



**Affinity Water
East Region
Drought Management Plan
Final Report**

November 2012



**AFFINITY WATER
EAST REGION**

Drought Management Plan

November 2012

In order to protect the security of our sites we have given them security coded names throughout the document.

EXECUTIVE SUMMARY

Affinity Water Limited, east region (AW) provides public water supplies to 156,000 people in North East Essex. Eighty percent of the supply comes from groundwater, drawn from robust confined aquifer chalk boreholes. The balance of the supply is sourced from the River Colne and stored in a reservoir shared with Anglian Water. Currently, these water sources provide sufficient water to meet all the needs of customers.

No significant problems were encountered during previous groundwater drought periods in the South-East of England including 1988-1992, 1996-1997 and 2006-2007 or during the record peak demand of the hot and dry summer of 1995. As the Company's supply/demand balance has continued to improve there is no likelihood of any problems due to drought in the foreseeable future. Any drought in the future would have to be much more severe in intensity or duration than experienced hitherto to require the implementation of demand management measures provided for in this plan.

Drought management plans are a statutory requirement for all water companies as prescribed under section 39B of the Water Industry Act 1991 (WIA) and as introduced by the Water Act 2003. The overall objective of this document is to establish a comprehensive set of plans and procedures that define the process for managing any potential drought conditions.

This will be achieved by:-

- Being prepared for drought at any time and having our plan ready to deal with it.
- Identifying the onset of drought and mobilising additional resources.
- Assessing drought duration and severity and the impact on water available to our customers.
- Minimising environmental impact of drought by optimising the use of our resources.
- Implementing measures to reduce the demand for water or increasing the capacity of our assets to maintain security of supplies. Our actions will become more strenuous as drought deepens and lengthens.
- Acting and communicating with our customers and other stakeholders in partnership.

CONTENTS

1	INTRODUCTION	8
1.1	Objectives of Affinity Water’s Drought Management Plan	8
1.2	Background Information	8
1.3	Water Resources	10
1.3.1	Groundwater	10
1.3.2	Surface Water	10
1.3.3	Distribution System	11
1.3.4	Improvement and Updates	11
1.3.5	Water Resource Zone	11
1.4	Emergency Storage	12
1.5	Water Resources Plan Levels of Service	12
1.6	Security of Supply Measures	12
1.7	Responsibilities for Drought Management	13
1.8	Responsibilities for Key Actions under DMP	13
1.9	Environment Agency Liaison	14
1.10	Essex Resilience Forum Liaison	14
2	DROUGHT TRIGGERS AND SCENARIOS	15
2.1	Drought Triggers	15
2.2	Historic Droughts	16
2.3	Drought Scenarios	17
2.4	Drought Action Zone Framework	19
2.5	Drought Forecasting	19
3	DROUGHT MANAGEMENT ACTION	20
3.1	Introduction	20
3.2	Demand Side Management Actions	20
3.2.1	Zone 1	20
3.2.2	Zone 2	21
3.2.3	Zones 3 and 4	22
3.2.4	Representations and actions prior to implementation of restrictions	22
3.3	Supply Side Options	25
3.3.1	Re-commissioning of Abandoned/Disused Sources	25
3.3.2	Engineering Works	25
3.3.3	Distribution Improvements	26

3.3.4	Inter Company Bulk Transfers	26
3.3.5	Supply Balancing	27
3.3.6	Use of Alternative/Existing Sources	27
3.3.7	Other Options	27
3.4	Drought Orders & Permits	27
4	ENVIRONMENTAL MONITORING PLAN	28
5	COMMUNICATIONS PLAN	29
6	POST DROUGHT ACTIONS	30
6.1	Identifying the end of a drought	30
6.2	Post-drought actions	30

LIST OF TABLES

TABLE 1.1	AFFINITY WATER –EAST REGION LEVELS OF SERVICE	12
TABLE 1.2	RESPONSIBILITIES FOR KEY ACTIONS UNDER DMP	13
TABLE 3.1	SUMMARY OF IMPLEMENTATION POLICY FOR TB AND DD11	23
TABLE 4.1	OPPORTUNITIES TO MITIGATE ENVIRONMENTAL IMPACT OF DROUGHT	28

LIST OF FIGURES

FIGURE 1.1	AFFINITY WATER OPERATING REGIONS WITHIN THE SOUTH EAST OF ENGLAND	9
FIGURE 1.2	AW EAST REGION AVERAGE DEMAND/SUPPLY BALANCE	10
FIGURE 1.3	COMPARISON OF DISTRIBUTION INPUT	11
FIGURE 1.4	AFFINITY WATER - EAST REGION RESOURCE ZONE	12
FIGURE 2.1	LADY LANE OBSERVATION BOREHOLE WATER LEVELS OVER PAST 20 YEARS	16
FIGURE 2.2	DROUGHT CONTROL CURVES AT TDED PUMPING STATION	18

LIST OF ABBREVIATIONS USED IN THIS DOCUMENT

ADPW	Average day demand peak week
AISC	Average incremental social cost
ALF	Alleviation of low flows
AW	Affinity Water
AWS	Anglian Water Services
CAMS	Catchment Abstraction Management Strategies
CAPEX	Capital expenditure
CLG	Communities and Local Government Department
DD11	Drought Direction 2011
DEFRA	Department for Environment, Food and Rural Affairs
DETR	Department of Environment, Transport and the Regions; (now Defra)
DI	Distribution Input
DoE	Department of the Environment; (now Defra)
DMG	Drought Management Group
DMP	Drought Management Plan
DO	Drought Order
DP	Drought Permit
EA	Environment Agency
EIA	Environmental Impact Assessment
ES	Environmental Statement
LPA	Local Planning Authority
LTA	Long term average
GCM	Global circulation models
GCCM	Global climate change models
MI/d	Megalitre per day; Megalitre = one million litres (1000 cubic metres)
MLE	Maximum Likelihood Estimation
NEP	National Environment Programme
OASIS	Operational Assessment of Summer Impacts and Stress
OBH	Observation Borehole
ODPM	Office of the Deputy Prime Minister (now replaced by CLG department).
Ofwat	The Water Services Regulation Authority
ONS	Office for National Statistics
OPEX	Operating expenditure
PCC	Per capita consumption - consumption per head of population
SEA	Strategic Environmental Assessment
SEMD	Security and Emergency Measures Direction
SMD	Soil moisture deficit
SRO	Source Reliable Output
SSSI	Site of Special Scientific Interest
TW	Thames Water
UKCIP	UK Climate Impacts Programme
UKWIR	United Kingdom Water Industry Research Limited
WAFU	Water Available for Use
WFD	Water Framework Directive
WIA	Water Industry Act 1991
WRP	Water Resources Plan 2004
WRMP	Water Resources Management Plan 2009
WSS	Water Scarcity Status
WTW	Water Treatment Works
WUO	Water Use Temporary Bans Order 2010

1 INTRODUCTION

1.1 Objectives of Affinity Water's Drought Management Plan

Drought management plans are a statutory requirement for all water companies as prescribed under section 39B of the Water Industry Act 1991 (WIA) and as introduced by the Water Act 2003. The purpose of the Drought Management Plan (DMP) is to demonstrate how Affinity Water East (AWE) plans to monitor and manage future drought related events, restrain demand and mobilise extra resources. The plan is agreed with the Environment Agency (EA) and approved by the Secretary of State following public consultation and provides a decision aid tool for use by the AW Drought Management Group (DMG).

The DMP is subject to consultation both prior to and following the preparation of the draft plan. The pre-consultation process involved feedback from key stakeholders including the EA and Ofwat as well as other water companies. This document outlines our Drought Management Plan in six main sections:

- (i) introduction to our supply area and water resources;
- (ii) a description of the drought scenarios;
- (iii) a description of drought management actions;
- (iv) an outline of the Environmental Monitoring Plan (EMP);
- (v) a description of our Communications Plan;
- (vi) and an outline of post-drought actions.

1.2 Background Information

AW operates in the South East of England (see Figure 1.1 below), a very dry region of the UK, with only half the average UK rainfall and delivers 25 million litres of water per day to a population of 156,000 people in the east region.



Figure 1.1 Affinity Water Operating Regions within the South East of England

We seek to manage water resources efficiently to ensure a continuous supply of high quality water to meet the demands of customers, while ensuring the sustainability of those resources and minimising any impact on the environment.

All water companies are required to produce a DMP to demonstrate the strategy to be followed and the measures to be taken to ensure that customers have sufficient water should a drought occur. Available data is studied to predict the onset of drought and the DMP outlines the actions to be taken to manage the various drought scenarios that could be encountered. We have developed a Communications Strategy (Section 5) to outline the key communications objectives and actions required in support of the DMP.

1.3 Water Resources

We have two sources of water; groundwater treated at THXI and surface water from TARD.

We have a good supply-demand balance such that any drought in the future would have to be much more severe in intensity or duration than experienced hitherto to require the implementation of the special measures provided for in this plan. Our WRMP forecast shows a surplus of supply over demand until beyond 2035, as shown in Figure 1.2.

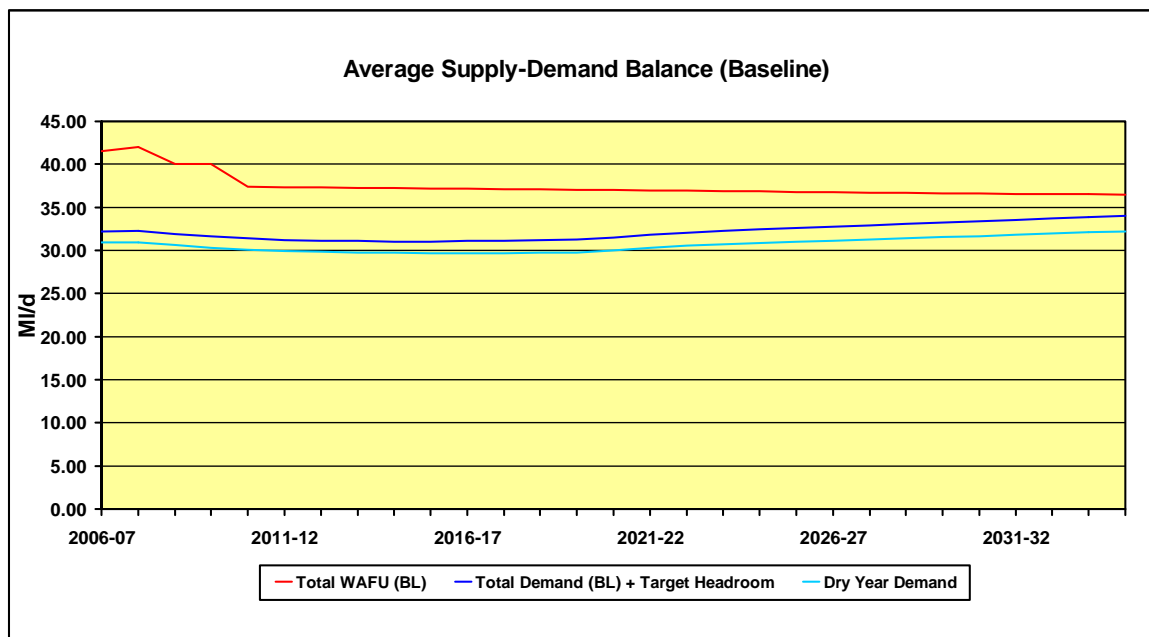


Figure 1.2 AW East Region Average Demand/Supply Balance

1.3.1 Groundwater

80% of supply comes from groundwater, drawn from confined aquifer chalk boreholes in the River Stour/River Brett valleys in Essex and Suffolk. The boreholes have a long history of good bacteriological quality and have proved robust and reliable during the groundwater drought conditions of 1988-1992, 1995–1998 and more recently in 2006/7. The balance of 20% of supply is sourced from the River Colne and stored in TARD which is owned and operated in equal partnership with AWS. These sources provide sufficient water to meet the needs of our customers.

1.3.2 Surface Water

The balance of demand is supplied by surface water from TARD. TARD is a small single season reservoir with a revised safe reliable output totalling 25.6MI/d for unrestricted (*scenario one*) demand. TARD can be re-filled each winter even in a dry winter. The revised yield for TARD has increased as the augmentation available from AWS groundwater is now included. The Company has an Agreement with AWS to vary the water sharing arrangements at TARD from 50:50 to 70:30 AWS:AW for the period 1st April 2010 to 31st March 2020, the drought yield assumed available to AW from TARD is therefore 7.7 MI/d. This represents a small decrease over the 9.4 MI/d previously assumed for 50% of the unsupported drought yield. For normal operation and during a drought either company can take extra water from TARD not required by the other company. In the limit either AWS or AWE could take all of the output available although at present only AW is able to supply all its east region customers over sustained periods without using TARD.

1.3.3 Distribution System

The two treated source waters are strongly linked in our distribution system such that the east region area is one water resource zone. Groundwater alone can supply all current demand including peak demand in a dry year. This could in certain circumstances allow for drought actions, which would otherwise be triggered by circumstances at TARD being delayed or avoided in the east region area.

1.3.4 Improvement and Updates

We have progressively sought to increase the water available for use and manage demand and have achieved leakage levels that are the lowest in the UK as litres per connected property per day. The record high demands which occurred in July and August 1995 did not give rise to any supply, treatment or distribution problems but did help to identify those parts of the system under greatest stress. With the benefit of the 1995 experience further works to improve supply and reduce demand have been successfully completed.

The comparison of Distribution Input (DI) in summer 1995 and 2003 as the closest weather conditions is dramatic. Peak demand in summer 2003 was circa 20% lower than 1995 despite an increase in population supplied of circa 4%. Between 1995 and 2003 household meter penetration increased from less than 7% to 46% and is now circa 73%.

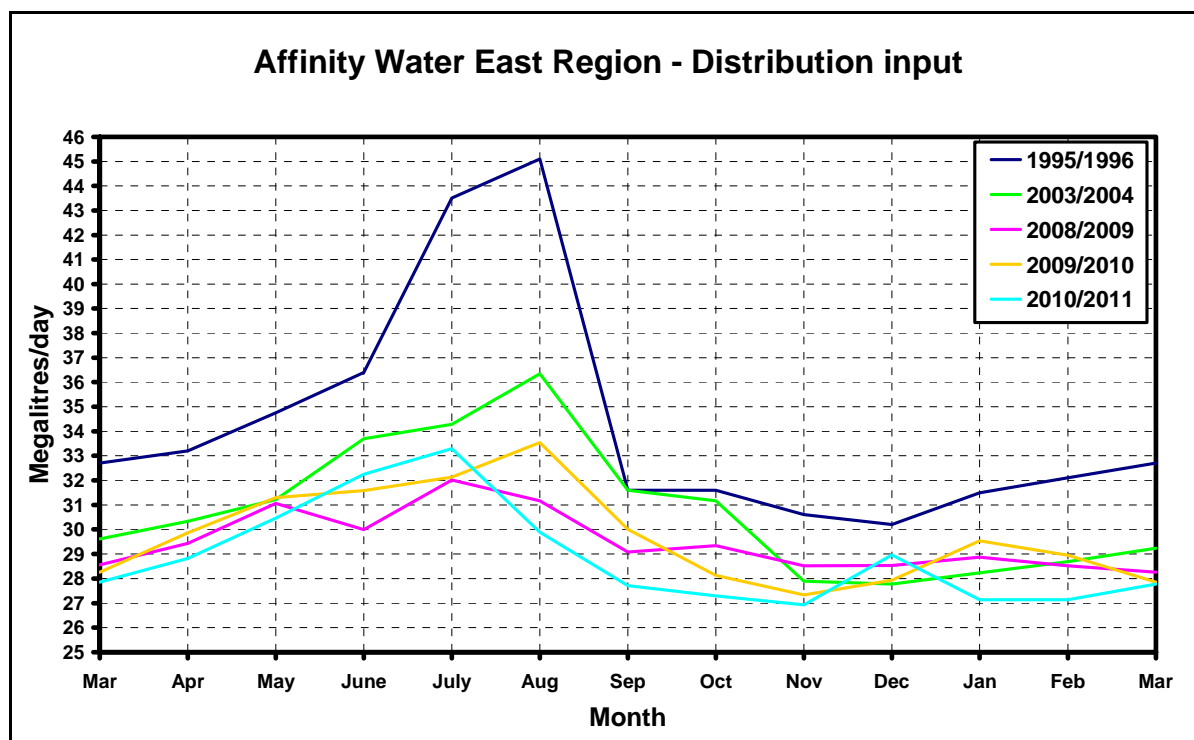


Figure 1.3 Comparison of Distribution Input

1.3.5 Water Resource Zone

A resource zone is the largest possible zone in which all resources, including external transfers can be shared and hence the zone in which all customers experiences the same risk of supply failure from a resource shortfall. Our supply network in the east region is highly integrated and the risk of supply failure is shared throughout our area.

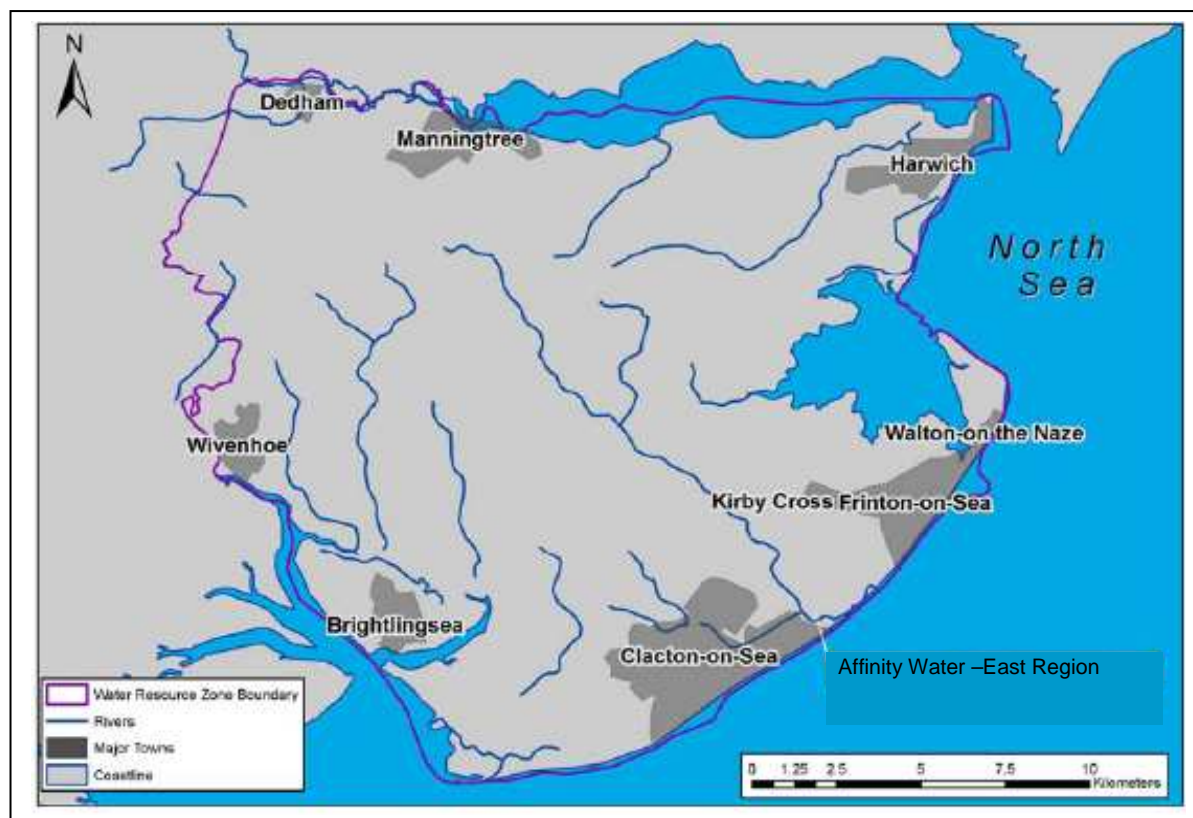


Figure 1.4 Affinity Water - East Region Resource Zone

1.4 Emergency Storage

We have no emergency storage facilities to call on under drought conditions.

1.5 Water Resources Plan Levels of Service

We have not needed to resort to formal restrictions in over 40 years, through several drought periods including 1995/96, and more recently in 2006/07 when many water companies in South East England imposed hosepipe bans. Thus the preferred Levels of Service are supported by historical *actual* Levels of Service (table 1.1).

Table 1.1 Affinity Water –East Region Levels of Service

Water Restriction	Level of Service
Hosepipe Ban	No restrictions
Drought Order/permit	No restrictions
Rota cuts/standpipes	No restrictions

1.6 Security of Supply Measures

The two treated source waters are strongly linked in our distribution system such that the whole company area is one water resource zone. Groundwater alone can supply all current demand including peak demand in a dry year. This could in certain circumstances allow for

drought actions, which would otherwise be triggered by circumstances at TARD being delayed or avoided in the Company’s area.

1.7 Responsibilities for Drought Management

Drought management will be overseen by relevant sectors of the business including:

1. **Water Resources** responsible for monitoring the state of available water resources and the prediction of likely impacts.
2. **Production** with specific responsibility for ensuring that the company’s water abstraction and production capability is at full capacity during months of low rainfall and high demand.
3. **Network Operations** to ensure that the network is operating at it’s most efficient when demand is highest.
4. **PR & Communications** to design and produce the necessary communication materials and set in motion the agreed communications channels.
5. **Customer Services** responsible for responding to customers queries regarding the drought and restrictions

All decisions on Drought Management are made by the Drought Management Group. The Head of Operations will lead on technical functions and the Head of Customer Services will lead on drought communications strategy. Supply-Demand Balance is considered by the Company’s Executive Management Committee (EMC) and the Company’s Board which meet ten and four times per annum respectively.

1.8 Responsibilities for Key Actions under DMP

Responsibilities for actions under the DMP are detailed in Table 1.2 below.

Table 1.2 Responsibilities for key actions under DMP

Action	Delegation	Timescale
Drought Monitoring	Head of Operations for the east region	Ongoing/Monthly. Enhanced during Drought
Review Drought Management Plan	Head of Operations for the east region	Annually
Drought Triggers Breached	Head of Operations for the east region	Upon Zone 1 breach
Convene Drought Management Group	Managing Director	Upon Zone 2 breach
Drought Records/Filing	Head of Operations for the east region	Under direction of DMG
Communications Customers, Group, Board EA Liaison OFWAT Liaison DETR Liaison DWI Liaison	Head of Customer Service for the east region Communications Manager Head of Operations for the east region Head of Operations for the east region or Engineering Manager Head of Operations for the east region	Under direction of DMG
Capex Programme identified	Head of Operations for the east region or Engineering Manager	Under direction of DMG
Opex monitoring system	Head of Finance	Cost Centre set up

Capex Delivery	Head of Operations for the east region	Under direction of DMG
Water Quality	Head of Operations for the east region	Under direction of DMG
Drought Order/Permit or Restriction removal	Head of Operations for the east region	Under direction of DMG
Promoting efficient use of water	Head of Customer Service for the east region assisted by Water Efficiency Technician and Communications Manager	Under direction of DMG
Appeals for Restraint	Head of Customer Service for the east region	Under direction of DMG
Restrictions on Supply	Head of Operations for the east region	Under direction of DMG
Emergency Planning	Head of Operations for the east region	Under direction of DMG
Stand down of DMG	Managing Director	Return to 'Normal' hydrological conditions

1.9 Environment Agency Liaison

Liaison with the Environment Agency takes place on a regular basis on a variety of water resources, environmental impact and water quality issues. The Head of Operations will be the primary point of contact with the Environment Agency including their Drought Co-ordinators.

1.10 Essex Resilience Forum Liaison

AW, east region, is a Category 2 Responder under the Civil Contingencies Act. The Head of Operations is the primary point of contact with the Essex Resilience Forum for the company and a water company representative liaises with the LRF on behalf of all the water companies serving Essex.

2 DROUGHT TRIGGERS AND SCENARIOS

2.1 Drought Triggers

We are able to use our available groundwater and surface water sources conjunctively. The ground water supply system is sufficiently robust that all demand (including peak summer) can be supplied indefinitely by groundwater alone. The surface water supply system is sufficiently robust to be able to maintain supplies during an emergency for a short period without a significant effect on customers. The period will vary depending on AWS ability to assist by allowing us a greater than normal proportion of the shared resource. The period could however be sufficient for essential repairs and/or flushing of the ground water system to be effected. Under favourable conditions we would be able to maintain near normal supplies from surface water only for several days. Together the groundwater and surface water systems are able to meet all historic and forecast demands throughout all historic droughts. A consideration of the supply/demand balance over time demonstrates the robustness of the resilience to drought. In 1995 the ratio of water available for use (WAFU) to dry year demand was 119% and 109% at average and critical period respectively. In 2010/11 the ratios were 124% and 120% respectively.

No significant problems were encountered during previous groundwater drought periods in the South-East of England including 1988-1992, 1995-1997 and 2002-2006 or during the record peak demand of the hot and dry summer of 1995. As the Company's supply/demand balance has improved there is no likelihood of any problems due to drought in the foreseeable future. There is therefore no credible drought scenario that would require special measures to be triggered. We will however respond prudently to any and all future periods of drought conditions using past experience.

In general terms, when groundwater levels are within the previous operational range for the time of year the Company can confidently predict that no actions are necessary related to potential drought. When groundwater levels are substantially below average for the time of year the Company monitors the situation more closely and assesses the significance of below average levels, their rate of recession and the significance of associated data such as rainfall and soil moisture deficit. The supply/demand balance position is reported at every Executive Management Committee with increased focus when there is any increased risk from developing drought conditions. The Company then also liaises more closely with the EA and neighbouring water companies.

We are fortunate to have a good set of historic data against which to benchmark potential droughts. The range of groundwater levels experienced since 1991 are reflected in the drought control curves included in Appendix 1. These curves have been built on data sets between 1988 and 2006. Using data from an EA observation borehole at Lady Lane (TM0351 4325) shown on figure 2.1 it can be seen that since 2006, water levels have not dropped below the levels recorded in 2006 and thus there is no significant value in updating the control curves. Figure 2.1 demonstrates that the lowest levels recorded were in 1997 and AW, east region, had no difficulty in meeting customer demand during this period. This is further supported by figure 1.3 which illustrates that current demands are lower than in the 1990's.

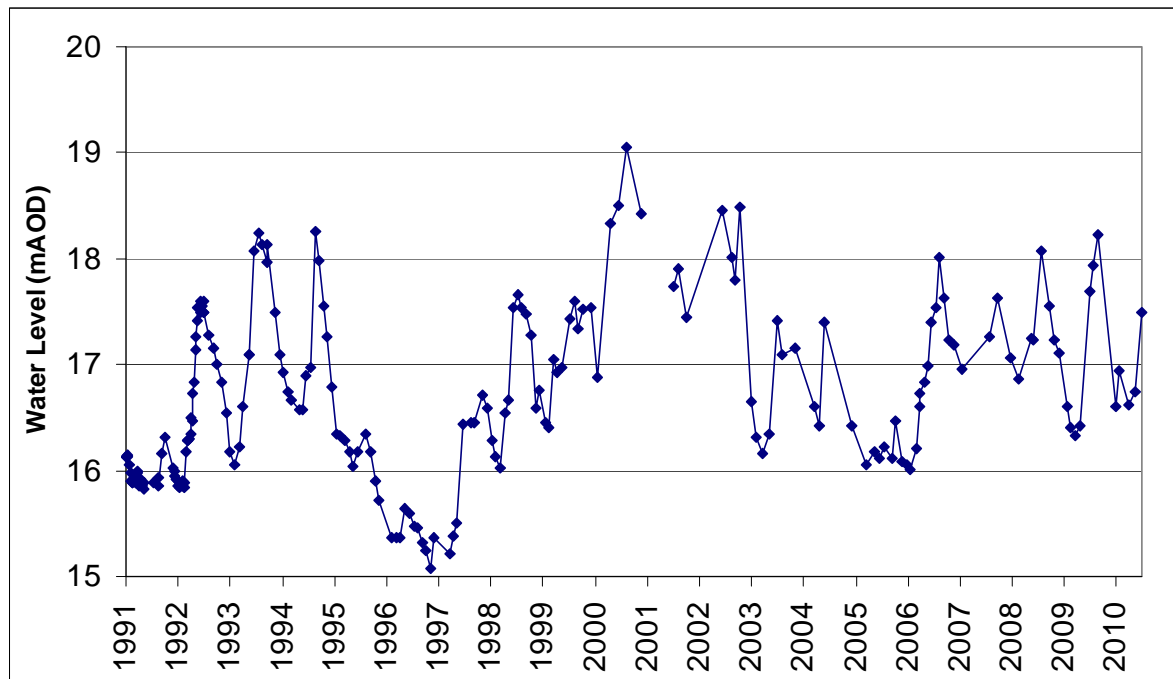


Figure 2.1 Lady Lane observation borehole water levels over past 20 years

In drawing up this drought plan AW, east region, has not assessed the return period of different degrees of drought as it is not possible to back-cast the behaviour of the Chalk aquifer under current levels of demand in the absence of specific drawdown data for those conditions. Accordingly this represents a practical and common-sense plan for managing various drought circumstances based on the empirical evidence of the 3 severe drought conditions seen since 1988.

2.2 Historic Droughts

Rainfall data has been collected daily since 1972 at THXI and has been used to identify drought sequences since that time. Drought sequences have been defined as being two successive recharge periods (September to February inclusive) of below 90% LTA rainfall with a below 90% LTA rainfall summer period (March to August inclusive) in-between. Three such sequences were identified, 1988-1992, 1995-1997 and 2002-2006.

1988-1992 drought sequence

The summer of 1988 was wet but was followed by low rainfall during the 1988/89 recharge period. Groundwater levels were already low at TDED BH2. Despite the low rainfall the ground water levels recovered slightly through the drought period. No specific drought related actions were taken by the Company during this period however an additional source at TSDN came into service in 1989. Abstraction reduced at TDED as TSDN increased, overall abstraction remained on a slightly increasing trend. Data from the Lady Lane OBH starts in 1991 and shows the groundwater level depressed as a result of the poor recharge and confirms the recovery during the 1992/3 recharge period.

1995-1997 drought sequence

Summer 1995 was long and hot and resulted in the highest peak demand experienced by AW, east region. Abstraction pumping was limited by the capacity of the raw water pumping mains and pinch-points in the distribution system limited the ability to maintain treated water storage levels. We undertook a trunk main reinforcement programme to remove the pinch-points and commission the construction of a raw water booster pumping station at Jupes Hill to booster flows to THXI WTW.

In addition a selective metering programme which commenced in 1997 saw the household meter penetration increase to 60% by 2003. No restrictions were imposed on customers during this drought sequence.

2002-2006 drought sequence

As a result of the increase in meter penetration resulting from the selective metering programme the distribution input had reduced levels similar to those experienced during the mid 1980's. Improvements to the distribution system and the improved availability of raw water sources put in place following the previous drought sequence resulted in the 2002-2006 drought sequence having no impact other than the slight reduction in ground water levels. The levels recorded at both Lady Lane and TDED boreholes were significantly higher than the lowest recorded providing reassurance that further water would have been available. No restrictions were imposed on customers during this drought sequence.

It should be noted that since 2007 the company has continued to install meters at customer's properties when requested. Meter penetration has increased to approx 73% and DI has reduced further.

2.3 Drought Scenarios

Drought scenarios of increasing severity have been considered when assessing the robustness of this plan. The three scenarios are Short, Medium and Long duration all of which encompass droughts within our experience. It is not thought that considering a scenario of greater severity than previously experienced would be helpful. However should a more severe drought occur the Drought Management Action Plan includes responses not previously needed for completeness.

Short duration drought

A short duration drought is regarded as being of between 6 to 12 months of reduced rainfall and includes a winter recharge period. Droughts of this magnitude have been experienced on a number of occasions over the length of our rainfall records and have resulted in no action having to be taken. The most recent example was during the winter recharge period of 2007/8. No actions were taken by the company other than to continue monitoring groundwater levels. The conclusion is that a short duration drought poses no threat to the Company or its customers.

Medium duration drought

A medium duration drought is regarded as being when there are two successive dry winter recharge period interspaced by a dry summer. The drought period 1995-1997 previously described is the best example of a medium duration drought experienced in recent times. The period was characterised by the high peak demand during the summer of 1995 which prompted a number of improvements to be made to both the abstraction and distribution

systems. No further measures were required but as a result we are now far better positioned to cope with a similar drought.

Long duration drought

A long term drought is regarded as when there are three successive dry winter recharge periods interspaced with dry summer periods. The 2002-2006 drought fulfils this criteria and as previously described we were able to supply water with no restrictions to it's customers and required no special measures to be taken.

The window between historic average and minimum groundwater level and deepest advisable pumping water level (DAPWL) has been used at the five principal groundwater sources to develop simple control curves to initiate and progress drought management actions.

The DAPWLs are taken from the safe reliable output (SRO) report prepared for us by Mott MacDonald in 1997 which utilised data up to 1996. We have not attempted to consider a catastrophic drought worse than that ever experienced, as it is not considered helpful to hypothesise on such an extreme event.

Appendix 1 contains groundwater control curves for each of the five principal production borehole sites. Each control curve has four drought action zones. An example is shown in figure 2.2. Details of the demand and supply options that would be considered are given in section 3

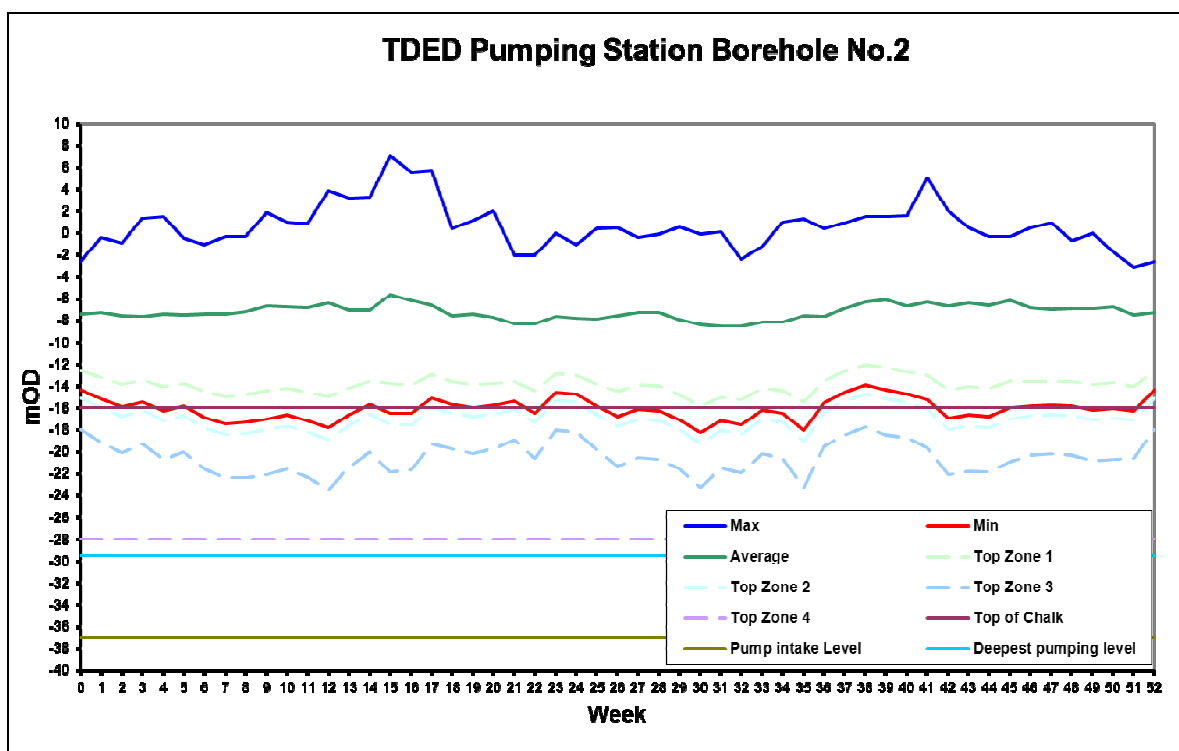


Figure 2.2 Drought control curves at TDED Pumping Station

2.4 Drought Action Zone Framework

We propose that for drought management purposes the zone philosophy remains consistent with that used in the WRP 2009.

Zone 1 – Drought Awareness

Entry into zone 1 is intended to create a state of readiness within the Company to ensure that proper consideration is given to the risk of drought occurring due to forthcoming hydro-geological conditions and the likely severity of that risk. Initial informal liaison with the EA may be set up during this period if rainfall is reduced as part of the preparation for a possible drought.

Zone 2 – Voluntary Demand Reductions

Entry into zone 2 would trigger an increase in activity both in terms of supply management and public awareness of the situation (demand management). Liaison with the EA and neighbouring water companies will be put on a formal footing with the Company's Drought Management Group being convened.

Zone 3 – Compulsory Restrictions on Use

Entry into zone 3 would trigger positive actions to restrain demand. The Company may choose, dependent upon timing, to initiate phase 1 of the temporary usage ban restrictions. Communication activity would also be raised accordingly. All remaining contingencies would also be prepared for implementation irrespective of cost or disruption.

Zone 4 – Unprecedented Drought Conditions

Water levels in this Zone would be at an extremely serious position and trigger consideration of further measures to restrain demand (e.g. implementation of drought orders as set out in the Drought Direction 2011).

Detailed drought actions assigned to Zones are described in Section 3.2

Balancing the use of groundwater and surface water sources has been excluded as a drought action above as it is considered as normal operational control. In a developing drought the balance between groundwater and surface water usage would be subject to increased detailed consideration with cost of decreased importance before crossing into Zone 1 and irrelevant before crossing into Zone 2.

The zone boundaries suggested have been tested against actual groundwater level curves for years since 1988 with below average groundwater levels when different drought management actions were taken. In general terms they give a reasonable fit with the control curves being suggested but the Company must retain some flexibility in making use of the curves to reflect the overall Company situation and the need for drought management actions. An example of this is that the absence of "hosepipe" bans during past droughts will not preclude the possibility of these being used in future.

2.5 Drought Forecasting

The EA are developing a groundwater model which includes the AW boreholes in east region. When completed this model can be used to assess future drought scenarios and determine regional groundwater level changes under various rainfall scenarios. The outcome from this analysis will be included in the next update of our Drought Management Plan.

For surface water the TARD control curve has been revised by AWS as part of their drought plan submission and is enclosed as Appendix 2. Further information on the curve for TARD is available from AWS. Identical control curves have been submitted by us and AWS for TARD even though the supply-demand balance is not identical for each company. Similarly the onset of a drought and its relative effect on each company is likely to be different. AW may choose not to implement certain actions even though these may be indicated by the TARD control curve. Any decision to delay implementation would be based on the prevailing circumstances with particular regard to the groundwater resource position.

3 DROUGHT MANAGEMENT ACTION

Please note the following drought actions would only be carried out in the event of a drought very much more severe than any previously experienced. Demand would have to increase to exceed levels experienced in 1995 and rainfall would have to fail for longer or be significantly less in order for the groundwater levels to fall significantly below the historic minimum levels.

As we can foresee no drought event when this is likely to occur the statement made in the Water Resources Plan where we foresee no restrictions within the 25 year planning horizon is valid. The actions and temporary restrictions covered in this section would only need to be applied during an extreme and unprecedented drought.

3.1 Introduction

Specific drought actions will be carried out under the supervision and management of the Drought Management Group. Details of internal roles and responsibilities concerning drought are contained within sections 1.7 and 1.8 and the Communications Plan in Section 5. We plan to follow a twin track approach using both Demand Management and Supply Side options as tools to manage the drought based on risk assessment of severity. The range of options to be considered are summarised in section 3.2 and 3.3.

3.2 Demand Side Management Actions

A summary of each chosen demand-side drought management action is presented in the table in Appendix 3.1. This table demonstrates:

- How we have outlined the priority, order, timing and combination of demand side actions it will take in a drought
- An overview of the key demand measures undertaken within each Zone when the triggers have been activated.

3.2.1 Zone 1

3.2.1.1 Water Efficiency

The company's long term vision is to provide a high quality, water efficient service. This will be delivered through a clear Water Efficiency Strategy (WES), with objectives focussed around:

- Limiting the average per capita consumption of domestic customers to not more than the government target of 130l/h/d by 2030. This will be achieved by supporting measured customers to save water, and increasing the number of measured customers.
- Household metering; 78% of homes to have a meter by 2015 and 82% by 2020.
- Advising/educating customers and consumers on a number of specific water efficiency initiatives

- Maintaining leakage at or below the sustainable economic level
- Reducing our own use of water and promotion of water efficiency within the Company

3.2.1.2 Water Operations

- Leakage – We will continue to monitor leakage and ensure it is maintained at a sustainable and cost efficient level.
- Pressure – We will continue to maintain pressure management as a tool for minimising leakage
- Water use at operational sites – We will carry out water audits at operational sites and set targets for water use
- Developing water efficient culture – We will develop water awareness programmes for our employees and expect them to become water efficiency ambassadors for AW.
- Procurement – We will procure in a sustainable manner and take advantage of the Enhanced Capital Allowance (ECA) scheme which supports businesses investing in water saving equipment or water saving technologies.

3.2.1.3 Metering

Our target for the east region is to see circa 78% of households fitted with a meter by 2015. A measured bill raises customer awareness and is the fairest way to pay, providing a financial incentive for customers to reduce their water usage. Importantly, most customers that pay for water using a meter use less water than those that don't, thus reducing the average per capita consumption.

3.2.1.4 Water Saving Initiatives

- Water audits – Free water efficiency audits will be offered to domestic and commercial customers.
- Water efficiency products – A range of free and charged water efficiency products will be offered/promoted by our customer service technicians to customers.
- Water efficiency initiatives – We will run a number of water efficient programmes.

3.2.1.5 Education and Promotion

- Education – Focus will be on measured customers and future customers by working with schools and children. We will provide information to all our customers on the benefits of switching to, or retaining more water efficient household appliances
- Website – Water efficiency will be made more readily available.
- We will structure advisory campaigns to deliver specific efficiency advice within an annual programme.

3.2.2 Zone 2

- Public Relations Campaign – Customer awareness focussing on drought implications.
- Enhanced Leakage Reduction – Unlikely to yield a significant increase in savings, but important to fix visible leaks and supply pipes to maintain customer support.

3.2.3 Zones 3 and 4

From the 1st October 2010 Section 36 of the Flood and Water Act 2010 allows water companies a wider range of temporary water use restrictions that they can implement during a drought without requiring a drought order. This updates the legislation on temporary water use restrictions, substitutes the previous section 76 of the Water Industry Act 1991 and therefore supersedes the previous hosepipe ban powers.

The Water Use (Temporary Bans) Order 2010 provides detailed definitions of uses, exemptions and conditions in relation to these new powers. The Drought Direction 2011 sets out those uses that still require an ordinary drought order to restrict in a drought. These three pieces of Legislation supplement each other and together they set out the categories of water use that can be restricted by a company and additionally with a Drought Order.

The background to the Order arises from the 2004-2006 drought experienced in the South East. The limiting scope of hosepipe bans which applied only to the watering of private gardens and the washing of cars gave rise to public criticism. The focus of the powers was seen as unfair in preventing garden watering whilst filling private swimming pools could continue.

The changes introduced by the government have made the powers clearer and have enabled more effective and equitable restrictions during times of drought. It is hoped that through introducing these new powers it will lead to better conservation of water earlier on in a drought and ensure supplies are protected for essential domestic use.

3.2.4 Representations and actions prior to implementation of restrictions

Before any restrictions were introduced there would be discussions with other companies likely to be in the same position with special consideration to Anglian Water Services due to the common supply area land boundary and shared resource. The liaison would be aimed at achieving a common approach to limit the scope for customer confusion or for comparing and contrasting differences in approach as far as possible.

Before any restriction is implemented under these new provisions, we will provide the opportunity for representations to be made.

Publicity Requirements

Section 76B of the WIA 1991 has enhanced previous publicity requirements with regard to imposing restrictions. Before any prohibitions can be applied, we must:

- Publish notice on the website at the same time as we publish notice in two local newspapers
- Provide details in the notice of how to make representations about proposed prohibition
- Give notice each time the scope of any prohibition imposed under section 76 of the WIA 1991 is altered in any way; and
- Give notice in relation to the lifting of any prohibitions on the website and in two local newspapers.

Whilst there will be a lead in time for the implementation of restrictions to allow for representations, there is no such lead in time necessary for the revocation of restrictions; the lifting of a ban will take effect as soon as notice is given by one of the required means.

Making Representations

Before a restriction is implemented under these new provisions, we will provide the opportunity for representations to be made. The time allowed for representations will depend on the scale of the proposed restrictions. Our proposed timescales are outlined in Appendix 3.1. Customers seeking to make a representation will be able to do so by completing and returning a representation form (Appendix 3.3). The following forms of media will be available for customers to complete this:

- Website
 - E-copy of the form will be available to be completed and returned directly online
 - Paper copy will be available for downloaded to be printed off, then returned to head office
- Telephone
 - A contact service advisor will be able to post a copy of the form to a customer address
 - A contact service advisor will be able to complete an e-copy of the form by taking customer details on the phone

Handling Representations

Representations received into the business will be collected and reviewed on a weekly basis. A panel of three members from the Drought Management Group will convene to discuss the outcome of representations, with a final decision made by all three representatives on the eligibility of the representation within 3 weeks of the form being sent in by the customer. There will be no appeal process if the application for a concessions or exemption is denied.

3.2.4.1 Implementation of Restrictions

Our proposed policy for implementation of the WUO 2010 and DD11 measures is summarised in table 3.1 below. Appendix 3.4 and Appendix 3.5 comprise a series of figures of each of these activities summarising key information associated with each restriction. These appendices have been adapted from the figures listed in the UKWIR Model Code of Practice.

Table 3.1 Summary of Implementation Policy for TB and DD11

Zone 3 – All 11 Temporary Ban (WUO 2010) measures introduced in single phase	Zone 4 – All 10 Drought Order (DD11) measures introduced in single phase
<ul style="list-style-type: none"> • Watering a garden using a hosepipe • Cleaning a private-motor-vehicle using a hosepipe • Watering plants on domestic or other non-commercial premises using a hosepipe • Cleaning a private leisure boat using a hosepipe • Filling or maintaining a domestic swimming or paddling pool • Drawing water, using a hosepipe, for domestic recreational use • Filling or maintaining a domestic pond using a hosepipe; and • Filling or maintaining an ornamental fountain • Cleaning walls, or windows, of domestic 	<ul style="list-style-type: none"> • Watering outdoor plants on commercial premises • Filling or maintaining a non-domestic swimming or paddling pool • Filling or maintaining a pond • Cleaning non-domestic premises • Cleaning a window of a non-domestic building • Operating a mechanical vehicle-washer • Cleaning any vehicle, boat, aircraft or railway rolling stock • Cleaning industrial plant • Suppressing dust • Operating cisterns

<p>premises using a hosepipe</p> <ul style="list-style-type: none"> • Cleaning paths or patios using a hosepipe • Cleaning other artificial outdoor surfaces using a hosepipe 	
---	--

A single phase in which all eleven activities are simultaneously banned at the start of the Temporary Ban is felt to be the most appropriate implementation policy for us. Levels of decline in groundwater are dominated by natural discharge from the aquifer, and will far outweigh any differences on a yearly basis made from demand management savings. Our priority is to ensure we have sufficient groundwater supplies to meet demand, whilst minimising the impact of these abstractions on the environment. By imposing the full use of powers immediately we are helping to ensure resources remain within our ability to supply the customer base. As well as maximising water savings it sends out a strong and clear message to our customer base that the situation is deteriorating. Customers would not in reality experience an abrupt start to restrictions as water savings are made gradually throughout zone 2 following an initial media and PR campaign promoting the severity of the situation.

Where the groundwater level was tracking the drought curve, but not likely to cross deeply into the Zone for some time, we may delay the imposition of restrictions to an appropriate time. For example, if the zone 3 trigger level was not crossed until the autumn and then tracked the trigger level, either slightly above or below, we would not aim to impose restrictions until the spring of the following year, when the pattern and amount of recharge was understood. We would review the situation in January, when the first half of the recharge season was completed and the DMG would, in consultation with the Environment Agency and neighbouring water companies, and then again in April.

We would not be introducing such extreme measures as given in the Drought Direction 2011 legislation if the water situation was not becoming demonstrably very serious. We consider that a straightforward total ban without exemptions not only sends a clear message underlining the severity but also maximises water savings and is easier to communicate and administer. In the unlikely event of the need to apply for an Emergency Drought Order, such an approach would stand the company in good stead for an application.

3.2.4.2 Concessions and Exemptions

Our DMP only includes formal statutory exemptions outlined in the WUO 2010. In order to conserve water and ensure a safe and secure supply during a drought, no other concessions will be granted by us. Please refer to each figure within Appendix 3.4 and Appendix 3.5 for a more detailed outline of the activities covered by each restriction and whether a formal exemption is associated with each. A summary of the key exemptions is listed below:

- 1) On the grounds of health and safety and bio-security:
 - *to clean the surfaces of a private leisure boat to prevent it from transferring invasive species to new waters.*
 - *to clean the walls or windows of domestic premises.*
 - *to clean paths or patios or other artificial outdoor surfaces*
 - *to fill or maintain a domestic pond or ornamental fountain in which fish or other aquatic animals are being reared or kept in captivity.*

- 2) To fill or maintain a domestic swimming or paddling pool:
 - *where necessary in the course of its construction.*

- *that is designed, constructed or adapted for use in the course of a programme of medical treatment.*
- *used for the purpose of decontaminating animals from infections or disease.*
- *used in the course of a programme of veterinary treatment.*
- *in which fish or other aquatic animals are being reared or kept in captivity.*

3.2.4.3 Vulnerable customers

Information relating to the support for vulnerable Customers is available on our website <http://www.Affinitywater.co.uk>

3.2.4.4 Application for Concessions

The company will consider applications based on the grounds of health and safety and bio-security. Customers must do so by completing and returning a representation form (Appendix 3.3). This form can either be completed by hand and sent back to the head office (it can be downloaded off the company website or can be sent out by post), completed and sent back directly online or filled in by phone with details taken and captured by one of our contact centre agents. A description of how the company will handle representations received has been outlined in section 3.2.3.1.

Please note that the company will not consider any applications for compensation in the event that temporary bans on water usage are introduced. The company has to plan on the basis that it may have to impose restrictions during long periods of very dry weather or drought. If you require further clarification on this please refer to the following link available through the Ofwat website –

<http://www.ofwat.gov.uk/sustainability/waterresources/restrictions/>

3.3 Supply Side Options

A summary of each chosen resource side drought management action is presented in the table in Appendix 3.2. This table demonstrates:

- How the company has outlined the priority, order, timing and combination of supply side actions it will take in a drought

An overview of the measures used is highlighted below.

3.3.1 Re-commissioning of Abandoned/Disused Sources

AWE has no sources which have been abandoned and which could be fully re-commissioned. There is however one source currently not in use, which can be brought back into service under existing abstraction licences.

3.3.1.1 TLAW Chalk Source

The TLAW well source has not been used for public supply since 1992. The TLAW source could be brought back into use quickly if required due to drought either with EA consent or depending on the licence position, unilaterally and can contribute up to about 5MI/d.

3.3.2 Engineering Works

The Company's supply side has been progressively augmented since the record peak demands occurred in July and August of 1995. The improvements are shown below:-

- Surplus AWS groundwater can be used for R. Colne augmentation. This increases raw water availability to TARD and is allowed for in the TARD Control/Trigger Curve given in Appendix 2. During 2011 AWS carried out tests and other work to allow 2 more groundwater sites to support the River Colne. A full explanation of the background to this is available from AWS.
- TARD was raised in 1997 providing an additional 180MI of useable storage, which equates to circa 1MI/d yield increase in a design drought.
- Several borehole pumps lowered and some more powerful pumps fitted. Further pump lowering may be necessary during a future more severe drought and would be actioned in Zone 2.
- Twin 160kW booster pumps fitted to borehole raw water mains to boost peak flow capacity from circa 39MI/d to circa 48MI/d
- Two additional boreholes in the Stutton Brook valley are now available for normal and drought conditions. The additional increase the spread of borehole abstraction. Licensed quantities have increased “permanently” by 2MI/d and 4MI/d for annual average and peak respectively

Given the success of the above measures and the success of demand management improvements we are unlikely to need further engineering works options in the foreseeable future.

3.3.3 Distribution Improvements

AWE has a well-integrated trunk and distribution main system with more than adequate capacity to meet peak summer demands. The Company has not experienced any difficulty in getting sufficient water to its customers since significant improvements were completed between 1990 and 1993. The company has been implementing a strategy of increasing and improving treated water storage. More than 24 hours treated water storage is available to balance variation in diurnal and weekly demand allowing sources and treatment facilities to operate at average weekly flows. There is therefore no need for consideration of distribution improvements such as construction of temporary pipelines.

3.3.4 Inter Company Bulk Transfers

AW, east region, has a short boundary with AWS. As joint owners and operators of the TARD scheme AW and AWS already have an effective mechanism for bulk transfer which works well.

The legal basis of TARD could result in strict sharing of resources in a drought. In practice the companies enjoy a close and effective working relationship and can vary operational practice to the benefit of both parties. The willingness of AWS to operate their chalk boreholes to benefit the availability of water in the R. Colne is a good example. Similarly the Company’s robust borehole and integrated distribution system can and has been operated to temporarily assist AWS.

In addition to the AWE/AWS arrangements facilities also exist for Essex and Suffolk Water (ESW) to release raw water to either TARD or direct into the TARD treatment works. ESW have confirmed that supply would be provided to AW/AWS via TARD provided the water was available. It is possible that all three companies could suffer equally in a future drought. There is however a greater probability that the progress of a drought would affect companies differently giving the opportunity for assistance to the worst affected area.

3.3.5 Supply Balancing

The Company's ground and surface sources are managed conjunctively to optimise the total supply. In normal operation and during a progressive drought, demand can be transferred from one source to the other in proportion to the ability to supply. This is a normal operating function but would come under greater scrutiny with decreasing regard to cost during a developing drought.

As explained above AW has a well-integrated supply and distribution system. The Company's area is treated as one water resource zone and therefore water, which is available, can be moved to meet demand in any part of the distribution system.

3.3.6 Use of Alternative/Existing Sources

The Company's groundwater licences already allow for varying abstraction between individual sites to mitigate any adverse impacts at any site. Similarly the TARD abstraction licence for the R. Colne intake has no minimum residual flow constraints and the ability to re-fill the reservoir is solely constrained by whether or not water is available in the river

Apart from the possible re-use of currently dormant sources there are therefore no drought permits or orders relevant to increasing supply side capacity.

3.3.7 Other Options

No other options exist except resorting to desalination of sea water using temporary treatment facilities which could be implemented in extreme and unprecedented drought conditions. The company's area is bounded by the North Sea and the tidal estuaries of the Rivers Colne and Stour with high demand and high capacity trunk mains adjacent to the coast. This option is included for completeness but is extremely unlikely to ever be needed.

3.4 Drought Orders & Permits

Due to the robustness of the resource available and having never had to impose restrictions on customers, AW does not believe the use of drought permits is required in the east region and therefore cannot envisage a situation where they would be required.

4 ENVIRONMENTAL MONITORING PLAN

The supply side options included as drought management actions will not involve any environment damage as all options are available within the operational limits of existing abstraction licences. In addition studies such as that for the River Brett AMP3 NEP Scheme did not demonstrate any connectivity of groundwater abstraction from the confined aquifer with no discernible environmental impacts on surface water features due to abstraction from the company’s sources. Similarly the abstraction from the R Colne was reviewed for possible impacts on the downstream estuary but no further action was considered necessary and the existing licence allowing all fresh water to be abstracted at the tidal limit (within overall licence volumes) remains in place.

Historical data demonstrates that we can rely on abstracting the full yield of existing sources under drought conditions. Our groundwater boreholes have also been shown to be sufficiently robust that it is feasible to support low flows in the R. Brett from groundwater. Facilities for the augmentation of the R. Brett are in place and can be used when instructed by the Environment Agency. During 2004 AW funded a new permanent pipeline between Shelley borehole and the R Brett. The existing arrangement is summarised in Table 4.1.

Table 4.1 Opportunities to mitigate environmental impact of drought

Site Location (grouped by type or location)	Monitoring Proposals	Potential Abstraction Impact during Drought	Proposed Mitigation Action
River Brett	By EA	Low flow in River Brett	Augmentation of River Brett at Shelley

5 COMMUNICATIONS PLAN

Affinity Water, east region is a small fragment of a water company and is close to its customers. Direct contact and local media are used to communicate with the public and other stakeholders.

Our communications plan for a drought is shown in Appendix 4. This communications plan is a skeleton which would be fleshed out according to the severity and timing of a drought. In the event of a drought very much more severe than any previously experienced a communications monitoring plan would be drawn up during the lead in period to determine the effectiveness of our communications with our customers.

AW, east region, is a resource zone with a very robust supply-demand balance and undoubtedly benefits from “drought” publicity initiated by others or from generally heightened public awareness during dry periods.

6 POST DROUGHT ACTIONS

6.1 Identifying the end of a drought

The end of a drought can be defined as when the risk of impact from drought is no greater than during a normal year, and where normal conditions have continued for a period of time. The hydrological conditions as a drought recedes can be complex and identifying the end of a drought can be difficult to determine. We will confirm first and foremost with the Environment Agency that the water resource situation has returned to normal before taking any action. The following stakeholders would also be notified before any actions are taken: DETR, OFWAT, Water UK, Consumer Council for Water, DWI, Environmental Groups, Board/ EMC, Employees.

The end of a drought will be determined using the company's triggers, with all restrictions able to be removed when GW levels have moved out of zone 3. The lifting of the ban will first require notice in relation to the lifting of prohibitions to be published on the company website and in two local newspapers. Unlike the imposition of restrictions however, there is no such lead in time necessary; restrictions will be revoked instantly after the notice is given.

6.2 Post-drought actions

Directly after a drought event, it will be the responsibility of the head of operations to produce a "lessons identified" report that will enable future processes to be improved. This report will be produced within 3-6 months of a drought ending and will be followed up within a year with evidence that recommendations were acted upon. The report will include:

- A review of the environmental impact of the drought by analysing baseline, in-drought and post-drought data.
- Determining if the appropriate environmental monitoring of baseline, during and after a drought was carried out to measure the impact of any drought permits or drought orders.
- A review of the effectiveness of any mitigation measures implemented.
- An assessment of how well individual sources delivered additional water and determine where any re-assessments of yields may be needed or invested to maintain yields of sources.
- An assessment of the estimates of demand reduction from the implementation of demand side drought management actions.
- An investigation into whether or not the company would need to make any changes to its demand forecast or longer term demand forecast

Additionally a drought workshop would be held to assess the efficacy of the management process and review whether any improvements or changes to the drought plan were required.