth review to ensure lessons have been learned.

Evaluation

- Media monitoring to assess take up of our messaging and the audience numbers reached
- Data capture on visitor numbers, page views, downloads etc on our website
- Use of social media monitoring tools during the drought to monitor conversations
- Registrations to our water use calculator and requests from customers for information/water saving devices/water efficiency information
- Customer surveys commissioned by us or other organisations such as CCW
- SES Water employee survey results and internal feedback
- Monitor feedback on ‘Talk On Water’ customer community
- Link between increased water saving messaging and behaviour change e.g. demand levels of metered customers
- Measurement of a reduction in demand either in response to localized action – for example text messaging of a district where demand is exceptionally high – and also zones where more widespread messaging / restrictions are in place

The evaluation results will be regularly shared with regulators including the Environment Agency, to gain feedback and give information on the decision-making process.

Following the drought, we will work in collaboration with the other companies affected, and the Agency, to determine the overall effectiveness of measures in comparison to previous droughts so that we can update our calculations and assumptions for future plans.

Appendix E: Groundwater Drought Options

See separate attachment.

Appendix F: River Eden May Drought Permit EAR

Available on request.

Appendix G: River Eden Summer Drought Permit EAR

Available on request.

Appendix H: Hackbridge Drought Permit EAR

Available on request.

Appendix I: Kenley & Purley Drought Permit EAR

Available on request.

Appendix J: Outwood Lane Drought Permit EAR

Available on request.

Appendix K: Strategic Environmental Assessment

Available on request.

Appendix L: Strategic Environmental Assessment Non-Technical Summary

See separate attachment.

Appendix M: Habitats Regulations Assessment Screening Report

Available on request.