
ESSEX&SUFFOLK
WATER living water
DROUGHT
PLAN 2018
October 2018

Exclusions on the Grounds of National Security

Northumbrian Water Limited has not excluded any information from this plan on the grounds that the information would be contrary to the interests of national security.

Under Section 37B(10)(b) of the Water Industry Act 1991, as amended by the Water Act 2003 (“the Act”), the Secretary of State can direct the company to exclude any information from the published Plan on the grounds that it appears to him that its publication would be contrary to the interests of national security.

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Essex & Suffolk Water is a trading division of Northumbrian Water Limited which is a group company of Northumbrian Water Group

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EXECUTIVE SUMMARY

What is our Drought Plan all about?

All water companies are required by law to produce a drought plan every 5 years. At its simplest, a drought plan details how a company will ensure that it can always provide sufficient water for its customer's basic needs, however bad a drought becomes. The document itself is rather complex as it has to reach a wide audience ranging from customers seeing how they may be affected, through to Government and regulators ensuring a balance has been reached between public water supply and environmental protection.

Defining exactly what is a drought and what is just a prolonged dry period is not possible. Knowing it was a drought is much easier to tell after the event. Additionally, not all droughts require a restriction on the use of water, although we would always ask our customers to use water wisely and not to waste water regardless of the weather.

Droughts that require us to take some form of action occur when a period of substantially below average rainfall coincides with a period of high demand for water. When these start to threaten our ability to keep meeting the demand for water, without reducing our stored supplies to very low levels, then we need to implement drought actions.

Every drought is different in the sense that rainfall may be very low at different times of the year (e.g. a dry winter or a dry spring). High demand for water in a hot summer may follow on from a dry winter or a wet winter. Depending on how these different factors come together determines whether we need to adopt drought actions. What experience shows us is that at times, we will have to put actions in place that curb our customer's water demand and sometimes increase available water supplies. These actions are tied into the Level of Service we provide.

Our **Levels of Service** are:-

Drought Action	Frequency
Level 1: Appeal for restraint	1 in 10 years
Level 2: Phase 1 Temporary Water Use Ban	1 in 20 years
Level 3: Phase 2 Drought Order Ban	1 in 50 years
Level 4: Pressure Reduction	1 in 250 years

In our previous Drought Plan, our level 4 drought action was a rota cut with the level of service being never on the basis that rota cuts would not have been required for the worst droughts in our historic record. However, the Environment Agency requires ESW to state a level of service for Level 4 restrictions. ESW does not consider the use of rota cuts and standpipes to be a viable drought action. Consequently, the Level 4 drought action has been changed to pressure reduction (to reduce the flow rate at customer's tap) with a frequency of 1 in 250 years.

Why do we need a Level of service?
Our supply area is in the driest part of the United Kingdom and so it is not possible to provide as much water as people want, all of the time, regardless of the weather conditions. If we attempted to construct sufficient storage to hold the amount of water needed to avoid any restrictions on use, the cost of water would rise considerably and the environment and other water users would suffer. We have therefore adopted the above Level of Service which our customers have confirmed that they find acceptable to them in terms of their willingness to pay and that a fair balance is struck with all of the other demands for water.

What does the Level of Service mean for you?
We state our Level of Service for an Appeal for Restraint as 1 in 10 years. However, this does not mean that an Appeal for Restraint will be made with such regularity. This is an average meaning a 1 in 10 year event may for example occur 3 times in 10 years and then not again for another 20 years. The frequencies quoted are just best estimates of what will occur over a long time span.

Level 1 Restriction: Appeals for restraint
Appeals for restraint are the most frequently introduced drought action but also the least restrictive, relying on the goodwill of our customers'. An appeal for restraint is when we provide our customers' with clear information about how the dry weather is affecting our water resources and asking them to use water much more carefully than normal. This is achieved by using various forms of media such as newspaper articles and adverts and local radio interviews. In addition to explaining the importance of using water more carefully, we also try to show how this can be achieved. Our website (www.eswater.co.uk) provides water efficiency tips and details of how to request free water saving products. Appealing to our customers' to save water is actually where the biggest savings in water comes from in a drought. Experience shows us that a demand reduction of 7% can be achieved by informing our customers of the need to save water. This is a significant reduction which could remove the need for further restrictions having to be imposed.

Level 2 Restriction: Phase 1 Temporary Water Use Ban
This Temporary Water Use Ban comes from Regulations introduced in October 2010 to replace the old "hosepipe bans" that water companies used to be able to impose. The droughts in London and the South East in 2005/06 showed the former hosepipe ban regulations were outdated and did not reflect the way water is used today. The 2010 regulations allow the banning of a wider range of water uses and more flexibility in which area of a company the ban covers. There is also the opportunity to exempt groups or activities from aspects of the ban.

How do we propose to use a Temporary Water use Ban?
Just as with the previous hosepipe bans, we intend to keep the application of a Temporary Water Use Ban separate for Essex and for Suffolk. We do not intend to impose the ban on smaller areas than Essex or Suffolk.

The ban applies mainly to the domestic use of water and stops the use of a hosepipe or sprinkler for any garden watering or cleaning. The legal definition of a garden under these powers includes domestic gardens, parks, public gardens, allotments and sports fields, including golf courses, cricket fields and race tracks. Cleaning covers domestic cars, boats, windows, patios and buildings.

What the ban does not mean

The ban only stops the use of hosepipes for watering gardens and plants and washing cars and windows. It does not stop plants being watered with a watering can or cars or windows being washed with a bucket and sponge. Hosepipes are banned because a hosepipe can use over 500 litres of water in 1 hour. This volume of water is greater than the total daily consumption of water for the average household. Using a watering can keeps your plants alive but uses a fraction of the water a hosepipe would as water is directed more accurately to where it is needed. Lawns do not need to be watered. They may turn brown during hot dry periods but they always recover when it eventually does rain.

Will we have exemptions from the ban

Legislation allows for a number of exemptions for “use” or “groups of users” and allows companies to introduce exemptions. The extent of exemptions will be dependent on the severity of the drought and may change as a drought progresses (see Chapter 6).

Temporary Water Use Bans will still be rare (1 in 20 years on average) and will only be implemented when there is a real need. In these circumstances, it is important to save as much water as possible. By maximising water savings when there is a temporary use ban means their frequency will be slightly less than they otherwise would have been. We believe this is most fair to all customers.

What are the commercial consequences?

The economic effects on commercial enterprises are minimised under the Temporary Use Ban, as opposed to the Drought Order ban, but even so there could be commercial groups affected. The nursery / garden service trade can be affected by the ban as customers are less willing to buy plants or new lawns when there is a ban. However, given the severe shortage of water available, something has to give and garden watering is the largest discretionary use of water there is. To minimise the effect on trade, the Company and we would assume the nursery trade, will emphasise that watering of plants is not banned, only watering using a hosepipe.

We will try to minimise any economic consequences for commerce from the Temporary Use Ban by exempting a number of activities that could be banned. However, any exemptions cannot compromise our ability to provide essential supplies of water, therefore any exemptions will be dependent on the severity of the drought we are facing. Our banning and exempting of commercial water uses will be proportionate to the prevailing situation and the water consumption of the activity.

Level 3 Restriction: Drought Order Ban
These are far rarer (1 in 50 years) but when they are put in place it will always be after a Temporary Use Ban has already been in implemented. The Drought Order Bans basically ban what has been applicable to the domestic customer under the Temporary Use Ban, to non domestic or commercial customers. These bans have economic consequences for businesses and have to be used as sparingly as possible. Our intention would be to apply for powers to ban all of the activities open to us, but only apply each restrictions when necessary and beneficial in terms of water savings and economic impact.

Level 4 Restriction: Drought Order (Pressure Reduction)
Level 4 restriction have previously related to the use of rota cuts and the level of service was 'never' (i.e. even in the most extreme of droughts, ESW would only ever impose Level 1, 2 and 3 restrictions). However, the Environment Agency requires ESW to state a level of service for Level 4 restrictions. ESW still believes that rota cuts and standpipes should never be used but that, pressure reduction to reduce the flow rate at customer's tap is a viable alternative. ESW therefore defines the Level 4 restriction as reducing pressure at the customer tap with a return period of 1 in 250 years on average. This return period is based on our supply and demand assessment for our PR19 Water Resources Management Plan. This concluded that all ESW Water Resource Zones (WRZ) are resilient across the full 40 year planning period (2020 to 2060) to a drought that occurs on average once in 200 years without the need to impose restrictions greater than a Temporary Use Ban. Therefore, we have set the Levels of Service for this restriction at 1 in 250 years on average.

Drought Permit / Orders
A number of the supply side drought actions detailed in Section 8 of this Drought Plan would provide additional water supplies by allowing ESW to operate outside of normal abstraction licence conditions. To do this, ESW would have to apply to the Environment Agency and/or Defra for a drought permit / drought order. The permission would need to be issued to ESW before the drought action could be implemented.

A drought permit application requires an accompanying environmental report to be submitted with the application. A baseline environmental report has been prepared for each of the supply side drought actions. These reports confirm the drought action, the mechanism by which the drought action could effect the environment, an assessment as to whether the drought action could cause a significant adverse effect on the environment and the mitigation and monitoring that would be employed to ensure the drought action would not have a significant adverse effect on the environment. They also include an environmental monitoring plan which sets out baseline, drought and post drought environmental monitoring.

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1. INTRODUCTION

1.1 Background

Essex & Suffolk Water is a trading division of Northumbrian Water Limited. This document is Essex & Suffolk Water's (ESW) Drought Plan 2018 which has been prepared following the Environment Agency's updated Drought Plan Guidance (2016).

The Environment Agency (2008) defines drought as "...a period of low rainfall [which] creates a shortage of water for people, the environment, agriculture, or industry". Beran (1985) defines drought as, "A decrease of water availability in a particular period and over a particular area". These definitions reflect the very unique nature of every drought in terms of depth and duration but also spatial distribution.

Our supply areas are particularly prone to drought, being located within some of the driest parts of the UK. We first identified the need to make adequate contingency for drought periods by producing the very first Drought Contingency Plan in 1996 / 97. This 2018 Drought Plan builds on previous reports and the company's extensive experience of managing droughts in the 1990s.

1.2 Purpose of this Drought Plan

This document identifies how we intend to manage a future drought, what trigger levels can be used to identify when action is required, and what measures are available to support supplies when levels of service are compromised. It also outlines how the effects of a drought and drought actions will be communicated to customers and takes account of the need to undertake environmental monitoring at those sites potentially affected by the implementation of drought actions.

1.3 Regulatory Framework

The requirement for water companies to produce Drought Plans is formally set out in Section 39B of the Water Industry Act 1991, as defined by the Water Act, 2003. The drought planning process is effectively regulated by the Secretary of State and the Environment Agency.

In producing this Drought Plan, reference was made to the following guidance and legislation:

- Water Company Drought Plan Guideline 2016, Environment Agency
- The Drought Plan (England) Direction 2016
- Drought Plan Guideline Extra Information: Environmental Assessment for Water Company Drought Plans, May 2016, Environment Agency
- Drought Plan Guideline Extra Information: Supplementary Information, April 2016, Environment Agency

- Drought Plan Guideline Extra Information: Drought Permit and Order Application Ready, November 2016, Environment Agency
- Water Company Drought Plan Guideline 2011, Environment Agency
- Water Industry Act 1991
- Water Act 2003 where s.63 inserts new sections 39B & 39C into the Water Industry Act 1991 and s.62 inserts new sections 37B-D into Water Industry Act 1991
- Drought Plan Direction 2005
- Drought Plan Regulations 2005
- Drought Direction 1991
- Flood and Water Management Act 2010 where s.36 amends the Water Industry Act 1991 by substituting a new s.76
- Water Use (Temporary Bans) Order 2010
- Environmental Assessment of Plans and Programmes Regulations 2004
- Conservation of Habitats and Species Regulations 2010
- Wildlife and Countryside Act 1981 as amended by the Countryside and Rights of Way Act 2000, Section 28G.

This document is supported by our Water Resources Management Plan 2014. This forecasts water demand for the period April 2015 to March 2040 and documents how we plan to meet this demand. By contrast the Drought Plan considers what measures can be implemented in the short term to address temporary shortages of water resources during drought conditions.

1.4 Draft Drought Plan Consultation

We recognise the value of early communication with the many stakeholders potentially affected by and involved in the drought management process. We pre-consulted with the Environment Agency, Natural England, Ofwat and our Customer Challenge Group known as the Northumbrian Water Group Water Forum. We also pre-consulted with our neighbouring water companies.

Consultee	Consultation Details
Environment Agency	▪ Letter sent to Nikki Baglee dated 15th March 2017 seeking views on what should be included in the draft drought plan. ▪ Meetings with the Environment Agency held on10th April 2017.
Natural England	Letter sent to Anne Ramsey dated 15th March 2017 seeking views on what should be included in the draft drought plan.
OFWAT	Letter sent to Peter Hetherington dated 15th March 2017 seeking views on what should be included in the draft drought plan.
Water Forum	Paper circulated 12th May 2017.
Other Water Undertakers	Letter sent Anglian Water, Thames Water, Affinity Water dated 12th May 2017 seeking views on what should be included in the draft drought plan.

The consultation period for the draft Drought Plan took place over an eight week period commencing on Monday 23rd October 2017 and closing on Sunday 17th December 2017. The start of this consultation coincided with

publication of the draft plan on our website https://www.eswater.co.uk/droughtplan.

The Statutory Consultees are:-

- The Secretary of State, Defra
- Ofwat
- Environment Agency
- Consumer Council for Water
- Natural England
- Local Authorities within company's supply area
- National Park Authority
- English Heritage
- Navigation Authorities

We have since reviewed the feedback received during the consultation and have prepared a Statement of Response (SoR) which details any changes we have made to the draft Drought Plan as a result of the feedback received during the public consultation. Our SoR is published on our website: www.eswater/droughtplan.

2. ESSEX & SUFFOLK WATER INFORMATION

2.1 Supply Areas and Water Resource Zones

2.1.1 Description

Essex & Suffolk Water (ESW) has geographically separate supply areas, known as the Essex supply area and Suffolk supply area respectively, as indicated in Figure 1. Water is supplied to ~1.5 million customers in the Essex supply area and ~0.3 million customers in the Suffolk supply area.

Water resources planning is undertaken at water resource zone level. A water resource zone is defined as 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. ESW has determined that for the purposes of drought planning, its activities are best managed at resource zone level. Therefore, in the case of ESW 'drought management areas' equate directly to water resource zones and vice versa.

In the case of ESW, four water resource zones have been delineated, one in Essex (the Essex resource zone) and three in Suffolk known as the Hartismere, Blyth and Northern/Central resource zones. The resource zones and associated infrastructure are indicated in Figures 2 and 3 for Essex and Suffolk respectively.

The resource zones are described in the following sections.

2.1.2 Essex Resource Zone

The Essex water resource zone (Figure 2) is bounded by the Thames Estuary in the south and the Essex coastline to the east stretching as far north as Salcott. The zone stretches as far north as Silver End and as far west as the London Boroughs of Redbridge, Barking and Havering. The zone includes the towns of Southend-on-Sea, Chelmsford, Witham, Brentwood, Billericay, Basildon, Grays, Dagenham and Romford.

In a drought year, only 58% of the water supplied within the Essex supply area is sourced from within it, with the other half being transferred into the zone from outside the area. The intrinsic water resources include the Essex rivers; the Chelmer, Blackwater, Stour and Roman River, which support pumped storage reservoirs at Hanningfield and Abberton, and treatment works near Maldon, Stratford St. Mary, Chelmsford and Colchester. The remaining water sourced from inside the zone (approximately 3% of total water supplied in the zone) is derived from groundwater via Chalk well and adit sources in the south and south west of the zone at South Essex Well 1 and South Essex Well 2, each with on-site treatment.

In a dry year, up to 26% of the water supplied in Essex is derived from the Ely Ouse to Essex Transfer Scheme (EOETS) which transfers water from Denver

in Norfolk via pipelines and pumping stations to the headwaters of the River Stour and the River Pant/Blackwater as indicated in Figure 1. The EOETS is owned and operated by the Environment Agency.

The EOETS, the Essex rivers, and their associated intakes, the pumped storage reservoirs at Abberton and Hanningfield and associated raw water transfer pipes, pumping stations and treatment works are collectively known as the 'Essex System'. This reflects the nature of the supply network in Essex which is a fully integrated one, with great flexibility for moving water around the zone to where it is required.

A further 16% of water supplied in Essex is provided via a raw water bulk transfer provided by Thames Water Utilities from the Lea Valley reservoirs. The raw water is pumped directly to ESW's treatment works at Chigwell for treatment and then into supply.

At the end of 2003, ESW completed works to construct an innovative effluent recycling scheme near Maldon. The scheme intercepts effluent from Chelmsford Sewage Treatment Works (STW) and treats it to a very high standard at a purpose built treatment plant. Once treated the water is pumped 3km upstream into the River Chelmer where it augments the natural river flow and is available for re-abstraction via existing intakes supporting a nearby Water Treatment Works (WTW) and storage into Hanningfield Reservoir. The scheme can provide an additional 20 Ml/d on average (April to November) of water for use within the Essex system during dry periods.

Between 2009 and 2014, ESW implemented the Abberton Scheme. This involved increasing the storage capacity of Abberton Reservoir by 58% by raising the top water level in the main part of the reservoir by 3.2 metres.

As part of the Abberton Scheme, the Environment Agency's Ely Ouse Essex Transfer Scheme abstraction licences at Denver and Blackdyke in Norfolk were also varied. These control the amount of water transferred to Essex from the Ely Ouse and provide the potential for additional water for transfer from Denver to fill the enlarged Abberton Reservoir.

In order to transfer additional water from Denver, two underground pipelines were also constructed, one from Kirtling Green in Suffolk to Wixoe on the Essex/Suffolk border where the additional water is put into the River Stour, and another from Wormingford, Essex, where that water will be abstracted from the river and transferred to Abberton Reservoir.

The Abberton Scheme makes the Essex water resource zone a very resilient zone and provides a surplus of water across the full planning horizon of the current Water Resources Management Plan under the design drought year of 1933/34.

2.1.3 Suffolk Hartismere Resource Zone

The Hartismere resource zone of Suffolk (Figure 3) is bounded to the north by the River Waveney, from its source at Redgrave in the west to Mendham in the east. The zone stretches as far west as Rickinghall and Wyverstone Street, and as far south as Mendlesham Green and Aspall. The zone includes the town of Eye situated on the River Dove, a major tributary of the River Waveney. The zone is predominantly rural in nature and is characterised by arable farming.

All the water supplied within the Hartismere resource zone is abstracted from eight groundwater sources.

The Hartismere zone was particularly affected by the last major drought to have affected Suffolk, between 1995 and 1997. As a consequence, the Company made significant investments in the zone in subsequent years. Improvements made included infrastructure enhancement to enable transfer of water more easily around the zone, and the successful development of two new groundwater sources to address security of supply concerns.

2.1.4 Suffolk Blyth Resource Zone

The Blyth resource zone of Suffolk is bounded by the Suffolk coastline in the east stretching from Aldeburgh in the south to Walberswick in the north. The zone stretches as far west as Earl Soham, and as far north as Chediston. The zone includes the towns and villages of Saxmundham, Leiston, Framlingham, Peasenhall and the southern side of Halesworth. Similarly to Hartismere, the zone is predominantly rural in nature.

All the water supplied within the Blyth resource zone is abstracted from seven groundwater sources.

2.1.5 Suffolk Northern/Central Resource Zone

The Northern/Central zone of Suffolk is bounded by the River Waveney and River Bure to the west, and the Suffolk coastline from Southwold to Winterton-on-Sea in the east. The zone includes the towns of Lowestoft, Great Yarmouth, north Halesworth, Bungay and Beccles. Demand in the zone is heavily influenced by the large population centres in Lowestoft and Great Yarmouth. The transient holiday population in Great Yarmouth during the summer can have a notable seasonal affect on demand.

Water supplied in the Northern/Central resource zone is predominantly sourced from surface water, with a smaller proportion from groundwater in the south of the zone.

Surface water is provided via four sources including the River Waveney, the River Bure, and groundwater fed lakes at Ormesby, Lound and Fritton.

A smaller component of raw water can be sourced from remote Chalk boreholes in the north of the zone. Larger quantities of groundwater produced in the south of the zone are abstracted from eight groundwater sources.

2.2 Assessing Water Supply and Demand

Water resources planning is the regulatory process used to determine how water companies intend to maintain the balance between water supply and demand over the long term (usually a 25 year period), and is commonly carried out at resource zone level. An important aspect of this process is the 'Supply Demand Balance' which is essentially a comparison of both forecast raw water availability (supply), against forecast demand. The forecasts are worst case in the sense that dry weather demands are measured against source yields defined by previous drought periods. Any deficits in the 'Supply Demand Balance' can be addressed by a combination of reducing demand (e.g. through leakage reduction, metering, water efficiency) and increasing supply (e.g. developing new sources of water).

By contrast, Drought Planning is essentially a prepared response to developing sustained dry weather (drought) conditions that have the potential to detrimentally affect public water supplies. Drought conditions are usually manifested in the form of:

- reduced raw water availability (e.g. low river flows, low reservoir storage, low groundwater levels) and/or

- increased demand (e.g. due to increased drinking, garden watering, showering etc in dry weather).

There are direct linkages between longer term water resources planning and drought planning in terms of the calculation of all elements relating to the Supply Demand balance, which for the purposes of this document can be assumed to be consistent.

It should be recognised that the frequency of drought may increase in the future due to the impact of climate change. Consequently, drought planning may move from being an infrequent irregular response to an expected regular response.

2.3 Levels of Service

Each year ESW provides Ofwat with information on its performance against various aspects of service. Ofwat publishes a 'levels of service' report which reviews the Company's performance in delivering customer service and in providing water supplies. The report compares water company performance against industry averages and external benchmarks. This provides an assessment of the quality of individual services delivered to our customers and allows Ofwat (and customers) to judge how individual water companies

are performing. The levels of service indicators are known as DG1-DG9 and are summarised as follows:

Table 1: Level of Service Indicators.

DG	Indicator
DG1	Adequacy of Water Resources (Water Resource Availability)
DG2	Inadequate pressure
DG3	Supply interruptions
DG4	Restrictions on use of water (population subject to restrictions)
DG5	Internal flooding from sewers & risk of flooding
DG6	Billing contacts
DG7	Written complaints
DG8	Bills for metered customers
DG9	Ease of telephone contact

In relation to drought planning, the most important level of service indicators are DG1, DG4 and to a slightly lesser extent DG2 and DG3.

The DG1 indicator (Water Resource Availability) is reflected in the security of supply index which is intended to provide an indication of a Company's ability to supply customers in a dry year for both industry standard and Company defined levels of service. The Security of Supply Index for ESW's Essex and Suffolk WRZs is 100.

Levels of service can also be expressed in terms of expectations about the frequency of restrictions on use, such as hosepipe bans during dry years. ESW has defined the levels of service it intends to provide to its customers as follows:

Table 2: Level of Service & Frequency of Restrictions

Drought Action	Frequency
Level 1: Appeal for restraint	1 in 10 years
Level 2: Phase 1 Temporary Use Ban	1 in 20 years
Level 3: Phase 2 Drought Order Ban	1 in 50 years
Level 4: Pressure Reduction	1 in 250 years

Level 4 restriction have previously related to the use of rota cuts and the level of service was 'never' (i.e. even in the most extreme of droughts as ESW would only ever impose Level 1, 2 and 3 restrictions). However, the Environment Agency requires ESW to state a level of service for Level 4 restrictions. ESW still believes that rota cuts and standpipes should never be used but that, pressure reduction to reduce the flow rate at customer's tap is a viable alternative. ESW therefore defines the Level 4 restriction as reducing pressure at the customer tap with a return period of 1 in 250 years on average. This return period is based on our supply and demand assessment for our PR19 Water Resources Management Plan. This concluded that all ESW Water Resource Zones (WRZ) are resilient across the full 40 year

planning period (2020 to 2060) to a drought that occurs on average once in 200 years without the need to impose restrictions greater than a Temporary Use Ban. Therefore, we have set the Levels of Service for this restriction at 1 in 250 years on average.

It should be noted that restrictions would never be placed on the use of water for fire fighting. Additionally, ESW's procedures for protecting vulnerable customers would come into force.

3. DROUGHT MANAGEMENT STRATEGY

3.1 Objectives

The overall objectives of the Company's Drought Management Strategy are:

- To present the Company's drought management plans and to identify potential drought measures that may be required in response to a range of drought conditions;
- To provide a comprehensive package of information and procedures that will enable the company to respond in a timely manner to drought conditions. One essential requirement is the collection of information necessary for a drought permit or drought order application;
- To enable early discussion with regulators, customers and other stakeholders on the proposed response to a drought; and
- To ensure that ESW management will be provided with detailed, relevant and reliable information on which to make decisions.

3.2 Internal Management

ESW has a number of procedures in place to cover various emergency events including drought. In the case of droughts, which typically begin to define themselves over a longer period of time than other 'emergencies', the process begins with the formation of a 'Drought Management Group' (DMG). The trigger for forming the group will be based on ambient supply and demand conditions, and will be particularly influenced by when resource monitoring starts to indicate a potential worsening of hydrological conditions, particular in terms of key indicators such as reservoir storage and pumping groundwater levels. These indicators are discussed further in Chapter 5 of this document, and will be reviewed on a regular basis by the Company's Water Resources Team.

The decision to form the DMG will ultimately be made by the Company's Head of Technical Strategy & Support and the Water Director. The DMG will be chaired by the Head of Technical Strategy and Support and will be formed from individuals both representing 'affected departments' and/or able to provide necessary expertise in relation to various areas of drought management. The DMG will also ensure the appropriate external bodies are sufficiently consulted and informed.

The Group will meet as frequently as needed to evaluate the water resource situation and the balance between demand and supply. Drought actions should be identified and implemented before a major resource difficulty occurs. Such actions will be reviewed on a regular basis in response to daily reporting of the resource situation.

The DMG will be formed from individuals both representing 'affected departments' and/or able to provide the necessary expertise in relation to various areas of drought management. The roles with key areas of

responsibility and/or expertise that form the Drought Management Group are indicated below.

Table 3: Likely ESW Drought Management Group Configuration

Area of Responsibility	Job Title	Department
Overall Management	Water Director	Management Team
Water Resources Strategy	Head of Technical Strategy & Support	Technical Strategy & Support
Water Production	Water Supply Manager	Water Supply
Raw Water Resources	Water Resources Manager	Technical Strategy & Support
Environment Agency Liaison	Water Resources Manager	Technical Strategy & Support
Communication	Corporate Affairs Manger	Corporate Affairs
Customer Contact	Customer Contact Manager	Customer Services
Water Efficiency	Water Efficiency Manager	Technical Strategy & Support
Distribution & Leakage	Head of Customer & Network Services	Customer & Network Services
Metering	Metering Manager	Metering
Water Resources System Modelling & Hydrology	Senior Technical Advisor (Resources & Reservoirs)	Technical Strategy & Support
Water quality issues	Water Quality Manager	Water Quality
Engineering Schemes	Asset Delivery Manager	Asset Delivery
Emergency Planning	Business Continuity Manager	Business Continuity
Maintenance and Planning	Maintenance Manager	Maintenance Operations
Water Resources System Modelling & Hydrology	Hydrologist	Technical Strategy & Support

A chairman of the Group and a secretary will be appointed. The secretary will take minutes of the Group meetings which will be widely circulated within the Company.

The Group will meet regularly to consider the water resource situation and the balance between supply and demand. Appropriate drought measures (e.g. publicity campaign) will potentially be considered early on in the development of a drought, in order that the impacts of a deepening drought may be limited later on.

During the course of a drought, a range of drought measures will be reviewed on a regular basis in response to daily reporting of the resource situation.

Extensive liaison with the Environment Agency will be required when deciding on any particular course of action that may impact the environment. Communication with the Environment Agency is covered under Chapter 10 of this document (Communications Plan).

3.3 External Partners

Outside of drought conditions, contact with the Environment Agency is regular and often with various information being passed on a daily, weekly and monthly basis. The frequency of this communication, both written and verbal will increase during drought conditions.

Experience of the drought in the south of England in 2012 has shown the importance of water companies, their regulators and Defra working in a collaborative, fully informed manner. ESW has gained a good insight into the importance of collaborative working during droughts. Our intention will be to work closely with Defra, the EA, other water companies and the National Drought Communications Group to ensure our messages are aligned.

One of the most important lessons learnt from the 2012 drought was that discussion amongst all of the “partners” prior to any release of information to the public is essential. Coordination of the timing and content of messages to our customers helps considerably in removing confusion about what is happening, and what we want our customers to do.

At the beginning of drought situations we would be encouraging and facilitating the formation of these relevant collaborative communications amongst the affected parties.

3.4 Drought Management Process

During meetings of the Drought Management Group, decisions on the potential implementation of drought measures will be made by reference to the process summarised in Figure 4 below which also references specific sections of the Drought Plan.

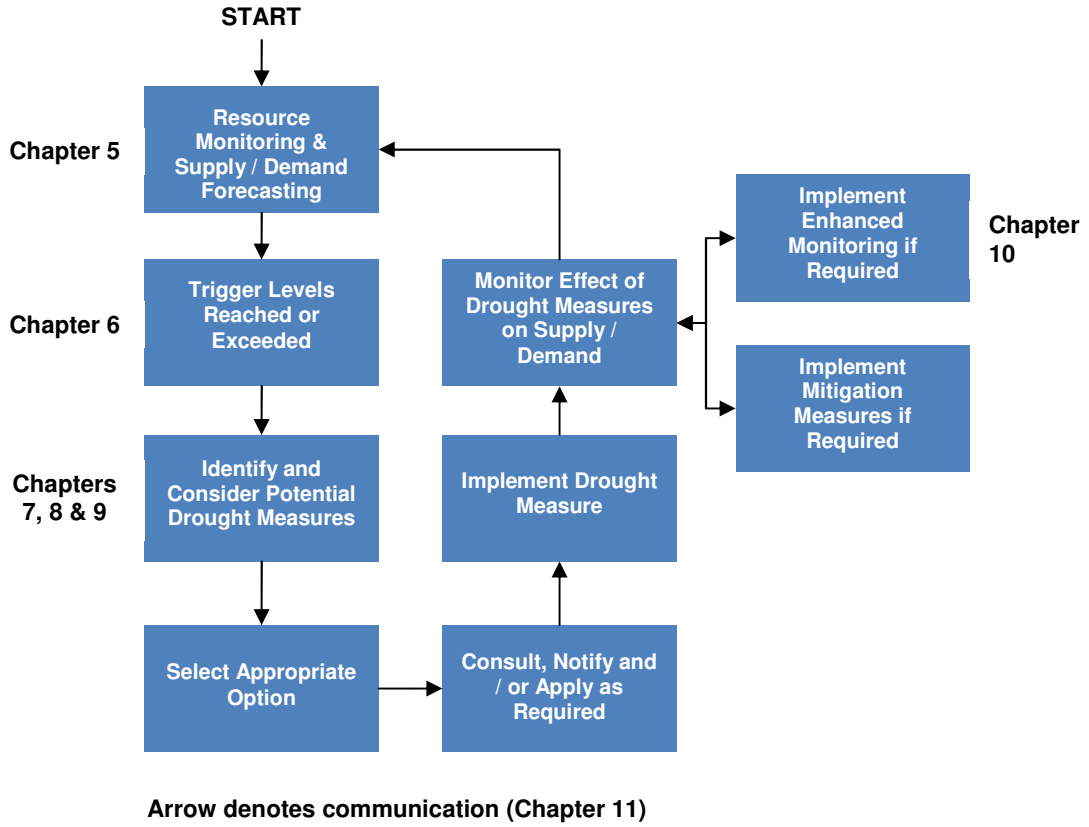


Figure 4: Drought Plan Process

The arrows in Figure 4 above denote lines of communication both internally and externally which are covered in Chapter 11. Understanding the context of drought outside of ESW's own supply area and catchments is essential. Consequently, communication with the Environment Agency, neighbouring water companies and with the National Drought Communications group will be very important.

The key elements of the above process are represented in the various chapters in this report:

In addition to the above steps, a post drought review mechanism is included as detailed in Chapter 10. The post drought review will enable an opportunity to identify lessons learnt and also consider potential improvements both to the Drought Plan and wider drought management strategy.

3.5 Decisions & Consultation in a Drought

The final decision for selecting and implementing a drought action lies with the Management Team and Board. As a drought intensifies, the Drought Management Group will brief the Management Team and Board with increased frequency. When a trigger level is reached, the Management Team and Board will already be fully briefed and aware of its implications. They will therefore be able to grant immediate approval.

Once an action has been selected, consultation with the Agency and other consultees including the Consumer Council for Water and Natural England will be initiated as appropriate before notice of the application is made. ESW will also engage when required with affected areas of the Fire Service in order to ensure that any implications for operational fire fighting have been adequately considered. This will be particularly important in the context of restrictions on water use.

A primary use of the Drought Plan is to expedite the process whereby all the necessary information to prepare the application is readily available.

Although the initiation of a Drought Order is governed primarily by the resource situation, it must also be supported by a strong business case to link short to long-term planning with the urgency of resource deficits.

4. RESOURCE MONITORING & DROUGHT INDICATORS

4.1 Background

An important requirement of the Drought Plan is to regularly monitor the status of water resources in terms of key indicators, such as rainfall, reservoir levels, groundwater levels etc. Such monitoring enables the water resources situation leading up to, during, and recovering from a drought to be established. Once parameter trigger levels are approached (as detailed in chapter 6), consideration will actively be given to implementing appropriate drought measures (sections 7 and 8), once the triggers are breached.

Section 5.2 details the classification of drought indicators and the type and length of record of monitoring data collected. A description of how monitoring data can be analysed and used in support of a drought application is outlined in section 5.3.

4.2 Drought Indicators & Monitoring

There is no single method of assessing and describing drought severity which will be suitable for all circumstances and users. Although one of the definitions of a drought is a period greater than 15 days without rain, this has little meaning in a water resources context and a more useful definition would be “a decrease of water availability in a particular period and over a particular area”.

Drought indicators can be classified as two types:

- Hydrological and meteorological indicators that measure the direct effect on the hydrological cycle. These include rainfall, temperature, evapo-transpiration, weather patterns, effective rainfall, soil moisture deficit, groundwater recharge, groundwater storage, groundwater level, river flow, reservoir inflows, reservoir storage, abstractable quantities.

- Demand, consumption, and socio-economic indicators measure severity in terms of the impact of the drought on the use of water in its broadest sense, for example, impact on water supply for domestic, commercial or agricultural use, impact on fisheries or recreation.

Drought indicators that historically have been of the greatest value in Essex and Suffolk are rainfall, reservoir storage, groundwater levels, river flows and demand. These are the indicators that are favoured in this Drought Plan. Both internal (ESW) and external (Environment Agency) data sources are utilised where appropriate.

4.2.1 Rainfall

Rainfall is the primary indicator of drought severity. It has a direct effect on many hydrological parameters (river flows, soil moisture deficit and

groundwater recharge) and thus can directly impact on the quantities of water available for abstraction. Rainfall can therefore be used to establish the effect of drought on ESW water sources, as required in a drought order application.

Rainfall is measured at rain gauges throughout the UK, and is independently recorded by ESW at the following treatment works:

Table 4: ESW Weather Stations with Rain Gauges

Essex	Suffolk	Norfolk
Hanningfield (1960 -)	Barsham (1983 -)	Ormesby (1992 -)
Chigwell (2006 -)	Lound (1998 -)	
Layer (1949 -)	Blyth Borehole 7 (2005 -)	
Langford (1929 -)	Bedingfield (2005 -)	
Langham (2006 -)	Hartismere Borehole 4 (2006 -)	

This data is available from ESW's Water Resources team. Under normal (non-drought) conditions daily rainfall data from Essex and Suffolk treatment works is sent to the Water Resource team at the end of each month. In a drought, daily rainfall figures can be obtained directly as required.

Monthly rainfall data is also provided by the Environment Agency within a wider 'Hydrometric Bulletin' provided by East Anglia area, and a 'Hydrological Summary' provided by Thames area.

The East Anglia area bulletin includes average monthly rainfall figures for Essex, Suffolk and Norfolk. The Thames region summary includes average monthly rainfall figures for the Lee Chalk catchment of their Northeast region.

More local rainfall data may be available on request from the Agency's database for most of the Essex and Suffolk water catchments.

4.2.2 Soil Moisture Deficit

Soil Moisture Deficit (SMD) is the amount of water required to raise a soil to field capacity. As a soil approaches field capacity, infiltration and ultimately aquifer recharge can potentially occur. The largest SMDs are found in the summer when rainfall is low and ambient air temperatures and evapo-transpiration rates are high. Aquifer recharge usually starts around late September/October when SMDs reach a critical threshold.

Similarly to rainfall, monthly SMD figures are quoted in the Agency's monthly bulletins and summaries on an area basis.

4.2.3 Groundwater Levels

The monitoring of groundwater levels is of greatest importance in the Company's Suffolk supply area, particularly in the groundwater dominated

Hartismere and Blyth water resource zones. Pumped groundwater levels are provided weekly at a number of groundwater sources.
Groundwater levels are also recorded on a semi-continuous basis via telemetry at 15-minute intervals at all ESW PWS borehole sites. In addition to the above, groundwater level data is also collected from monitoring borehole sites as required under various abstraction licence conditions.

Groundwater level data can also potentially be used to optimise and adjust the position of borehole pump intakes as appropriate.

Similarly to rainfall and SMD, monthly 'average' groundwater levels are quoted in the Agency's monthly bulletins and summaries on a groundwater unit basis (e.g. Suffolk Chalk, Suffolk Crag, Essex Chalk, Essex Gravels, Great-Ouse Chalk and Lee Chalk).

4.2.4 River Flows

ESW has installed telemetry at relevant Environment Agency's gauging stations on the Rivers Chelmer, Blackwater, Stour, Waveney and Bure with 15 minute flow data being stored on ESWs MIPS system. Hydrographs for each of these rivers are also provided in the Agency's monthly bulletins and summaries.

Longer records for key gauging stations are already held in electronic format and are used for water resources system modelling and statistical analysis.

4.2.5 Reservoir and Lake Levels

The Company's two large pumped storage reservoirs in Essex, Hanningfield Reservoir and Abberton Reservoir, have storage capacities of 26,075 Ml and 41,375 Ml respectively. Since the previous Drought Plan, the Abberton Scheme (including the enlargement of Abberton Reservoir) has been completed which has increased Abberton reservoir storage by 60%. This means that the Essex WRZ has moved from having a supply deficit to a significant supply surplus.

Reservoir levels are a critical element of monitoring the Essex system and form the basis of the trigger levels referred to in Chapter 6. Essex reservoir storage is calculated on a weekly basis using both a level method (and converting it to volume using look up tables) and a water balance method (comparing what goes in the reservoirs with what comes out). Reservoir storage levels are widely circulated both internally and to external organisations such as the Agency and Essex Wildlife Trust.

Lake levels are recorded at Fritton Lake and Ormesby Broad in the Company's Suffolk Northern/Central zone, on a daily basis.

Both reservoir and lake levels are graphically presented to compare current levels with historic minimum, mean and maximum levels.

4.2.6 Weather Forecasts

The Company has access to Met Office weather forecasts. In the event of the on-set of drought conditions, weather forecasts are scrutinised more regularly, with a range of short and long range forecasts being reviewed.

4.2.7 Operational Reporting

Internal Operational Reporting

Daily water availability, supply and demand figures for both the Essex and Suffolk supply zones are provided in daily supply reports.

Additionally in Essex, daily abstraction, transfer (raw water) and treated water volumes are regularly updated and used to allow the assessment of:

- the current operation of the transfer scheme and compare with previous years (this is critical when refining predictions);
- the use of available resources at the Company's river intakes and groundwater sources; and
- operational problems and their impact on forecasts.

Ely Ouse to Essex Transfer Scheme Operation

Meetings are held with the Agency to determine the operation of the Ely-Ouse to Essex Transfer Scheme. These are held quarterly, with additional meetings between these if the need arises. The meetings cover the following issues:

- an update on the regions current water resource situation, including river flows, reservoir storage and groundwater levels;
- raw water quality issues;
- predicted resource availability;
- the operational status of the transfer scheme, treatment works and pumping station infrastructure, including planned maintenance downtime;
- current and predicted customer demand; and
- the appropriate use of the transfer scheme and groundwater augmentation schemes.

4.3 Reporting & Analysis of Drought Conditions

Each drought in the UK has a unique spatial and temporal signature. Droughts are also unique in their depth, duration and severity, as well as their individual hydrological and consequential characteristics. It is important therefore to ensure that reporting and analysis of a drought situation takes account of the wide range of factors that potentially define it.

Historical data can be used to demonstrate:

- an exceptional shortage of rainfall;
- that shortage of rain is affecting key sources, either for surface water or groundwater abstraction ; and
- how ESW's situation compares with neighbours and at a national level.

The Company's Water Resources team maintains data on the indicators described in Section 5.1. This data combined with that from other sources (e.g. Environment Agency hydrometric bulletins) can be used to achieve rapid analysis of water resources data during a drought. Weekly 'Water Resources Situation' (WRS) reports will be used for supporting drought order applications, and in updating the Drought Management Team on ambient drought conditions. WRS reports will comprise of the following elements:

- Comparison of recent rainfall data with long term mean and minima for different sites representative of either supply or catchment area (point and area rainfall)
- Comparison of rainfall trends, groundwater levels and river flows to assess the impact of low rainfall on sources (surface and groundwater)
- Assessment of trends in soil moisture deficit and groundwater levels and their impact on river baseflows and prospects for recharge
- Assessment of refill for Abberton and Hanningfield reservoirs
- Comparison of relevant hydrometric data against applicable drought measure trigger levels

WRS reports can therefore provide information that can be used to support drought management decisions.

Weekly WRS reports are produced as soon early drought indicators indicate that a drought could be possible. Typically these reports will be circulated within the Company before formation of the DMG is required.

5. TRIGGER LEVELS

5.1 Overview

Drought management decisions should always be based on sound planning and judgement. During a drought, the Drought Management Group (DMG) will be formed before the implementation of all drought actions. The DMG will actively review water availability and demand on a regular basis. One tool to assist the DMG in deciding whether to implement potential drought actions is the use of trigger levels defined for key surface and groundwater sources.

Trigger levels associated with source operating policy should be used as a guide to aid the DMG's decision-making process. It should be recognised that the use of trigger levels, although valuable, is only one element of the drought management process. External factors, such as public perception and political pressures often come into play when considering the implementation and timing of drought actions.

This section describes the trigger levels used for key sources within the Essex and Suffolk supply areas. In Essex, the trigger levels relate to storage in ESW's pumped storage reservoirs at Hanningfield and Abberton. In Suffolk, the main trigger levels relate principally to groundwater levels at borehole sources and, in the case of the main river abstractions on the River Waveney and River Bure, prescribed flows as measured at relevant gauging stations.

It should be appreciated that many methodologies for determining trigger levels will utilise data (water levels, river flows, etc) from previous drought periods. To this extent, it should be recognised that each drought is unique in character in terms of severity, duration, and season. The subsequent use of trigger levels should therefore be exercised with some caution, and only when combined with an understanding of how they were defined, and their inherent limitations and uncertainties.

5.2 Trigger Level Tools for the Essex Water Resource Zone

In the Essex system, two types of trigger level tool are used to inform decisions as to when to implement drought measures in response to storage in the Essex reservoirs. These are described as follows:

(1) The first tool is a set of control curves that are used to call on the Ely Ouse Essex Transfer Scheme (EOETS) to support refill of Abberton and Hanningfield reservoirs. These control curves are reviewed and agreed with the Environment Agency through the Ely Ouse Essex Transfer Scheme Quarterly meetings.

For water resources planning, a further set of control curves for Level 1 (Appeal for Restraint), Level 2 (Temporary Use Ban) and Level 3 (Non-essential Use Ban) restrictions are incorporated into the Essex Aquator model (see figure in Section 9.4.2). When modelled combined Essex reservoir storage falls below each control curve, a demand saving is

triggered in the model. During a real drought, a comparison of actual combined reservoir storage against the Level1 to 3 drought restriction control curves can be used by ESW's Drought Management Group as an indicator as to when the restrictions could be implemented.

(2) The second tool is a probability matrix which give an indication of the probability of not achieving refill for various reservoir storage states in various months. The current matrix was defined for combined storage using a behavioural analysis called *refill reliability*, using a combination of the Company's water resources system model (Aquator) and a probabilistic yield assessment approach.

An extension of the naturalised flow record for the Essex and Ely Ouse rivers was undertaken for ESW's PR19 Water Resources Management Plan modelling. Consequently, ESW has agreed with the Environment Agency that it will re-define the control curves and re-calculate the probability matrix values using the new naturalised flow record in 2018. The control curves will be re-defined using a methodology agreed with the Environment Agency through its Ely Ouse Essex Transfer Scheme Operators Group meetings. Once this work has been completed, the revised control curves and any change in deployable output will be reported in subsequent Water Resources Management Plan annual updates.

Both tools have value in guiding the decision making process that the DMG would need to undertake in relation to the implementation and timing of drought actions.

The trigger level tools are not designed to be used in a prescriptive manner due to the inherent nature and variability of droughts. Rather they are used as a guide for management decisions. These control curves have been successfully tested by ESW during the 2003 and 2006 drought periods, and more recently during the dry periods experienced in spring/summer 2010 and 2011.

The two trigger level tools are described in more detail below:

5.2.1 Trigger Level Tool 1: Ely Ouse Essex Transfer Scheme Control Curves

Operational control curves are used by ESW and the Environment Agency which define the reservoir storage level below which the Ely Ouse to Essex Transfer Scheme (EOETS) can be used to support refill of both Abberton and Hanningfield reservoirs. The current control curves are presented in Figure 6.

The areas between control curves define discreet zones which indicate what level of support should potentially be implemented. The first zone (Zone A) reflects an 'ideal' situation whereby combined storage levels stay within acceptable limits throughout the year, and natural river flows are sufficient to maintain these levels. The next zone (Zone B) reflects when storage levels have fallen such that operation of the Ely Ouse to Essex Transfer Scheme should be initiated.

5.2.2 Trigger Level Tool 2: Probability Matrix

The refill reliability probabilistic approach has been used extensively by ESW to determine the probability of reservoir refill for both drought planning and reservoir control curve development. It is an in-depth analytical/probabilistic approach, which requires the use of water resources modelling software, and is based on the principal of defining the probability of achieving total reservoir refill by the end of April for any given starting month and storage state. This probability can be 'read-off' the matrices using the current month and combined storage volume.
The purpose of adopting this approach is to inform operational decisions, during drought conditions, to ensure both reservoirs are full by the end of April in any given year. It is only when this total storage is achieved at the beginning of the drawdown period that the system can sustain its reliable yield throughout a drought of intensity comparable to the worst drought on record.

Figure 7 show the refill reliability matrices for 2011/12 and was produced using the Company's water resource modelling software called Aquator.

5.2.3 Use of Reservoir Trigger Level Tools by Drought Management Group

The Drought Management Group should consider the reservoir trigger level tools defined as described, in the following manner:

Trigger Level Tool 1 (Figure 5)

The trigger curves provide a clear pictorial representation of the antecedent and contemporary combined reservoir storage status, and thus the actual storage level and the trajectory of drawdown informs both the current need for action and the possible timing of future potential requirements for action.

Trigger Level Tool 2 (Figure 6)

The probability information in the matrices can be used to determine the level of risk the Essex system is being operated to at any time based on the month of the year and the combined reservoir storage state at that time. During both a dry period and a subsequent drought, the DMG can determine the level of risk refill is under from the matrices and use it to decide upon the current requirement for additional resources and also help predict future requirements and timings for additional actions.

The refill reliability matrix has informed the setting of previous Ely Ouse Essex Transfer Scheme control curves. However, ESW does not propose to set any further drought triggers against the matrix.

5.3 Trigger Levels for Suffolk Area – Groundwater Sources

For the Suffolk Area the definition of trigger levels for groundwater sources, (particularly in the Hartismere and Blyth resource zones), can provide an early warning of the onset of potentially severe drought conditions, and the need to make arrangements for those drought measures indicated in Chapters 7 & 8.

Unlike the Essex reservoir control curves there is no specific series of measures that are implicated when trigger levels are exceeded, but instead individual drought actions are selected in response to specific problems of supply in those worst affected parts of individual resource zones. Hence trigger levels are used more for guidance and input into making informed decisions on drought management actions, which are in turn based more on operational knowledge and judgement.

5.3.1 Definition

Operational experience from all the drought periods from 1990 onwards indicates that very few of ESW's sources have been detrimentally affected by drought, with the notable exception of Hartismere Borehole 6.

A potential means of defining trigger levels for groundwater sources is already provided by a series of drought curves produced for each source as part of the exercise to define source deployable outputs for both average and peak demand drought conditions for water resource planning purposes.

The methodology to calculate groundwater deployable output (UKWIR, 1995) relies on utilising both operational data (water level/output data) from drought periods and where available, analytical data derived from test pumping of the sources. When the water level/source output data is plotted, along with a suitable drought rest water level, drought-bounding curves can be constructed that define the lower limit of the envelope of all points plotted.
Drought curves and deployable outputs are defined for both average and peak demand conditions. The average demand condition is defined as that during the months over which groundwater levels were at a minimum during the worst drought to have affected an area. The peak demand condition is defined as that during the ADPW (annual day demand peak week) in the year of the worst drought to have affected an area.

A review of average and peak deployable output diagrams for key sources was originally undertaken in order to generate indicative groundwater level based 'trigger levels'. The majority of these trigger levels were defined by analysis of the source drought curves (defined using operational drought data during the 1996/97 drought) and associated constraints. These indicative triggers have been reviewed against observed water levels to 31 March 2017 although none have been exceeded.

As a result of this process, ten drought indicator boreholes were identified as being most representative of the overall Company groundwater situation in terms of susceptibility, geographical coverage and aquifer type.

ESW's Drought Indicator Boreholes and their associated pumping water level triggers are indicated as follows:

Table 5: Drought Trigger Levels for Drought Indicator Boreholes in Suffolk

Aquifer	Representative Source	Drought Trigger Level (mbd)	Basis of Trigger Level Definition
	Hartismere Borehole 2 (No. 2)	41.62	Lowest historical level (February 1995)
	Hartsimere Borehole 6 (No. 5)	47.30	Lowest historical level (February 1995)
Chalk	Northern Central Borehole 7 (No.3)	9.64	Lowest historical level 1992 + 'headroom'
	Blyth Borehole 1 (No. 3)	22.30	Lowest historical level (September 1992)
	Northern Central Borehole 2	31.30	Pump intake depth
	Northern Central Borehole 8 (No. 1)	4.20	Intersect of test data with licence
Crag	Blyth Borehole 3	20.69	Lowest historical level (August 1996)
	Hartismere Borehole 7 (Crag 2)	42.67	Lowest historical level (October 1992)
	Hartismere Borehole 1 (No. 2)	35.00	Drought curve
Gravels	Northern Central Borehole 11	4.20	Intersect of pumping test data with licence.

As soon as one of the groundwater trigger levels detailed in Table 7 above is reached, ESW would commence discussions with the Environment Agency regarding the likelihood or needing supply side drought actions, enhancing drought monitoring and the completion of drought permit applications.

ESW has previously agreed with the Environment Agency and Natural England that the 1996/97 drought can be considered a long term drought (i.e. more than one year) while 2006 can be considered a short term (single year) drought. Beccles Treatment Works rainfall data for these years is graphed below.

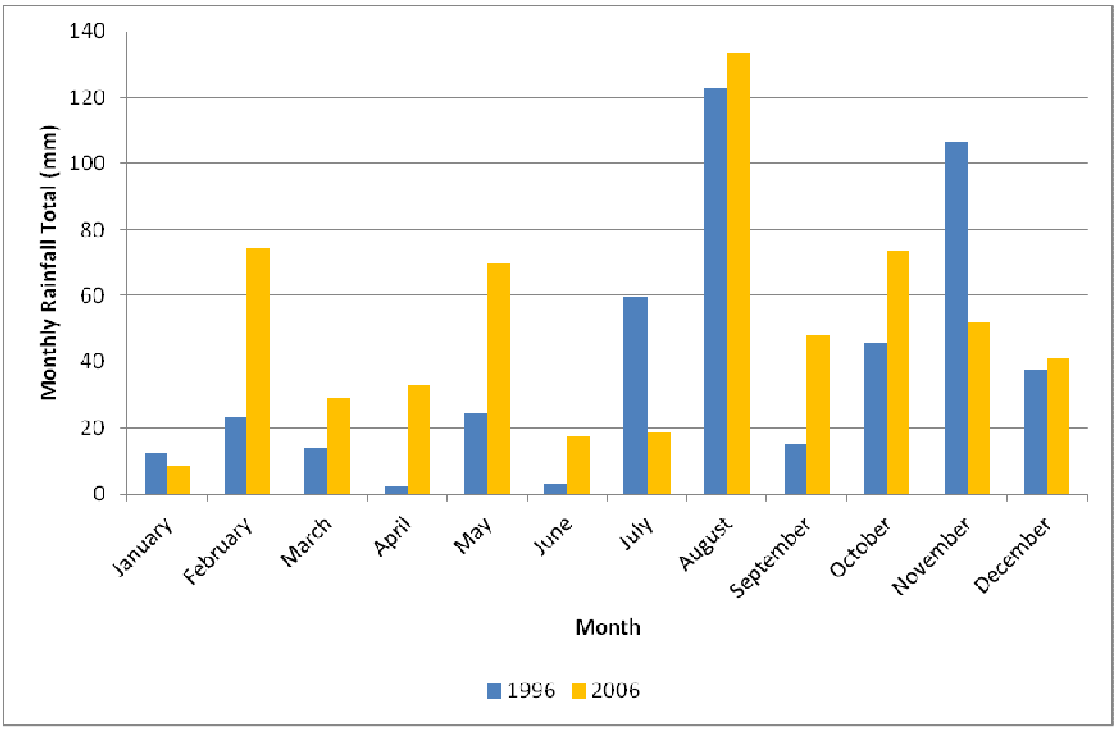


Figure 7: Beccles Monthly Rainfall Totals

When considering the 1996/97 drought, with the exception of Hartismere Borehole 6, none of the other sources have been known to experience rapidly declining pumped water levels; instead a gradual decline in some sources is observed as a drought progresses. The pumped groundwater levels for the above sources are reviewed on a weekly basis both in the lead up to, and during a drought. The majority of the triggers are designed to flag deteriorating groundwater storage but this may not necessarily equate to immediate supply difficulties. A high degree of vigilance would be employed during a drought in order for the DMG to determine whether any drought actions would be needed or not.

In addition to the above operational (pumping water level) triggers careful attention will be paid to the wider area picture (observation borehole hydrographs) as summarised in the Agency's Anglian Region (Eastern Area) hydrometric bulletin. Both sources of information will provide an important reference for the DMG to consider in the event of the onset of a groundwater drought in the Suffolk supply area.

During a drought, the DMG will review pumping water levels at the Company's groundwater sources on a regular basis. In the event these levels begin to approach or exceed the trigger levels indicted in the above table, available drought measures as outlined in Chapter 6 will be discussed by the Group.

5.4 Trigger Levels for Suffolk Area Rivers

5.4.1 River Waveney

Potential drought trigger levels for the River Waveney already exist in the form of prescribed flow/abstraction conditions tied into ESW's abstraction licence. The licence conditions stipulate that as soon as gauged flows in the Waveney at Ellingham Mill fall below 0.62 cumecs, the daily quantity of authorised abstraction reduces as indicated below:

Table 6a: River Waveney Prescribed Flow Triggers

Gauged Flow at Ellingham Mill	Rates of Abstraction not to Exceed
0.620 cumecs	20.50 Ml/d
0.530 cumecs	13.60 Ml/d
0.450 cumecs	9.10 Ml/d
0.400 cumecs	4.50 Ml/d

In addition, there is a requirement once flows at Ellingham Mill drop below 0.8 cumecs, for ESW to inform the Agency of their predicted abstraction requirements from the river.

ESW's predicted demands are assessed by the Agency and the WAGS boreholes provide a potential means of augmenting flows in the Waveney such that higher rates of abstraction can be re-instated.

5.4.2 River Bure

Similarly to the River Waveney flow constraints also exist in relation to ESW's abstraction from the River Bure near Wroxham as detailed in the abstraction licence. The constraints relate to allowable level of abstraction dependent on the recorded gauged flow on the Bure at Ingworth, and are summarised as follows:

Table 6b: River Bure Prescribed Flow Triggers

Gauged Flow at Ingworth	Allowable ESW Daily Rate of Abstraction from the Bure near Wroxham
> 0.450 cumecs	27.20 Ml/d
0.450 to 0.420 cumecs	22.73 Ml/d
0.420 to 0.385 cumecs	20.45 Ml/d
<0.385 cumecs	18.18 Ml/d

5.5 Suffolk Area: Ormesby Broad & Lound Ponds

The company's abstractions from Ormesby Broad, the River Bure, Lound Ponds and the River Waveney are located within the Northern/Central water resource zone. In the droughts of the 1990's, the zone appeared to absorb drought effects to a greater degree than the groundwater-dominated Hartismere and Blyth water resource zones, suggesting that supplies can be maintained deeper into a drought. For this reason detailed trigger levels for

these sources have not been defined over the drought analysis used to determine source deployable output. Operational experience indicates that it is dry weather related changes in water quality that affect these sources rather than quantity of resource.

It is also notable that both these sources have significant groundwater inflows, and respond very quickly (in terms of water level) to rainfall events. Only when the availability of these sources is tested in future droughts, more extreme than those of the 1990s, will sufficient data become available to define meaningful trigger levels. Until then, and as indicated in chapter 5, graphs of daily water levels compared to historic mean, minimum and maximum levels will be used as a tool for the DMG in consideration of the need to implement specific drought measures.

5.6 Triggers to Increase Annual Licence Conditions

The Environment Agency's representation on our previous draft Drought Plan noted that ESW has included a number of supply-side drought actions to increase annual abstraction licence limits, because high demand has caused abstraction to come close to license limits in previous droughts. However, the draft plan does not include triggers based on demand and/or licence utilisation. It suggests that this type of information should be included in the Drought Plan so that it is able to make timely decisions to implement drought actions.

ESW monitors abstraction licence utilisation on a daily basis. For operational reasons, one borehole may need to be taken out of supply and so a neighbouring borehole within the same Water Resources Zone may take up the demand, thus its annual licence may be utilised more quickly. However, this is acceptable as the demand can be switched so that the other borehole can rest. For this reason, we believe that an absolute trigger based on licence utilisation is not appropriate. Consequently, an indicative trigger of 15% above target utilisation will be used. This trigger will invoke detailed discussions with ESW Operations teams and a view will be taken as to whether licence utilisation can be brought back within target or whether a recommendation to the Drought Management Group should be made to pursue an increase in the annual licensed quantity.

6. DROUGHT MEASURES OVERVIEW

6.1 Drought Management Group

The first action to be implemented in the lead up to a drought will be the formation of the Drought Management Group (DMG). Drought measures will then be implemented in an appropriate order as determined by the DMG, and ratified by the Executive Leadership Team and Board.

The DMG acts as the hub of the drought management process. The DMG has responsibility for reviewing water availability and demand on a weekly and/or daily basis and deciding whether and when drought measures should be implemented, and when they should be subsequently withdrawn. Implementation will be strongly influenced by reference to ambient hydrological conditions indicated in chapter 5 and exceedance of the trigger levels indicated in chapter 6.

Drought measures would typically take the form of the following type of option and may be implemented in a similar order to that indicated:

Table 7: Potential Types of Drought Measure

Item	Type	Description
1	Demand reduction	Appeal for restraint and voluntary reduction in water use
2	Demand reduction	Temporary Water Use Ban
3	Increase resources	Drought permits to temporarily increase licensed quantities on abstraction licences, reduce compensation flows, etc
4	Demand reduction	Drought Order Ban
5	Increase resources	Drought orders to obtain additional water.
6	Demand reduction	Pressure Reduction
7	Increase resources	Consideration of esoteric options to augment resources

Prior to the implementation of any drought measures, efforts will be focused on averting the effects of drought through maximising existing resources. In the case of ESW this may be limited since resources are already deployed effectively under normal operation. Similarly, enhanced demand management such as additional water efficiency promotion, leakage control or pressure reduction are not considered as feasible options to further reduce demand in a drought as they are maximised in our “business as usual” working.

Items 1, 2 and 6 are generic options to restrain the demand for water, which can be applied to any water resources zone. Hence, these are described further within that context. Options 3, 5 and 7 are largely resource zone specific.

For each drought action considered a summary Drought Options Form has been completed. The forms are located in Volume 2, Appendix B and contain the following information:

- **Option Implementation Assessment:** triggers, yield/demand saving, implementation timetable, permissions required, risks.
- **Environmental Assessment:** risk to the environment, summary of possible environmental effects, details of studies, monitoring requirements and mitigation actions.
- **Impact on Other Activities**

The environmental assessment section of the summary form has been populated using information from the environmental assessment reports for the supply side actions.

7. DEMAND SIDE ACTIONS

7.1 Background

This section details the demand side drought measures/actions that may be employed to address potential water supply shortages in a drought. There are no significant changes from the previous Drought Plan.

Significant changes to demand restrictions were introduced in our previous Drought Plan. This was as a result of the *Water Use (Temporary Bans) Order 2010* and the *Drought Direction 2011* being introduced. A summary of the relevant legislation with respect to drought provisions is indicated in Appendix A.

7.2 Public Relations Campaigns and Appeals for Restraint

This is detailed in ESW's Communication Plan presented in Chapter 11. Effectively this measure involves conveying key messages to customers in relation to using water wisely.

Appeals for restraint may result in average demand reductions ranging from 0 to 5% (UKWIR/Environment Agency, 1998). However, experience to date shows we can expect reductions in demand nearer to 7%. This may decrease in the future as meter penetration increases and customers have already altered their water use because of being on a measured supply. However, we will only know this through experience gained during future droughts.

7.3 Leakage Control

Prolonged periods of drought may result in soil shrinkage and increased ground movement causing mains to fracture and leakage values to increase. It is, therefore, vital to have a robust leakage detection strategy in order to control this potential demand increase.

Essex and Suffolk Water has made significant progress in the control of leakage over the recent years using appropriate levels of resources and investment, to both control and economically reduce the level of leakage. The impact of extreme winter weather events can impact our ability to achieve our annual leakage targets, but we continue to strive to meet our customer and environmental expectations.

We have worked closely with OFWAT and the Environment Agency to agree annual targets for leakage. The agreed targets are driven from the outputs of modelling work which defines the Sustainable Economic Level of Leakage (SELL). This is the point at which the marginal cost of saving an additional unit of water exactly equals the marginal benefit derived from the water saved.

The supply network is divided up into District Metered Areas (DMAs) which are small managed areas of the network with flow meters monitoring inlet flows. All of our DMAs are reviewed on a weekly basis to prioritise the areas for leakage detection activities. This period can be shortened during drought or severe weather events and can be prioritised to address specific issues and areas of severe drought.

During drought periods we ensure that workloads are prioritised in order to repair all visible leaks as soon as possible, often the same day. In such periods, the number of bursts can easily increase by 60% over a month. If this is not prioritised the leakage value would rise by at least 3.25 Ml/day over this period. This is a key aspect of demonstrating to our customers that we can all work together to reduce excessive levels of leakage.

We remain conscious of the customer perception of excessive leakage and we fully recognise their poor view of company performance by asking them to conserve water whilst appearing to allow water to waste away. However, the majority of leakage from our network is coming from small leaks, typically from a proportion of the pipe joints, of which there are millions. These leaks almost invariably soak into the ground and are invisible from the surface. Leakage of this type is impossible to fix in an economic manner, a point which is recognised by Ofwat. To remove it by pipe replacement alone would result in significant increases to customer's bills. The less frequent, but decidedly more visible leaks, are the bursts that reach the surface, sometimes causing damage and disruption. These are the leaks that our customers rightly expect us to fix promptly, especially when they are, themselves, striving to conserve water.

7.4 Pressure Management

The relationship between pressure and leakage is well understood and, when managed effectively, can have a significant impact on the reduction of leakage levels. Pressure in the distribution network can be reduced by the installation of a Pressure Reducing Valve (PRV) which reduces the pressure at its outlet to a predetermined value, or daily profile of values. This means that the whole area downstream of the PRV is subjected to a reduced pressure. Pressure reduction reduces the flow rates from existing leakage sites as well as reducing the frequency of the outbreak of further leak events. A further benefit is the reduction of wastage at customers taps caused by reducing the flow rates.

Essex and Suffolk Water continually monitors network pressures and will continue both during and outside of a drought to identify locations where new pressure management schemes can be implemented or existing schemes optimised to a lower pressure value. This work has to be undertaken carefully to ensure that no new areas with poor pressure are created or unsatisfactory customer levels of service caused.

7.5 Metering

Water metering is an important part of the company's strategy for managing demand. Meter penetration in the ESW region currently stands at 60.0% (as of 31st March 2017). Essex is 58.9% and Suffolk 66.3%.

ESW actively promotes the benefits of installing a water meter, including free installation, that it can help reduce usage and could save money.

It is also ESW policy to meter the following types of domestic property.

- All new properties
- Where there is a change of occupier of an unmetered property within the Essex area of supply, ESW will look to install a meter before issuing an account to any new occupier. This is likely to change from April 2018 to a system of pre-metering customers, billing them as unmeasured but sending them the equivalent measured bill to show how much they would pay if they opted for a meter. We intend to get the equivalent number of "pre-metered" optants as we would have got new measured customers from the selective programme.
- Properties where water is used in significant quantities, including:
    - For garden watering, other than by hand-held apparatus. This includes the use of sprinklers.
    - For the automatic replenishing of ponds or swimming pools with a capacity greater than 10,000 litres.

Unmetered bills will draw customers' attention to this. Customers are required to notify ESW if you they using water for any of these purposes. Arrangements will be then made to fit a meter at no cost to them.

During a drought, particularly prior to the introduction of any restrictions, the requirement for large discretionary users of water, described above, to have a meter installed is emphasised in communications.
ESW has made considerable progress over recent years to increase meter penetration in order to support customers making savings on water consumption. This has included encouraging customers to opt for a free meter by giving annual information on free meter installation in our billing documentation, numerous metering campaigns over the years, a programme of selective meter installations on non household properties.

In earlier Drought Plans we had proposed an enhanced awareness campaign to increase meter uptake rates during a drought. Whether this was ever going to be effective is debatable, but with meter penetration approaching 67% in Suffolk and 60% in Essex it is no longer considered a drought action. We can only encourage customers to opt for a free meter but given the annual information on free meter installation in our billing documentation and numerous metering campaigns over the years, it is unlikely that many, if any, who would want a meter are not aware. In addition our new "pre-metering" programme in Essex should further stimulate customers to opt for a metering knowing they will save money. Experience of previous drought also indicates

that appeals for restraint, being highly successful, are already getting customers to save the water that they would have saved by having a meter installed. We will however continue to respond to all meter applications and aim to have the majority of meters installed within 30 days.

7.6 Water Conservation Measures (Water Efficiency)

Water efficiency projects

Essex & Suffolk Water has been running water efficiency projects since 1997 and has since that time contacted over one third of the households supplied.

A wide variety of water efficiency projects have been run by the company; including large-scale home retrofit projects, school audits, business audits, research projects and initiatives with partners such as housing associations. ESW's water efficiency strategy has demonstrated its value by delivering quantifiable and sustainable water savings through innovative, creative and leading projects.

A critical part of our ongoing programme is the monitoring of results to find out what the actual savings in water are and how sustainable they are. The Company strives to be proactive and innovative. This has involved researching the most cost effective methods of reducing water consumption, developing new analysis techniques, studying the link between behavioural economics and trying to improve our understanding of people's behaviour and motivations to evaluate the most beneficial approaches to promoting water efficiency as well as providing practical advice and help to customers.

We have reviewed our strategy as part of our Water Resources Management Plan and our strategy continues to be based on a process of reviewing effectiveness, making improvements and responding to new opportunities to trial new products, evaluate new methods of working, work with new partners and improve our measurement and analysis techniques.

Our market research has demonstrated an ongoing understanding of our supply position and a commitment to water efficiency.

Water saving products

ESW offers a range of water saving products to its customers free of charge to its customers. The products and offers are promoted by the methods described above. A free water saving kit is offered to all customers. The kits include a shower aerator, shower timer, save-a-flush and tap inserts. The kits can save up to 95 litres of water per day and reduce utility bills by up to £60 per year. Individual items from within the kits are also offered to customers free of charge. ESW customers are also offered discounted water saving products, such as water butts, from affiliate companies. During drought

conditions promotion of water saving products via the communications methods described above will be enhanced.

Water Efficiency During Drought

At times of drought, the water efficiency strategy will remain in place to keep customers informed of the key water-saving messages and the need to use water wisely. Under the campaign heading of Every Drop Counts, the programme includes a variety of initiatives aimed at helping customers to reduce their water consumption. The strategy includes encouraging customers to request water saving devices via appointments with customers, through the company website, and at events; undertaking households retrofit projects; a large scale educational programme aimed at primary schools; and providing information to customers on how to save water via the company website, in billing literature, in dedicated leaflets and through a wide spread radio campaign. Additionally, a key component of Essex & Suffolk Water's water efficiency strategy is the offer of water butts to domestic customers to promote rainwater harvesting. On an annual basis, customers in towns targeted as part of ESW's Every Drop Counts programme are offered a free water butt through the home water and energy saving retrofit visits. Outside of this programme, customers are able to purchase water butts at low prices through a partnership between ESW and a water butt supplier.

In the event of a drought, the momentum of the campaign can be increased and focused particularly on the delivery of key water efficiency messages and encouraging customers to request free water saving devices.

The company's water efficiency target, of carrying out water efficiency activity with our customers to save 0.49Ml/d per annum over each of the 5 years of AMP6, means changes to this activity compared to previous drought plans with a key difference being the requirement to report measured water savings as opposed to assumed as per the AMP5 reporting guidance. The profile of general water efficiency has been dramatically raised with our customers as many campaigns have been used through Every Drop Counts to reach our annual target. This has the benefit of increased customer education about water but means many more customers have already become more water efficient. During future droughts we will use the "Appeals for Restraint" to further promote water efficiency to our customers, focus on the delivery of key water efficiency messages and direct customers towards water efficient products, from us or to buy. Water efficiency enhancement now becomes part of our Appeal for Restraint.

7.7 Operational Water Usage

7.7.1 Flushing of water mains

Regular flushing of our water mains is a necessary requirement to ensure compliance with the drinking water quality regulations. However during a drought the wrong message on water shortage and its careful use is given out if large volumes of water are seen flowing from our pipes, down the road and

into the drains. The water mains may only need to be flushed at 5 or even 10 yearly intervals. It is therefore possible to stop the regular flushing programme for the duration of a drought and to catch up with the programme when more water is available.

During a drought we will therefore suspend our flushing programme. This could save 0.04 Ml/d and will certainly help with our messages. Some flushing may always be necessary for hygiene purposes and we would never compromise on this. It may also lead to an increase in complaints of discoloured water complaints during the period of suspension.

7.8 Temporary Water Use Bans

7.8.1 Introduction

The droughts in the southern half of England during 2005/06, requiring a number of water companies to apply 'hosepipe bans' on their customers usage, showed the inadequacy of the existing legislation in this area. The temporary bans on water use, as provided for in Section 76 of the *Water Industry Act 1991*(WIA), were basically unaltered since 1945 and did not reflect the current ways in which water is now used. The Government amended Section 76 of the WIA by Section 36 of the *Flood and Water Management Act 2010*. From this Act the *Water Use (Temporary Bans) Order 2010* and the *Drought Direction 2011* were enacted and this legislation is used to define our proposed temporary restrictions on the use of water during droughts.

The Company's defined Levels of Service were re-titled in our Drought Plan 2013 and our Water Resources Management Plan 2014 to reflect the new legislation albeit the frequency of the restrictions remained the same.

Frequency	Restriction (previous)	Restriction (new)
1 in 10 yr	Appeal for restraint	Appeal for restraint
1 in 20 yr	Hosepipe ban	Temporary use ban
1 in 50 yr	Non essential use ban	Drought Order ban

When having to impose restrictions on the use of water by our domestic and commercial customers, especially when failure to comply with a restriction can lead to a significant fine, it is essential that what is restricted is as unambiguously stated as possible.

7.8.2 Background to Temporary Water Use Bans

ESW, operating in the driest part of the United Kingdom and being an area of constant population growth, has imposed a number of hosepipe bans in its history. The experience of these bans, especially from the 1970s to date, allow us to have a reasonable expectation of what we are likely to achieve in water savings from our customers from a future Temporary Water Use Ban.

7.8.3 Areas of Restrictions

The new legislation allows a company to impose restrictions ranging from a whole company area down to part of a Water Resource Zone. Previously we have imposed restrictions on the whole of Essex or the whole of Suffolk rather than on ESW company customers as a whole. Often the bans in Essex and Suffolk have been in force at similar times but not necessarily for the same duration.

We intend to maintain the Temporary Water Use Ban on a separate Essex and Suffolk basis. The reason for this separation is due to the integrated nature of each county's water supplies, but with no link between the counties. In Essex, the zone is completely integrated with water from any of its five major treatment works theoretically capable of feeding any area. This means any shortage of water is not attributable to any specific group of Essex customers or their water demand. Savings from any Essex customers help to preserve the total amount of water we have available in Essex.

Suffolk, whilst currently still having three Water Resource Zones (WRZ), has progressively seen the increase of shared supplies across the WRZs. The relative proportion of the Suffolk population in each zone (Northern/Central 77%, Blyth 14% and Hartismere 9%) and experience from previous droughts, does not suggest any advantage would be gained in imposing restrictions on a smaller scale than the whole Suffolk area. Indeed confusion amongst customers, who would not necessarily know which WRZ they are in, would most likely make a WRZ only restriction unworkable.

7.8.4 Phasing of Restrictions

We have considered what would be the most appropriate number of phases for Essex and Suffolk and have concluded that a single phase approach best suits the supply situation of the company. Therefore, Temporary Water Use Bans, as allowed for in the *Water Industry Act 1991* s76 as amended by the *Floods and Water Management Act 2010* s36, will be implemented when a severe shortage of water begins to threaten our ability to continuously supply. In reaching the conclusion that a single phase is the most appropriate action under the Temporary Water Use Ban (TUB) we have considered how droughts affect our resources and how restrictions affect the demand for water.

For both Essex and Suffolk, the company maintains a Level of Service (LoS) of 1 in 20 years for TUB restrictions and 1 in 50 years for Drought Order restrictions. A 1 in 20 year LoS for TUB restrictions means that we have developed sufficient water resources and water treatment capacity to meet our customer's demand for water, on average, in 19 out of every 20 years, whatever the weather. However in the 20th year there will not have been sufficient rainfall for us to meet the unconstrained demand of our customers and we need to impose restrictions on how they can use water. This then reduces their demand and allows us to conserve sufficient water to get through the dry period. 1 in 20 years is an average period for restrictions and

in reality we may have to impose restrictions twice in a 10 year period and then not impose any restrictions for the next 30 years. Drought Order restrictions are far rarer, needing to be invoked only once in every 50 years on average.

Consideration has been given to a two phase approach for restrictions under the Temporary Water Use Ban powers, with a new initial phase of banning sprinklers or unattended hosepipes for the watering of domestic lawns and grass verges. Although some worthwhile volumes of water would be saved by this particular ban, it would not delay the imposition of a full TUB by any meaningful period. Therefore, it would be of dubious practical purpose as a lesser means of restriction. The reason that we do not think banning grass watering alone would ever be a worthwhile restriction is twofold. A lot of this watering is reduced during the Appeal for Restraint period when we ask our customer's to reduce their water use voluntarily. In addition this type of ban may be more appropriate for companies that are challenged to supply water at peak periods during drought conditions. A ban, or pre-set times for grass watering, can help them distribute sufficient water to meet the constrained or time restricted demand.

For our Essex and Suffolk supply areas, our need for restrictions is not to meet peak demands but because of an annual shortage of water during a severe drought. A grass watering ban as a first phase would also not yield sufficient reduction in demand due to our customer base. In Suffolk, we have almost 66% of our customer's metered and 59% in Essex.

For metering to have a positive effect on customers demand it must lead to a reduction in their normal water use. One of the primary reductions is in their outdoor use and a significant part of the saving is because they no longer water their lawns during dry periods. Therefore, a ban would only apply to the water use of less than 40% of the customers.

Because of metering and appeals for restraint already reducing garden watering, and especially lawns, we do need to be careful not to over estimate the savings from potential restrictions by double counting savings.

Experience from our previous use of water restrictions during dry periods, demonstrates that we do not impose restrictions lightly but when we do we need to achieve water reductions in demand equivalent to those assumed from our proposed Temporary Water Use Ban.

Temporary Water Use Ban.

An additional demand reduction of 5% (cumulative with the 7% saving made from an appeal for restraint) is estimated in response to a temporary use ban. This is based on evidence from previous hosepipe bans and also accounting for the temporary use ban including all hose pipe use (not just domestic gardens). This 5% saving does however assume there are no exemptions to the TUB. Defra have made it clear that when the TUB regulations were drawn up they had an expectation that companies would exempt a number of groups

or activities from the TUB. The 2012 TUBs introduced by the South East and East Anglia companies also resulted in a number of groups and activities being exempt from the ban. All involved companies eventually had consistent exemptions from their bans. We will now exempt certain groups and activities from future TUBs and this could reduce the savings made by our TUB by a further 1 or 2 percent of demand.

Powers used

All of the restrictions proposed by the Company in its Phase 1 Temporary Water Use Ban are provided for in:-

Section 76 of the Water Industry Act 1991, as amended by Section 36 of the Flood and Water Management Act 2010

and

The Water Use (Temporary Bans) Order 2010, which is a statutory instrument providing definitions of words and phrases and certain exceptions to the categories of water use in Section 76 of the WIA 1991 (as amended by the FWMA 2010)

TUB advertising and timeline to implementation

According to the WIA 1991 Section 76B(2) to implement a temporary Water Use Ban a company must adopt the following procedure:-

"Before the period for which a prohibition is to apply the water undertaker must give notice of the prohibition and its terms-

a. *in at least two newspapers circulating in the area to which it is to apply, and*
b. *on the water undertaker's internet website."*

The notice of prohibition must set out clearly the terms and extent of the proposed prohibition and specify the date on which the prohibition will commence and the area to which the ban will apply. We must also provide details of how customers can make representations about the proposed prohibitions to us, and leave a reasonable period for the representations to be made.

We consider a reasonable period to be 21 days from when the Notice of the prohibition is posted on our website. This time period allows the advertisement of the ban to appear in the local newspapers, which may only be published weekly, and 14 days for representations to be made as a result of the newspaper advertisement.

Definition of "using a hosepipe"

For the purposes of temporary use bans we have used the definition of "using a hosepipe" as given in the Water Use (Temporary Bans) Order 2010, that is:-

a) Drawing relevant water through a hosepipe
b) Drawing relevant water through a hosepipe from a container and applying it for the purpose; and
c) Filling or partly filling a container with relevant water by means of a hosepipe and applying it for the purpose.

A reference to a hosepipe includes anything designed, adapted or used for the same purpose as a hosepipe. “Relevant water” refers to mains water i.e. supplied by the water undertaker; it does not include water supplied before the water restriction was implemented.

The legislation does not state any exemptions to the definition of a hosepipe.

We considered whether micro-irrigation systems should be exempted from a temporary use ban but concluded that they should not be exempted. Whilst we recognise micro-irrigation systems use water more efficiently than a hosepipe or sprinkler, a 1 in 20 year ban is more about conserving water than using water more efficiently. If micro-irrigation was exempted from a hosepipe ban, more systems would be sold during the ban thereby decreasing some of the volume of water conserved from the imposition of the hosepipe ban.

The above definition of a hosepipe applies to all of the 11 categories detailed in Table 8 below.

Table 8: Water Uses to be Temporarily Banned during a TUB

Description of Activity
1. Watering a garden using a hosepipe
2. Cleaning a private motor-vehicle using a hosepipe
3. Watering plants on domestic or other non-commercial premises using a hosepipe
4. Cleaning a private leisure boat using a hosepipe
5. Filling or maintaining a domestic swimming or paddling pool
6. Drawing water, using a hosepipe, for domestic recreational use
7. Filling or maintaining a domestic pond using a hosepipe
8. Filling or maintaining an ornamental fountain
9. Cleaning walls, or windows, of domestic premises using a hosepipe
10. Cleaning paths or patios using a hosepipe
11. Cleaning other artificial outdoor surfaces using a hosepipe

Whilst all of these uses of hosepipes are banned it should be remembered that during any ban gardens may still be watered:

- by hand using a bucket or watering can
- with grey-water (ex bath/ washbasin water) through a hosepipe
- using rainwater from a water-butt through a hosepipe (assuming sufficient rainfall)

Further explanation of uses to be banned

1. Watering a garden using a hosepipe

The definition of "a garden" has been widened and clarified under the Water Use (Temporary Bans) Order 2010. We intend to ban the use of watering using a hosepipe for all categories allowed to be banned, with no exceptions.

The areas where watering a garden using a hosepipe will be banned under Phase 1 are:-

a) a domestic garden
b) a park
c) gardens open to the public
d) a lawn
e) a grass verge
f) an area of grass used for sport or recreation
g) an allotment garden
h) any area of an allotment used for non-commercial purposes
i) any other green space

Exemptions:

Under legislation a "garden" does not include the following, meaning hosepipe use is allowed to continue in these areas under a Phase 1 temporary use ban.

a) agricultural land
b) other land used in the course of a business for the purposes of growing, for sale or commercial use, any crops, fruit, vegetables or other plants.
c) land used for the purpose of a National Plant Collection.
d) a temporary garden or flower display
e) plants (including plant organs, seeds, crops and trees) which are in an outdoor pot or in the ground, under cover. NB for domestic purposes watering of these by a hosepipe is still banned under our Phase 1 but it comes under a different category in the legislation.

(Legislation excludes the banning of "watering a garden using a hosepipe" when the use is for "health or safety reasons". However use of this exclusion is likely to be rare and the company would scrutinize the genuineness of such a claim).

2. Cleaning a private motor-vehicle using a hosepipe

Washing of any private motor vehicle, using a hosepipe is banned. This includes commercial car wash businesses that use hosepipes or pressure washers to wash customer's cars. Private cars can still be washed by householders and commercial businesses by hand using water from a bucket.

Exemptions:

Legislation excludes:

a) a public service vehicle, as defined in section 1 of the Public Passenger Vehicles Act 1981; and
b) a goods vehicle as defined in section 192 of the Road Traffic Act 1988.

NB. Taxis and minicabs are public service vehicles and are therefore excluded from the ban.

Commercial carwashes, that do not use a hosepipe or similar apparatus, are also exempt from this ban.

3. Watering plants on domestic or other non-commercial premises using a hosepipe

This category covers the banning of watering by a hosepipe of plants which are in an outdoor pot or in the ground, under cover (predominantly plants growing in a greenhouse border).

"Domestic or other non-commercial premises" means

a) Any land, building or other structure used or enjoyed in connection with the use of any of the following which is used principally as a dwelling:

- A building or part of a building
- A caravan
- A boat
- Any land or premises which is not used principally for the purpose of a business

Exemptions

Legislation defines some exemptions:-

- Plants in outdoor pots and in the ground, undercover in public authority premises
- Plants in outdoor pots and in the ground, undercover in commercial premises
- Plants grown or kept for sale or commercial use
- Plants that are part of a National Collection or temporary garden or flower display.

Whilst Local Authorities are not restricted in their watering of plants, using a hosepipe, in outdoor pots or in the ground, under cover by the Phase 1 ban, we would expect them to also cease watering this category when a ban is imposed. This is likely to be seen to be fairer by the public and helps to fulfil a Local Authority's duty under the Water Act 2003 to conserve water.

4. Cleaning a private leisure boat using a hosepipe

Using a hosepipe to clean a private leisure boat is banned. A private leisure boat is defined as "a vessel or other thing, other than a seaplane, which is designed, constructed or adapted to move through, in, on or over water".

Boats in private ownership only are included, whether trailer launched or not. The ban includes all small water craft also e.g. canoes, kayaks, jet skis etc.

Exemptions:

Legislation exempts the following;

- Vessels used in the course of a business
- Vessels made available or accessible to the public
- Cleaning of any area of a private leisure boat which, except for doors and windows, is enclosed by a roof and walls
- Using a hosepipe to clean a private leisure boat for health or safety reasons.

5. Filling or maintaining a domestic swimming or paddling pool

A domestic swimming or paddling pool is defined as swimming or paddling pool, other than a pool that is being used for the purpose of a business, which is:

a) in a building or part of a building used principally as a dwelling; or
b) on any land or in any building that is used or enjoyed in connection with (a).

Exemptions:

Legislation excludes filling or maintaining a pool:

a) where necessary in the course of its construction
b) using a hand-held container filled with water drawn directly from a tap
c) that is designed, constructed or adapted for use in the course of a programme of medical treatment
d) used for the purpose of decontaminating animals from infections or disease
e) used in the course of a programme of veterinary treatment
f) in which fish or other aquatic animals are being reared or kept in captivity.

6. Drawing water, using a hosepipe, for domestic recreational use

This category covers the banning of the use of a hosepipe to operate water slides or other domestic recreational equipment. This is interpreted to mean both slides designed to be used with water and any temporary or ad hoc water slides or sprinklers. Recreational use covers the use by adults or children.

Exemptions:
There are no legislative exemptions.

7. Filling or maintaining a domestic pond using a hosepipe

This restriction is fairly limited in the number of ponds likely to be effected. A wider ban on filling ponds comes in under the Phase 2 restrictions and requires the company obtaining a Drought Order under the Drought Direction 2011. A "domestic pond" is defined as a pond, including a swimming pond, on land that is used in connection with a building, or part of a building, used principally as a dwelling; and is not being used for the purpose of a business. A pond can be natural or man-made and can be internal or external, and includes ornamental ponds.

Exemptions:

Legislation excludes filling or maintaining a pond in which fish or other aquatic animals are being reared or kept in captivity.

8. Filling or maintaining an ornamental fountain

This category covers any water fountain or water cascade that serves a purpose that is primarily decorative. This includes sculptures that have a water component. Filling by any means is banned including permanent plumbing.

This ban applies equally to fountains, cascades and sculptures using water that are privately owned or publicly owned. It also applies to features that use recycled water.

Exemptions; Legislation exempts the filling or maintaining of an ornamental fountain which is on 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.

9. Cleaning walls, or windows, of domestic premises using a hosepipe

This category refers to the cleaning of walls or windows on domestic premises using a hosepipe. The restriction also applies to businesses cleaning domestic walls or windows using such apparatus as water-fed poles.

A domestic premise is defined as:

a. A building used principally as a dwelling or dwellings
b. A garage, shed, outbuilding or other building or structure used or enjoyed in connection with a building used principally as a dwelling; or
c. A wall or other means of enclosure within the cartilage of a building used principally as a dwelling.

Exemptions:

Legislation exempts cleaning activities for health and safety reasons. However these are likely to be rare with health or safety reasons likely to be restricted to:

- Removing or minimising any risk to human or animal health or safety; and
- Preventing or controlling the spread of causative agents of disease.

10. Cleaning paths or patios using a hosepipe

This ban on use applies regardless of who is carrying out the cleaning and regardless of whether they are on domestic or commercial premises. The ban applies whatever the paths or patios are made of.

Exemptions:

Legislation only exempts cleaning using a hosepipe for health or safety reasons. Again these exemptions are likely to be rare and similar to the exemptions for H & S given in (**9**).

11. Cleaning other artificial outdoor surfaces using a hosepipe

This category bans the use of a hosepipe for outdoor cleaning of artificial surfaces regardless of who is doing the cleaning and regardless of whether the premises are domestic or commercial. Artificial outdoor surfaces are defined as:

a) Any area outdoors which is paved or laid with hard or artificial material;
b) Timber decking;
c) A quay (including a jetty, pontoon, wharf or slipway).
d) A trailer designed, constructed or adapted to launch boats or other vessels or craft into water, other than a private motor vehicle
e) The roof of any domestic premises.

Exemptions:

Legislation only exempts cleaning using a hosepipe for health or safety reasons. Again these exemptions are likely to be rare and similar to the exemptions for H & S given in (**9**).

7.8.5 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 prior to treatment in the following ways:

- River abstraction;
- Reservoirs filled by river abstraction or impoundment of river water; and / or
- Groundwater abstraction from boreholes and springs.

The ratio of source types varies within a company's own water resource zones and between companies and this causes variability in drought resilience and response.

Unlike unseasonably dry soil that constitutes an agricultural drought and which can arise from only a few weeks of dry and sunny weather over the growing season, it takes at least several months of below average rainfall to initiate a water resources drought. Particularly important is winter rainfall as it is this that replenishes most water resources. The low groundwater levels and river flows that result from this type of dry period reduce water availability from rivers and boreholes and so reservoir levels fall. This 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 for later in a drought and reduce the environmental impacts of abstraction during this critical period.

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 among some customers when one company introduces restrictions but its neighbouring water company does not. Clearly from a customer point of view, if restrictions need to be imposed then a simple and consistent approach should be adopted for introducing water use restrictions across the South East. Where your water company has to appeal for restraint or impose restrictions, it will always give as much information to you as possible.

Two reasons why water companies may have to react differently in terms of restrictions and their timing are as follows:

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 may cause differing levels of drought severity across the region. In other words, the need to impose restrictions for one company may not equally apply to another company in the South East.

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; and
- 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 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 preferentially in its more vulnerable WRZs while it may not need to extend the ban to the remaining zones in its area of supply. 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.

7.8.6 Company Exemptions additional to legislative exemptions

Following the implementation of a TUB, we will consider any appeals for exemptions made to us and will take account of other water companies experience of exemptions during similar droughts.

ESW intends to introduce exemptions that will benefit its disabled customers and, in the initial stages at least, reduce to a minimum the economic consequences of a drought on its non household customers. The precise groups and activities to be exempted during any TUB will form part of the advertisements that are necessary to introduce a drought and will also appear on our website. The extent of exemptions granted will be dependant on the severity of the drought that we are in. For example the 2012 drought was mainly a water resource drought caused by two dry winters leading to low recharge of ground waters and reservoir storage. The effects of the drought on water supplies were not compounded by being accompanied by hot, dry summers causing increased demand for water. In fact the intervening summers, and the summer of 2012, were below average temperatures and wetter than normal. Should hotter summers be associated with dry winters then reducing water demand becomes even more important and some possible exemptions may not be allowed.

We intend to allow:

- Customers who hold a Blue Badge watering their own garden with a hosepipe, if no other fully able-bodied person is permanently resident at the property.
- The commercial cleaning of windows using a pole attached to a hose.
- The commercial washing of private motor vehicles.
- The playing surface used for International or National sporting events.
- Depending on the severity of the drought, and the outcome of studies into their impact, we will consider exempting:

- The filling of domestic swimming pools if they are filled in accordance with Best Practice Guidance.
- The watering of newly laid turf if done in accordance with Best Practice Guidance.

- The use of certain micro irrigation systems if proven to be water efficient.

We will also consider, at the time of implementing a TUB, any other reasonable cases made for exempting any particular group or activity covered by the ban.

7.8.7 Reimbursement of licence fees paid by customers

A TUB or Drought Order Ban forms part of the Level of Service we have with our customers and no general refund of any part of the customers water bill is refundable as a consequence of a ban being introduced. However a very small number of customers who have a large water use, but whose property we are unable to install a meter at, pay for this additional water by an annual licence. The three groups requiring this type of licence are the unmeasured customers with either:

- A swimming pool – circulating
- A swimming pool – un-circulating
- A sprinkler

In total there are less than 50 of these customers in Essex and Suffolk combined.

In the years when a TUB is required each of these customer's will be reimbursed 1/12 of their annual licence fee for each calendar month, or part of any month, for which their use of water for which the licence is required, is restricted.

7.9 Drought Order Powers

On average, every 1 in 50 years, the shortage of raw water may become so acute that we have to implement restrictions on the use of water that are more severe than those brought in under the Temporary Water Use Ban. To introduce these more stringent restrictions requires a company to apply to the Secretary of State at the Department of the Environment, Food and Rural Affairs (Defra) for these powers. In addition to granting powers for increased restrictions on the use of water, a Drought Order can include permission to take additional water resources beyond those normally available to a company.
It is very difficult to estimate the effect of this type of water use restriction on customer demand as very little data is available. It has been assumed that further restrictions on water use beyond appeals for restraint (7%) and a

temporary use ban (5%) will yield an additional reduction in demand of 2%, giving a total estimated demand reduction of 14%.

The programme for implementing a Drought Order is best considered in 3 stages:-

Stage 1: Preparing and lodging an application
The company must prepare an application stating the reasons why a Drought Order is being sought. There must be an accompanying environmental report with supporting information, including how the company has enacted its Drought Plan up to that time. There is likely to be a section on the social and economic impacts that the additional powers to restrict the use of water will have. Whereas our Temporary Water Use Ban predominantly restricts the use of our domestic customer base, the Drought Order Bans more affect the commercial customers and has a greater economic impact. The application must also contain copies of the required advertisements, meaning that the Drought Order must be advertised prior to the application being made to Defra.

Applicants are required to publish a notice of the Drought Order Application in local newspapers and the London Gazette. The Environment Agency and all Local Authorities in the company's area must be sent a service notice by priority mail. The company must also make a copy of the application available for viewing and advise that objections should be made to the Secretary of State within a seven day period. We would include all of the application documentation and advertisements on our website during the advertising period.

Stage 2: Hearings or inquiries
If any objections are received, the Secretary of State must hold a local inquiry or hearing unless he/she considers the drought order must be made urgently.

The process around the inquiry or hearing is a lengthy one. An inspector must be appointed, a location identified and a date agreed upon. The company is the required to advertise the hearing in the same manner as it advertised the application. Again, a 7 day advertising period is required by statute.

Following the hearing the Inspector must prepare a report setting out their recommendations to the Secretary of State. The Secretary of state will then make their decision and advise the company accordingly.

Although theoretically this whole process could be done in 26 days, in reality at least three months should be allowed. This time scale and the need to minimise any hearing or inquiry to a single event, dictates that we will seek all permissions in one go, but may impose them flexibly.

Stage 3: Implementation
Once the drought order has been approved, and before it can be enacted, the company must again advertise, in the same manner as previously, that it will be implementing the drought order that has been granted.
Depending on the prevailing conditions, including the time of year, we would intend to enact all of the prohibitions granted under the drought order at once, or introduce only those necessary at that time to preserve water. This phased approach of selectively banning certain actions granted under the drought order is the most proportionate response to the situation. The decision on which order to introduce certain restrictions on use will only be decided after the drought order is granted. This will insure that we can restrict the minimum uses of water necessary at any particular time whilst minimising any economic impact.

The drought order can only be granted for a maximum of 6 months and extended for up to a further six months. The order can only be extended by further application to the Secretary of State.

Activities to be banned under a Drought Order

Description of Activity
1.Watering outdoor plants on commercial premises
2. Filling or maintaining a non-domestic swimming or paddling pool
3. Filling or maintaining a pond
4. Operating a mechanical vehicle washer
5. Cleaning any vehicle, boat, aircraft or railway rolling stock
6. Cleaning non-domestic premises
7. Cleaning a window of a non-domestic building
8. Cleaning industrial plant
9. Suppressing dust
10. Operating cisterns

Commercial Premises

For the purpose of a Drought Order, commercial premises are defined as:-

“Means any land, building, other structure or premise not being domestic or other non-commercial premises within the meaning of the Temporary Water Use Ban”.

1. Watering outdoor plants on commercial premises using a hosepipe

This banning of activity covers:

a) Plants which are in a pot or other container that is outdoors or undercover
b) Plants which are in the ground under cover.

Exemptions:

Legislation exempts the watering of plants using a hosepipe that are:-

a) Grown or kept for sale or commercial use; or
b) Part of a National Collection or temporary garden or flower display.

2. Filling or maintaining a non-domestic swimming or paddling pool

For the purpose of the Drought Order, the Drought Direction 202011 defines non domestic swimming or paddling pools as "a swimming or paddling pool as defined and covered by the Water Industry Act S76(2)(e). The intention is that filling of domestic pools will already have been banned under the Temporary Water Use Ban.

Exemptions: Legislation exempts the following from filling or maintaining pools:

a) That is open to the public
b) Where necessary in the course of its construction
c) That is designed, constructed or adapted for use in the course of a programme of medical treatment
d) That is used for the purpose of decontaminating animals from infections or disease
e) Used in the course of a programme of veterinary treatment
f) In which fish or other aquatic animals are being reared or kept in captivity
g) That is for use by pupils of a school for school swimming lessons

For the purpose of exemptions "Open to the public" is defined as:

A pool is **not** open to the public if it may only be used if the user is a paying member of an affiliated club or organisation i.e. these are not exempt.

3. Filling or maintaining a pond

This extends the areas of pond filling or maintaining being banned beyond those already covered by the Temporary Water Use Ban. Non domestic ponds are now also covered by the ban on the use of hosepipes and both domestic and non domestic ponds are banned from having water added by a fixed pipe. Ponds include manmade and natural ponds of any size.

Exemptions: Legislation exempts the filling of any ponds, domestic or non domestic, by hosepipe or fixed pipe, which contains fish or other aquatic animals that are being reared or kept in captivity. It also excludes the filling of any ponds using a hand-held container which is filled with water directly drawn from a tap.

4. Operating a mechanical vehicle-washer

This is fully defined as "operating a mechanical vehicle-washer, whether automatic or not".

Exemptions: There are no exemptions in legislation. While we are not considering any outright exemptions, we would intend to delay implementing this ban, for as long as we consider sensible, for mechanical washers that recycle water and use less than 23 litres of water per vehicle wash.

5. Cleaning any vehicle, boat, aircraft or railway rolling stock using a hosepipe

A boat is interpreted, in this case, as a vessel or other thing that:

a) Is designed, constructed or adapted to move through, in, on or over water; and
b) Is not a private leisure boat within the meaning applied under the Temporary Water Use Ban.

A vehicle is defined as any of the following which is not a private motor vehicle within the meaning of the Temporary Water Use Ban:

a) A vehicle, designed, constructed or adapted for use on roads; or
b) A trailer or other thing designed, constructed or adapted for attachment to a vehicle falling within a) above.

Railway rolling stock is interpreted to include passenger train cars, freight train cars, locomotives and tube trains.

Aircraft are interpreted to include privately and commercially owned airplanes, helicopters, gliders and hot air balloons.

Exemptions: The only exemption in legislation is on the grounds of health or safety reasons.

6. Cleaning non-domestic premises using a hosepipe

The activity to be banned is defined as:

a) Any exterior part of a non domestic building other than a window
b) A non domestic wall

Exemptions: The only exemption in legislation is on the grounds of health or safety.

7. Cleaning a window of a non-domestic building using a hosepipe

This restriction is equivalent in all ways to that covered under the Temporary Water Use Ban for domestic properties. The ban extends to the use of water fed poles where mains water is the source used to create the de-ionised water.

Exemptions: The only exemption in legislation is on the grounds of health or safety.

8. Cleaning industrial plant using a hosepipe

In this restriction "plant" is defined to mean "*The equipment, including machinery, tools, instruments and fixtures necessary for an industrial operation"*

Exemptions: The only exemption in legislation is on the grounds of health or safety.

9. Suppressing dust using a hosepipe

The Drought Direction 2011 defines "using a hosepipe" as:

a) Drawing relevant water through a hosepipe from a container and applying it for the purpose; and
b) Filling or partly filling a container with relevant water by means of a hosepipe and applying it for the purpose.

This also includes anything designed, adapted or used for the same purpose as a hosepipe.

Exemptions: The only exemption in legislation is on the grounds of health or safety.

10. Operating a cistern in any building that is unoccupied and closed

A cistern is defined as meaning an automatically-operated flushing cistern which services a WC pan or urinal.
Occupation of a building by security staff is interpreted to comprise a building that is "unoccupied".

7.10 Miscellaneous Demand Reducing Measures

Other potential demand reducing measures to be considered include ships watering in Northern/Central Zone (Suffolk Coastline). Currently ESW supplies around 102Ml per year for the purposes of ships watering, predominantly via Great Yarmouth. In a drought this quantity could potentially be reduced by only supplying the essential amount of water required for a ship to get to its next port. It is estimated that only a relatively small quantity (approximately half the 102 Ml) would be saved in a year. This option would not require a drought permit or drought order.

7.11 Level 4 Restriction: Drought Order (Pressure Reduction)

Level 4 restriction have previously related to the use of rota cuts and the level of service was 'never' (i.e. even in the most extreme of droughts, ESW would only ever impose Level 1, 2 and 3 restrictions). However, the Environment Agency requires ESW to state a level of service for Level 4 restrictions. ESW

still believes that rota cuts and standpipes should never be used but that, pressure reduction to reduce the flow rate at customer's tap is a viable alternative. ESW therefore defines the Level 4 restriction as reducing pressure at the customer tap with a return period of 1 in 250 years on average. This return period is based on our supply and demand assessment for our PR19 Water Resources Management Plan. This concluded that all ESW Water Resource Zones (WRZ) are resilient across the full 40 year planning period (2020 to 2060) to a drought that occurs on average once in 200 years without the need to impose restrictions greater than a Temporary Use Ban. Therefore, we have set the Levels of Service for this restriction at 1 in 250 years on average.

8. DROUGHT MEASURES: SUPPLY SIDE ACTIONS

8.1 Measures to Obtain Additional Water - Essex Resource Zone

The following potential drought measures have been identified as viable drought actions to obtain additional water for the Essex Water Resource Zone:

Essex Resource Zone: Measures to Obtain Additional Water

- Increased bulk transfers from Thames Water Utilities (by agreement)
- Increased abstraction from SAGS (drought order)
- Reduction in the compensation flow from Hanningfield Reservoir into Sandon Brook

The frequency of needing these supply side drought actions would be greater than 1 in 200 years on average. This is because all of ESW's Water Resources Zones have a supply surplus during a drought with a return period of 1 in 200 years.

The order in which the supply side drought actions would be implemented would be decided by ESW's Drought Management Group. However, the most likely order would be as listed in the table above. This is because an increase in the Thames bulk transfer would be by agreement with Thames Water and would not require a drought permit or drought order. The EA confirmed on 22 January 2018 that cessation of the Sandon Brook compensation discharge would not be possible and so the drought action has been amended to a reduction in the daily rate of the compensation discharge instead. The EA confirmed that even this may be difficult to permit and so it is the least preferred of the Essex supply side drought actions.

ESW's Essex Effluent Recycling Plant will be in operation prior to consideration of the above measures.

The measures are described as follows:

8.1.1 Increased bulk transfers from Thames Water Utilities by Agreement

DROUGHT ACTION : Increased Bulk Transfers from TWU via Chigwell

The drought action would be to negotiate with TWU as to the possibility of temporarily increasing the Chigwell bulk supply during a drought. The potential to do this assumes that TWU's own resource situation would be robust and that the spatial distribution of drought impact would not cover the Thames supply areas.

The Chigwell bulk supply arrangement is captured in an agreement between the Metropolitan Water Board (now Thames Water Utilities) and South Essex Waterworks Company (now Northumbrian Water Limited) dated 30 May 1963.

The bulk supply is provided from the King George and William Girling Reservoirs in the Lea Valley and if required, can potentially be supported by

abstraction directly from the River Lea at defined intakes. Under normal operating conditions, the scheme provides for a bulk water supply of 91 Ml/d on average not exceeding 118 Ml/d on any one day from Thames Water to ESW. This is reduced to 71Ml/d (as a quarterly average) at Thames water request.
Clause 2b of the bulk supply agreement refers to what will happen in the event of Thames Water imposing a hosepipe ban on its domestic customers. If ESW also applies a hosepipe ban on its customers then the full average quantity of 71Ml/d remains available to ESW. The last occasion this occurred was in 1976. If ESW do not impose a hosepipe ban on its domestic customers, then the supply from TWU is reduced by 25%. This was the situation in 2006.

Within the agreement is also a statement that during an "unusual drought" Thames Water shall supply to ESW such quantities as shall represent “fair apportionment” of the water available. We have agreed with Thames Water that "unusual drought" will in future be defined as when Thames Water have entered their stage 3 drought restrictions (implemented powers from a non-essential use ban). Fair apportionment will not be pre-emptively defined as the circumstances of each particular drought differ spatially and temporally (evidenced by 1995/97 and 2005/06). It will be considered at the time that stage 3 restrictions are put in place. However, the apportionment will be derived from the relative shortfall in deployable output that each company is experiencing.

Therefore, in future droughts affecting ESW, the potential for temporarily increasing the bulk supply will be dependent on TWU’s own resource situation, the nature and spatial distribution of the drought, and demand in the Chigwell area. In summary the drought action option is only realistic in the event that a drought affecting ESW does not materially affect TWU. This drought action would need the support of Thames Water.

8.1.2 Increased Abstraction from SAGS

DROUGHT ACTION : Increased Abstraction from SAGS
Support the Agency in making an application to the Secretary of State for a drought order to increase the 15-year abstraction licence volumes in respect of their SAGS boreholes.

There are sixteen Agency owned boreholes which can be operated under the Stour Augmentation Groundwater Scheme (SAGS), four of which are pond support boreholes, and twelve boreholes that augment flows in the River Stour to support ESW abstractions and transfers to Abberton reservoir.

The Agency’s abstraction licence authorises during any period of fifteen years a maximum of:

- 25,000 Ml to be abstracted from boreholes 1 to 8;
- 9,450 Ml to be abstracted from boreholes 11 and 12; and

- 4,750 Ml to be abstracted from boreholes 15 and 16.

Daily licences for the SAGS boreholes are 10 Ml/d each for boreholes 1, 2 and 5, 12 Ml/d each for boreholes 11 and 12, and less than 4.5 Ml/d each for boreholes 6, 7 and 8. These daily licensed quantities reflect the results of borehole yield testing originally carried out at these sources. Thus there is no scope for increase to the daily licensed volumes in the event of a drought.

The 15-year licence conditions are the only potential constraint on SAGS operation in a prolonged, severe drought that could be considered for a drought action. ESW, being the primary beneficiary of the scheme, will be expected by the Agency to provide the necessary information required to support a drought order application. In practice, the potential requirement for a drought order to increase the 15-year licensed volumes will be assessed and decided on by the EOETS Operators Group, i.e. both ESW and Agency personnel in collaboration.

Historical borehole utilisation until 31 March 2016 has been provided by the Agency and used to calculate the volumes remaining available on the 15-year licenses.

Boreholes	Utilisation (%) 2003 – 2017 (inclusive)	Volume remaining on 15-year licence (Ml)
1 to 8	10	22,604
11 and 12	17	7,853
15 and 16	29	3,370

If the daily licensed volumes are taken to be maximum capacities, and using the volumes remaining on the 15-year licences, the number of days of augmentation that in theory could be made by the three groups of boreholes is as follows:

- boreholes 1 to 8 could be run at maximum capacity for 356 days
- boreholes 11 and 12 could be run at maximum capacity for 327 days
- boreholes 15 and 16 could be run at maximum capacity for 281 days

This is a similar position to our previous 2013 Drought Plan.

The Agency has a preferred switch-on order based on which boreholes have the highest and most reliable yield, and they also look to balance recharge to the aquifer over time. It is not possible to say before hand, specifically which boreholes would be prioritised for use in any particular drought. This would be determined at the time of application in collaboration with the Agency based on their groundwater monitoring information, and their preferred operational strategy.

The licence utilisation in 1997 totalled 7,442Ml, reflecting the 1996/97 drought, which was the last time ESW implemented a hosepipe ban. There is sufficient volume remaining on the three group 15-year licences combined, to pump the

same volume on an annual basis for the next 4.55 years. Therefore, it is highly unlikely that the 15-year licence will become restrictive. Additionally, since we published our 2013 Drought Plan, the Abberton Scheme has now been completed meaning the need for this drought action is extremely unlikely.
These calculations indicate that there would be ample lead-in time, at least 12 months, to identify the potential need for the SAGS drought action and complete work to support any potential drought order application. If substantial support from the SAGS boreholes was required in a prolonged dry period, annual abstraction returns would be reviewed with the Agency to monitor 15-year licence utilisation and determine remaining volume availability. This would trigger the initiation of supporting monitoring or modelling.

This drought action would need the support of the Environment Agency who own the abstraction licence.

8.1.3 Reduction of Compensation flow from Hanningfield Reservoir into Sandon Brook

DROUGHT ACTION : Reduction of Compensation flow from Hanningfield Reservoir into Sandon Brook
The drought action would be to apply for a drought permit to reduce the compensation discharge from Hanningfield Reservoir to Sandon Brook.

ESW is required under abstraction licence number 8/37/37/*S/0025 to make a compensation discharge of 0.909 Ml/d into Sandon Brook from Hanningfield Reservoir. A reduction of this discharge would potentially conserve additional, albeit very small quantities of water for public water supply use.

No specific permissions over and above the drought permit would be required. ESW already has permission from the landowner to access the site.

8.2 Measures to Obtain Additional Water - Suffolk Resource Zones

Unlike Essex, the Suffolk supply system is only semi-integrated and has three distinct resource zones; namely Hartismere, Blyth, and Northern/Central. There is little scope for the transfer of water between water resource zones. Consequently, a different approach has been taken in managing drought in Suffolk, with different options employed to address potential supply problems.

During the 1997/98 drought, a Supply Review Group was formed in the Suffolk area to report to the Drought Management Group. It is likely that this group, essentially a sub-group of the wider Drought Management Group, would be reformed during future drought conditions.

Previous droughts in Suffolk have particularly affected the groundwater-dominated Hartismere supply area, most recently in 1997/98 when a headroom deficit determined in the supply demand balance was confirmed by

the need for tankering. However, the headroom situation was addressed through the development of an additional groundwater source and treatment works at Hartismere Borehole 1 to provide additional resources in the zone. In addition, a large number of other improvements have been made to improve security of supply within the zone.

Drought actions for the different supply zones in Suffolk are considered in Section 8.3 for Hartismere, Section 8.4 for Blyth, and Section 8.5 for the Northern/Central zone.

The following potential drought measures have been identified as viable drought actions to obtain additional water for the Suffolk Resource Zones:

Suffolk Hartismere Resource Zone – Measures to Obtain Additional Water
▪ Increase restricting annual quantity on Hartismere Borehole 1 licence
▪ Increase restricting annual quantity on Hartismere Borehole 4 Group licence
▪ Merge Hartismere Borehole 1 and 4 Group Licences
▪ Reduce compensation flows from Hartismere Borehole 5 borehole
Suffolk Blyth Resource Zone – Measures to Obtain Additional Water
▪ Increase restricting daily quantity on Blyth Borehole 6 licence
▪ Reduction of compensation flows from Blyth Borehole 2
Suffolk Northern/Central Resource Zone – Measures to Obtain Additional Water
▪ Increase annual licence and April to Oct quantities on Lound licence
▪ Increase restricting annual quantity on Ormesby/Bure licence
Suffolk - All Resource Zones – Measures to Obtain Additional Water
▪ Tankering

The frequency of needing these supply side drought actions would be greater than 1 in 200 years on average. This is because all of ESW's Water Resources Zones have a supply surplus during a drought with a return period of 1 in 200 years.

The order in which the supply side drought actions would be implemented would be decided by ESW's Drought Management Group. However, the most likely order would be as listed in the table above. Those drought actions to reduce compensation discharges are the least preferred options as the risk of significant adverse environmental effect is greater given it would be a direct reduction in flow at a time when it would be most required.

Further groundwater modelling of the Hartismere Borehole 4 and Hartismere Borehole 1 drought actions will be undertaken in 2018. The drought action implementation order will be reviewed once this work has been completed.

There are a number of drought actions that involve increasing the annual licensed quantity. The level of abstraction during a drought is determined by customer demand. During previous droughts such as in 1996/97, customer demand was such that some of the annual licensed quantities in our

abstraction licences were fully utilised. This was a reflection of the extended dry weather and elevated customer demand during what was an extreme drought.

8.3 Suffolk Hartismere Zone Drought Actions

While the Company's Hartismere supply zone was highly susceptible to the droughts of the 1990s, this was mainly because supply was constrained by licence. However, since then, a large amount of investment within the zone has resulted in substantial improvements such that it is anticipated that the zone should be able to absorb the effects of any future droughts for a much longer period of time without the need for early restrictions.

Specific drought actions for Hartismere are indicated as follows:

8.3.1 Increase restricting annual quantity on Hartismere Borehole 1 licence

DROUGHT ACTION : Increase restricting annual quantity on Hartismere Borehole Licence
The potential drought action is to apply for a drought permit/order to increase the annual quantity of the Hartismere Borehole 1 abstraction licence. A suggested increase would be from 200 Ml/annum to 250 Ml/annum. The daily licensed quantities would remain unchanged.

The daily licence allows for 1.6 Ml/d of groundwater to be abstracted from Crag boreholes. This compares to an annual licence quantity of 200 Ml which equates to 0.55 Ml/d.

The abstraction licence was fully utilised in 2000 with utilisation exceeding 90% of the annual licence in most years since. Consequently, the annual licence is likely to be a key constraint in a drought.

Permission from landowners to access land to implement mitigation measures will be required.

8.3.2 Increase restricting annual quantity on Hartismere Borehole 5 Group licence

DROUGHT ACTION : Increase restricting annual quantity on Hartismere Borehole 5 GroupLicence
The potential drought action is to apply for a drought permit/order to increase the annual quantity of the Hartismere Borehole 5 Group licence. A suggested increase would be from 2500 Ml/yr to 3000 Ml/yr. The sources that would be utilised more to facilitate this are Hartismere Boreholes 2, 3 and 5.

The Hartismere Borehole 4 Group Licence allows abstraction from a number of groundwater sources as follows :

Source	Daily Licence (Ml/d)	Aquifer
Hartismere Borehole 2	1.091	Chalk
Hartismere Borehole 3	0.9	Chalk
Hartismere Borehole 5	3.637	Chalk
Hartismere Borehole 7	5.364	Chalk & Crag

The annual licensed quantity for all the sources combined is 2,500 Ml/annum. This quantity was exceeded during drought periods in the 1990's although this would not have been the case if Hartismere Borehole 1 and treatment works (constructed in 1998) had been available then. Nevertheless, a viable drought action could be to increase the annual quantity as this could be a key limiting factor during future droughts. The scope for increases in daily licensed quantities are limited.

Permission from landowners to access land to implement mitigation measures will be required.

8.3.3 Merge Hartismere Boreholes 1 and 4 Group Licences

DROUGHT ACTION: Merge Hartismere Boreholes 1 and 4 Group Licences

The potential drought action is to apply for a drought permit/order to merge the Hartismere Borehole 1 and Hartismere Borehole 4 abstraction licences.

This drought action will provide greater operational flexibility and would allow the additional annual licence secured under the Hartismere Borehole 4 Group licence drought action (Section 6.5.2) to be utilised at Hartismere Borehole 1 thus avoiding any significant adverse effect on Chalk groundwater levels at Redgrave Fen.

Permission from landowners to access land to implement mitigation measures will be required.

8.3.4 Reduce Compensation flows from Hartismere Borehole 5

DROUGHT ACTION : Reduce Compensation Flows from Hartismere Borehole 5

The potential drought action is to apply for a drought permit/order:

- to reduce compensation discharges from Hartismere Borehole 5 during peak demand periods to Hall Farm Meadows, Hall Farm Pond; and Hall Farm Stream; and additionally
- to potentially abstract, in addition to current daily licensed quantities for public water supply, the daily licensed quantities currently earmarked for compensation discharge purposes.

The Hartismere Borehole 4 Group Licence requires a compensation discharge from Hartismere Borehole 5 to be made at the request of the Agency to:

- Hall Farm Meadow to maintain local groundwater levels (0.13 Ml/d);
- Hall Farm Pond to maintain surface water levels (0.13 Ml/d); and
- Hall Farm Stream to augment flows in the River Waveney (0.432 Ml/d)

The maximum daily compensation quantity is therefore 0.69 Ml/d.

The compensation quantities are included as a separate part of the licence (they are in addition to the Hartismere Borehole 5 daily licensed quantity for public water supply purposes). Cessation of the compensation discharge alone may assist in preserving the groundwater resources at Hartismere Borehole 5 for later abstraction. However, additionally, ESW may consider the option of abstracting the quantities currently prescribed for compensation discharge purposes, in addition to current licensed quantities for public water supply purposes.

No specific permissions over and above the drought permit would be required. ESW already has permission from the landowner to access the site.

8.4 Suffolk Blyth Zone Drought Actions

In the Blyth resource zone, the current balance between supply and demand is such that, under normal operation, there should be no need for drought applications to seek additional abstraction. However, under extended drought conditions, this may not necessarily be the case. The following drought actions have therefore been identified:

8.4.1 Increase Blyth Borehole 6 Daily licence

DROUGHT ACTION : Increase restricting Blyth Borehole 6 Daily Licence
The potential drought action is to apply for a drought permit to increase the Blyth Borehole 6 daily licensed quantity from 0.91 Ml/d to 1.2 Ml/d.

At Blyth Borehole 6, the daily licence and treatment works capacity are 0.91 Ml/d and 1.2 Ml/d, respectively. Therefore a small daily increase at this site may also be possible.

Permission from landowners to access land to implement mitigation measures will be required.

8.4.2 Reduce compensation and/or abstraction at Blyth Borehole 2

DROUGHT ACTION : Modify compensation and/or abstraction from Blyth Borehole 2
Potential drought actions may include drought permits applications to: ▪ Reduce the compensation discharge and maintain the daily licence; or ▪ Reduce the compensation discharge and increase the daily licence by an appropriate quantity. A suggested increase would be 3.0 Ml/d (10% increase). ▪ Retain the compensation discharge and increase the daily licence by an appropriate quantity. A suggested increase would be 2.8 Ml/d.

ESW, at the request of the Agency, is required to make a compensation discharge of 0.205 Ml/d (25 Ml/annum) between July and October inclusive from the Company's Blyth Borehole 2 to the Hundred River.

The high demand period for the Blyth zone is likely to be within the period that compensation discharges are required. Hence, one potential drought action is to reduce the compensation discharge and potentially look towards making the same daily quantities available for additional abstraction for public water supply purposes. Additionally an increase to the daily licence may make additional quantities available for supply.

Permission from landowners to access land to implement mitigation measures will be required.

8.5 Suffolk Northern/Central Zone Drought Actions

Similarly to the Blyth zone, the current balance between supply and demand in the Northern/Central zone is such that, under most drought conditions, there should be no need for drought applications to seek additional abstraction. However, under extended drought conditions, this may not necessarily be the case. The following drought actions have therefore been identified:

8.5.1 Increase annual licence and April to Oct quantities on Lound licence.

DROUGHT ACTION : Increase annual licence and April to Oct quantities on Lound licence.
The potential drought action is : ▪ to apply for a drought permit/order to increase the licensed annual quantity of water that can be abstracted from Lound Ponds. A suggested increase would be from 2,955 Ml to 3,250 Ml (10% increase); and ▪ to apply for a drought permit/order to increase the quantity of water that can be abstracted during the period April to October inclusive. A suggested increase would be from 2,216 Ml to 2,438 Ml (10% increase).

Surface water abstraction at Lound is constrained by a seasonal licence condition not to abstract more than 2,216 Ml during the period April to October inclusive. This is equivalent to 10.36 Ml/d which is significantly less than the daily licence of 20.4 Ml/d.

The annual licence is 2,955 Ml/annum, which has previously been a restriction during a drought year. Hence, the drought action to increase the annual quantities by 10% is seen as a prudent measure.

No permissions over and above the drought permit would be required as ESW owns the lakes and has access to the lake shore.

8.5.2 Increase Restricting Annual Quantity on Ormesby/Bure licence.

DROUGHT ACTION: Increase restricting annual licence and April to Oct quantities on the Ormesby/Bure licence.

The potential drought action is :

- to apply for a drought permit/order to increase the licensed annual quantity of water that can be abstracted from the Trinity Broad and the River Bure. A suggested increase would be from 10,000 Ml to 10,500 Ml (5% increase); and
- to apply for a drought permit/order to increase the quantity of water that can be abstracted during the period April to October inclusive. A suggested increase would be from 7,500 Ml to 7,875 Ml (5% increase).

ESW is currently licensed to abstract 10,000 Ml per year from the River Bure and Trinity Broads combined with four Chalk boreholes. Additionally, the governing abstraction licence indicates that abstraction from the sources must not exceed 7,500 Ml in the period from April to October inclusive.

The current annual licence quantity has been approached in previous drought periods. Hence, an appropriate increase via drought permit/order may release additional water for supply in dry years.

In 2012, the Environment Agency's representation on ESW's previous draft Drought Plan, stated that it will only support drought permit applications to increase supplies from the Trinity Broads and the River Bure where ESW has a resource shortfall caused by an acute shortage of rain and that it would expect the company to have maximised its use of licensed resources prior to applying for a drought permit/order, and to move water within its resource zone to meet demand.

In terms of maximising use of existing resources, ESW has now started a project to construct a new resilience scheme called "Gorleston Pumping Station and New Pipeline". This scheme, to be completed by 31 March 2019, will allow north Gorleston (currently supplied only by Ormesby TWs) to utilise surplus resource in the south of the Water Resource Zone. The new pumping station and pipeline significantly increases resource zone resilience and reduces the likelihood of this drought action being required.

Nevertheless, the drought action still remains valid. As agreed with the Environment Agency on 22nd January 2018, if this drought action were to be implemented, the additional water would need to be abstracted from the River Bure and not from the Trinity Broads. The additional abstraction from the River Bure would be subject to the Hands Off Flow conditions outlined in the existing abstraction licence. The drought permit application would not look to change these. Additionally, it would not look to change the Trinity Broad abstraction cessation level.

Permission from landowners and the Broads Authority to access land to implement mitigation measures will be required.

8.6 Suffolk All Zones: Road Tankering

DROUGHT ACTION : Road Tankering in Suffolk

The potential drought action is to transport water from areas with spare resource (other resource zones inside or outside the Company's Suffolk supply area) to areas of water shortage via road tanker.

Following implementation of road tankering of water in the south Suffolk area during 1997, a similar strategy could be adopted in the event of a severe drought. Due to the relatively small quantities of water that can be provided even with a rigorous operation, tankering's main benefit in Suffolk is seen as maintaining levels in water towers rather than replacing lost output from water treatment works.

As was the case in 1996 and 1997, water required in the Hartismere resource zone via tankering would be available from Carlton Colville Pumping Station, sourced from within the surface water dominated Northern/Central zone. Historically the Northern/Central zone has been able to maintain demand much deeper into a drought than the groundwater dominated Hartismere and Blyth zones.

The Company's tankering strategy may be summarised as follows:

- Carlton Colville Reservoir will be the base for filling operations, utilising its purpose built overhead filling gantry;
- Hartismere Borehole 1 and Hartismere Borehole 2 towers will be the base for the discharge operations;
- A Tanker Control Officer will be appointed; and
- Staff from outside the Company's Water Supply team will operate tankers.

Following on from experiences in 1996, a large number of improvements were made to equipment and procedures in 1997 including tanker turnaround rates, chlorination/ disinfection procedures, sampling procedures and transportation, access to tanker filling and discharge points and overall logistics. As a result, arrangements for tanker filling, discharge and staffing worked well in 1997. The Company is therefore confident that in the event of tankering being required in the future, the plant and procedures would quickly be in place for when required during a drought.

8.7 Compensation In Respect Of Drought Orders

Any claim for compensation arising from an NWL Drought Orders application will be dealt with as outlined in Schedule 9 of the Water Resources Act.

8.8 Esoteric Drought Options

8.8.1 Background

Esoteric options are those assumed to be unlikely to be realised at present due to technical complexity, environmental concern, high cost and/or problems of promotion. However, these factors change with time, and certain esoteric measures could eventually be considered viable in times of drought, when more cost-effective measures have been exhausted.

This section provides an overview of options that could potentially be considered as drought actions in the event of a prolonged and severe drought. These are as follows:

- Desalination of Brackish Water via Mobile Plant;
- Sea Tankering from Norway;
- Towing Flexible Bags from Teesside (Kielder Water);
- Essex Road Tankering.

Also included is a section on temporary bulk transfers with neighbouring water companies.

8.8.2 Desalination of Brackish Water via Mobile Plant

Although seawater desalination is not currently considered a viable long term water resource option, the costs particularly for brackish water desalination are decreasing such that the option could be examined as a solution for peak lopping and/or as a contingency option in severe drought. This option, for example, is being considered by Water Resources East.

Reverse osmosis (RO) is likely to be the preferred treatment process for brackish water desalination, as it uses less energy than the alternatively used method of multi-stage flash (MSF) distillation. Also unlike MSF distillation, RO plants can be 'packaged' and skid-mounted for simple delivery and installation, although such plants are usually small in yield, largely due to the maximum size of plant that can be transported by lorry. A 5 Ml/d capacity temporary plant could however be achievable by connecting a number of smaller 1 Ml/d units in parallel.

However, there are two key issues to be resolved in consideration of brackish water desalination as a drought option:

Time

The time period for ordering and agreeing contractual agreements with a supplier, plant delivery, plant commissioning and testing, and providing linkage to the supply network, is such that the minimum time between ordering plant and producing water for use is estimated at 8 to 12 months.

Location

The number of locations for such a unit with an adequate supply of brackish water are limited to coastal or estuarine areas. As most of these areas are on the periphery of the ESW distribution systems in Essex and Suffolk supply areas, this potentially poses a major difficulty.

Given the above issues it is unlikely that this drought option would be employed unless in a very severe drought.

8.8.3 Sea Tankering from Norway

Sea tankering is a proven method of supplementing water resources in a drought, and Northumbrian Water gained experience of this in the 1980's when 425 Ml of water was tankered from Teesside to Gibraltar.

The preferred water source for ESW would be from one of several supplies located at hydro-electric power stations in Norway. The water here is of higher quality and significantly cheaper than raw water which could be supplied from Teesside.

It is likely that the water carried would be treated water thereby limiting the transfer of undesirable species in the cargo. Suitable tanker linings/coatings are available to preserve water quality. It is understood that there is deep water berthing potentially available for use for sea water tankers in the Thames Estuary near Canvey Island. The treated water would then be pumped ashore and could potentially be available for delivery into the supply and distribution network. Both storage and blending are likely to be key issues that would need to be addressed. In addition, if the water were to be directed to Hanningfield, a 19.2km long pipeline would be required to transport the water from the mooring, incurring significant capital cost.

The yield from tankering is constrained by the size and number of tankers being used. Typically tankers have between 300 and 500 Ml capacity. A single 325 Ml capacity tanker would be able to deliver the equivalent of 50 Ml/d based on a seven day round trip including loading and unloading. The long term nature of contracts associated with tankering operations means that this option would have to provide a continuous and ongoing yield for a number of years.

High unit costs for utilising sea tankering, as a drought option, means that it would only be considered after all other lower cost options have been exhausted. The potential requirement for a pipeline from the tankering mooring point to a suitable storage point (e.g. Hanningfield) makes the option highly unlikely in the short term.

8.8.4 Towing Flexible Bags from Teesside (Kielder Water)

The idea of towing flexible bags filled with freshwater from areas of surplus water to areas of shortfall came into fruition in the 1990's. Technology exists to attach flexible bags, made out of strong polypropylene to tugs that would be able to tow the bags.

Flexible bags could be used to transport water from Kielder water in Northumbrian Water's region to Essex. Kielder water currently has surplus yield and already has a secure supply pipeline that can deliver large volumes of non-potable water to Teeside, via pipelines and river systems. It would be possible to use some of this surplus yield, transferred to the Tees Estuary for filling flexible bags for towing via the North Sea to Essex. As with the sea-tankering option berthing facilities would be required and a pipeline would be required to transfer the water to Hanningfield reservoir.

High unit costs for utilising flexible bags as a drought option means that it would only be considered after all other lower cost options have been exhausted. The potential requirement for a pipeline from the tankering mooring point to a suitable storage point (e.g., Hanningfield) makes the option highly unlikely in the short term.

8.8.5 Essex Road Tankering

Tankering in Suffolk is considered separately in Section 9.6. Based on the hire of 5,000 gallon tankers, drivers, and tractor units, and a tanker turnaround rate of four hours (three per day), 30 tankers would need to be employed to achieve a 2 Ml/d supply in Essex. Operational costs for just the tankering aspect are estimated at approximately £2.1 million for a three month period. Additional costs include the construction of fill and discharge points at either tower or reservoir sites, chemicals and staff (co-ordination). Capital costs could also be significant.

An objective assessment of tanker fill and discharge sites would need be made, when in the early stages of a drought. Sites should ideally:

- Have adequate space for transport movements;
- Have access to pumping and reservoir storage
- Have good access to main roads
- Have few close neighbours, thus minimising the risk of causing nuisance.

This option is considered esoteric as water would have to be sourced from outside the company's supply/resource area, it is also very expensive and would provide minimal benefit in supporting supplies. In this respect tankering in Essex is viewed more as a publicity campaign. In addition, ESW could only start negotiating with another water companies once they in turn had established whether they have any surplus supplies.

8.8.6 Transfers from/to Other Water Utilities

Transfer possibilities with neighbouring water companies Anglian Water, Affinity Water and Thames Water have been investigated in the past.

In relation to Thames Water, increases to the Chigwell bulk supply are included as a drought measure described in Section 9.1.2. All other potential transfers are more esoteric due to the likely need to install substantial lengths of transfer

pipelines and potential issues with availability of water. Other options explored have included:

- Potential for augmenting the EOETS from Anglian Water's Grafham reservoir using the Bedford Ouse as a conduit - this option is not however considered viable on a long-term basis.
- Boundary transfers with Affinity Water – this option is also not considered viable and could be ruled out anyway due to Affinity Water's own resource situation.

The Anglian region water companies periodically discuss options for sharing resources. Although there are no definitive cases where additional water supplies can be provided between water undertakers during a drought, companies would still look to provide mutual assistance dependent upon the characteristics of a drought and their availability of water resources and treated water supplies.

9. DROUGHT SCENARIOS AND DROUGHT PLAN TESTING

9.1 Overview

The Environment Agency's Drought Plan guidance requires that a Company's Drought Plan is tested against a range of drought scenarios to assess whether the drought actions and associated triggers ensure that planned levels of service are met.

Before completing this assessment, it is useful to:

i. Understand the return periods of previous droughts. An assessment is presented in Section 9.2 below; and
ii. understand how previous droughts were managed. A summary of those droughts in the 1990's is presented in Section 9.3 below.

The effectiveness of the Drought Plan is then considered against both the worst historic drought on record and against a drought with a return period of 1 in 200 years.

9.2 Drought Return Period Assessment

An assessment of the return period of each of the droughts considered in this Drought Plan has been undertaken. These include the late-1990s drought in Suffolk and the early-1920s and early-1930s droughts in Essex.

The analysis has been undertaken following a methodology provided by the Environment Agency, based upon papers published by the National Climate Information Centre (Allen, 2012; n.d.) and in the Meteorological Office Scientific Paper No. 37 (Tabony, 1977).

Monthly rainfall totals for a 5-6 year period containing the known drought were obtained, and monthly long-term rainfall averages for the 1961-1990 period of data were calculated, as the 1961-1990 climatology is approximately 5% drier than for the 1981-2010 period (Allen, n.d.). A rainfall deficit for each month in the analysis period was calculated relative to the long-term average, and then summed to obtain a series of cumulative deficits.

Plotting the cumulative deficit series allows a window of analysis to be identified. An example for the late-1990s Suffolk drought is provided in the figure below, in which the plot suggests beginning the dry period analysis in October 1995.

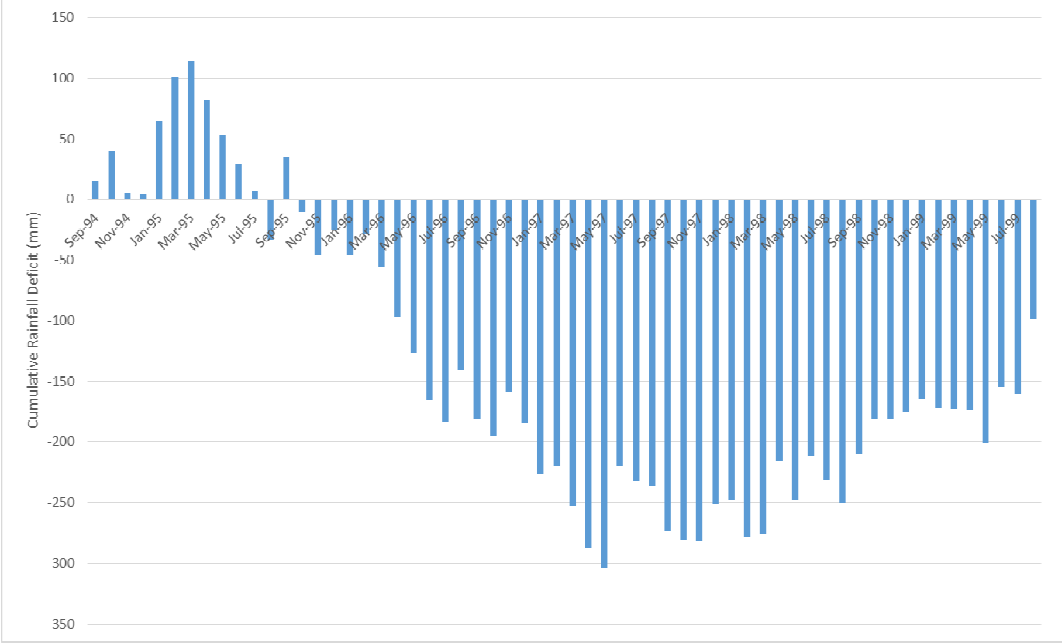


Figure 8: Monthly cumulative rainfall deficits for the late-1990s Suffolk drought

For dry periods lasting one month or more, it is suggested to use Tabony tables for extreme value analysis (Tabony, 1977). The cumulative rainfall and cumulative long-term average rainfall is calculated from October 1995 to the end of the analysis period, and the percentage of the cumulative rainfall in relation to the cumulative long-term average rainfall is calculated for each month. The Tabony table for the Anglian region, which identifies the percentage of long-term average rainfall corresponding to a given return period, was used to estimate a return period for a range of drought durations as illustrated in the table below.

Table 9: Tabony table for the Anglian region (Allen, n.d)

Return periods of dry spells	6 months	12 months	18 months	24 months	36 months	48 months
1 in 5	82	87	89	91	92	93
1 in 10	73	80	84	86	88	90
1 in 20	66	75	79	82	85	87
1 in 50	58	69	74	78	81	84
1 in 100	53	66	71	75	79	81
1 in 200	49	62	68	72	77	80

The return periods quoted in the table are determined from 1961-1990 long-term averages for areal averages of precipitation within the Anglian region, and the return periods are for rainfall of n-months duration starting in any month (Bader and Folland, 1977). Comprehensive uncertainties have not been determined for the return period estimates, but they will be high for the multi-century return periods, which should be viewed as indicative only.

Therefore, the return periods are disaggregated into broad categories, and the tables do not specify return periods beyond 200 years (Allen, n.d.).

The results of this analysis are outlined below.

Suffolk: 1995-97 Drought

This drought is characterised by two dry winters as illustrated in the rainfall deficit graph below.

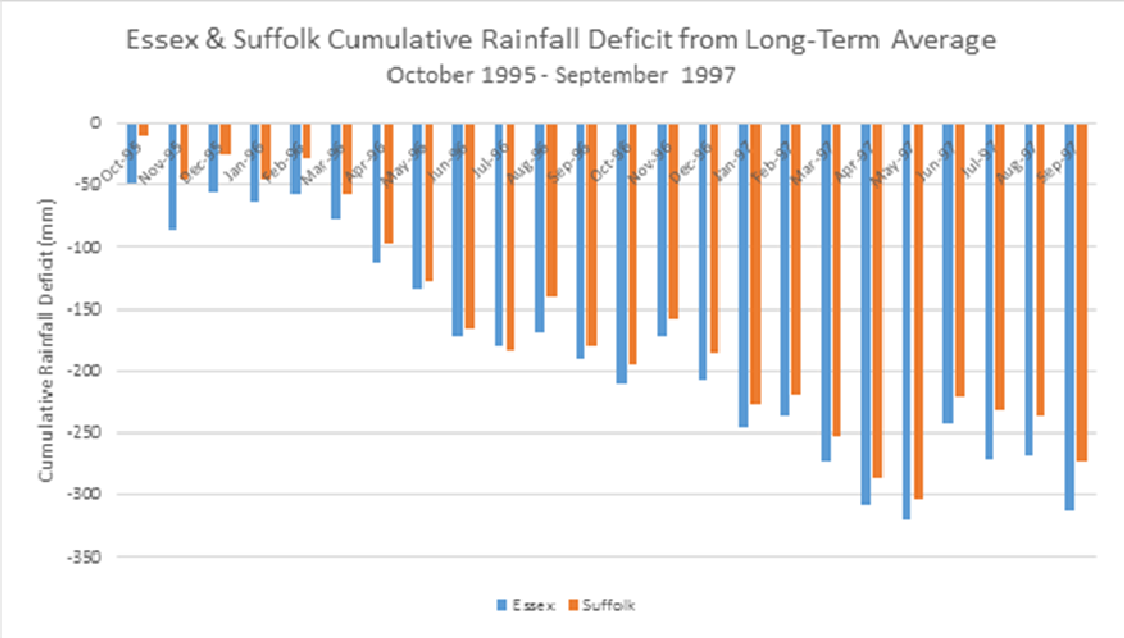


Figure 9: Monthly cumulative rainfall deficits for the late-1990s drought

Indicative return periods for durations of dry weather starting in October 1995 are summarised in the table below.

Table 10: Indicative return periods for durations of dry weather starting in October 1995

Duration	Return Period (years)
6 months	15
12 months	175
18 months	>200
24 months	165
36 months	15

Essex: Early-1920s drought

This drought is characterised by two dry winters as illustrated in the rainfall deficit graph below.

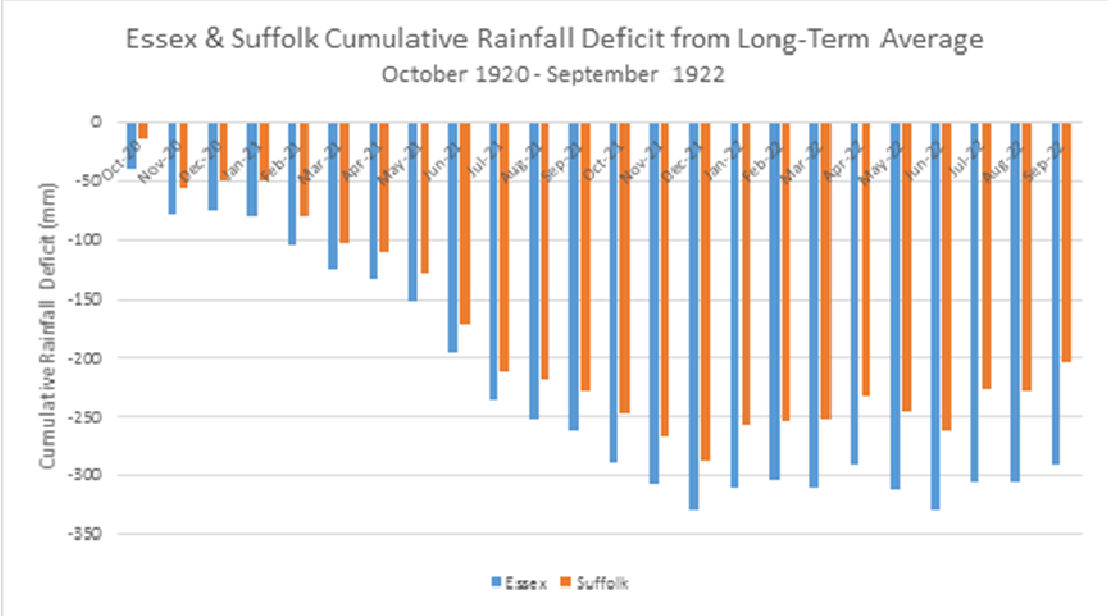


Figure 10: Monthly cumulative rainfall deficits for the early 1920s drought

Indicative return periods for durations of dry weather starting in October 1920 are summarised in the table below.

Table 11: Indicative return periods for durations of dry weather starting in October 1920

Duration	Return Period (years)
6 months	40
12 months	>200
18 months	>200
24 months	85
36 months	200

Essex : Early-1930s drought

This drought is characterised by two dry winters as illustrated in the rainfall deficit graph below.

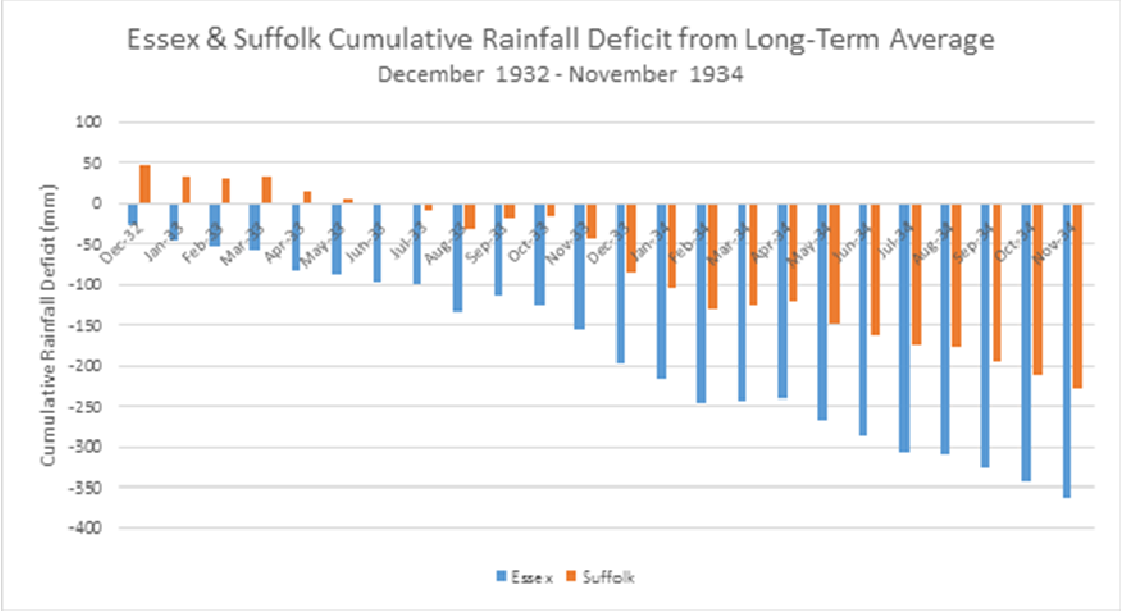


Figure 11: Monthly cumulative rainfall deficits for the early 1930s drought

Indicative return periods for durations of dry weather starting in December 1932 are summarised in the table below.

Table 12: Indicative return periods for durations of dry weather starting in December 1932

Duration	Return Period (years)
6 months	40
12 months	50
18 months	>200
24 months	>200
36 months	50

It can be concluded that the critical historical droughts affecting the Essex & Suffolk supply areas all have a return period greater than 1 in 200 years.

It wasn't required for ESW to apply for drought permits during those periods, and modelling of a hypothetical 1 in 200 year return period drought on the current system for WRMP19 reporting concludes that there is still a supply surplus during 1 in 200 year return period drought conditions. Therefore, the likelihood of needing to apply for a drought permit for any of the supply actions identified in the ESW Drought Plan is very low.

9.3 Summary of Previous Droughts and Drought Measures

9.3.1 Background

The most recent periods of drought to have affected the Essex and Suffolk supply areas were during the 1990s. During these droughts in 1990-92 and

1995-97, ESW gained extensive experience of drought management. In the last drought (1995-97), the Company implemented a number of drought measures including the imposition of a hosepipe ban (now known as a Temporary Use Ban 1) in both its supply areas.

A summary of how previous drought measures were implemented in recent droughts effecting Essex and Suffolk is presented in Section 9.3 below.

9.3.2 Essex

Hosepipe bans imposed in Essex during the 1990's occurred in the period from 29 July 1990 to 13 October 1992 inclusive, and 13 June 1997 to 3 April 1998 inclusive.

The 1990-92 drought was characterised by a prolonged period of below average rainfall that led to a lowering of groundwater levels throughout the Southeast and parts of East Anglia, thereby impacting on base-flows to rivers. By contrast the 1995-97 drought was more directly impacted by the lack of rainfall, in terms of the absence of runoff to support the rivers on clay catchments.

The 1995-97 drought is worthy of further note in terms of the conditions that affected ESW and the actions taken by the Company to address supply concerns. Rainfall during 1995 -97 in Essex was significantly lower than the long term average. Figure 5 (overleaf) displays monthly rainfall for 1995 to 1997, against the long term average for Hanningfield.

A lack of winter rain, particularly in 1995 and 1996 resulted in incomplete reservoir re-fill. This is illustrated in the reservoir storage profile for Hanningfield Reservoir indicated also in Figure 10. It was this cumulative effect which made 1997 a particularly severe drought in East Anglia, and necessitated the convening of the Company's Drought Management Group (DMG), and the eventual imposition of drought restrictions.

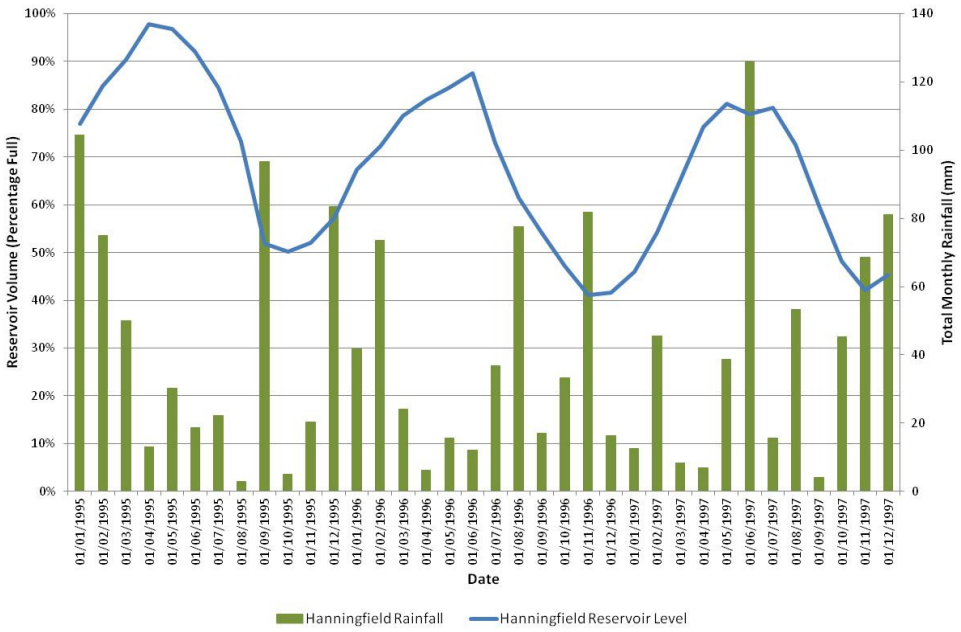


Figure 12: Hanningfield Rainfall and Reservoir Levels

Drought actions were first implemented in 1997 and were included in ESW's Drought Contingency Plan released in March of that year. The DMG considered a wide variety of options, some of which were rejected for a variety of reasons mainly related to timing and feasibility. Drought actions that were implemented in Essex in 1997/98 included the following:

- Public relations campaigns (including press releases & radio advertising, fact sheets for opinion formers, posters & stickers, talks to local groups);
- Water efficiency initiatives (water conservation leaflets/newspapers etc);
- Hosepipe bans;
- Commissioning of abandoned sources (e.g. well in south Essex);
- Pumping capacity upgrades;
- Temporary effluent Recycling Scheme near Maldon; and
- Improving abstraction potential at Abberton reservoir via dredging.

A press conference took place on 11 June 1997 to announce the current water resource situation and the hosepipe ban. A press release was circulated beforehand to invite local press. A company-wide hosepipe ban was introduced with effect from midnight on 12 June 1997. It remained in force until ESW was reassured that there was no need for restrictions during the summer of 1998. The hosepipe ban ended in Essex on 3 April 1998, following a significant improvement in the water resources situation.

ESW successfully operated a temporary recycling scheme between July 1997 and December 1998. The scheme involved abstracting up to 23 Ml/d of waste water from the Chelmsford Sewage Treatment Works pipeline and disinfecting with ultra violet light prior to mixing with water abstracted from the Rivers Chelmer and Blackwater. The water was then pumped into Hanningfield Reservoir. The scheme was applied for through normal discharge consent procedures as opposed to a drought order. A permanent Effluent Recycling Scheme was commissioned in 2002/03.

9.3.3 Suffolk

The only hosepipe ban imposed in Suffolk during the 1990's occurred in the period from 13 June 1997 to 14 May 1998 inclusive.

Although the lowering of groundwater levels during the 1995-97 drought had the potential to impact on public water supplies sourced from groundwater in the Suffolk Hartismere and Blyth water resources zones, this was not the reason that restrictions were required. In reality, borehole yields held up extremely well with the exception of one Chalk source (Hartismere Borehole 6). It was the unprecedented high demand fuelled by a long hot summer, meant that a hosepipe ban was necessary.

Drought actions that were implemented in Suffolk in 1997/98 included the following:

- Public relations campaigns and water efficiency initiatives (as for Essex);
- Hosepipe bans;
- Hartismere Borehole 4 environmental drought order;

- Development of a new groundwater source and treatment works (Hartismere Borehole 1);
- Hartismere Borehole 3 licence variation (increase in daily licence); and
- Road tankering.

A drought order to permit increased abstraction from Hartismere borehole 4 to supply Redgrave and Lopham Fen with 8 l/s of water was implemented during the summer. This action safeguarded the breeding conditions required by the Great Raft Spider and freed resources enabling the company to use the full licensed quantity for public supply. Hartismere borehole 4 was later closed and its replacement, Hartismere borehole 5 was commissioned on 7th July 1999.

A successful tankering operation was implemented in Suffolk during 1997. Water was transported from a treated water reservoir near Lowestoft to discharge facilities in the Hartismere water resource zone.

With an improving water resources situation in early 1998, hosepipe restrictions were finally lifted on 14 May 1998.

9.4 Effectiveness of Drought Plan

9.4.1 Approach

The synergies with the long-term water resources planning process have already been commented upon in section 2.2 of this document. The 'dry year' is the fundamental basis of the supply and demand forecasts used in the Company's Water Resources Management Plan. All of the Company's demand forecasts are constrained in the sense that assumptions regarding demand-reducing measures such as metering, leakage control and water efficiency are included. The Company considers this a prudent decision, since there is an overwhelming need to incorporate demand management at the heart of its water resource planning strategy. Demand management is seen as an ongoing essential option regardless of whether a drought is occurring or not. For ESW, demand management is not an option, it is seen as an essential prerequisite.

Operational experience has indicated that critical period scenarios such as those based on average day peak week (ADPW) are not appropriate for the Essex and Suffolk water resource zones as none of the Company's water resource zones are significantly peak constrained from a water resources perspective. In the case of the Essex, resource zone peaks can usually be absorbed due to the integrated nature of the supply network and the storage provided by the two large pumped storage reservoirs. Similarly, in the Suffolk Northern/Central zone, the flexibility over utilisation of the three main surface water works near Lound, Barsham and Ormesby provide a buffer to impacts from peak demands. The groundwater fed zones of Hartismere and to a lesser extent Blyth, previously had peak/critical period concerns, last observed in the 1995 to 1997 drought. These have now been addressed through investment in both zones in terms of intra-zone reinforcement and integration, and the development of new sources to support Hartismere. Hence no ADPW or similar peak scenarios are appropriate.

In terms of both water resources planning and drought planning, the most constraining historic droughts for which data is available are the 1990-91 and 1995-97 drought in Suffolk, and the 1933-34 drought in Essex. Therefore, these periods have been used as the scenarios to determine the amount of raw water that can potentially be relied upon to be available in future drought periods.

9.4.2 Essex Water Resource Zone

The Deployable Output (DO) of the Essex System is calculated using water resources modelling software called *Aquator*. It utilises Microsoft Access to store information and data, and Microsoft Visual Basic for Applications (VBA) programming to explicitly define the behaviour of the components which are used to represent the hydrological entities in a water resources system.

The key features are the single demand centre, due to the integrated nature of the raw and potable network, and the river catchment components, which are assigned the naturalised river flow time series (1915-2015) that represent the majority of raw water resource in the model. All infrastructure, licence, and operational constraints are included in the model.

Aquator models a water resource system by combining a daily multi-pass calculation of how water is to be distributed within a system together with the operating rules built into each component in the model. This approach attempts to optimise the allocation of water, by allowing demands to first reserve and then take water. The reservation of water by all demands before any one demand actually takes water allows a sharing algorithm to make decisions based on predefined rules. These rules can be replaced or modified by the user to simulate the requirements of the water resource system being modelled.

ESW uses the 'English & Welsh' method of determining DO. This method tests the resource system against a range of demands in turn until the system fails to meet the required demand through the worst drought in the hydrological record, the 'design drought'. The highest demand the system is able to meet throughout the design drought is the DO.

Worst Historic Drought on Record

The PR19 draft Water Resources Management Plan (ESW, February 2018) Essex DO can be used to demonstrate that drought triggers ensure that ESW's Planned Levels of Service are met. The PR19 Essex WRZ Aquator model was used to determine the rate of supply that can be maintained from the resource zone when the system is operated to meet the Company's levels of service. The DO resulting from this scenario is defined at the point at which either water resources run out (i.e. resource constrained) or abstraction licensed quantities are used up (licence constrained). The DO for the Essex WRZ is defined by the 1920-22 drought. The DO value is then used to determine Water Available For Use (WAFU) (DO less outage) for the Essex WRZ.

WAFU (Ml/d) is greater than Distribution Input (Customer demand plus an allowance for network leakage) plus Target Headroom (an allowance for uncertainty) across the current statutory minimum 25 year planning period and the 40 year planning period that we have considered in our PR19 draft Water Resources Management Plan. This is illustrated in the supply demand balance graph below.

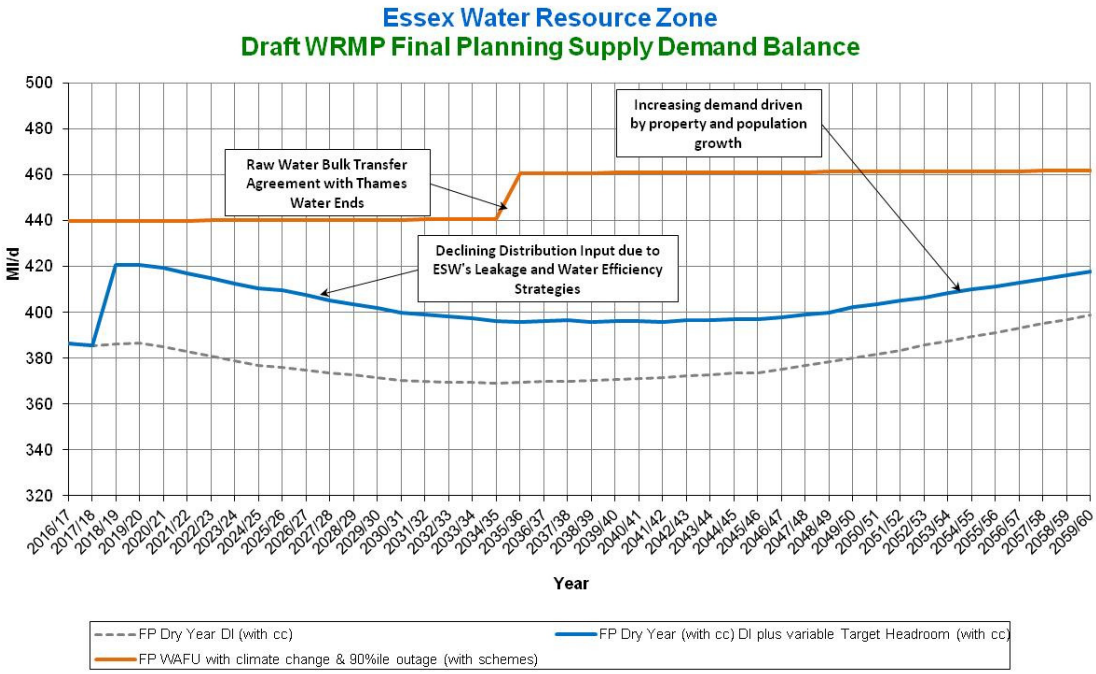


Figure 13: Essex Draft WRMP Final Planning Supply Demand Balance

The supply surplus was achieved without the need for Level 2 Temporary Use Restrictions. This is illustrated in the figure below which shows that combined reservoir storage in 1934 (the year with the largest combined reservoir drawdown) stays above the trigger for level 2 restrictions.

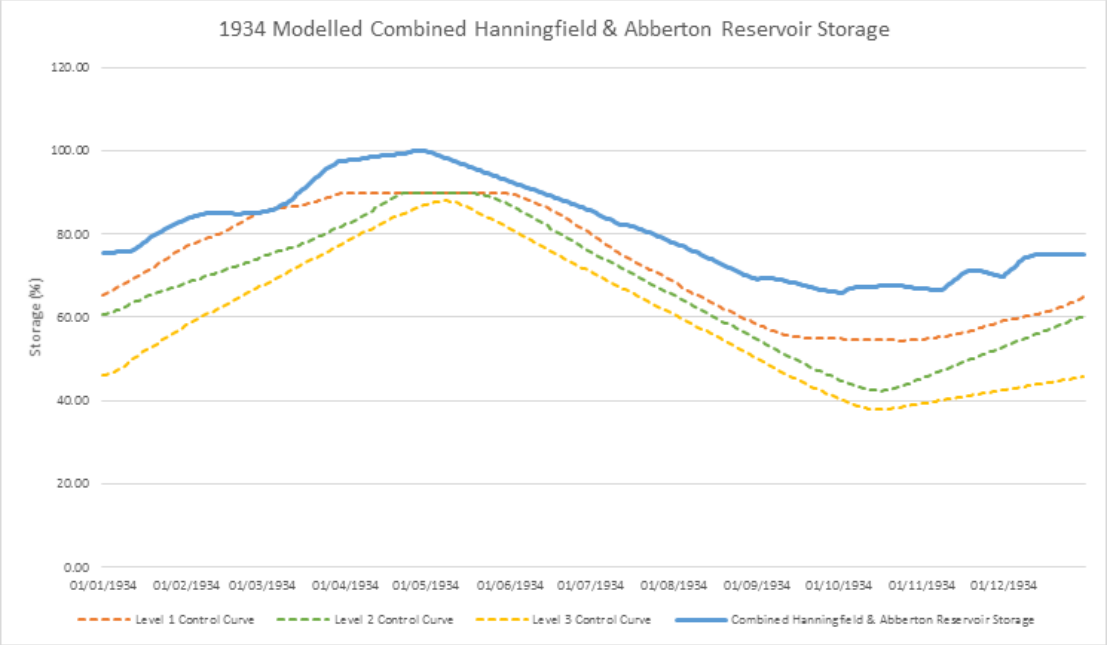


Figure 14: 1934 Modelled Combined Essex Reservoir Storage v Level 1 to 3 Restriction Control Curves

Given the above, it can be concluded that the Drought Plan will ensure that the Company's planned levels of service (1 in 10 years for an Appeal for Restraint and 1 in 20 years for a Temporary Use Ban) are met.

1 in 200 Year Drought

The resilience of the Essex System to droughts not represented within the baseline DO assessment has been recently assessed for ESW's PR19 draft Water Resources Management Plan (ESW, February 2018). The Scottish Method DO Analyser in Aquator was used for this assessment. For a drought with a 0.5% Annual Exceedance Probability (i.e. a 200 year return period drought), the result was a DO of 394 Ml/d thus maintaining a significant supply surplus across the 25 and 40 year planning periods. The supply surplus was achieved without the need for Level 2 Temporary Use Restrictions and so it can be concluded that the Drought Plan will ensure that the Company's planned levels of service are met.

This means that drought permits or drought orders would only be required and could only be justified by an exceptional shortage of rainfall caused by a drought with a return period greater than 1 in 200 years.

9.4.3 Suffolk Water Resource Zones

Worst Historic Drought on Record

The PR19 Water Resources Management Plan DO and WAFU assessments (ESW, February 2018) can also be used for the Suffolk Water Resource Zones (Blyth, Hartismere and Northern Central) to demonstrate that the Drought Plan ensures that ESW's Planned Levels of Service are met. The

design drought year for Suffolk is the 1995-97 drought which has a return period of greater than 1 in 200 years.
Supply Demand Balance graphs for each of the Suffolk Water Resource Zones are illustrated below.

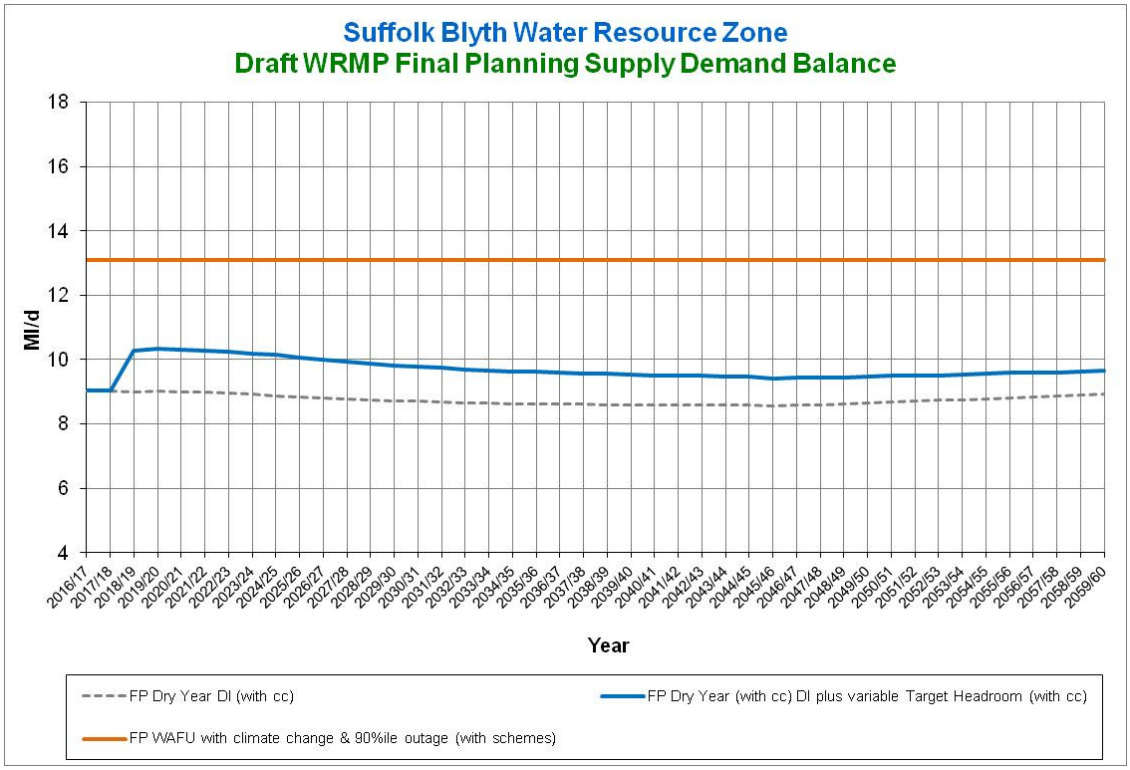


Figure 15: Blyth Draft WRMP Final Planning Supply Demand Balance

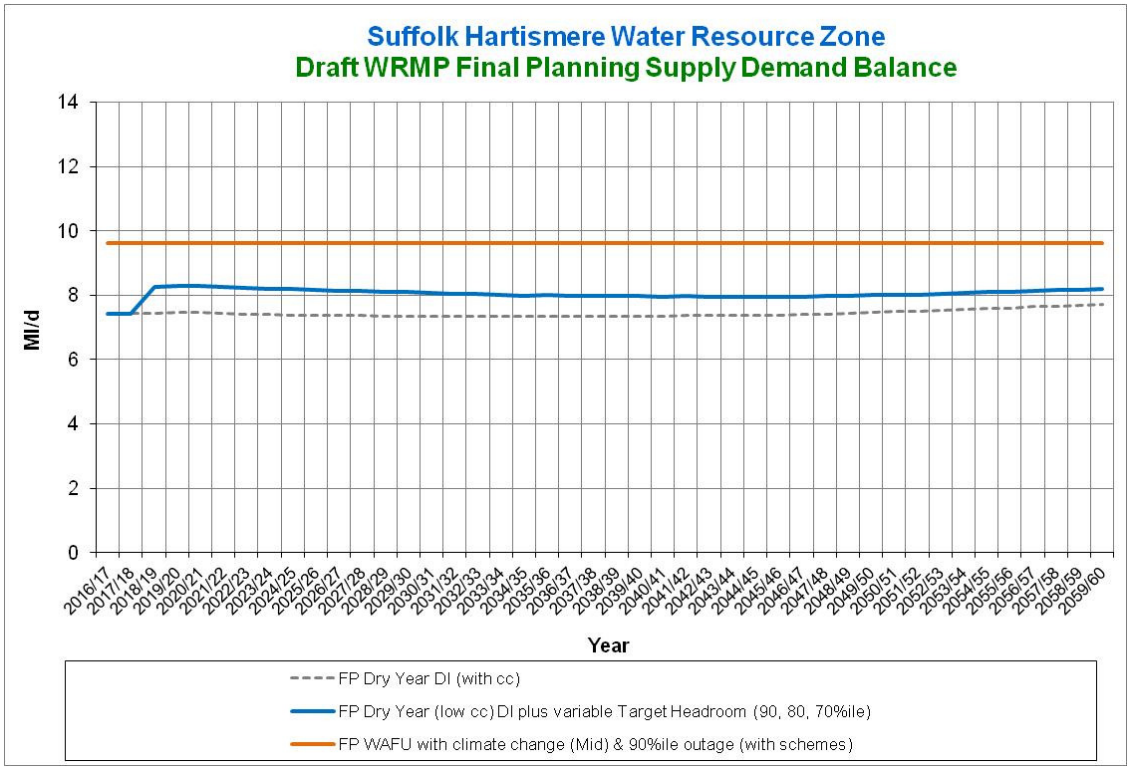


Figure 16: Hartismere Draft WRMP Final Planning Supply Demand Balance

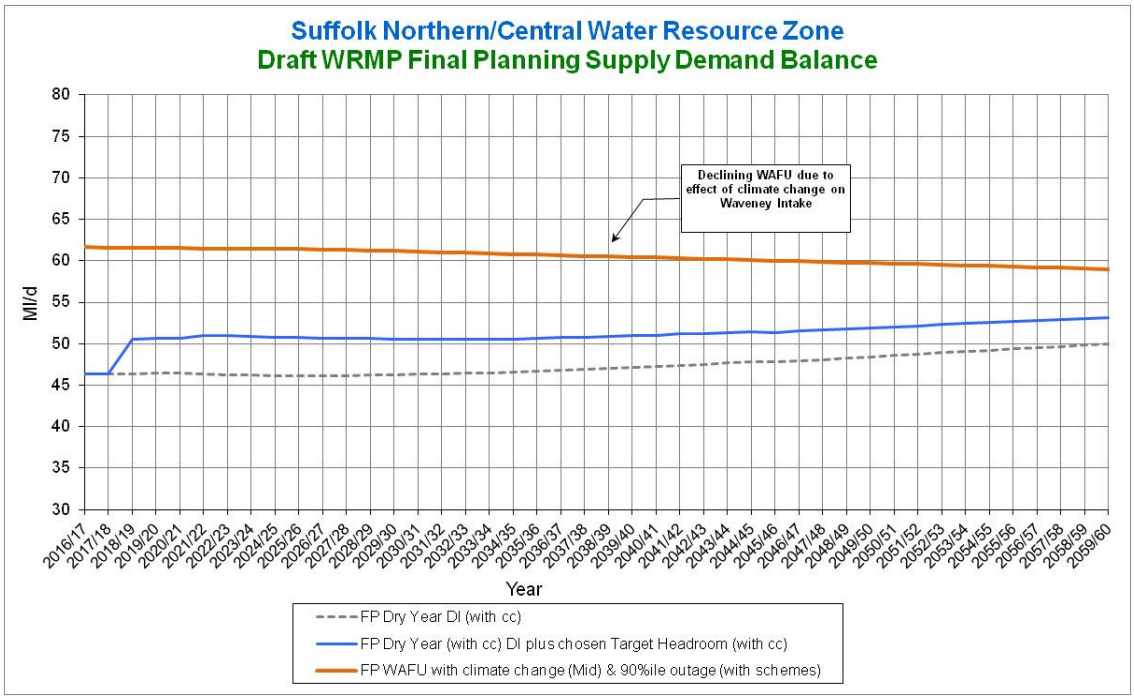


Figure 17: Northern Central Draft WRMP Final Planning Supply Demand Balance

The supply demand balance graphs show that WAFU (Ml/d) is greater than Distribution Input (Customer demand plus an allowance for network leakage) plus Target Headroom (an allowance for uncertainty) across the 25 and 40 year planning periods that we have considered in ourPR19 draft Water Resources Management Plan. Consequently, for this scenario, it can also be concluded that the Drought Plan ensures levels of service are met.

1 in 200 Year Drought

ESW has tested the resilience of it's groundwater sources to a synthetic 1:200 year drought as part of its PR19 draft Water Resources Management Plan (ESW, February 2018). Amec Foster Wheeler (AFW) was employed to carry out groundwater modelling using the Northern East Anglian Chalk (NEAC) and Essex regional groundwater models.

The stochastic weather data generated for the Water Resources East project was imported into the Agency's regional groundwater models. Three model runs were carried out for each regional model; 1 in 200 year Naturalised, 1 in 200 year Fully Licensed (FL) and 1 in 200 year Recent Actual (RA) with ESW sources at FL. It was agreed with the Agency that the most realistic model run was the RA run with all ESW sources at FL, with the exception of the North Essex boreholes and Waveney Augmentation Groundwater Scheme (WAGS), which used utilisation and abstraction rates from ESW's Aquator model.

Modelled groundwater heads for all of ESW's groundwater sources were determined. Further details of the sensitivity testing carried out by AFW is presented in a technical note on the 1 in 200 year drought modelling (AFW, 2017).

For each groundwater source the lowest modelled historical water level experienced between 1970 and 2014 was compared with the lowest modelled 1 in 200 year drought groundwater level during 1949 and 1950. The difference between these two groundwater level heads was then applied to the drought baseline curve for each groundwater source reliable output graph to determine whether there was likely to be a reduction in DO due to a 1 in 200 year drought.

The following graph presents an example of how the drought baseline curve was adjusted for Northern Central Borehole 6 to take into account the modelled change in groundwater level for a 1 in 200 year drought event, to determine whether this would affect the DO of the source.

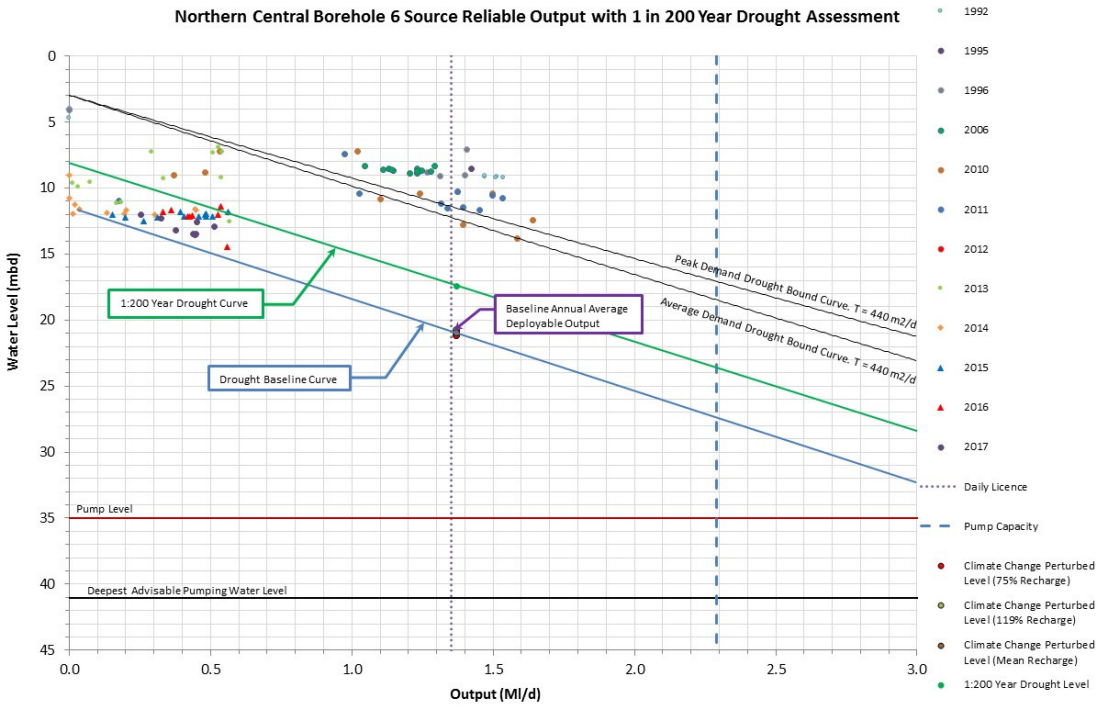


Figure 18: Northern Central Borehole 1 in 200 Year Drought Reliable Yield Assessment

From the groundwater modelling assessment, all Suffolk sources were found to be resilient to a 1 in 200 year drought, with no decline in DO. Consequently, the supply surplus illustrated in each of the Suffolk Water Resource Zone supply demand balance graphs illustrated above remain. This means that drought permits or drought orders would only be required and could only be justified by an exceptional shortage of rainfall caused by a drought with a return period greater than 1 in 200 years.

9.5 Worked Examples

Section 9.4 above illustrates that a supply surplus in all WRZs is maintained across the planning period for both the worst historic drought on record and

the 1 in 200 year drought without the need to impose Level 2 restrictions. Consequently, this makes it difficult to present a worked example. However, there may be times in the future where it is appropriate to implement level 1 (appeal for restraint) and level 2 (temporary use ban) restrictions.

For the Essex WRZ, both level 1 and 2 restrictions may be required in response to Thames Water imposing Level 2 restrictions on their own customers. This is because ESW receives a bulk raw water supply of water to a treatment works near Chigwell in Essex. Under the terms of this bulk supply agreement, the bulk supply could be reduced if Thames Water imposes a level 2 restriction but ESW does not. Consequently, to maintain the Essex system deployable output, ESW may choose to introduce level 1 and 2 restrictions as well.

It is reasonable to present a worked example of how ESW would introduce level 1 and 2 drought restrictions based on when we introduced them in the 1995-1997 drought. This will be a conservative approach as the resilience of all WRZs has been increased since the droughts of the 1990s. For example, the Abberton Scheme significantly increased the resilience of the Essex WRZ in 2014. Additionally, a new treatment works and additional groundwater sources have since been constructed in the Hartismere WRZ.

The worked example below presents the rainfall deficits observed during the drought as well as the points in time at which level 1 and 2 restrictions were imposed in 1997.

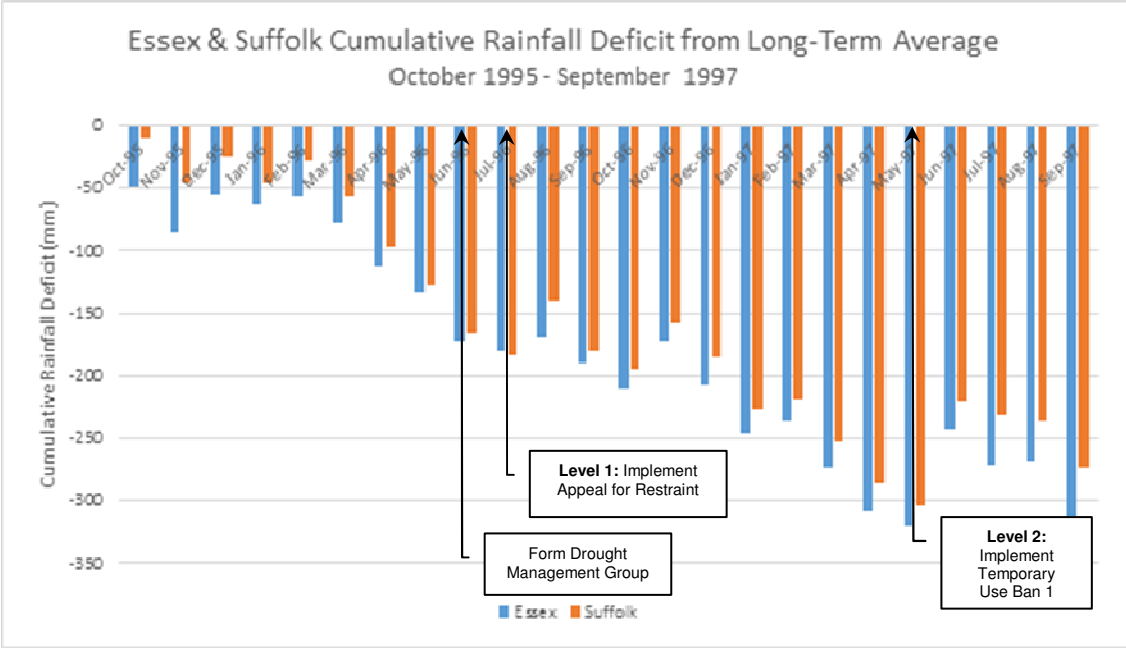


Figure 19: Worked Example of Essex and Suffolk WRZ Drought Triggers

The Environment Agency has recently published a document called "Using the Drought Vulnerability Framework in Water Resources Management Plans" (Environment Agency, November 2017). The framework provides an approach that water companies can use to improve the understanding of the vulnerability of their systems to drought and demonstrate this graphically by

producing 'drought response surfaces' (DRS) for their water resources zones (WRZs). ESW will agree with the Environment Agency whether this approach can be used for ESW's Water Resource Zones. Assuming they can, ESW will report the findings either in its final PR19 Water Resources Management Plan or in water resource management plan annual updates.

10. ENVIRONMENTAL ASSESSMENTS & DROUGHT PERMITS

10.1 Drought Permits

10.1.1 Background

A number of the supply side drought actions detailed in Section 8 above would require ESW to apply to the Environment Agency for a drought permit. The permit would need to b issued to ESW before the drought action could be implemented.

A drought permit application would be submitted to the Environment Agency. The application process for applying for a drought permit is described on .gov.uk (https://www.gov.uk/government/collections/apply-for-a-drought-permit-drought-order-or-emergency-drought-order) and is called "Apply for a drought permit, drought order or emergency drought order".

10.1.2 Drought Permit Application Process

Inline with the application process and guideline, the following information would be submitted with each drought permit application:

i. a draft copy of the permit;
ii. a description of how you'll use the permit;
iii. a map clearly showing where you'll use the permit;
iv. A supporting environmental report (see Section 10.2 below); and
v. an explanation of why you need the permit.

In terms of point iv) above, the explanation of why the permit is required would include:

- evidence of an exceptional shortage of rain - include monthly rainfall figures compared with the long-term average for the area;
- the effects of the current water shortage;
- how many people are affected by the shortage;
- daily demand on the affected water source;
- alternatives to drought permits that you've considered and why you've rejected them;
- what could happen if you don't get a drought permit;
- what you've done so far to reduce demand and conserve supplies;
- what you've done to comply with any relevant water resource management arrangements;
- any operational changes you could make to avoid future drought-related problems; and
- details of your plans for dealing with water shortages in both the area covered by the permit and the wider supply area.

In addition to the above, an application would also include:

- a copy of any existing abstraction licence you hold - plus a copy of any statutory instrument or local act connected to it or to a discharge permitted by the drought permit;
- a copy of the notices and advertisements relating to your application;
- a description of your arrangements for the public inspection of the application;
- comments from anyone you've consulted about the application;
- details of any objections you've already received or agreements you've reached with objectors
- information on timings, publicity activities and how you'll work with any interested people or organisations; and
- any written consent you've had from the navigation authority.

A supporting environmental report (see Section 10.2 below) would be submitted with any permit application. These have been prepared for each of the supply side drought actions and have identified information regarding how the drought action could effect a statutory designated site as well mitigation and monitoring. We would submit the environmental report in full.

If the supply side drought action were to affect a European site such as a Special Area of Conservation or Special Protection Area, then a drought order would be applied for instead.

10.1.3 Drought Permit Application Ready

The Drought Plan Guideline states that water companies should work towards being drought permit application ready with as much preparation work as possible being undertaken in advance of a drought event.

Much of the information that would be required to explain why the permit is required (see above), can only be prepared once the trigger for starting discussions with the Environment Agency has been reached. This is because every drought is different in terms of spatial coverage, magnitude and duration and so it is not possible to present information on rainfall deficits, reservoir storage, customer demand, affected population and demand management measures already implemented in advance of the event. However, data for each of these points is collected as part of our business as usual monitoring programme.

We have already prepared environmental reports for each of the supply side drought actions and updated them in 2017 (see Section 10.2 below).

10.2 Environmental Reports

10.2.1 Background

Some of the supply side drought actions require Environment Agency consent through the formal issue of a drought permit or drought order, both of which require an accompanying environmental report on application.

A baseline environmental report has been prepared for each of the supply side drought actions and are available to read at our Water Resources office. Please email waterresources@nwl.co.uk should you wish to read these reports.

The initial environmental reports were prepared in 2013 in consultation with the Environment Agency and Natural England and were not subject to any improvement actions. ESW has reviewed and updated the environmental reports for the draft Drought Plan 2018. The Company subsequently met with the Environment Agency on 22nd January 2018 to review the Environment Agency's consultation response and to review each of the drought action environmental reports to establish whether the drought action should stay in the Drought Plan (i.e. is it likely that the it could be permitted), whether the Environment Agency has any further information; and whether any further updates of the environmental reports were required. As a result of this meeting, a number of the Suffolk environmental reports (Hartismere Borehole 4 Group, Hartismere Borehole 1, Blyth Borehole 6 and SAGS) will be updated further in 2018 to reflect the output from planned regional model runs.

The reports have been prepared following the approach outlined in the Environment Agency's guideline entitled, Drought Plan Guideline Extra Information: Environmental Assessment for Water Company Drought Plans (May 2016).

The guideline states that the resource used to complete each environmental assessment should be relative to the overall risk and likelihood of use presented by each drought action. Inline with the guidelines, Figure 20 below has been used to assess the level of effort required for each of our supply side drought actions.

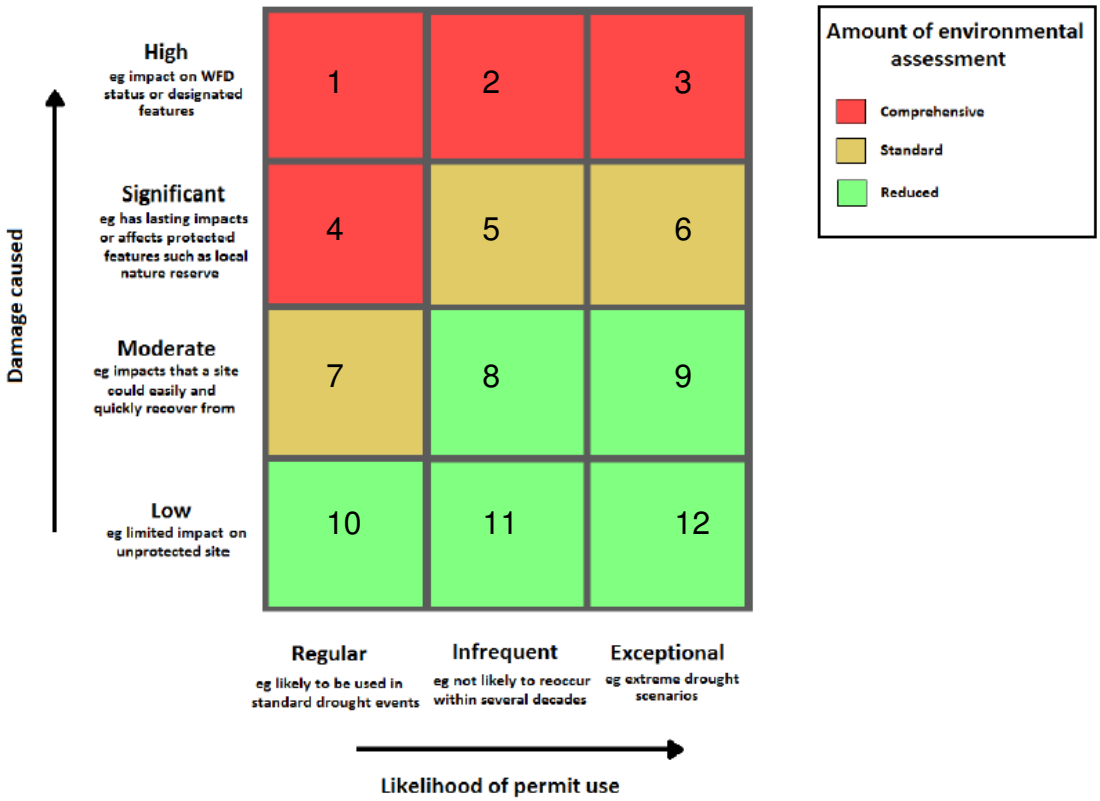


Figure 20: Amount of Environmental Assessment Required Guide (Environment Agency, March 2016).

In summary:

i. all of ESW's supply side drought actions are only likely to be required under infrequent (i.e. not likely to reoccur within several decades) or exceptional (e.g. extreme drought scenarios) conditions. Our justification for this is because no supply side drought actions have been required in the previous 20 years; and
ii. the potential damage caused by our supply side drought actions is likely to be low (e.g. limited impact on unprotected sites) or moderate (e.g. impacts that a site could easily and quickly recover from). The justification for these categories is based on the conclusions of the environmental assessments.

Our environmental assessments have been based on the above assessment although where more detailed data exists, this information has been presented and used in each of the assessments.

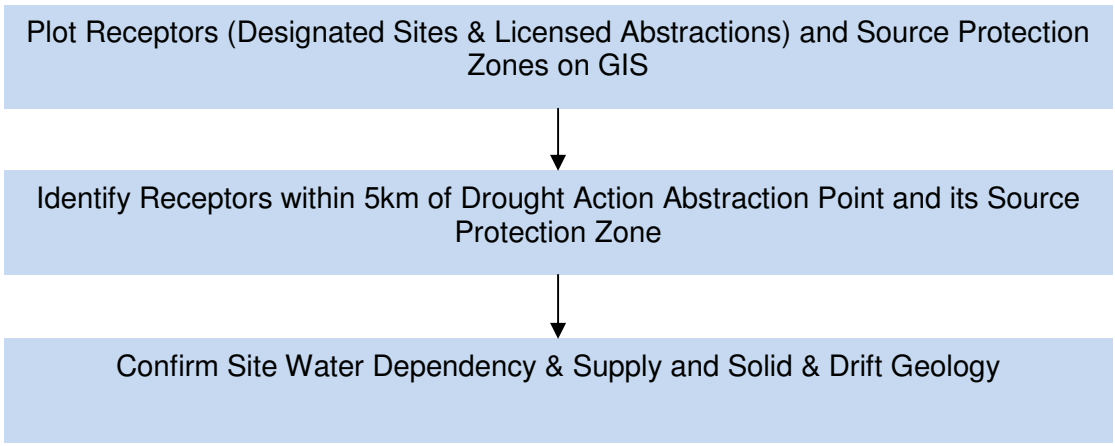
Each environmental report includes the following information:

- **Summary:** A description of the drought action;
- **Baseline Environment:** A description of the current environment (i.e. the aquatic and physical environment, and associated habitats);
- **Monitoring data**;
- **Assessment of the Environmental Impacts of the drought action:** Identification and prediction of impacts on the current environment;

- **Alternatives:** Details of alternative actions / sources;
- **Mitigation**: Compensation measures where adverse effects are identified;
- **Water Framework Compliance Assessment**; and
- An **environmental monitoring plan**.

10.2.2 Drought Action Receptor Screening

The diagram below illustrates the screening process that has been used to identify potential environmental receptors and other protected rights.



A five kilometre designated site search centred on each drought action abstraction point has been undertaken using ESW's Geographical Information System (GIS) APIC (see Figure 21 for overview map and detailed maps in drought action environmental reports). In accordance with the Agency's Drought Plan Guidance, the following designated sites have been identified:

- Special Protection Areas (SPA);
- Special Area of Conservation (SAC);
- Sites of Special Scientific Interest (SSSI);
- National Nature Reserves;
- RAMSAR sites.

The following sites have also been highlighted:

- Local Natures Reserves;
- County Wildlife Sites; and
- RSPB Reserves.

Where available, site citations have been reviewed to identify those sites which are ground and/or surface water dependant and those which are not.

Wetland sites most likely to be at risk of being affected by a drought action have been assessed as those:

i. that fall within the total catchment of the drought action's groundwater protection zone; and

ii. whose groundwater and/or surface water supply is likely to be from the same aquifer or water body as that from which the drought action abstraction point pumps water from. Where possible, this has been assessed following a review of BGS solid and drift geology maps and of ESW borehole logs.

A review of ordnance survey maps has also been undertaken to identify all non-designated rivers and streams within 5 km of the drought action abstraction point.

Licensed abstraction borehole locations within five kilometres of each drought action abstraction point have been provided by the Agency. Groundwater Protection Zones have been used to identify those licensed abstractions most likely to be affected following the implementation of a drought action.

10.2.3 Potential Environmental Receptors

Table 13 below summarises the potential environmental receptors identified during the environmental screening stage. Summary maps showing the locations of these sites are also provided within each of the environmental assessment reports.

Table 13: Potential Environmental Receptors

Receptor	Potential Effects and/or Affected Features
Drought Measure : SAGS	
River Stour and tributaries River Glem and River Brett	Subsequent potential reduction in base-flow may impact river level & flow, with effects on riparian habitats, fish, invertebrates and protected species including otter, water vole, and on eel migration.
Glemsford Pits SSSI	Reduced water level in pits and effect on aquatic habitats and the designated Odonata assemblage.
Drought Measure : Hanningfield Reservoir/Sandon Brook	
Sandon Brook	Reduced water level and flow. Fish and invertebrates, aquatic habitats
Drought Measure : Hartismere Borehole 4 Group Licence	
River Dove	Reduction of baseflow, reduced water levels/flows
River Waveney	Reduction of baseflow, reduced water levels/flows
River Deben	Reduction of baseflow, reduced water levels/flows
River Gipping	Reduction of baseflow, reduced water levels/flows
Hall Farm Meadow	Reduced water levels. Desiccation of meadow flora and fauna

Receptor	Potential Effects and/or Affected Features
Hall Farm Stream	Reduced flows. Fish/invertebrates
Hall Farm Pond	Reduced water levels. Aquatic environment.
Redgrave & Lopham Fen SSSI, Ramsar	Spring fed valley fen. Distinct fen vegetation, wet heath woodland, flora and fauna including Fen Raft Spider, ponds supporting habitat.
Drought Measure : Hartismere Borehole 5 Compensation Flow Reduction	
Hall Farm Meadow	Reduced water levels. Desiccation of meadow flora/fauna
Hall Farm Stream	Reduced flows. Fish/invertebrates
Hall Farm Pond	Reduced water levels. Aquatic environment.
Drought Measure : Hartismere Borehole 1 Boreholes	
River Dove	Reduction of baseflow, reduced water levels/flows
River Deben	Reduction of baseflow, reduced water levels/flows
River Waveney	Reduction of baseflow, reduced water levels/flows
Drought Measure : Blyth Borehole 1 Group Licence	
River Alde	Reduction of baseflow, reduced water levels/flows
River Fromus	Reduction of baseflow, reduced water levels/flows
Gromford Meadow SSSI	Spring fed fen meadow, marshland plants
Cransford Meadow SSSI	Pond and species rich meadows
Drought Measure : Lound Ponds	
Lound Ponds & Fritton Lake	Reduction of water levels.
Drought Measure : Blyth Boreholes 2 and 3	
Hundred River	Reduction of level and flows – aquatic flora/fauna
Leiston Stream	Reduction of level and flows – aquatic flora/fauna
River Alde	Reduction of baseflow, reduced water levels/flows
North Warren	Wetland grazing marshes. Winter wildfowl, butterflies, dragonflies
Leiston-Aldeburgh SSSI/Thorpeness Mere	Birds, plants, shallow mere water body and associated flora, ditch network and plant species.

Receptor	Potential Effects and/or Affected Features
Sizewell Marshes	Wet meadows, invertebrates, birds, plants, aquatic flora.
Crag Aquifer	Saline incursion
Drought Measure : Ormesby Broad & River Bure Group Licence	
Trinity Broads System SSSIs	Lake drawdown effect on residence times and effect on fen groundwater levels. Desmoulin whorl snail, hard oligo-mesotrophic & natural eutrophic lakes, calcareous fen, alluvial forest, otter.
Burgh Common SSSI	Desmoulin whorl snail, oligotrophic & eutrophic lakes, marginal fen, wet woodland, otter
Hall Farm Fen SSSI	Fen and eutrophic ditches
The Broads SAC	All of the above.
Bure Broads & Marshes SSSI	Wetland drawdown, saline incursion, low flows, Desmoulin whorl snail, hard oligo-mesotrophic & natural eutrophic lakes, calcareous fen, alluvial forest, otter, birds

ESW has undertaken a review of Local Biodiversity Action Plans. A number of water dependant habitats and species have been identified as being potential receptors to ESW drought actions, including:

Habitats

- Fen
- Reedbed
- Mesotrophic Lakes

Species

- Eel
- Otter
- Water Vole
- Desmoulin's whorl snail

ESW fully understands its BAP duties and where a BAP habitat or species has not been fully considered in the current environmental assessment reports, the Company will consider that the effects of its drought actions on BAP habitats and species will be assessed in a timely manner prior to a supply side drought action being submitted.

Fens, reedbed, mesotrophic lakes and Desmoulins Whorl Snail specifically relate to the Ormesby/Bure drought action and are covered by the Ormesby/Bure environmental report.

ESW is already working with the Environment Agency to ensure that all of its river intakes and structures are compliant with the Eel Regulations. All of its river intakes will have been fitted with compliant eel screens by 31 March 2020.

In terms of water vole and otters, ESW will liaise with Wildlife Trust officers should supply side drought measures be required.

10.3 Environmental Assessment

An assessment of the potential effects of each drought action on the identified receptors has been undertaken. This was based on a review of existing environmental reports and of baseline drought monitoring data.

A generic list of potential effects provided in Table 14 below has also been used to facilitate the identification of possible effects.

Table 14: Potential Environmental Effects Arising from Drought Actions

Effect	Potential Monitoring
Base flow	Impact of groundwater abstractions on: ▪ base flows to rivers ▪ discharges to wetland fen, littoral margin and open water habitats ▪ wetland open water levels
Surface and Groundwater levels	Impact of surface water abstractions on: ▪ river levels and flows ▪ wetland groundwater levels
Desiccation	Desiccation of wetland habitats (fen, river corridors, river corridor margins, reed bed etc.)
Derogation / Protected Rights	Impact of surface and groundwater abstractions on other abstractors.
Fish / Invertebrate Stress / Kills	Concentration of pollutants as the volume of water in the river is reduced with consequent impacts on sensitive species of fish and invertebrates Higher water temperatures and reduced oxygen levels in the water may cause stress to fish and invertebrates. During low flows fish congregate in pools where they are more susceptible to pollution, predation and spread of disease and parasites.
Turbid Water	Concentration of nutrients, reduced flushing and increased algal residence times which could lead to turbid water conditions.
Aesthetics	Aesthetic quality of the habitat reduced.
Siltation	Reduced flows can lead to siltation of channels which can clog up fish spawning grounds or cover eggs that have already been laid, starving the developing embryo of oxygen;
Fish Spawning	Fish may not be able to access shallows for spawning.
Fish Migration	Trout may not be able to migrate due to low water levels

Effect	Potential Monitoring
	and associated obstructions.
Saline Intrusion	Lower flows on tidal rivers could result in the movement of saline water further upstream.

The results of the environmental assessment have been presented in the drought action environmental reports described in Section 10.1 above. A summary of the environmental effects identified is presented in Appendix B.

10.4 Environmental Monitoring

10.4.1 Essex & Suffolk Water

An Environmental Monitoring Plan is required to facilitate understanding of the effects of a drought and drought actions on the environment both before (baseline), during and after the implementation of a drought action. The level of monitoring needed is risk-based.

The drought plan guideline states that water companies should plan to collect adequate data about the normal conditions at any sites drought actions might adversely affect and that this should be done as soon as is practical after the publication of the company's plan. Normal conditions are the conditions at the site that exist when a drought is not taking place or about to happen (i.e. no drought action or drought action mitigation is in place).

Not all sites will require in-drought and post-drought monitoring. Where an action has low risk to the environment, no further monitoring has been proposed. Where moderate to major environmental risk has been identified, monitoring has been focused on those features sensitive to the likely impacts from implementing drought management actions.

By undertaking baseline monitoring under non-drought conditions, a body of evidence can be gathered to support and potentially speed up drought permit/drought order applications, and guide the wider decision making process.

In-drought monitoring is required to assess the impacts from the implementation of the drought action and for the management of mitigation actions during a drought. Post-drought monitoring aims to assess a site's recovery and to assess the success of any mitigation measures used.

The environmental monitoring process can be as summarised in the following diagram.

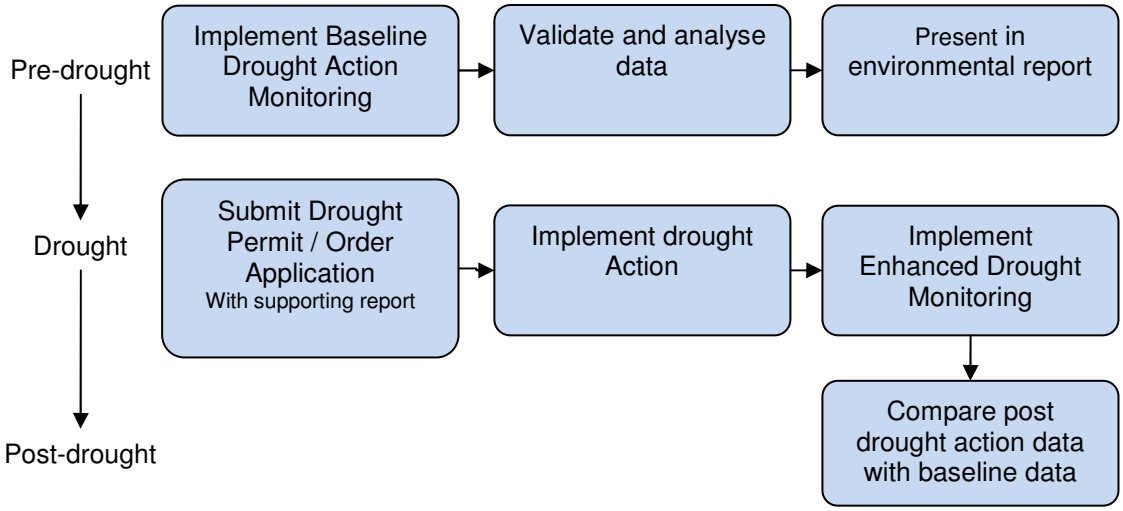


Figure 22: Environmental Monitoring Process

ESW's Environmental Monitoring Plans are located within the separate supply side drought action environmental assessment reports although have also been reproduced in Appendix C of the Drought Plan.

Baseline environmental monitoring data has been used in undertaking the drought action environmental assessments and Habitats Regulation Assessment.

The types of monitoring considered for each drought action are presented in Table 15 below.

Table 15: Types of Drought Action Monitoring

Effect	Potential Monitoring
Base flow	
Impact of groundwater abstractions on: • *base flows to rivers* • *discharges to wetland fen, littoral margin and open water habitats* • *wetland open water levels*	Wetland groundwater levels River Flow Spot Gauging / Gauging Station
Surface and Groundwater levels	
Impact of surface water abstractions on: • *river levels and flows* • *wetland groundwater levels*	Wetland groundwater levels River Flow Spot Gauging / Gauging Station
Desiccation	
Desiccation of wetland habitats (fen, river corridors, river corridor margins, reed bed etc.)	Open water surface water levels Wetland groundwater levels
Derogation / Protected Rights	
Impact of surface and groundwater abstractions on other abstractors.	Groundwater levels River Flow Spot Gauging / Gauging Station

Effect	Potential Monitoring
Fish / Invertebrate Stress / Kills	
Concentration of pollutants as the volume of water in the river is reduced with consequent impacts on sensitive species of fish and invertebrates	Water Quality Analysis (Particularly BOD and DO concentrations)
	River Flow Spot Gauging
Higher water temperatures and reduced oxygen levels in the water may cause stress to fish and invertebrates.	Fisheries surveys
	Temperature, BOD and DO & Visual
During low flows fish congregate in pools where they are more susceptible to pollution, predation and spread of disease and parasites.	Fisheries surveys
Turbid Water	
Concentration of nutrients, reduced flushing and increased algal residence times which could lead to turbid water conditions.	Water Quality Analysis (Particularly N and P and algal counts)
Aesthetics	
Aesthetic quality of the habitat reduced.	Visual
Siltation	
Reduced flows can lead to siltation of channels which can clog up fish spawning grounds or cover eggs that have already been laid, starving the developing embryo of oxygen;	Channel depth
	Siltation using mats
Fish Spawning	
Fish may not be able to access shallows for spawning.	Fisheries surveys
Fish Migration	
Trout may not be able to migrate due to low water levels and associated obstructions.	Fisheries surveys
Saline Intrusion	
Lower flows on tidal rivers could result in the movement of saline water further upstream.	Water Quality Analysis (EC)

10.4.2 Data Sharing

ESW will share its data with the Environment Agency and other water companies providing it is being used solely for the purposes of drought monitoring. All data requests should be made by emailing waterresources@eswater.co.uk.

The Environment Agency has also agreed to share details of existing long-term ecological and environmental data records with water companies.

10.5 Mitigation

Where adverse impacts associated with a particular supply side drought action have been identified as part of the environmental assessment, details of likely mitigation or compensation measures have been proposed in the environmental assessment reports. Mitigation measures generally fall into one of the following categories:

- Abstraction management
- Compensation discharges to augment surface water bodies
- Aeration to raise dissolved oxygen concentrations to prevent fish stress/kills.

Mitigation actions will be agreed with the Environment Agency and Natural England prior to a drought permit / order application being made. The mitigation will be based on the level of understanding gained through environmental monitoring and assessment and on experience from previous droughts.

10.6 Habitats Regulation Assessment

10.6.1 Drought Plan 2018 Assessment

As a competent authority, NWL is required to undertake a Habitats Regulation Assessment to assess the potential effects on European sites (also known as a Natura 2000 site) of implementing the Drought Plan. The European sites include:

- Special Areas of Conservation (SACs) designated under the Habitats Directive which protect habitats and non-avian species of European importance;
- Special Protection Areas (SPAs) designated under the Birds Directive which protects bird species of European importance; and
- areas designated as globally important wetlands under the Ramsar Convention (1971).

The purpose of HRA is to consider the impacts of the Drought Plan against the effected European site's conservation objectives to ascertain whether the site integrity would be adversely affected. Where significant effects are likely, alternative options should be examined else imperative reasons of over riding public interest must be demonstrated.

Due to the proximity of the Blyth Borehole 1 group licence, Hartismere Borehole 4 group licence and Ormesby / Bure licence drought action abstraction points to European sites, an assessment was undertaken in 2012 for the previous Drought Plan to establish whether significant effects are likely. The results of this assessment are presented in a separate report entitled, Revised Drought Plan Habitats Regulation Assessment Screening Report (2012) which was approved by both the Environment Agency and Natural

England. ESW has reviewed the report as part of this Drought Plan update and has concluded that no changes to the report are required.

For the Ormesby/Bure, Blyth Borehole 1 and Hartismere Borehole 4 Group Licence drought actions, given the quantities of additional licence and the proposed monitoring and mitigation measures, this assessment concludes that it is unlikely that significant adverse effect would be caused. Consequently, a conclusion of no likely significant effects has been drawn meaning that an Appropriate Assessment for these drought actions is not required.

10.6.2 Review of Consents Licence Changes

An outcome of the Environment Agency's review of Consents process was that three of ESW's abstraction licences were modified as follows:

Trinity Broads: Inclusion of an abstraction cessation level
Northern Central Borehole 1 Licence: Inclusion of a condition that requires a compensation discharge to be made to Geldeston Meadows ditch system once groundwater levels fall below a drought trigger.
Blyth Borehole 1 Licence: Inclusion of a condition that requires a compensation discharge to be made to the River Alde once river flows fall below a drought trigger.

These requirements have been built into our Water Resources Management Plan deployable output assessments both for worst historical droughts on record and also for a 1 in 200 year drought.

ESW's Water Resources Management Plan and Drought Plan both plan for full compliance with these new licence conditions during all droughts.

10.7 Strategic Environmental Assessment

ESW completed a Strategic Environmental Assessment (SEA) of the supply side drought actions identified in its previous Drought Plan. Where appropriate, mitigation measures were identified (the same as those identified in the drought action monitoring plans) to prevent, reduce or offset significant adverse environmental effects. The SEA was documented in a SEA environmental report entitled Drought Plan SEA Environment Report (2012) and was accepted by the Environment Agency and Natural England at the same time as the draft Drought Plan.

A screening exercise (see figure overleaf) was completed to see whether an SEA should be completed for this draft Drought Plan.

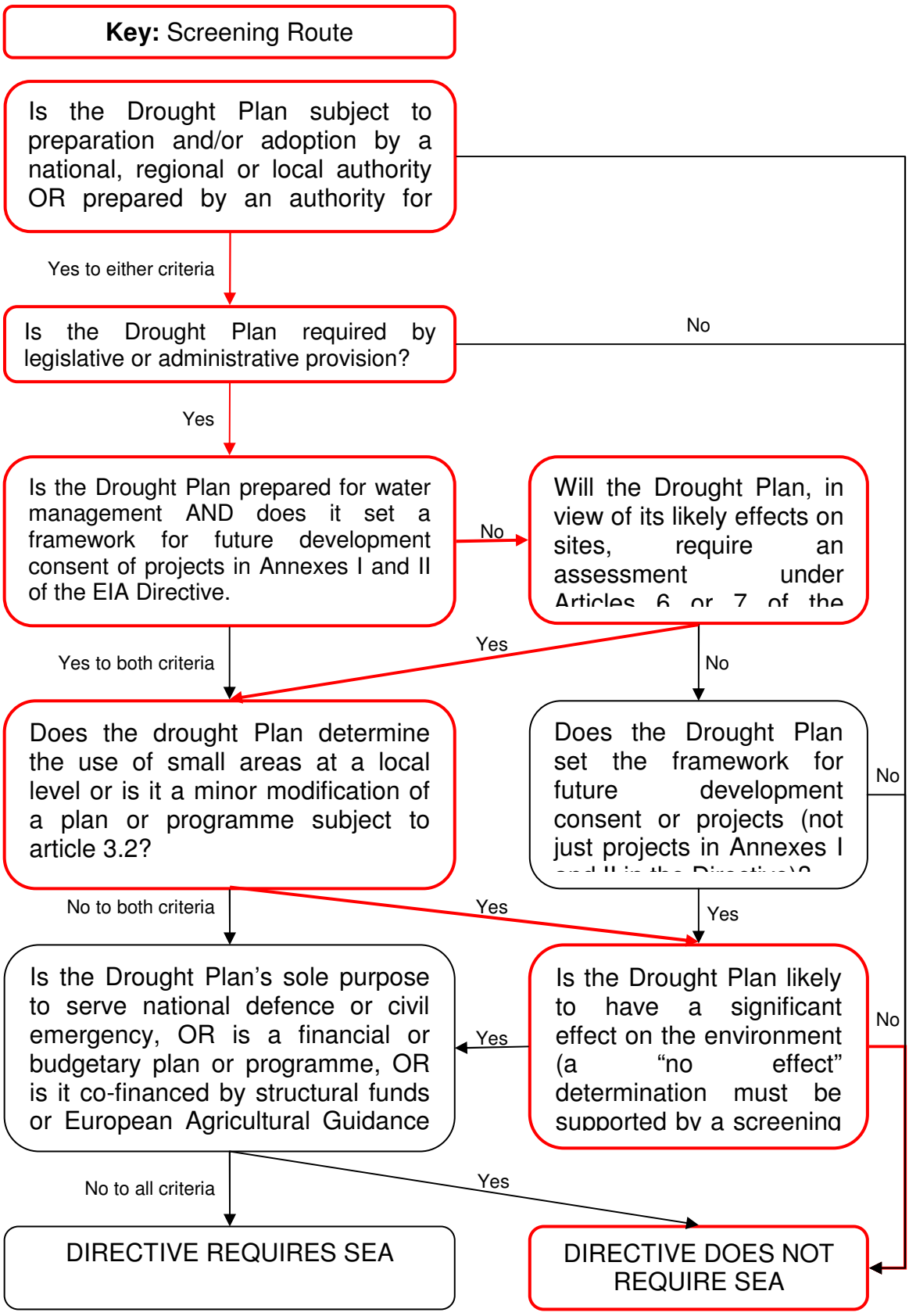
The results of the screening exercise are as follows:

i. The Drought Plan will be prepared and adopted by NWL who, under the EIA Directive, is considered an "authority";

ii. The Drought Plan is required by legislative provision, being a statutory document under the Water Act 2003 amending the Water Industry Act 1991;
iii. The Drought Plan will be prepared for water management but does not set a framework for future development;
iv. The Drought Plan, in view of its potential likely effects on sites, require an assessment under Articles 6 or 7 of the habitats Directive;
v. The drought Plan does not determine the use of small areas at a local level but is a minor modification of a plan or programme subject to article 3.2; and
vi. We do not believe that this action will have significant effect on the environment.

The supply side drought actions in our current Drought Plan were assessed after mitigation not to have a significant effect on the environment. This would mean that SEA is not required.

Following a pre-consultation meeting on 15 March 2017, Natural England confirmed that there would not be a requirement for an SEA of the updated plan providing there are no new supply side drought actions.



Source: UKWIR (2007) SEA Guidance for Water Resources Mgt Plans & Drought Plans

Figure 23: Key Stages of Screening

10.8 Water Framework Directive Compliance Assessment

10.8.1 Background

The Water Framework Directive (WFD) requires all water bodies to meet Good Ecological Status (GES) or Good Ecological Potential (GEP). Overall ecological status or potential is made up of a number of biological, physiochemical, hydromorphological and chemical quality characteristics called elements. The overall status is determined by the lowest element status. For example, if biological status was 'moderate' and the rest of the components were 'good', the overall status of the water body would be 'moderate'.

Article 4.1 of the WFD sets the following 'Environmental Objectives' which are relevant to a drought permit or drought order application. These are:

- **WFD Objective 1:** No changes affecting high status sites
- **WFD Objective 2:** No changes that will cause surface water bodies to fail to achieve GES or GEP
- **WFD Objective 3:** No changes that will result in a deterioration of surface water bodies 'Ecological Status' or 'Ecological Potential'
- **WFD Objective 4:** No changes that will permanently prevent or compromise the 'Environmental Objectives' being met in other water bodies
- **WFD Objective 5:** No changes that will cause failure to meet good groundwater status, or result in a deterioration of groundwater status.

While objectives 3 and 5 above state that there should be no deterioration of water body status, Article 4.6 of the WFD provides an exception that allows a temporary deterioration in status if caused by an exceptional or unforeseen event such as extreme floods, prolonged droughts or accidents.

ESW has not needed to apply for a drought permit or drought order in the previous 20 years. In deed, the last time we imposed a hosepipe ban (now a temporary use ban 1) was in 1997/98. There have been subsequent dry / drought years, notably in 2012 although an appeal for restraint was only required. We therefore think that it is reasonable to conclude that a Suffolk drought worse than 1996/97 (Suffolk design drought year) and an Essex drought worse than 1933/34 (the Essex WRZ design drought year) would be required before we would even need to consider drought permits. Consequently, we consider that article 4.6 would allow for any temporary deterioration caused by ESW drought [permit applications.

Nevertheless, in line with the WFD, we would ensure that all practicable steps were taken to prevent any deterioration in status and to limit it where possible.

We have undertaken a WFD assessment and have considered the effects of our supply side drought actions on WFD objectives and water body classification. The results are presented in each of the supply side environmental assessment reports.

10.8.2 Approach

The WFD assessment methodology is as follows:

Step 1: Scope the assessment through baseline data collection and define the sensitivity of water bodies

Step 2: Define quality elements and define issues and features at a water body scale

Step 3: Screening of the application against the five WFD objectives to determine if the application has any impact on the criteria identified for those water bodies
Step 4: Detailed assessment is undertaken for those criteria where potential adverse effect has been identified to determine the effects in relation to the WFD objectives:

- Identified impacts are then considered in relation to the ecological and chemical status objectives
- The application is then assessed to determine compliance of the scheme against relevant standards or objectives for sites under other EU legislation (as identified in Article 4.9 of the WFD)
- For HMWB the application is then also assessed against their relevant mitigation measures to determine whether the scheme complies with the overarching relevant WFD objective.

Step 5: Article 4.6 and 4.7 test. If the application is predicted to cause temporary deterioration in WFD water body status or prevent the water body from meeting its' objectives, then an assessment is also made against the conditions listed in Article 4.6 and 4.7.

The following information has been used in the WFD assessment:

- Details of relevant surface and groundwater bodies that may be affected by proposed drought actions
- information on the biological and chemical condition of these water bodies
- details of any reasons for failure to achieve GES/GEP
- sensitivity of the water bodies to the proposed drought action
- details of any measures identified to achieve GES/GEP and whether these will be affected by the proposed drought action
- any mitigation measures and details of alternative actions to ensure compliance with WFD environmental objectives.

Much of the above information has been sourced from the EA's Anglian River Basin Management Plan and its annexes.

10.8.3 Conclusions

Following an initial assessment of each of the supply side drought actions, it has been possible to conclude that this Drought Plan is WFD compliant. This is because one of the following conclusions have been drawn:

i. It has been possible to demonstrate that a proposed drought action is not likely to have a significant effect on the environment and therefore that it is also possible to conclude compliance against the WFD environmental objectives; or

ii. Although a drought action has been assessed as likely to temporarily effect WFD objectives or temporarily cause deterioration to a water body, appropriate mitigation measures to prevent deterioration have been proposed as part of the monitoring and mitigation plan within the drought plan.

11. COMMUNICATIONS PLAN

11.1 Background

This chapter forms ESW's Drought Communication Strategy.

Communication in a drought is essential and can be separated into that required with customers, and that required with regulators (principally the Environment Agency) and other stakeholders.

It is important to note that no two droughts are ever the same. Therefore, it is important there is flexibility in the drought communications plan. Communication tools and methods outlined below will be deployed taking into account prevailing conditions and adapting as appropriate as a drought develops.

11.2 Approach

ESW has a well-developed ongoing campaign to encourage customers to use water wisely.

The promotion of water efficiency to customers has been an important part of managing supplies of water since 1997, following the last major drought and during 2011 when water resources were significantly low.

'Using water wisely' and 'taking care of a precious resource' messages are central themes in Essex & Suffolk Water's communication plan. They are applied all year round and to different stakeholder and customer groups. A dedicated communications team works closely to ensure that all its activities enforce and do not dilute the need for water efficiency.

We would break our communications into reactive and proactive with different messaging to specific audiences.

Essex & Suffolk Water runs pro-active campaigns every year under the 'Every Drop Counts' banner with two sub-campaigns in the programme. This would run alongside reactive media responses based around our core central messages of 'Using water wisely' and 'taking care of a precious resource'.

Any communications plan is compiled to raise awareness, give timely and accurate information on the water resource situation and to offer advice and encouragement on using water wisely. The strategy also seeks to identify audiences for communications and to structure messaging aimed at specific groups and stakeholders. This strategy will make use of and seek to mirror the Environment Agency's Drought Communication messaging for reactive messages and link into our pro-active messaging aimed at key active audiences responsive to those messages, effectively mobilising the support of our customers in response to climatic conditions.

The communications team is based at Hanningfield treatment works near Chelmsford and is part of and supported by a larger Northumbrian Water Group Corporate Affairs team working in Durham.

All the members of the team ultimately report to the Director of Corporate Affairs who in turn reports directly to the Chief Executive Officer. This enables access to key decision makers and a closer understanding of strategic issues and policies. It also gives the southern team access to additional resources, in particular additional trained media personnel who can deal quickly with print and broadcast enquiries.

The Corporate Affairs team also includes specialists working in internal communications to ensure all employees are engaged, understand key messages and are able to act as advocates to our customers

The team works closely with NWG's marketing team, which can produce readable and eye-catching materials in-house which might be needed to support a water efficiency campaign. The team also manage the Essex & Suffolk Water website, which will be a key communication channel during drought. The marketing team is also able to provide specialist research support providing key audience insight to help shape communications activity.

The roles of the southern External Communications team cover:

- Pro-active and reactive media (print, broadcast and online)
- Public Affairs and NGO stakeholder communication
- Education, sponsorship and community support
- Social media and video

Audiences

The audiences for specific messaging around drought communications are:

- Household customers
- Employees
- Suppliers and partner
- Non-household customers
- External stakeholders and specialist interest groups
- Media

Messages will be tailored so that are relevant and impactful for each audience; while at the same time ensuring there is consistency.

Broad messaging will be developed that is appropriate for our people and for use in direct customer communications. This messaging will be important to give our employees across the business the confidence to answer questions from customers they interact with on a daily basis, their neighbours, families and the public about the developing situation. Employees are powerful advocates and ambassadors for drought messages and we know from past

experience that often frontline employees are first to get questioned about any drought situation.

Some external stakeholder audiences are partner organisations, may benefit from a more detailed briefing about the current water supply situation or more specific information about particular aspects. This could range from a specialist interest group, charitable partner, environmental NGO, to MPs or local councillors or the water retailers.

The media audience will be targeted to primarily help communicate with domestic customers and the wider public about the developing drought situation and to allow for wider dissemination of the key messages.

By identifying the key audiences we have some flexibility, should it be necessary, to address different messages to different groups. This is most likely to involve more detailed briefing for stakeholder audience groups.

11.3 Key Messages

Messages need to be reinforced by the facts, so ESW continually and consistently repeats information about below average rainfall combined with the demands of a developing region.

In addition, messages are communicated regarding the need to manage water resources for a sustainable future that protects wildlife and habitats as well as customer needs.

ESW's responsibility to manage its water resources carefully and skilfully is emphasised. That means encouraging metering, reducing leakage and applying innovative and carefully researched planning to the use of our water resources.

Mirroring the Environment Agency's Drought Messaging structure, Essex & Suffolk Water has developed its own specific messaging for different stakeholder groups.

The key overall messaging is likely to be the same for all groups and it is important for the water company to give a consistent message to the public, customers, stakeholders and the media. Please see the tables below for the specific messages.

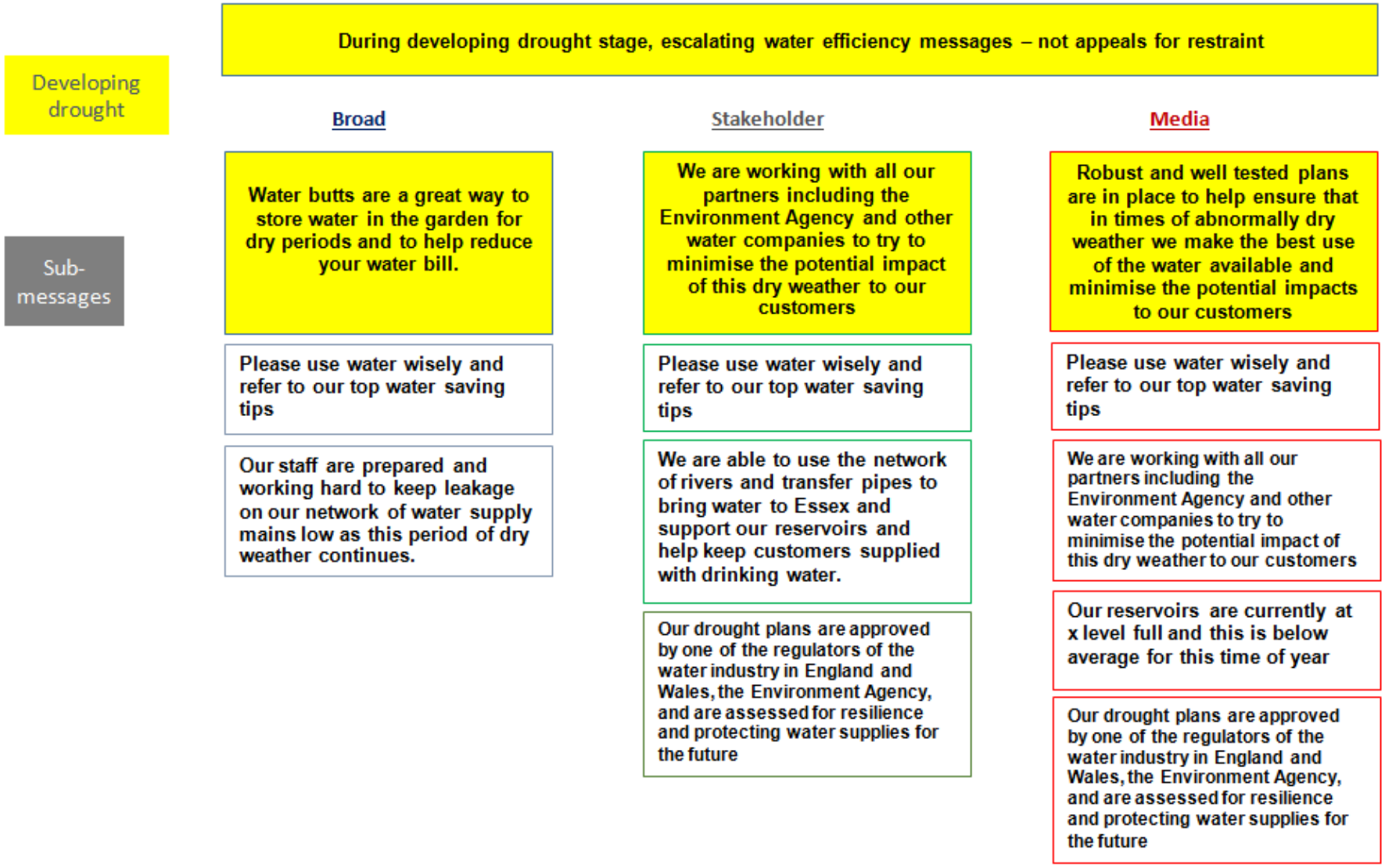
A list of top water saving advice would also be attached and used in-conjunction to these key messages where appropriate and these tips relate to garden and outdoor advice as well as inside the home

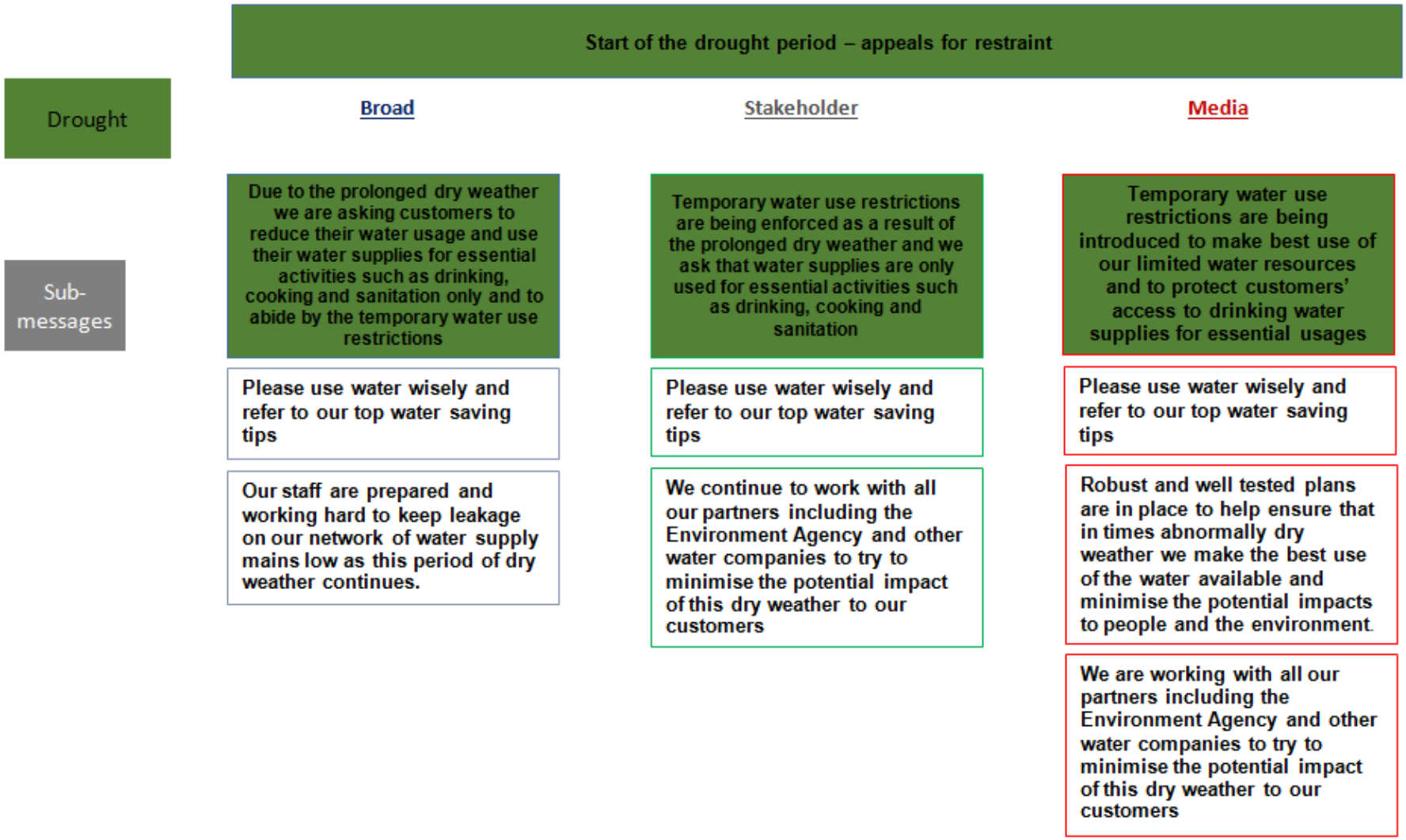
11.4 Key messages during a drought

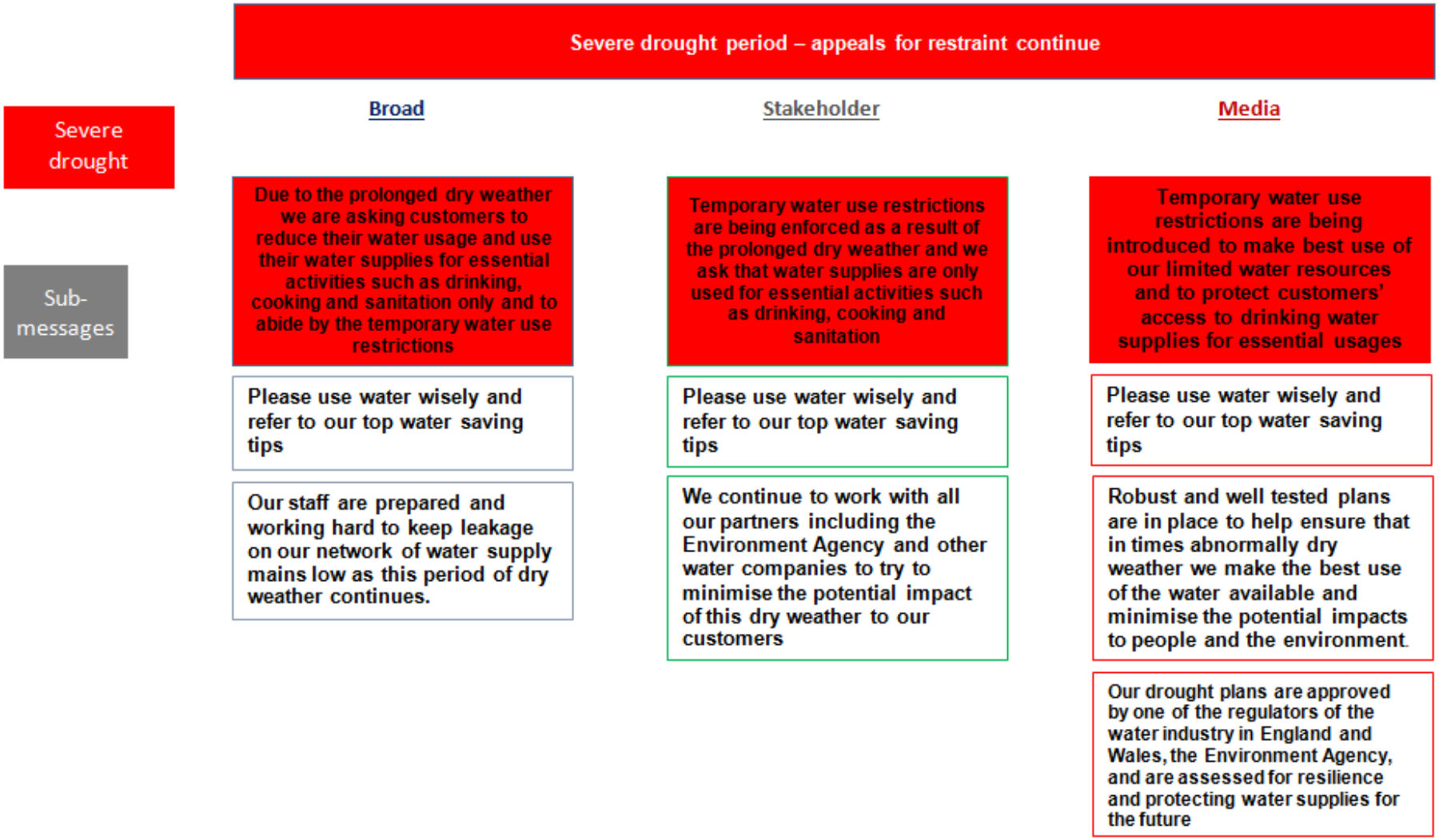
The tables below set out our key messaging and the audiences.

Overview of primary reactive drought message for each drought stage

	Broad	Stakeholders	Media
Normal	The weather conditions are normal, and levels of water are fairly typical for the time of year.	The weather conditions are normal, and levels of water are fairly typical for the time of year.	The weather conditions are normal, and levels of water are fairly typical for the time of year.
Developing drought	We are continuing to monitor our water resources situation and the ongoing low rainfall - Please use water wisely.	We are working with all our partners including the Environment Agency and other water companies to try to minimise the potential impact of this dry weather to our customers	Robust and well tested plans are in place to help ensure that in times of abnormally dry weather we make the best use of the water available and minimise the potential impacts to our customers
Drought	**Our water resources are below average for this time of the year following low rainfall – Please reduce your water usage**	**Our water resources are below average for this time of the year following low rainfall – Please reduce your water usage**	**Our water resources are below average for this time of the year following low rainfall – Please reduce your water usage**
Severe drought	**Due to the prolonged dry weather we are asking customers to reduce their water usage and use their water supplies for essential activities such as drinking, cooking and sanitation only and to abide by the temporary water use restrictions**	**We would ask customers to think very carefully about the amount of water they use following below average rainfall – It is important that customers reduce their water usage immediatley.**	**We would ask customers to think very carefully about the amount of water they use following below average rainfall – It is important that customers reduce their water usage immediatley.**
Recovering from drought	After the recent rainfall, our reservoirs and resources are recovering. It takes time for levels of water to recover. Please continue to use water wisely.	After the recent rainfall, our reservoirs and resources are recovering. It takes time for levels of water to recover. Please continue to use water wisely.	After the recent rainfall, our reservoirs and resources are recovering. It takes time for levels of water to recover. Please continue to use water wisely.


During developing drought stage, escalating water efficiency messages – not appeals for restraint
Developing drought
Sub-messages
Broad
Stakeholder
Media
Water butts are a great way to store water in the garden for dry periods and to help reduce your water bill.
We are working with all our partners including the Environment Agency and other water companies to try to minimise the potential impact of this dry weather to our customers
Robust and well tested plans are in place to help ensure that in times of abnormally dry weather we make the best use of the water available and minimise the potential impacts to our customers
Please use water wisely and refer to our top water saving tips
Please use water wisely and refer to our top water saving tips
Please use water wisely and refer to our top water saving tips
Our staff are prepared and working hard to keep leakage on our network of water supply mains low as this period of dry weather continues.
We are able to use the network of rivers and transfer pipes to bring water to Essex and support our reservoirs and help keep customers supplied with drinking water.
We are working with all our partners including the Environment Agency and other water companies to try to minimise the potential impact of this dry weather to our customers
Our drought plans are approved by one of the regulators of the water industry in England and Wales, the Environment Agency, and are assessed for resilience and protecting water supplies for the future
Our reservoirs are currently at x level full and this is below average for this time of year
Our drought plans are approved by one of the regulators of the water industry in England and Wales, the Environment Agency, and are assessed for resilience and protecting water supplies for the future


Start of the drought period – appeals for restraint
Drought
Broad
Stakeholder
Media
Sub-messages
Due to the prolonged dry weather we are asking customers to reduce their water usage and use their water supplies for essential activities such as drinking, cooking and sanitation only and to abide by the temporary water use restrictions
Please use water wisely and refer to our top water saving tips
Our staff are prepared and working hard to keep leakage on our network of water supply mains low as this period of dry weather continues.
Temporary water use restrictions are being enforced as a result of the prolonged dry weather and we ask that water supplies are only used for essential activities such as drinking, cooking and sanitation
Please use water wisely and refer to our top water saving tips
We continue to work with all our partners including the Environment Agency and other water companies to try to minimise the potential impact of this dry weather to our customers
Temporary water use restrictions are being introduced to make best use of our limited water resources and to protect customers' access to drinking water supplies for essential usages
Please use water wisely and refer to our top water saving tips
Robust and well tested plans are in place to help ensure that in times abnormally dry weather we make the best use of the water available and minimise the potential impacts to people and the environment.
We are working with all our partners including the Environment Agency and other water companies to try to minimise the potential impact of this dry weather to our customers


Severe drought period – appeals for restraint continue
Severe drought
Sub-messages
Broad
Stakeholder
Media
Due to the prolonged dry weather we are asking customers to reduce their water usage and use their water supplies for essential activities such as drinking, cooking and sanitation only and to abide by the temporary water use restrictions
Temporary water use restrictions are being enforced as a result of the prolonged dry weather and we ask that water supplies are only used for essential activities such as drinking, cooking and sanitation
Temporary water use restrictions are being introduced to make best use of our limited water resources and to protect customers' access to drinking water supplies for essential usages
Please use water wisely and refer to our top water saving tips
Please use water wisely and refer to our top water saving tips
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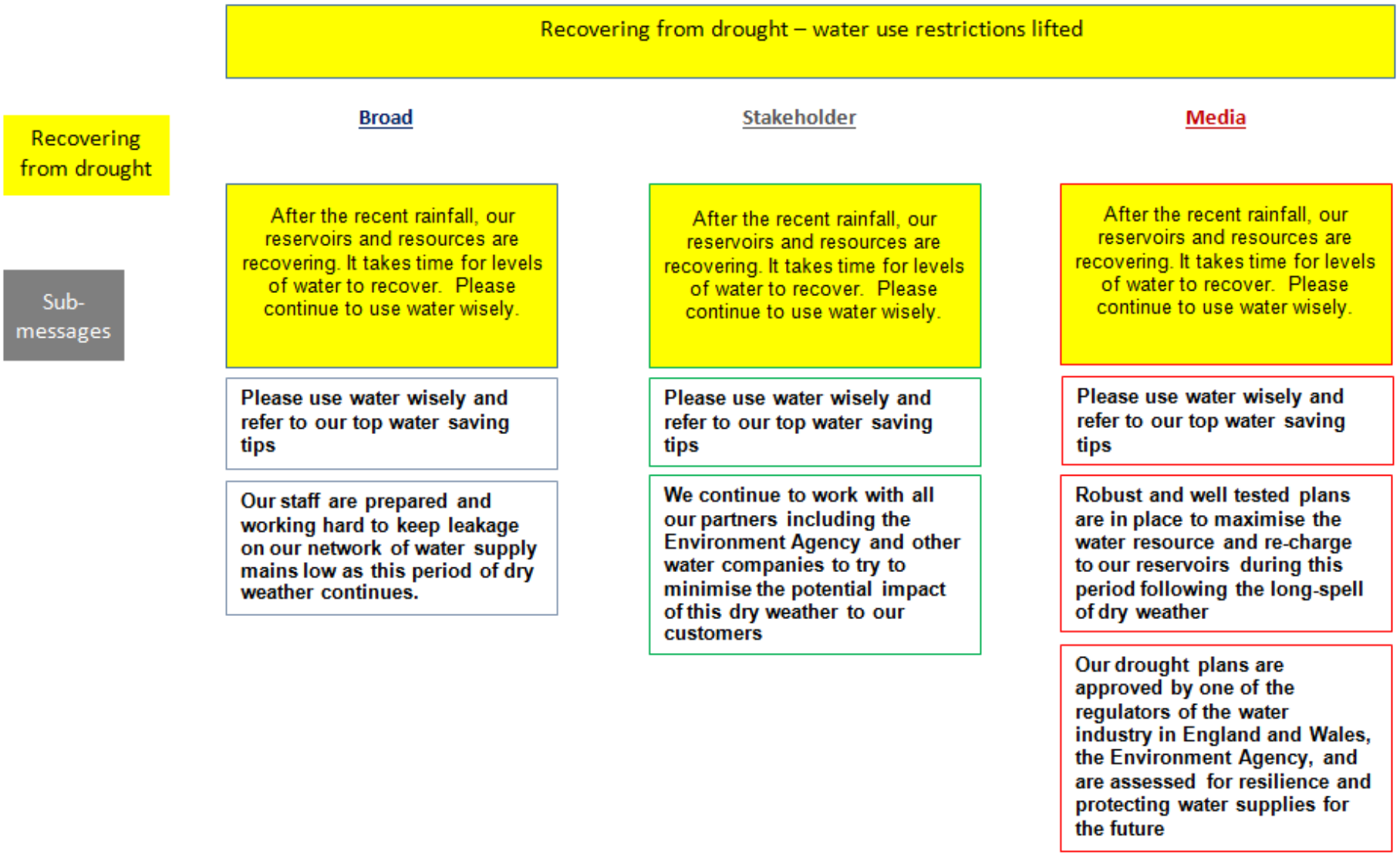
Our staff are prepared and working hard to keep leakage on our network of water supply mains low as this period of dry weather continues.
We continue to work with all our partners including the Environment Agency and other water companies to try to minimise the potential impact of this dry weather to our customers
Robust and well tested plans are in place to help ensure that in times abnormally dry weather we make the best use of the water available and minimise the potential impacts to people and the environment.
Our drought plans are approved by one of the regulators of the water industry in England and Wales, the Environment Agency, and are assessed for resilience and protecting water supplies for the future


Recovering from drought – water use restrictions lifted
Recovering from drought
Sub-messages
Broad
Stakeholder
Media
After the recent rainfall, our reservoirs and resources are recovering. It takes time for levels of water to recover. Please continue to use water wisely.
After the recent rainfall, our reservoirs and resources are recovering. It takes time for levels of water to recover. Please continue to use water wisely.
After the recent rainfall, our reservoirs and resources are recovering. It takes time for levels of water to recover. Please continue to use water wisely.
Please use water wisely and refer to our top water saving tips
Please use water wisely and refer to our top water saving tips
Please use water wisely and refer to our top water saving tips
Our staff are prepared and working hard to keep leakage on our network of water supply mains low as this period of dry weather continues.
We continue to work with all our partners including the Environment Agency and other water companies to try to minimise the potential impact of this dry weather to our customers
Robust and well tested plans are in place to maximise the water resource and re-charge to our reservoirs during this period following the long-spell of dry weather
Our drought plans are approved by one of the regulators of the water industry in England and Wales, the Environment Agency, and are assessed for resilience and protecting water supplies for the future

11.5 Communication Methods

Water efficiency campaigns

Every Drop Counts is Essex & Suffolk Water's water saving campaign. It takes an innovative and wide-reaching approach by offering customers the chance to participate in a range of initiatives that are usually delivered at different times and places throughout the year.

It uses a combination of targeted advertising and community based marketing to maximise participation in the wide range of water efficiency projects to help our communities not only save water, but energy and money too. Since the initial trial of the whole-town approach in 2014, we have completed 13,221 home retrofit audits and over 150 business audits in six towns.

Every Drop Counts offers water savings schemes, initiatives and solutions to households, businesses and schools within the targeted town. A key component of the campaign is the offer to householders of a free plumber-led home retrofit visit worth over £130. The water and energy saving visit includes the installation of a wide range of retrofit products alongside effective engagement with the householder to enact long-term behaviour change.

Every Drop Counts is the main campaign we use to pro-actively communicate our water efficiency programmes to customers and to make positive interventions to help customers use water wisely. The campaign is split into two strands:

- Every Drop Counts Gardening campaign – aimed at gardeners and encouraging them to use less water outdoors
- Every Drop Counts Home Audits campaign –targeted at all homes in specific towns and encourages home owners to install water saving devices and products within their homes reducing consumption

These programmes continue each year, even in non-drought years to help promote water efficiency in some of the driest areas.

<u>Every Drop Counts Gardening Campaign</u>

This proactive campaign has a message of reducing water use in the garden with a primary and secondary message aimed at a broad and keen interested gardeners audience.

Essex & Suffolk Water runs this campaign each year during spring when water use in gardens typically increases across the drier months. It is primarily aimed at driving behaviour change in garden water use habits and increasing the use of water butts.

The primary message:

Use water wisely in the garden and take care of this precious resource.

The secondary message:

Keen gardeners can reduce their water use in the garden by following our helpful water saving tips and by installing a water butt, so water can be stored during a time of plenty and used later on for watering plants.

In 2012, our survey data collected from 6,346 properties in Essex, 57 percent of measured and 48 percent of unmeasured customers said they already owned a water butt. A similar pattern is demonstrated in our Suffolk supply area with 3,241 properties surveyed and 64 percent of measured and 57 percent of unmeasured customers stating they had a water butt.

This survey also showed that more than 80 percent of all respondents carry out watering between 6pm and 9pm and so the hours either side of this time could be an important period for communicating directly with people interested in gardening.

Experience during previous dry periods has found that gardeners are keenly interested in information on water resources and also highly motivated to store rain water for future use. There is evidence to show that it is better for plants rather than water drawn from the mains supply.

The gardening campaign allows Essex & Suffolk Water to start communications with an active and responsive group likely to reduce their water use at the start of spring with dry conditions likely before entering into a drought situation. This campaign usually features a discount water butts sale from our approved supplier and free talks about saving water in the garden.

In the past two years, Christine Walkden, a leading writer, horticulturalist and media personality through the BBC's One Show has promoted the water saving messages through a series of talks to customers in Essex and Suffolk.

It also allows for water saving messages to start being communicated with the wider public and information is readily and easily understood and available for different sources to help supplement this campaign.

Every Drop Counts Home Audits Campaign

This second element of our pro-active campaigning and would feature home water saving audits and general publicity around water saving at home, and helping customers to reduce their utility bills through saving water.

Essex & Suffolk Water runs this campaign throughout the year and often focuses the promotion of home audits during the summer months.

The primary message:

Use water wisely in the home and take care of this precious resource.

The secondary message:

Water saving audits for the home can help customers reduce their utility bills and save money as well as helping to conserve a precious resource.

Linking our messaging to 'Value for money' helps to ensure that the widest possible number of customers are interested in and likely to take part in this scheme.

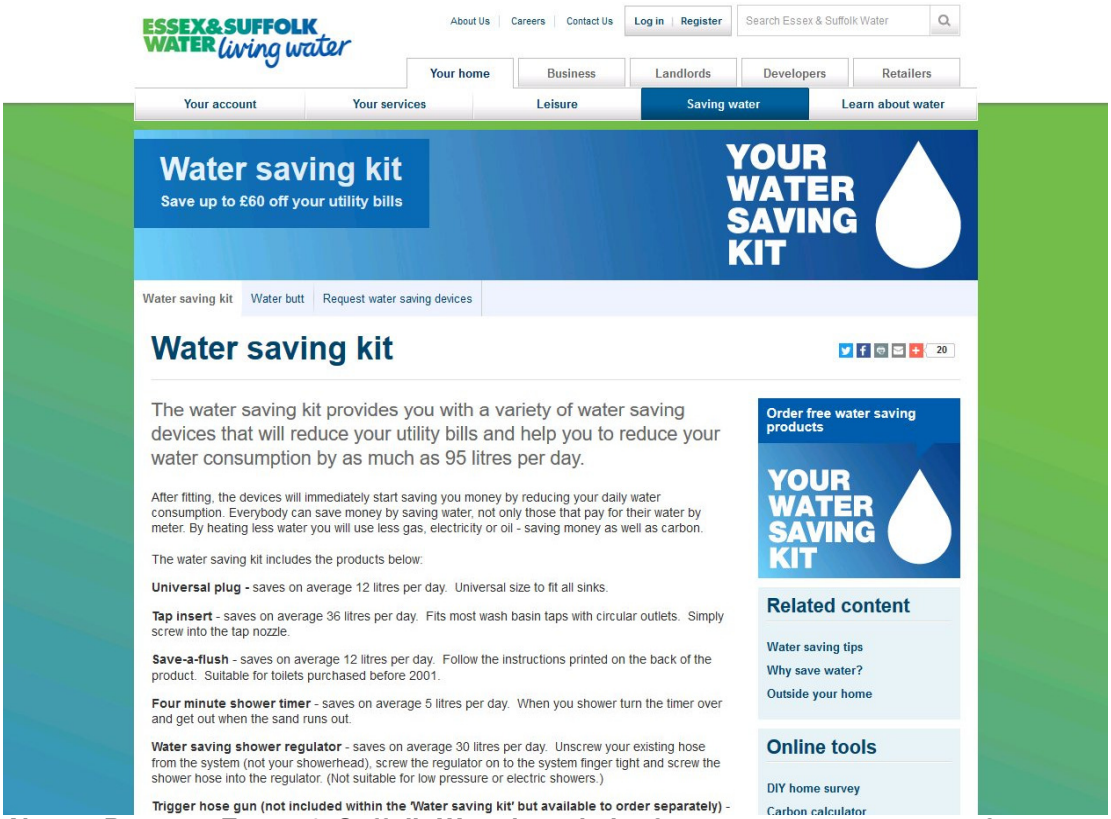
Marketing including mass mail shots to customer takes place and to invite customers to take part in a home audit. This is supported by billboard, newspaper and radio advertising.

A recent retrofit programme in Southend-on-Sea, Essex, highlighting installation of devices to save water when flushing an older toilet had 1,921 visits completed with technicians also fitting other water saving products.

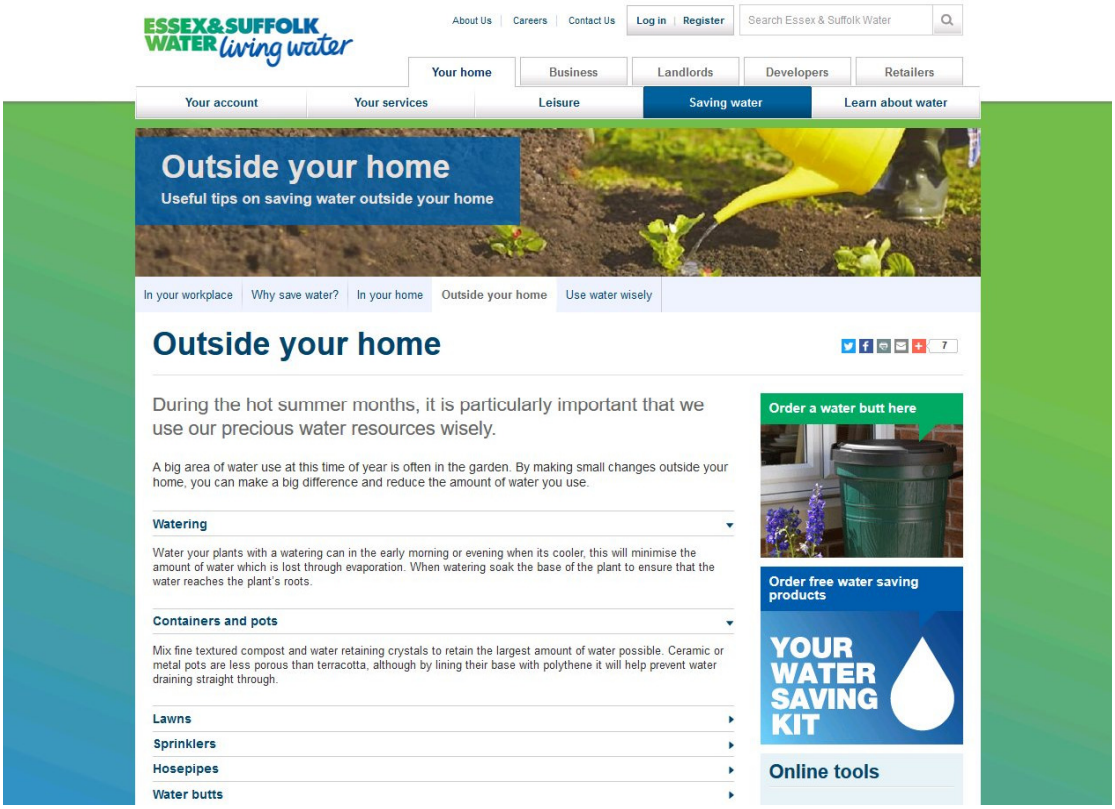
During a pro-longed dry period and with wider media messages about potential drought situations, it might be reasonable to expect an increase in participation as general awareness on water efficiency could be higher.

Depending on the nature of the dry period, the company would also consider increasing the number of locations involved in this programme.
Below are examples of Essex & Suffolk Water's websites for the two programmes:

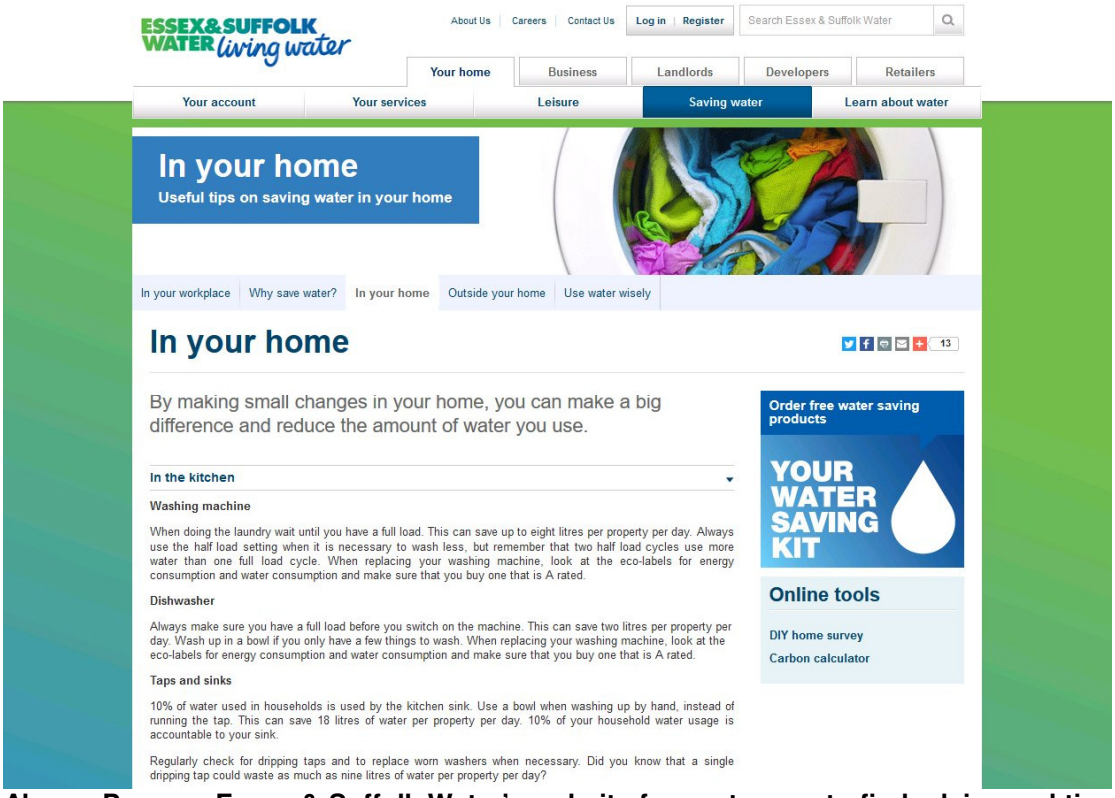
Above: Sub-website for Essex & Suffolk Water's Every Drop Counts home audit programme to allow customers to sign up for free home visits and water saving audits.



Above: Page on Essex & Suffolk Water's website for customers to request free water saving devices for their homes.



Above: Page on Essex & Suffolk Water's website for customers to order a garden water butt and find advice and tips for saving water whilst gardening.



Above: Page on Essex & Suffolk Water's website for customers to find advice and tips on saving water in their homes.

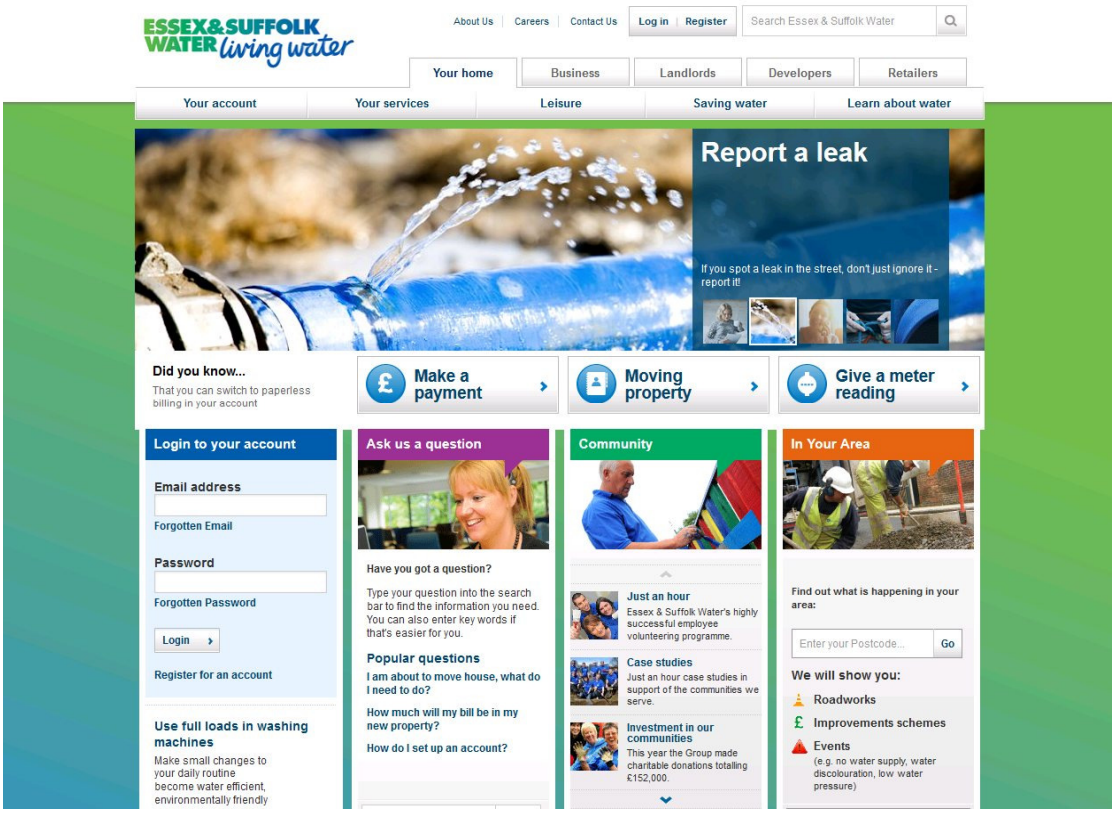
Website

The Essex & Suffolk Water website (www.eswater.co.uk) is a dynamic communications tool which is continually reviewed and updated.

Page:	**Page Impressions:**
Homepage (eswater.co.uk)	3,971,174
Saving water	13,838
Media centre	
1,038	

ESW's website has an internal web manager who is able to update and add information frequently and quickly. This facility enables the company to respond quickly to critical incidents, giving customers the information they need.

The home page of the ESW website has a prominent message regarding water efficiency. This links to further details including all of the key messages.



Home page of ESW website (as of February 2017) showing prominent message around encouraging customers to report leaks for repair.

The website contains detailed explanation on the importance of using water wisely and the incentives for customers to do this. It also contains practical advice and tips on how customers can help save water in all parts of the home and garden.

The ability to request free water saving products, such as the water saving kit, is also available on the website. In addition, there are links to affiliate company's website where ESW customers can benefit from savings on water efficient products, such as water butts.

In the event of drought, the website can be adapted to give a raised profile of water efficiency messages, water saving product offers and to the current resource situation.

Media and social media

Regular press releases to local and regional media are used to inform and engage a wide audience about the key messages. Features in the local media can help to engage individuals/groups about water efficiency that might otherwise not have taken an active interest.

All media releases associated with water efficiency incorporate the key messages.

Media releases highlighting specific water efficiency projects or free water saving products are circulated to the local media.

Media releases are issued regarding water efficiency projects, such as the as the two Every Drop Counts campaigns.

The water efficient home audits carried out by the demand planning team are used to for offer practical advice to customers through the resulting press publicity.

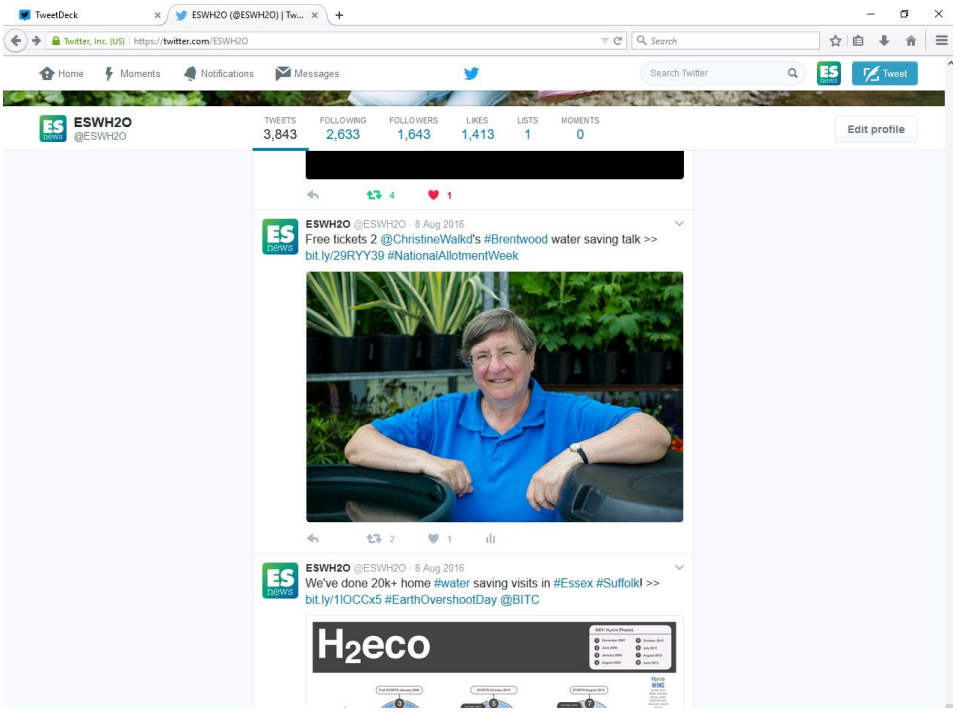
In addition, opportunities to incorporate water efficiency messages during media interviews are also taken wherever possible. For example, ESW occasionally takes part in local radio station 'phone ins' during which it is often a good opportunity to highlight water efficiency messages.

As part of its media partnerships, Essex & Suffolk Water has regular space in local newspapers for adverts and editorial copy in a sponsored page. These features are regularly used to promote the Every Drop Counts campaigns (See below for example page).

In a drought situation, this would be used to put relevant information and advice into publication about the drought situation.

Targeted local newspaper and occasionally radio advertising is also used to promote specific water saving products (such as water saving kits). Below are examples of adverts used for Christine Walkden's garden water saving talks.

Essex & Suffolk Water has YouTube and Twitter accounts (@ESWH2O) During August 2016, @ESWH2O achieved 43 thousand page impressions, this was more than 50 per cent higher than the previous month and similarly up on other average months throughout the year. This indicated interest in the gardening campaign and the free water saving talks, it also suggests that at drier times in the year water efficiency is an important topic for users of the social media platform in our supply areas.
Our YouTube account has been viewed more than 40,000 times across the lifetime of the channel and a range of video content. Material includes water saving videos and the channel was set up in 2013. This content is available online for longer durations and is viewable during a period of dry weather. There are videos about water butts and tips for reducing water usage around the home to watch.



Above: An example of the Twitter feed with a tweet advertising free tickets to a garden water saving talk by Christine Walkden.

Above: Examples of adverts placed for Christine Walkden's free water saving talks in August 2016 and for a discount sale on water butts from ESW's approved supplier with Christine as the 'face'.

10 NEWS www.theenquirer.co.uk Thursday 16 July 2015 ENQUIRER

Environment Matters

An Enquirer feature in partnership with ESSEX&SUFFOLK WATER living water

Win top tips

TWO lucky gardeners could win a signed copy of Christine Walkden's 'No-nonsense Vegetable Gardening' book.

It gives lots of practical tips on vegetable gardening and using water around the garden. All you have to do is find the answer this simple question...

If our vegetable garden is 25 metres by 25 metres and Jim waters each square metre with five litres per day, for four days - how many litres of water will he use in total over the period?

A: 1000 Litres
B: 500 Litres
C: 600 Litres

Answers on a postcard to the Enquirer Newspaper, Independent House, Radford Way, Billericay, Essex CM12 0BZ or email admin@theenquirer.co.uk.

Competition closing date Thursday, 30 July 2015.

CONGRATULATIONS to our last competition winner Patrick Lench from South Woodham Ferrers, who correctly answered that the extra water in Abberton Reservoir is equivalent to 6,000 Olympic-sized swimming pools.

Students produce a great garden

WRITTLE College Further Education students have created a beautiful garden at an Essex primary school so children can go pond-dipping, make bug hotels and learn more about nature.

The stunning garden at Kings Road Primary School in Melbourne, Chelmsford, was officially opened by Lord Petre, Lord Lieutenant of Essex and Patron of Essex Wildlife Trust on Monday.

Level 3 Extended Diploma in Horticulture students - who were also involved in the College's winning Ideal Home Show garden - built and planted the garden over the last two years.

The garden, funded by the school's PTA, features an outside building with pergola, decking so the children can go pond-dipping, dry stone walling with bug hotels, a natural filtration system, stepping stones so they can go safely into the pond, hand-built wooden trays so they can look at the beasts they have caught...and much more!

Ben Wincott, FE Horticulture Lecturer, who designed and oversaw the construction of the garden, said: "Creating this garden has given our students real-life, practical experience of working for a client to a brief. They have designed an inspirational, functional, safe area for pupils to get up-close to nature, constructed some difficult elements, and ensured the planting is appropriate and thought-provoking.

Don't waste it

TV gardener and author of 'No-nonsense Vegetable Gardening', Christine Walkden shares some of her top tips for saving water around the garden this summer...

ESSEX is one of the driest counties so it is really important to collect as much of that lovely rain whenever it falls from the sky. One of the best ways to do this is to use a water butt.

Having more than one water butt can be useful in your garden for storing more water. I have four loads near my important crops/around my garden, as plenty of watering is key to successful vegetable growing.

Approximately 90,000 litres of water falls onto a typical roof in any one year, that's enough to fill 473 water butts. Capture some of this water by placing a water butt by sheds, greenhouses, and conservatories, not only will this provide you with a source of water without having to tap into your home's supply, rainwater is better for your plants.

Points to consider when buying a water butt are to make sure it has a lid, this will prevent anything from falling into the container and will help to keep pets out! Also connecting the water butt into your guttering system will help you to store water that falls off of a roof.

Some form of filter to keep debris out and a key point is to make sure the water butt is raised off of the floor to allow a watering can underneath the tap for filling!

Using a spare water butt to make-up a fertiliser stock solution to enable easy liquid feeding is also something to consider doing.

Other top tips for watering in the garden will help you to really make the most of all of that precious water saved in those water butts...

Water your plants with a watering can in the early morning or evening when its cooler, this will minimise the amount of water which is lost through evaporation.

When watering soak the base of the plant to ensure that the water reaches the plant's roots.

For those using containers and pots mix with good quality compost and water retaining crystals to retain the largest amount of water possible. Ceramic or metal pots are less porous than terracotta, although by lining their sides with polythene it will help prevent water draining straight through and evaporation.

Using mulches can help to control weeds and prevent unnecessary water evaporation from the soil.

And with hosepipes, don't let them run unnecessarily; by fitting a trigger hose gun it will allow you to turn the water on and off easily.

So remember if there is one thing I'd encourage you gardeners out there to do, it is to get some good quality water butts and make sure your keeping some of natures bounty for your garden.

Essex & Suffolk Water customers can take advantage of a special 40 percent discount by visiting www.eswater.co.uk/saving water and clicking on the water butt offer promotion.

■ Christine Walkden

■ Keen gardeners and regular *Enquirer* readers Ray and Linda Osborne from Benfleet took delivery of their water butt prize. Linda entered the competition for May's edition of 'Environment Matters' to win a water butt for the garden. She thought the water butt would be handy, but it was Ray who came up with the answer. "A real joint-effort," said Linda. The question was tough, asking readers to identify the rainfall intensity filling a 200 litre water butt from a 2 m2 - the answer was 20mm/hr. Ray said: "It has come at just the right time - as our old butt has sprung a leak!"

Initiative helps bridge the generation gap

YEAR EIGHT students at the Bromfords School and Sixth Form College have been taking part in various projects that are part of the Giving Nation initiative.

This competition challenges young people to create and deliver projects that will have a positive impact in their local community. One group of students decided that they wanted to do a mixture of voluntary and fundraising activities that were focussed on working with the elderly community. In school they arranged a cake, sweets and drinks sale with all proceeds going to Age UK. The total raised was £106.35.

In addition, this group of students arranged a visit to the local care home Chaplin Lodge (pictured) where they played board games and painted the nails of some of the residents.

Green Apple award for housing association

SWAN Housing Association is celebrating after winning a Green Apple Environment Award. The award celebrates a pilot project Swan carried out in partnership with Axis and Essex & Suffolk Water. The project saved an average of 41.94 litres of water per property per day, over a year this adds up to 191 baths!

The Green Apple Awards began in 1994 and have become established as the major recognition for environmental endeavour among companies, councils, communities and countries.

The awards are organised by The Green Organisation - an international, independent, non-political, non-activist, non-profit environment group dedicated to recognising, rewarding and promoting environmental best practice around the world.

Swan's pilot project covered 69 properties in Basildon.

The properties received water audits to identify where water savings could be made and the homes were fitted with water saving devices such as tap inserts, water butts and water saving crystals for gardens.

Mary Gibbons, Executive Director - Strategy and Support said: "We are delighted that this project has been recognised.

Not only has it helped save essential resources, it has also helped our residents save an average of £47.10 per year from their household bills. We are now working to offer this service to Swan residents making Swan's properties more efficient and cheaper for residents to run."

Essex & Suffolk Water's water efficiency analyst, Kerri Russell, has worked closely with the team at Swan Housing Association and said: "We're always pleased to work with partnership organisations, such as Swan Housing Association, to ensure that customers' bills are reduced through reduced water usage.

"The recognition this project has received at a prestigious environmental awards shows that we can all make a difference through saving water in one of the driest parts of the UK," she said.

Above: An example of a sponsored page in the Essex/Thurrock/East London Enquirer newspapers, featuring an editorial article by Christine Walkden, TV gardener and an advert for the discount water butts sale.

Public Affairs Stakeholders

ESW regularly communicates with stakeholders and opinion formers, such as local councillors, MPs, and NGOs.

The ESW External Communications team will ensure that drought communications are issued promptly and regularly to all opinion formers

(including the Consumer Council for Water) to help reinforce water efficiency messages.

These key stakeholders will be emailed media releases and other information relating to water efficiency particularly if relevant to their area of influence and operation.

Stakeholders can have wide online circles of influence, such as a local MP, and often getting that individual to retweet or post on their website about water company communications can be a useful tool for getting a message out to customers and the public.

A key contact to be regularly updated through email and conference phone calls is one of our regulators, the Environment Agency and DEFRA. Members of the Area Environment Agency operations team have joined our incident teams for briefing and ESW has a close working relationship with the two organisations.

Educational activity

Education is a key element of ESW's water efficiency strategy; incorporating help to educate all ages about the importance of using water wisely and how they help make a difference.

Essex & Suffolk Water's education resources are focused on the 'Super Splash Heroes', a group of water saving heroes. Online content and the website offers educational resources for teachers and schools, as well as supporting fun learning for children and families with online activities, worksheets, videos and even information about the broad range of careers available within the water industry.

Pupils from Key Stage 1 through to school leavers can find out more about the industry and the part it plays in the water cycle, interacting with nature to protect one of Earth's most important natural resources.

See: https://www.eswater.co.uk/your-home/learn-about-water.aspx

A short stage production aimed at schools and young children also tours our regions and promoting the key messages through the Super Splash Heroes. ESW regularly has employees as speakers in schools and for interest groups to give a presentation about water. These presentations include the key messages about using water wisely targeted as appropriate for the age group.

Commercial customers

ESW has extensive experience of helping businesses manage their water resources more effectively. It supplies around 22,000 million litres of water a year to more than 40,000 business customers in the region.

There is a clear financial incentive for businesses using water as efficiently as possible, which is communicated to customers.

After April 2017, non-household customers will be able to choose their water retailer and it will be the responsibility of the water retailer to keep businesses updated about necessary messages around general water efficiency.

In a drought situation it would be the most efficient way to communicate with non-household customers through their water retailers and this would be done through Essex & Suffolk Water's Wholesale Team.

ESW External Communications team would prepare a briefing note for distribution to all water retailers fairly and in-line with regulations relating to conversations with water retailers and wholesale operators.

Road shows/Exhibitions

Road shows and exhibitions can be a useful tool to give domestic customers the opportunity to find out more about water efficiency, discuss this with ESW staff and provide water saving products as appropriate. This form of communication is an effective mechanism to provide a one-to-one service in a public environment.

ESW occasionally runs or takes part in road shows/external exhibitions to help communicate these messages and encourage customers to request available water saving products.

For example, during August 2016, TV gardener Christine Walkden gave four talks on saving water in the garden and these were attended by 150 people.

We have also worked with Groundwork East, a charitable partner organisation of ESW, to host community engagement road shows in public places that tour the region during the summer and help to give out devices for saving water in the home.

Newsletters

Newsletters are used to provide information but on a regular basis to a large number of people.

A series of newsletters called '**Water efficiency news' are produced** to keep our regulators, stakeholders and other interested organisations up to date with our progress with water efficiency. The newsletter contains details of the many water efficiency campaigns, projects and initiatives underway at ESW.

During a drought situation, newsletters would be used to update external stakeholders on a regular basis.

11.6 Communication methods during a drought

In a drought, existing communication is increased and further integrated for maximum effect. Additional items may include, as appropriate:

- door to door mail shots
- local press and radio advertising campaigns
- regular media releases offering latest information and guidelines
- social media campaigns Twitter/YouTube
- joint TV campaigns with neighbouring water companies
- poster sites/billboards
- stakeholder workshops
- articles in parish council and borough magazines
- negotiated point of sale material at garden centres and DIY outlets
- fact sheets and drought themed activities distributed to all schools in critical supply areas
- prominent facts and tips on our websites
- message on bills, envelopes and company vehicles
- messages as standard footer on company emails.
- roving displays (libraries, village halls, shopping centres)

In addition, it is essential to keep ESW's most valuable communication ambassadors, its employees, fully informed of the company's position, priorities and progress so they in turn can give accurate information and advice to any customers. Weekly bulletins are used, and employee briefings given to cascade information through the company.

11.7 Communication with the Environment Agency

Communication with the Agency outside under normal (non-drought) conditions is regular and often. The frequency of this communication will inevitably increase during drought conditions.

Public relations issues will also be dealt with at water company liaison meetings with the area Agency as required. Additional adhoc one to one meetings between directors, senior managers and technical staff of the Agency and ESW may be required in response to specific issues.

It is anticipated that increased liaison with the Agency will also be required to discuss DMG decisions and the potential need to initiate drought restrictions and specific drought measures via drought permits and drought orders.

The Agency has its own Area Drought Plans, last updated in April 2010.

The main document of relevance to ESW is the Eastern Area Plan, although some elements of the Central Area Plan (mainly in relation to the EOETS) are also of direct relevance.

The Plan sets out how the Environment Agency will plan for and manage drought in the Region.

Key elements of the Agency's Anglian Region plan are:

- the Region's drought management structure;
- the drought monitoring that will be undertaken by the area drought team;
- the drought management actions that the area drought team may need to take and the triggers for these actions;
- how the area drought team are involved with drought permit and drought order applications;
- the area drought communications actions;
- how the area will report on drought .

11.8 Data and Information Exchange with the Environment Agency

Data and information exchange with the Environment Agency occurs regularly and often under normal operating conditions, and it is anticipated that this will increase during the course of a drought.

Both organisations collect hydrometric data and fund/undertake studies and surveys that would feed into environmental monitoring required both under non-drought (baseline), drought and post-drought (recovery) conditions.

In general terms where requests for data are reasonable and necessary, there have historically been few restrictions in the flow of data and information between the two organisations, and ESW see no reason why this should not continue into the future.

11.9 Communication with Other Organisations

ESW recognises that in additional to communication with customers and the Environment Agency there are other organisations that it must keep informed during a drought.

This is particularly the case where the Company's DMG considers that drought restrictions/actions may need to be implemented.

As early as possible during such decision making, contact will be made with (but not restricted to) the following organisations as appropriate:

Organisation	Area of Interest/Responsibility
Natural England	In drought permit/order applications that may have the potential to affect designated sites (e.g. under the Habitats Directive).
Consumer Council for Water	Customer representations, vulnerable groups etc
Ofwat	Funding implications, levels of service
Neighbouring Water Companies	Opportunities for support; sharing of resources, modifications to bulk supply arrangements.
Fire Service	Securing water supplies for emergency fire and rescue needs.

Communications with all the organisations outlined above already occurs on an ongoing basis regardless of whether in a drought or not, and this is highlighted above.

The list of organisations above is not exhaustive. A wider range of stakeholders will also contacted by letter, electronic newsletter and personal briefing as appropriate; including but not limited to:

- MPs, MEPs
- Councillors
- County, Borough and parish councils
- Regulators and authorities e.g. Broads authority, drainage boards, DWI
- NGOs/ Interest groups– such as County Wildlife Trusts, RSPB, Royal Horticultural Society, National Farmers Union

ESW will consider a wider list of “Drought Communication Audiences” as outlined in the Environment Agency guideline entitled, Drought Plan Guideline Extra Information: Supplementary Information (April 2016).

The Civil Contingencies Act, places a duty on ESW to share information as a Cat 2 responder, or involvement of the Local Resilience Forum during decision making on drought orders. ESW will consult the Local Resilience Forum should we apply for a drought order.

12. POST DROUGHT ACTIONS

12.1 Drought Recovery

The true end of a drought can only be determined retrospectively. Recovery from drought will be manifested by drought trigger levels being approached from the direction of an improving situation of increasing reservoir levels, lake levels and groundwater levels. The recovery or potential recovery from drought will be monitored by the Company's Water Resources Team and the DMG. The decision to remove restrictions or drought orders must be carefully judged since an apparent ending of drought conditions could easily be confused with a temporary respite in a prolonged drought sequence. Decisions must be balanced with the need to avoid impacting on customers for longer than is necessary. The Environment Agency would be consulted to obtain their view on drought recovery (rainfall deficit, river flows, groundwater levels etc) before ESW removes any restrictions.

There are no additional actions proposed associated with drought recovery. Rather, existing procedures in terms of data collection and interpretation combined with communication with the Environment Agency will be continued until normal operations can resume.

Trigger levels, the current resource situation, and operational experience of the DMG will be used in determining when drought measures should be lifted.

12.2 Post Drought Review

When a drought has ended and normal operating conditions have resumed, a Post Drought Review (PDR) will, where appropriate, be initiated internally by ESW. The review will enable an opportunity to identify lessons learnt and also consider potential improvements both to the Drought Plan and wider drought management strategy. Additionally and where appropriate the need for future investment to limit the impact of similar drought conditions occurring in the future will be considered, as will the need for any additional monitoring. The PDR will examine:

- The hydrological conditions leading up to the drought and the effectiveness of drought indicators.
- The effectiveness of drought trigger levels and any need for their review or redefinition.
- The management decisions made during the course of the drought in view of the timing of drought measures.
- Customer responses to the imposition of drought measures and in particular the effectiveness of restrictions in reducing demand.
- The data collected during enhanced environmental monitoring and comparisons with the baseline defined prior to the onset of drought conditions.
- The effectiveness of the Communications Plan.
- Implications for future levels of service

- The overall performance of the DMG and the Environment Agency in managing the drought. This review would be undertaken with the Environment Agency.

Recommendations for improvement to the drought management process will be made where appropriate.

In addition the Company's drought action environmental reports and associated environmental monitoring plans are seen as an ongoing initiative and will be reviewed in conjunction with production of the PDR

It is considered appropriate that post drought reviews will be completed within one year of the cessation of drought measures. Production of the PDR will be led by the Water Resources Team under the direction of the Head of Technical Strategy & Support. All members of the DMG are expected to contribute to the PDR.

12.3 Revision of Drought Plan

ESW is obliged to revise this Drought Plan if there are likely to be any material changes. ESW will decide whether the Plan requires revision on an annual basis. If a review is necessary then the process as described in the Drought Regulations will be followed.

13. REFERENCES

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14. Glossary

Abstraction	The removal of water from any source, either permanently or temporarily.
Abstraction licence	The authorisation granted by the Environment Agency 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 the environment, abstraction licence, pumping plant and/or well or aquifer properties, raw water mains and/or aquifers, transfer and/or output main, treatment or water quality.
Drought order	An authorisation granted by the Secretary of State 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 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	A plan describing how the company will address gaps in the environmental assessment of the supply-side drought management action: baseline monitoring (including pre
Environmental report	The report that accompanies an application for a drought order or drought permit. It is 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	Central Government (Defra)
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 undertake 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.
Water 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.
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 25 years.
Resilience options	Additional options to deal with plausible droughts worse than those in the recorded record.
Habitats regulation assessment (HRA)	A HRA identifies whether or not drought actions will have an adverse effect on a site's (SPA or SAC) integrity.

FIGURES

Figure 1
Essex and Suffolk Supply Areas and Transfer Scheme Infrastructure

Figure 2
Essex Resource Zone and Associated Infrastructure

Figure 3
Suffolk Resource Zones and Associated Infrastructure

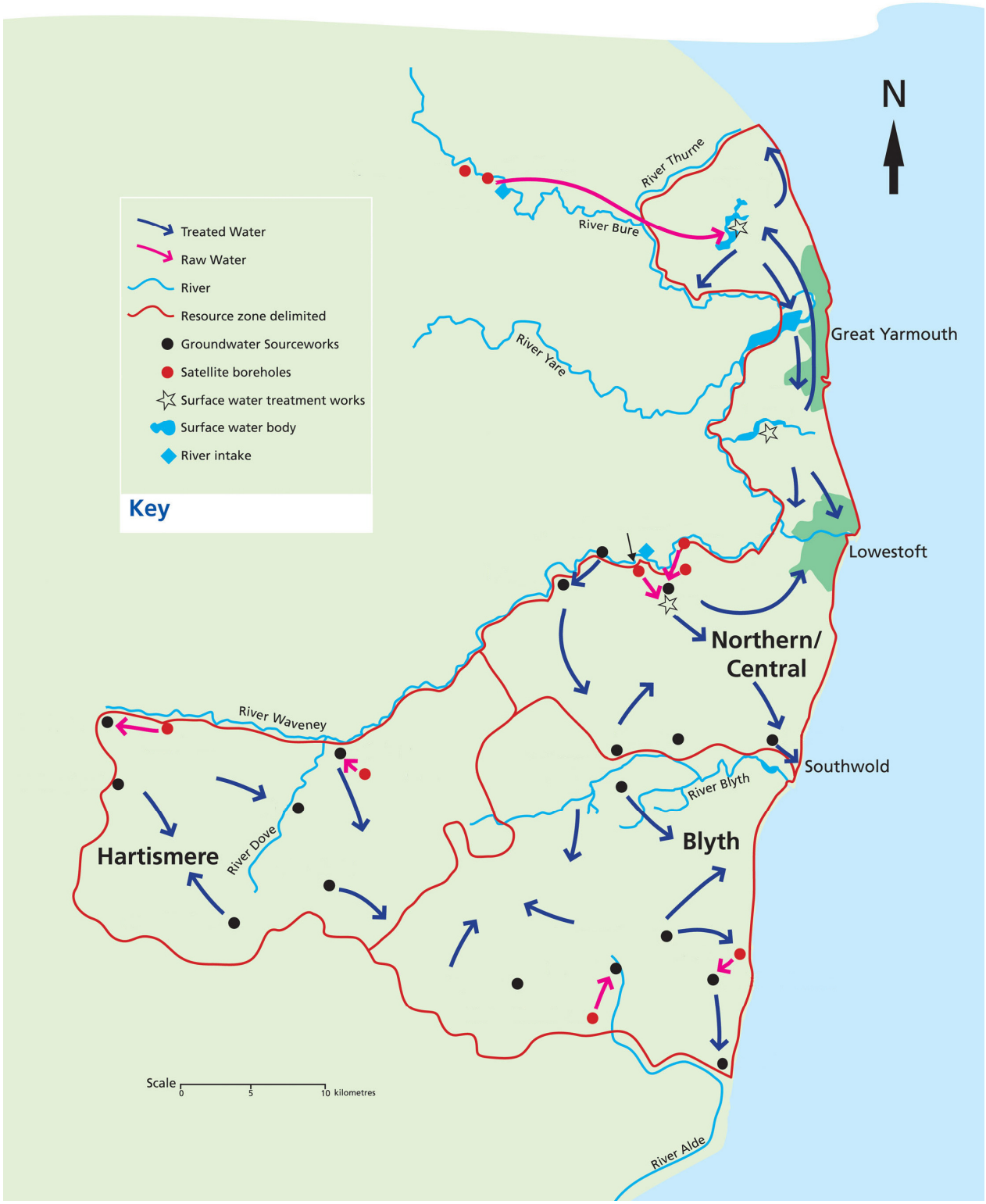
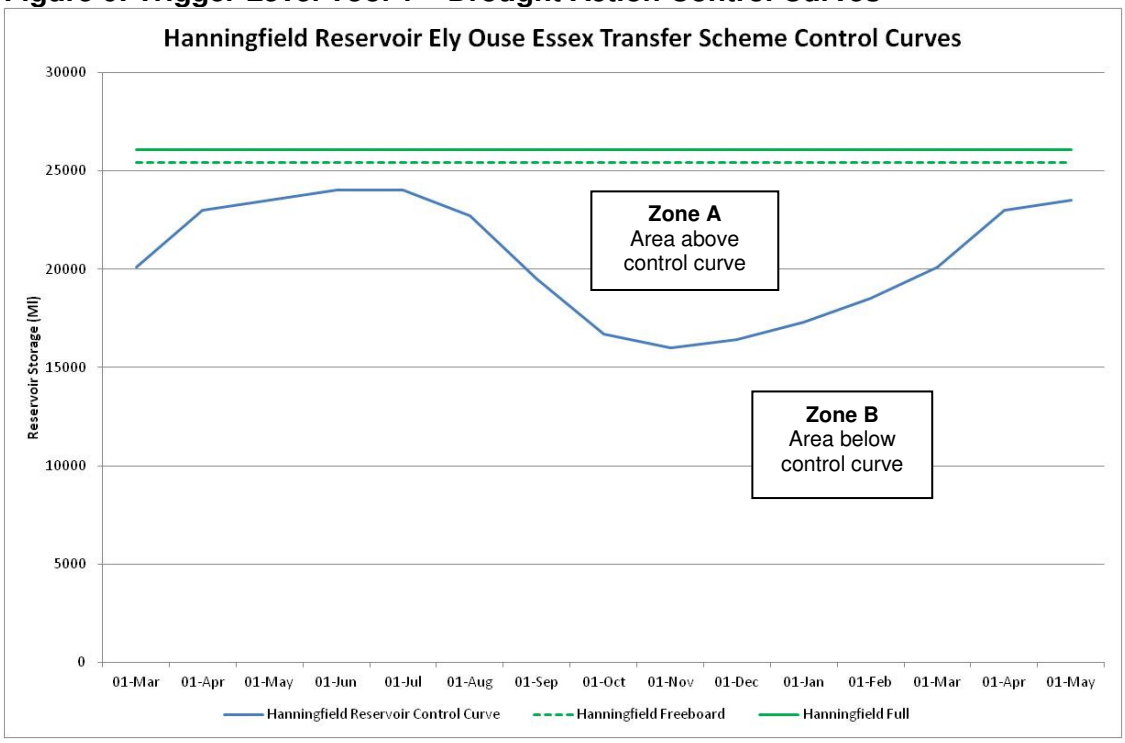
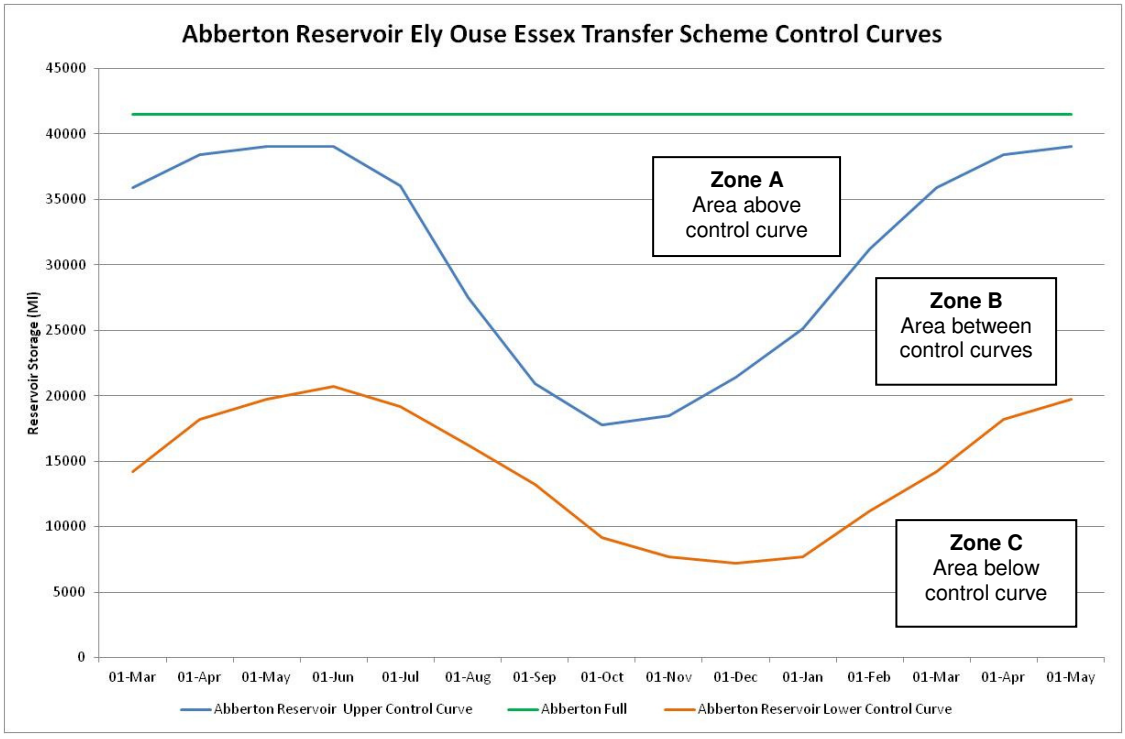


Figure 6: Trigger Level Tool 1 – Drought Action Control Curves



ZONE A: Abstract all natural flows subject to water quality and pumping constraints. No Ely Ouse Transfer. No GOGS or SAGS pumping.
ZONE B: If natural flows inadequate transfer from Ely Ouse and SAGS or GOGS

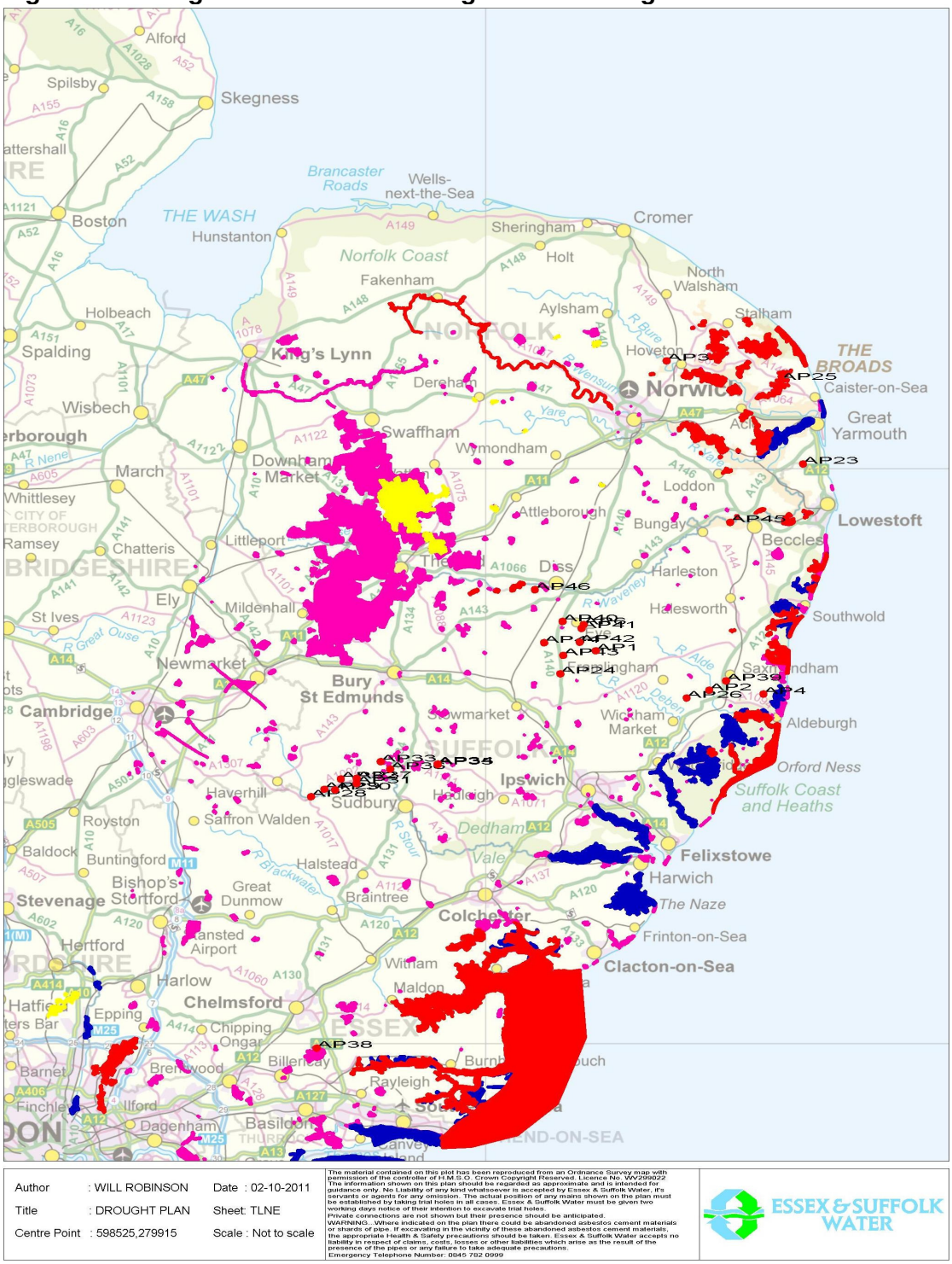


ZONE A: Abstract all natural flows subject to water quality and pumping constraints. No Ely Ouse Transfer. No SAGS pumping.
ZONE B: If natural flows inadequate transfer from Ely Ouse. No SAGS pumping.
ZONE C: If natural flows inadequate transfer from Ely Ouse and SAGS

Figure 7: Trigger Level Tool 2 – Example Combined Storage Refill Reliability Matrix

Zone Band	Storage Zone	Volume at bottom of		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Ml		Ml	%												
		50995	100%												
50995 - 48700	A	48700	95%	91.10%	91.10%	95.80%	97.40%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%
48700 - 46405	B	46405	91%	91.10%	89.50%	91.10%	97.40%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	97.40%
46405 - 44110	C	44110	86%	89.50%	89.50%	91.10%	92.70%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	92.70%
44110 - 41815	D	41815	82%	89.50%	89.50%	91.10%	92.70%	97.40%	99.00%	99.00%	99.00%	97.40%	97.40%	95.80%	69.00%
41815 - 39520	E	39520	77%	89.50%	87.90%	87.90%	87.90%	94.30%	99.00%	99.00%	99.00%	97.40%	97.40%	92.70%	42.10%
39520 - 37225	F	37225	73%	87.90%	87.90%	86.40%	87.90%	92.70%	97.40%	99.00%	99.00%	97.40%	97.40%	91.10%	
37225 - 34930	G	34930	68%	87.90%	87.90%	84.80%	86.40%	89.50%	95.80%	99.00%	97.40%	97.40%	94.30%	81.60%	
34930 - 32635	H	32635	64%	86.40%	87.90%	84.80%	86.40%	89.50%	92.70%	97.40%	95.80%	94.30%	91.10%	67.40%	
32635 - 30340	I	30340	59%	86.40%	84.80%	84.80%	84.80%	89.50%	91.10%	95.80%	94.30%	92.70%	87.90%	51.60%	
30340 - 28045	J	28045	55%	86.40%	83.20%	84.80%	84.80%	86.40%	89.50%	91.10%	92.70%	92.70%	86.40%	7.30%	
28045 - 25750	K	25750	50%	81.60%	78.50%	81.60%	84.80%	86.40%	89.50%	91.10%	91.10%	87.90%	75.30%		
25750 - 23455	L	23455	46%	80.00%	78.50%	80.00%	84.80%	84.80%	89.50%	89.50%	91.10%	86.40%	64.20%		
23455 - 21160	M	21160	41%	78.50%	78.50%	78.50%	83.20%	84.80%	86.40%	89.50%	86.40%	80.00%	18.40%		
21160 - 18865	N	18865	37%	78.50%	75.30%	76.90%	83.20%	81.60%	84.80%	86.40%	86.40%	51.60%	1.00%		
18865 - 16570	O	16570	32%	76.90%	72.10%	72.10%	72.10%	78.50%	83.20%	84.80%	80.00%	7.30%			
16570 - 14275	P	14275	28%												
14275 - 11980	Q	11980	23%												
11980 - 9685	R	9685	19%												
9685 - 7390	S	7390	14%												

Figure 21: Drought Action Sites and Significant Ecological Sites



Author	: WILL ROBINSON	Date	: 02-10-2011
Title	: DROUGHT PLAN	Sheet:	TLNE
Centre Point	: 598525,279915	Scale	: Not to scale

ESSEX & SUFFOLK WATER

Key:

Sites of Special Scientific Interest (SSSI)
Special protection Areas (SPA)
Special Area of Conservation (SAC)
RAMSAR Site