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South Staffs Water

incorporating

CAMBRIDGE WATER COMPANY

Water Resources Management Plan 2014
Cambridge Region
Main report

Contents

Foreword from the Managing Director

The Water Resources Management Plan sets out our water resources and demand projections for the Company's Cambridge region of supply, for the next 25 years. The Company does not forecast a supply demand deficit within the 25 year planning horizon, therefore major resource development or demand management measures are not required to meet a supply shortfall.

Ensuring that all of our customers have a plentiful supply of high quality drinking water is at the heart of our business. We are proud of our record of not having a hosepipe ban since the drought of 1991 and this plan demonstrates that we will continue to maintain the highest levels of security of supply to our customers.

However, we recognise the pressures that taking water from the environment for public water supply can have on flora and fauna and therefore will continue to promote increased metering so that customers can better understand how much water they use and can make most benefit from our water efficiency activities. Research with our customers has shown that most agree that meters are the fairest way to pay for water and support further metering.

Alongside the metering programme, we will refocus and reinforce our activities in the area of water efficiency to provide our customers with the information they need to make informed decisions about using water wisely. We will also continue to work hard to maintain leakage at the economic level. Our proposed leakage targets from 2015 are significantly lower than current targets set by Ofwat for the AMP5 period.

We have consulted customers and keys stakeholders during the preparation of this plan and the views we obtained have helped shape our proposals. More customer engagement has been undertaken than ever before.

It now gives me great pleasure to present to you the Company's final Water Resources Management Plan for the period 2015 to 2040.

Phil Newland
Managing Director

Executive Summary

Cambridge Water's number one priority is to ensure a safe and consistent supply of high quality water for its customers, now and in the future.

We aim to achieve this in a way that is affordable and takes into consideration any environmental pressures on our resources.

The draft Water Resources Management Plan sets out how we plan to achieve this over the next 25 years.

The plan has been prepared in compliance with our statutory duty as a water undertaker, as set out by the Water Act, and the Water Resources Management Plan Direction 2012.

We have also followed guidance provided by the Environment Agency, and taken account of the Government's guiding principles on resources planning.

Specifically, the plan sets out how Cambridge Water intends to balance the amount of water it has available for supply with the forecast demand. This is known as the 'supply demand balance'.

Factors likely to influence the supply demand balance, are described in detail within this plan.

Our overall aim is to ensure there is a surplus, or available headroom, in supply.

If a deficit in supply over demand is predicted, it is our responsibility to include and evaluate the costs and benefits of options to remove any deficit.

During the preparation of this plan, we have consulted with members of the Local Water Forum, an independent body comprising representatives of Cambridge Water's regulators and its household and non-household customers.

A sub group of the Local Water Forum was set up to look specifically at the draft Water Resources Management Plan to understand and challenge the assumptions made in its preparation.

Members of the forum are satisfied that the approach Cambridge Water has taken to determine the baseline supply demand position is appropriate, and the assumptions made are reasonable.

Following Direction by the Secretary of State, this draft plan will be published for public consultation, and any representations regarding the contents of this draft plan can be made to Defra during the consultation phase which ends 12 weeks from publication.

During the consultation, the views of customers and stakeholders on our draft plan will be taken into account when producing our final plan for 2014.

Baseline water resources situation

Cambridge Water is able to demonstrate a surplus in deployable output, and therefore available headroom, in the baseline supply demand balance for the next 25 years.

In arriving at this conclusion, we have taken account of the influencing factors and allowed for uncertainties in producing the plan. Most notably these are reductions in available supply, population growth and new demand, environmental concerns and leakage.

All the factors that influence the supply demand balance are summarised below. Full details of each of these issues are contained in the plan.

One area of uncertainty relates to Water Framework Directive legislation. This requires the Company to ensure our abstractions do not impact on the water environment and the ecology it supports.

The impact of this legislation is still being assessed and any that are identified will be notified as Sustainability Reductions and may become reductions to abstraction licences. We recognise the potential risk to our licences, particularly towards the end of the planning period, and are working closely with the Environment Agency to assess possible future impact, and we will manage these risks as appropriate.

As likely reductions are not yet fully ascertained, and in accordance with the latest Environment Agency guidance, no reduction in deployable output has been allowed for at this stage. We will further review this issue as more information becomes available.

Overall the Company is confident that a surplus in headroom can be maintained, without the requirement to develop options in this plan.

The main influences on the supply demand balance are included in our forecast, and explained fully within the plan, these are summarised below:

Water Demand:

We expect significant growth in the region over the next 25 years, and Cambridge Water is planning for 47,000 new properties to be built by 2040, with the number of connections increasing each year through much of the period. This growth is in line with the latest local authority forecasts, although we have taken a realistic view on the phasing of the expected growth.

The continuation of our strategy to encourage unmetered customers to opt for a metered supply will result in 87% meter penetration by 2040, and universal metering by 2050, without the need to impose compulsory metering on customers. The benefits of metering in reducing peak demand have been seen over recent years, and our customers are opposed to the idea of compulsory metering, therefore we do not propose an accelerated household metering programme during the planning period

The demand for water in new properties will reduce as a result of new Building Regulation standards now in force, and together with the effects of our water efficiency measures, will ensure that average per capita consumption (PCC) will decline, from 140 litres/head/day to less than125litres/head/day by 2040.

Demand for water in household and non-households is expected to increase by less than 1% over the planning period as a result of climate change.

We will continue to promote water efficiency to meet a minimum annual reduction of 1litre/property/day, although no regulatory target exists. Our customers have expressed their expectations of the company to continue to help them to become more efficient.

The Company plans to maintain leakage at 14.0 mega litres per day (Ml/d), in accordance with Government requirements in the planning guidelines. This is despite our Sustainable Economic Level of Leakage (SELL) being assessed at 15.5Ml/d. To maintain this level, per property leakage will reduce 35% by 2040.

We shall also continue to lobby for newly built properties to meet the higher levels of the Code for Sustainable Homes (CSH). Where this can be shown, we will incorporate the lower consumption figures into our demand forecasts. We will consider the role of infrastructure charges for new developments, and how this can encourage the development of lower consumption properties.

Water Supply:

Since our last plan total available deployable output (DO) under annual average conditions has increased slightly, due to the re-commissioning of a previously un-used source.

Cambridge Water's supply area is no longer designated by the Environment Agency as an area of serious water stress.. We have not proposed a compulsory metering programme in this plan, as it has not been shown to be necessary in addition to our existing policies.

As a result of the Environment Agency's National Environment Programme, we have recognised sustainability changes, resulting in a reduction in deployable output of 5.4Ml/d. We will continue to work with the Environment Agency to achieve the most appropriate solution at the sites implicated to protect flows in the environment.

A further reduction in deployable output has been included to account for the likely removal of two sources from supply due to treatment considerations for the short to medium term.

A small reduction in deployable output is predicted across all of our sites to account for the impact of climate change. We will continue to work with the Environment Agency, and use its regional ground water models to further understand and quantify the impact on a small number of our most vulnerable sources as appropriate.

The overall outage allowance included in the plan has been revised, applying current best practice, and has reduced to 8.5Ml/d.

Where there are potential environmental issues arising from the Water Framework Directive (WFD), we will continue to work with the Environment Agency to ensure the risk from these is managed appropriately. Likely reductions are not yet fully ascertained, and therefore no reduction in deployable output has been explicitly allowed for in this plan, in accordance with the latest Environment Agency guidance

From 2020 onwards, we will also look to introduce measures that increase the security of our supply at single boreholes sites. This will further reduce the allowance for outage, and increase available headroom.

Preferred Final Plan

Cambridge Water is able to demonstrate a surplus in supply and available headroom in its supply demand balance for the next 25 years, and therefore our final planning solution does not differ from that in our baseline assessment.

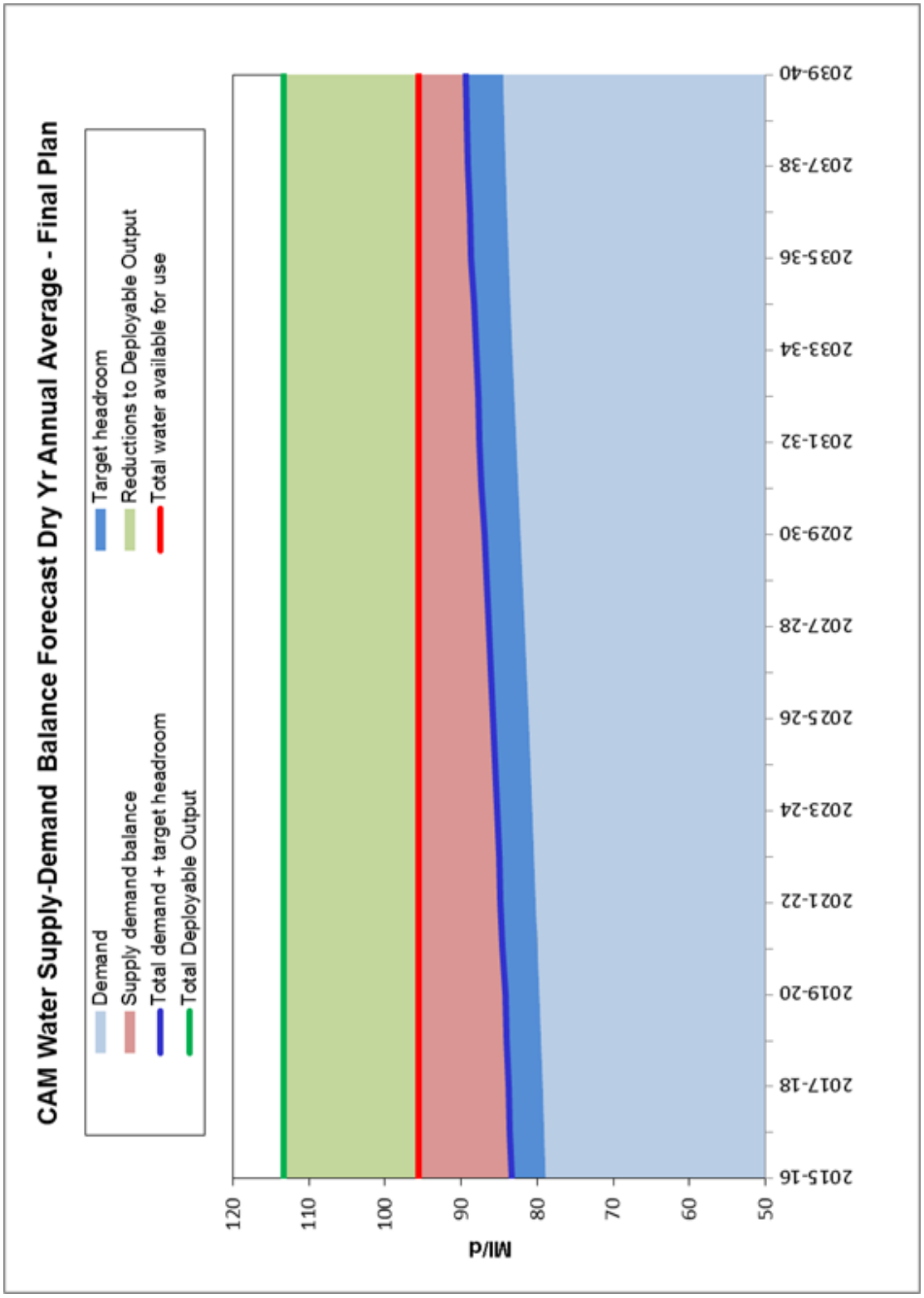
Whilst the Cambridge Water resource zone is no longer classified as being seriously water stressed we operate in an area with significant planned growth and increasing pressure on water availability. We are mindful these pressures on resources and of Government aspirations in water resources planning. These factors allow for companies to adopt a ‘do the right thing’ approach in order to propose measures that allow them to become more efficient and maintain a positive supply demand balance into the future.

In drafting this plan we have explored various additional measures we could include in order to improve our baseline supply demand position. Our review has demonstrated that any such additional measures will not alter the supply demand balance significantly, and would be at additional cost to our customers.

We therefore do not propose to adopt any solutions that differ from our baseline assessment at this stage. We remain committed to our water efficiency and demand management activities to encourage lower water consumption.

Following public consultation on the draft plan and the Company’s customer engagement process for the PR14 business plan, additional measures have not been developed further for including in the final plan.

Figure 1 - Baseline and Final Supply Demand Balance



1. Overview

1.1 Introduction

The purpose of this draft Water Resources Management Plan (WRMP) is to demonstrate sufficient water supply availability over the statutory 25 year planning period, and this plan shows how Cambridge Water intends to maintain the balance between supply and demand over the period 2015 to 2040. The plan is complemented by Cambridge Water's drought plan, published in November 2012, which sets out the short-term operational steps we will take if a drought occurs. This plan shall also directly inform the company business plan for the Price Review 2014, with respect to customer demand forecasts and any required resource development to be included in the next five year plan.

Cambridge Water published its first water resources plan in March 1999, and has produced a revised plan every five years, in line with Defra recommendations, and Government legislation. The previous WRMP was finally published in January 2010, following full consultation with the Environment Agency and other stakeholders.

The Water Act 2003 introduced a statutory duty for water companies to prepare and maintain water resources plans. The Water Resources Management Plan Direction 2012 prescribes how plans are to be prepared and published, and is supported by the latest technical guidance issued by the Environment Agency in 2012, which covers the process in detail. This plan has been prepared in line with The Water Resources Management Plan Direction 2012 from the Secretary of State, and the latest Environment Agency guidance. Responses received from consultees at the pre-draft stage have also been considered in the compilation of this document, and the Environment Agency has been consulted throughout the preparation of the plan. The key assumptions made in the development of this plan have been discussed with members of the Local Water Forum, who have been provided with opportunity to challenge and inform the planning process at regular meetings.

The Board of Cambridge Water reviewed and endorsed the draft WRMP and its underlying policies at a board meeting held on 22 March 2013. Following publication of this plan, there followed a period of consultation, and this plan has been revised to take account of the representations received A final draft will be produced, as directed by the Secretary of State, once Defra is satisfied with the plan and it has been updated, where necessary, to take account of representations received.

1.2 Background to Cambridge Water

In October 2011, Cambridge Water was acquired by the South Staffordshire Group. The acquisition was referred to the Competition Commission, which has determined that the merger of Cambridge Water and South Staffs Water could go ahead without impact to customers. Details of the Commissions conclusions are publicly available online. On 1 April 2013 the company was merged in to South Staffordshire Water PLC, but continues to trade under the name of Cambridge Water, following the successful application to Ofwat to merge licences. As Cambridge Water operates in a distinctively separate geographical and water resource areas, this plan is only concerned with the resources situation for the Cambridge Water area. References to 'the company' in this document refer specifically to Cambridge Water.

Cambridge Water is the water undertaker supplying wholesome potable water to a population of 315,000 in Cambridgeshire and Huntingdonshire, an area that includes Cambridge city and extends to Ramsey in the north, Gamlingay in the west, Balsham in the east and Melbourn in the south. The area supplied is shown in Figure 2.

The company's water resources are supplied from groundwater sources, 97% from chalk aquifers and the remaining 3% available from greensand aquifers. The underground chalk strata is generally a robust water storage aquifer, recharged by rainfall mostly during the winter months each year from which we abstract water using boreholes sunk into the ground, at 26 sites across the area. There are also a number of small bulk imports and exports with neighbouring water supply companies, which have been in operation for a number of years at the periphery of the company's supply area.

The area of the south east UK supplied by Cambridge Water is one of the driest in the country, and the company's resources catchment area was at the time of producing a draft of this plan classified by the Environment Agency as an area of serious water stress[1] due to its vulnerability to a changing climate and being situated in a fast growing region, with considerable growth and housing development planned over the coming years. In July 2013, the Environment Agency published a revised classification for water stressed areas using a new and refined methodology, and as a result Cambridge Water has a final classification of not seriously water stressed.

In spite of this change we remain conscious of the considerable planned growth in our region, and of increasing pressure on the natural environment from water abstraction, and the company takes its responsibilities for water supply seriously when planning for the future. Therefore we encourage the efficient and effective use of the water resources for which we are responsible, and are committed to continued water efficiency programmes and activities to reduce water consumption.

[1]Water resources in England and Wales - current state and future pressures, Environment Agency, December 2008 (GEHO1208BPAS-E-E.pdf)

Figure 2 - Company Area of Supply

1.3 Consultation

The statutory process for the preparation of water resources management plans sets out defined stages for consultation. In preparing to produce its draft plan, the company has produced and maintained a consultee contact and communication plan outlining its approach. The three principal consultation stages are:

1. Pre-draft consultation with statutory consultees and licensed water suppliers, including any licensed water supplier which supplies water to premises in the undertaker's area via the undertaker's supply system.[2]

2. Consultation with the Environment Agency's regional planners, with the Water Services Regulation Authority (Ofwat), and with customers and other stakeholders during the preparation of this draft plan.

3. Consultation with specified organisations, with the company's customers, and with anyone else who is likely to be affected, following publication of the draft plan. This is a four stage process: advising stakeholders of the plan's publication; ensuring that it is made available to those affected; subsequent to publication, allowing a reasonable time for interested parties to make representations; and, publishing a Statement of Response to show how the final plan has been updated to take account of representations received.

To ensure customers have been engaged throughout the planning process for the WRMP and the Business plan, companies are required to show evidence that customer engagement and the opportunity to challenge our plans has been provided. The Company has established a Local Water Forum comprising key stakeholders and customer representatives in order to communicate key issues and obtain feedback throughout the planning process.

A record of consultation activity is made in the consultee contact and communication plan for the Water Resources Management Plan, a copy of which is presented in appendix A1.

[2] There are currently no such licensed water suppliers operating in the Cambridge water area of supply which supply water to premises in the Cambridge Water's area via the company's supply system.

1.3.1 Pre-consultation

The following bodies were consulted prior to producing the draft plan; these include both statutory and additional non statutory consultees.

- Environment Agency
- Ofwat
- Defra & Secretary of State
- Customers (through the Local Water Forum)
- Natural England
- Consumer Council for Water
- Anglian Water
- Affinity Water
- The Woodland Trust
- South Cambridgeshire District Council
- Wilbraham River Protection Society
- Middle level commissioners
- Cambridgeshire County Council
- Cambridgeshire City Council
- Huntingdonshire District Council
- Conservators of the Cam

A summary of the pre consultation responses received is set out in appendix A2. The company has considered all of the comments made, and believes that this draft plan satisfactorily addresses the issues raised at the pre consultation phase.

1.3.2 Consultation during plan preparation

Throughout the preparation of this draft plan, the company has been in contact with the Environment Agency's local area water resources teams, and has held regular progress meetings to discuss and identify any issues of concern and points of clarification prior to publication.

In addition, the view of customers and other stakeholders have been taken into account through engagement with the Local Water Forum. Members of the forum were invited to review the water resource plans and make appropriate challenges.

1.3.3 Local Water Forum

In order to ensure the needs and views of our customers and stakeholders have been taken into account during the preparation of this draft WRMP and the company's business plan for the next price review, the regulator Ofwat requires companies to establish Customer Challenge Groups, and to carry out customer research.

In May 2012, the Local Water Forum was formed to scrutinise and challenge proposals Cambridge Water puts forward for its Business Plan. The Local Water Forum is an independent group which represents Cambridge Water's regulators, household and non-household customers. Its members include representatives from the Consumer Council for Water, the Environment Agency, the Drinking Water Inspectorate, local councils, local businesses, third sector organisations, and education.

The Local Water Forum's remit is to help shape Cambridge Water's investment priorities, by tailoring its services to customers' needs and expectations, ensuring customers understand what they pay for, and establish what customers are willing to pay for. The issues discussed by the forum include levels of service, bills, metering, value of the environment and leakage.

A sub group of the Local Water Forum was established to specifically understand and, where appropriate, to challenge the water resources planning process. This group has been closely involved in the key assumptions made in the approach to preparing this draft plan.

The Local Water Forum sub group consists of members from the National Farmers Union (NFU), The Babraham Institute, The Environment Agency, CCWater, The Wilbraham River Protection Society and Anglian Ruskin University. The issues addressed at meetings of the water resources sub group of the Local Water Forum have included:

- Growth in housing
- Customer consumption
- Sensitivity of the supply demand balance
- Economic impacts
- Climate change
- Sustainability changes
- Level of service for restrictions on use
- Metering strategy
- Leakage strategy
- Water efficiency strategy
- Water trading
- Customer engagement

The sub group endorsed the approach and the key assumption made in producing the baseline supply demand balance in March 2013, and will continue to be involved subsequent to publication in the further consultation process. Further details of the Local Water Forum can be found on the company's website[3]

[3] http://www.cambridge-water.co.uk/home/local-water-forum

1.3.4 Customer Research and Engagement

Cambridge Water is committed to understanding the views of its customers in planning for the future. The Local Water Forum has been used to start this process, and a customer engagement sub group was formed in October 2013, which has overseen the appointment by Cambridge Water of an independent research company to undertake qualitative research based on recommendations received from the Consultation Institute. Following due process, a research consultant was appointed to carry out four customer focus groups to identify customers' spontaneous views of water related issues and Cambridge Water, as well as explore specific issues relating to the Company's short and long term strategy. Two took place in St Ives and two in Cambridge. Further interviews have been held with WaterSure customers on the Company's low income tariff, a number of non-domestic customers via the Chamber of Commerce, advisors and clients of the Citizens' Advice Bureau, and at educational institutions. The findings of the research that relate to water resources planning are as follows:

- Security of water supply: Many participants were concerned about the impact of future development on water supply.
- Leakage: Customers felt that leakage was an important issue, and did not perceive that Cambridge Water has a problem with controlling leakage
- Tariffs: Participants were not in favour of a seasonal tariff with higher prices in summer and lower prices in winter
- Water efficiency: All participants were aware of the importance of water efficiency and were pleased that the company had not required a temporary use ban during the 2012 drought. They felt that the Company could do more to encourage customers to use less and, and to reduce leakage further.
- Water Meters: It was felt that meters should be encouraged, but there was no appetite for compulsory metering.
- Water resilience plans and resources: Management of resources and future planning was a key priority

The full report from the customer focus groups is presented in appendix A3. Alongside this facilitated and focused customer research, the company has initiated a marketing campaign entitled Your CH2Oice designed to encourage all members of the public to get involved with the customer research. This campaign has been promoted via the company's website, in the media, and featured in the company's customer Reflections magazine, issued with every bill from April 2013.

The Company has also undertaken willingness to pay and acceptability research on the issues identified by customers, including those mentioned in this plan. The results of this are summarised in the following section, and the full methodology and results included in Appendix A.20

1. Willingness to Pay & Acceptability Results

The key priorities that came out of the research focus groups on Water Resources Planning were:

- Leakage Levels

  Both household and business customers would like to see further leakage reductions. However, the results have shown that customers are not prepared to meet the cost of reducing leakage levels beyond the SELL, and the Company's leakage levels are already below the economic level.

- Security of water supply, particularly during drought periods

Business customers in particular were keen to see evidence of resilience and future planning for water resources, plus there were concerns over pressures on supply from housing development in the area.

- Water efficiency

Customers felt that water efficiency should be practiced by both customers and the Company, with businesses suggesting they would like water audits to be offered

- Metering levels

While there was no general appetite for compulsory metering, meters were seen as a priority for reasons including possible cost savings, water efficiency, environmental benefits and equity among customers.

- Having the infrastructure available to cope with housing growth

Concern was expressed over the additional pressures caused by housing developments put upon the infrastructure and business customers were also concerned over possible detrimental effects of supply interruptions.

- Supply interruptions

Business customers were also concerned over possible detrimental effects of supply interruptions.

The engagement process has helped shape the outcomes of the Company's business plan and customer acceptability of the proposals within. These are supported by the principles and policies that apply to water resources planning and that are outlined in this plan, specifically relating to our water efficiency policy, environmental commitments and the preferred plan to maintain a healthy supply demand balance. There is no requirement to further develop the options proposed in our plan further as a result of the customer engagement process.

1.3.5 Competition

The Water Act 2003 amended the Water Industry Act 1991 to extend the opportunities for competition within England and Wales. However, there are currently no licensed water suppliers operating within the company's area: neither does the company see any opportunities, at this time, for selling water outside its statutory area of supply through this form of competition. Thus, competition has had no impact on the preparation of this plan.

1.4 Context and Objectives of the Plan

We have a statutory duty to provide safe and wholesome water to our customers, now and into the future. We have sufficient resources to achieve this presently, and for the foreseeable future, as this plan will demonstrate, however, we will need to take action in the future to ensure supplies are maintained and this plan helps inform us when this will be necessary. In addition to our statutory duties, the Government and the industry regulator has set principles for future water resources planning, and these align with the company's strategic direction statement which sets out our policies for the longer term.

The aspirations of the Government for water resources are set out in its Water White Paper[4], and are included in summary form in the Defra statement of obligations[5] document. The industry regulator, Ofwat, has also published a statement of principles it expects to see addressed, in its future price limits[6] and sustainable water[7] documents.

The company also has a number of key objectives that have been minded in the development of this plan; which are:

- Improve the company operations and use of its assets to operate as efficiently as possible and to maximise the output of the assets while minimising costs and environmental impacts
- Manage our abstractions in the least environmentally damaging manner and the most cost effective way
- Maintain a base level of water efficiency activities to promote and communicate water use reductions to our customers
- Balance the need for water from future development with the need to account for a water stressed area by reducing the demand from new developments
- Support the implementation of the Code for Sustainable Homes (CSH) water consumption targets at code levels 5 and 6, including water recycling as good practice for new developments to reduce water consumption
- Ensure that we plan to meet the demands of current and future customers, as estimated by regional growth projections
- Assess the impacts of climate change on future availability of supplies and customer demands
- Consider all demand reduction options to reduce customer consumption in the most cost effective manner
- Explore possibilities for further water trading and transfers where it is an economical preferable option for water supply regionally
- Adopt the appropriate levels of risk for future resources planning, for example a no regrets approach
- Consult fully with our customers to incorporate their views, in the planning process and on their willingness to pay for options that could be taken forward in planning scenarios
- Communicate and consult with all stakeholders throughout the planning process.

[4] http://www.official-documents.gov.uk/document/cm82/8230/8230.asp

[5] http://www.defra.gov.uk/publications/files/pb13829-statement-obligations.pdf

[6] http://www.ofwat.gov.uk/future/monopolies/fpl/pap_pos201205fplprincip.pdf

[7] http://www.ofwat.gov.uk/aboutofwat/reports/forwardprogrammes/rpt_fwd_20100303ofwatstrategy.pdf

1.5 Underlying principles of a WRMP

The production of a WRMP is a process of assessing the various elements that make up the available 'supply' and forecasted 'demand' to ensure that there is available water over the period, or that supply is greater than or equal to expected demand. This provides the Company's supply demand balance for water resources planning. A number of allowances and margins for uncertainty are included in the calculation. Where insufficient supply is available to meet demand, options to address the deficit should be assessed to determine the most appropriate solution both in terms of environmental and economic costs and benefits.

The core elements for each of the supply and demand side are shown below, and discussed in further detail in further sections.

Supply components	Available supply Abstraction licence constraints Operational constraints Climate change impacts Source outage allowance Environmental reductions (sustainability changes)
Demand components	Future housing growth Consumption of new properties Change over to metered households (optants) Consumption of optants Consumption of existing non metered households Consumption of existing and future non households Climate change impacts

1.6 Water Resources Legislation

The requirements for producing water resources plans are set out in the Water Industry Act 1991 Section 37 A to D, as amended by Section 62 of the Water Act 2003. Detail on the process to be followed, including requirements for consultation, representations and publication is set out in the Water Resources Management Plan Regulations 2007, and the Secretary of State has made additional Directions in the planning cycle, the most recent of which, and applicable to this plan, is the Direction dated 2012.

The Water Resources Management Plan Direction 2012 and the Water Industry Act 1991 regulations require the company to submit a draft Water Resources Management Plan to the Secretary of State in accordance with section 37B(1) before 31 March 2013. The matters to be addressed by a WRMP are prescribed in section 3 of the Direction, and are reproduced in Table 1, which also indicates the section of this plan which applies to the Direction.

Table 1 - Reference to the Water Resources Management Plan Direction 2012

Regulation in WRMP Direction 2012	Reference section in this WRMP
3. In accordance with section 37A(3)(d), a water resources management plan must include a description of the following matters— *(a) how frequently the water undertaker expects it may need to impose prohibitions or restrictions on its customers in relation to the use of water under each of the following—* *(i) section 76(a);* *(ii) section 74(2)(b) of the Water Resources Act 1991(b); and* *(iii) section 75 of the Water Resources Act 1991;*	3.2 3.2 3.2 3.2
(b) the appraisal methodologies which it used in choosing the measures it intends to take or continue for the purpose set out in section 37A(2), and its reasons for choosing those measures;	1.3.4,1.4, 8.3.9, 11.0
(c) the emissions of greenhouse gases which are likely to arise as a result of each measure which the water undertaker has identified in accordance with section 37A(3)(b);	10.5
(d) how the supply and demand forecasts contained in the Water Resources Management Plan have taken into account the implications of climate change;	10.0
(e) how it has estimated future household demand in its area over the planning period, including the assumptions it has made in relation to population and housing numbers, except where it does not supply, and will continue not to supply, water to domestic premises.	8.3.3
(f) its estimate of the increase in the number of domestic premises in its area, over the planning period, in respect of which it will be required to fix charges by reference to volume of water supplied to those premises under section 144A;	8.3, 13.2
(g) where the whole or part of its area has been determined by the Secretary of State to be an area of serious water stress under regulation 4(1) of the Regulations, its estimate of the number of domestic premises which are in the area of serious water stress and in respect of which it will fix charges by reference to volume of water supplied to those premises over the planning period;	3.3, 3.3.1
(h) its estimate of the increase in the number of domestic premises in its area (excluding any domestic premises which are included in the estimate referred to in sub-paragraph (g)), over the planning period, in respect of which section 144B(2) will not apply because the conditions referred to in section 144B(1)(c) are not satisfied and in respect of which it will fix charges by reference to volume of water supplied to those premises;	3.3
(i) full details of the likely effect of what is forecast pursuant to sub-paragraphs (f) to (h) on demand for water in its area;	n/a
(j) the estimated cost to it in relation to the installation and operation of water meters to meet what is forecasted pursuant to sub-paragraphs (f) to (h) and a comparison of that cost with the other measures which it might take to manage demand for water, or increase supplies of water, in its area to meet its obligations under Part III of the Water Industry Act 1991; and	3.3.2
(k) a programme for the implementation of what is forecasted pursuant to sub-paragraphs (g) and (h).	n/a

Note:

i. References to a numbered section are to those in the Water Industry Act 1991, unless otherwise stated.

ii. The Regulations' means the Water Industry (Prescribed Conditions) Regulations 1999 (as amended by the Water Industry (Prescribed Conditions) (Amendment) Regulations 2007).

1.7 National Security and Commercial Confidentiality

The company's Security Manager has assessed the content of this plan with reference to the Defra guidance on the release of security sensitive information. We do not consider the plan to contain any information that is commercially confidential or that is nationally security sensitive. This plan is published with a certifying statement to this effect, and the entire plan is presented here without redaction of sensitive or commercial information.

1.8 Government Policy and Aspirations

1.8.1 Water Paper

In June 2011 the Government published The Natural Choice, its Natural Environment White Paper and Water for Life, the Water White Paper. The Natural Environment White Paper provides a backdrop to water and the environment, by showing the wider benefits of healthy water systems, such as rivers, estuaries, lakes and groundwater, and how the wider benefits of managing ecosystems at this scale can be realised. The Water White Paper sets out the challenges and Government objectives for the water sector in light of increasing pressures on water availability. The paper calls for an approach that delivers improved environmental outcomes at reduced costs to the customer encouraging solutions that reduce the demand for water, enable transfers and trading of water resources and that includes the environmental cost of abstraction.

The government policy that applies to WRMPs is detailed in the Water Resources Planning Guidelines - The Guiding Principles for developing a water resources plan, which sets out Water Company and regulator responsibilities alongside Government aspirations in the Water Resources planning context. This plan demonstrates the minimum measures that the Company plans to take in order to achieve the aspirations of reduced demand for water, water trading and leakage in particular. It also sets the scene for further engagement with our customers and other stakeholders on consideration of further measures that can be taken if appropriately supported.

1.8.2 Statement of Obligations

Defra has published a Statement of Obligations report which summarises the environmental statutory obligations that water undertakers are required to address. WRMPs, and the further legislation underpinning them, are included in the obligations identified within the document; these include assessing the impacts of abstraction, maintaining and protection of biodiversity and habitats, water efficiency and demand management. These issues are addressed in later sections of this plan.

1.8.3 Water Framework Directive

This EU Directive establishes a framework for water policy which in the UK is implemented through the Water Framework Directive (WFD) Statutory Instrument[8], and River Basin Management Plans (RBMPs). The requirement in WRMPs to assess impacts on water bodies, and demonstrate 'no deterioration' in water body status under this legislation is included in the planning guideline section on assessment of the environmental and social impacts of options[9].

The environmental requirements of WFD in RBMPs will be identified to water companies within the Environment Agency National Environment Programme (NEP), where investigations and impact assessments are required relating to water company operations. Therefore water companies have an important role in delivering WFD objectives. The precise nature of the WFD requirements under the National Environment Programme are still emerging, and we are in discussion with the Environment Agency on how these may affect us, however, we do not believe there will be any immediate impact on our operations at this time, and until such time as improved information and evidence is available, have made no alteration to our plan in this respect. Further detail is provided in sections 6.3.1, 5.8.1 and 13.

[8] Water resources England and Wales, the water environment (water framework Directive) Regulations 2003, Statutory instrument No 3242

[9] WRPG appendix 14

1.9 Links to other plans

1.9.1 PR14 Price Review

Company business plans will be submitted to Ofwat in 2014 detailing investment requirements for the 2015/16- 2019/20 period, which will form the basis of the review of price limits for this period. The proposed Ofwat approach[10] takes account of, and supports the Water White Paper requirements while ensuring water services are efficient and customer orientated. The methodology includes consideration of;

- Retail and wholesale price limit separation
- Customer supported long term outcomes
- Water trading incentives
- Environmental damage abstraction disincentives
- Ensuring the customer is engaged in the price review process

The WRMP and business plan are integrated in so far that any investment identified in a WRMP to maintain the supply demand balance will be include in company business plans, and the weighted average supply demand balance produced for the plan will be used by Ofwat as the basis for a company's revenue forecast. It is important therefore, that the company takes account of customer views on the prioritisation of any options proposed within this plan for the Final Planning Solution, through the customer engagement process, as described in section 1.3. This will continue through the consultation on this draft and will inform any final draft WRMP which includes any customer supported options.

1.9.2 Water stress

The Environment Agency published its view on water stress for each water company's Water Resources Zone (WRZ) in 2008, which designated Cambridge Water as being in an area of serious water stress. The methodologies to determine water stress status have since been updated and revised water stressed classifications were published by the Environment Agency in July 2013[11]. This classification gives powers to companies under Regulation 4 of the Water Industry (Prescribed Condition) Regulation 1999 (as amended) to implement compulsory metering in such water resource zones.

As the Company's water stress classification has been revised downwards from 'serious water stress' to 'not seriously stressed' there is no requirement to evaluate the need for a compulsory metering programme. Whilst the Company is no longer designated as 'seriously water stressed', it operates in a water stressed region, and takes its responsibility to ensure that water is used efficiently and effectively seriously, and as such is committed to continuing its policies on water efficiency and metering; these are explained fully in this plan.

Our approach to metering customers is explained fully in section 3.3.

[10] Setting Price Controls for 2015-20 – Framework and Approach, Ofwat

[11] Water stressed areas – final classification, Environment Agency July 2013, LIT 8538

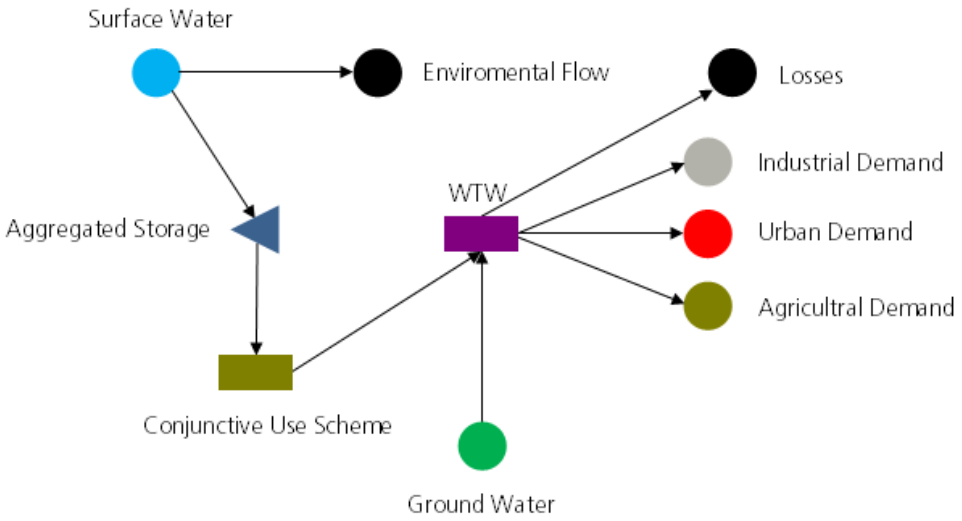
1.9.3 Water Resources East Anglia Project

The combined 2010 water company resource plans for Anglian Water, Affinity Water, Cambridge Water and Essex and Suffolk Water indicate, as a whole, that supply-demand deficits may be widespread in the East Anglia region from the mid-2030's.

In response to this, a joint project has been established to approach water resources optioneering regionally. The purpose of the project is to develop a common understanding of long-term supply demand risk in the region and to develop a strategy to effectively plan for the delivery of asset and investment decisions.

Levels of growth in the region, combined with climate change uncertainty and future sustainability reductions will put increasing pressure on water resources and in response to this, we will have to reduce demand, increase connectivity in our supply systems, and trade water more alongside the development of new supplies. Since there are no resources available for year-round direct abstraction, options for developing these will be limited to winter storage reservoirs, water reuse schemes and aquifer storage and recovery. All of these have high Capex, Opex and carbon requirements.

This collaborative project will provide a robust decision making approach to planning for future water resources that will promote the most effective use of available resources and provide a framework for developing a long-term water resource strategy for the region, together with an indication of what the preferred strategy should be. The model will use the same simulator that was used to build the ESPRC-funded Adaptation and Resilience to Climate Change (ARCC-Water) model of the south east of England. Testing of this has shown that the model can represent regional water resource and supply systems with sufficient accuracy and detail while allowing for uncertainty. The basic building blocks in the model for a basic resource zone are illustrated:



The model will include sources of uncertainty such as; Impact of climate change on hydrological flows and groundwater levels, growth in demand, and sustainability reductions. A number of scenarios will be produced and tested to reflect the priorities of water companies, regulators, customers and the environment. Throughout 2013 and into AMP6 the model will continue to be developed with results expected in AMP6 for delivery of assets in

AMP7. Anglian Water is leading on reporting from this project, details of which are summarised in Appendix A.19.

1.9.4 Drought Plan

Cambridge Water published its Drought Plan in November 2012. The Drought Plan complements the Water Resources Management Plan in many areas, but the plans have a different purpose. Whereas the WRMP is a planning document used to determine if and when significant investment may be required to maintain the supply demand balance, the Drought Plan outlines the short term operational measures that we would take before, during and after a drought. A Drought Plan is a methodical but also flexible approach to managing the company's available resources, and other management actions during a drought to ensure resources are optimised and protected through the drought.

Our Drought Plan identifies the actions we can take to enhance resource availability and to reduce customer demands, together with when these will be considered during a drought. These actions are determined by the monitoring of drought indicators, which inform the company when it may be appropriate to consider implementing them.

In particular the Drought Plan and Water Resources Management Plan consider the level of service that we expect to provide, and agree the frequency of any temporary usage bans (TUBs)[12] with our customers. Increased levels of service may require investment within a water resources plan, whereas reducing levels of service can improve the supply demand balance. Changes to levels of service will alter the timing of drought actions, and so both plans need to be considered together when modifying this level of service.

We have made no changes to our planned level of service in this plan, so no update will be required to our Drought Plan. The company's Drought Plan can be found on our website[13]

[12] Temporary ban on water use, as defined by the Flood and water management Act 2010

[13] http://www.cambridge-water.co.uk/customers/drought-plan

2. Summary of Plan

The company is able to demonstrate a surplus of deployable output against the forecast demands, for both average daily and estimated peak week. Our aim is to support sustained demand management measures and ensure our customers continue to benefit from security of supply, while ensuring any surplus resources are shared in an appropriate way. This approach will protect the security of supply for existing customers and enable us to accommodate future planned growth over the next 25 years.

While this approach is fully justified by the current healthy supply demand balance shown in the baseline forecast and our planned actions in the baseline scenario, there are a number of uncertainties in maintaining this throughout the planning period. As far as is practical, and in full accordance with the prescribed methods within the Water Resources Planning Guideline, we have examined the uncertainties in our scenario and sensitivity testing, and included allowances for these as necessary. As many of these uncertainties are difficult to quantify precisely using currently available evidence, the company has included no plans for major investment in additional resources during the next 25 years, as a result of these. Our approach to supply demand forecasting will minimise any potential impact from uncertainties in the shorter term, until more evidence is available. Where applicable, we have identified in this plan the need for further work, where this will reduce the level of uncertainty in our water resources planning.

The company's baseline and proposed final planning supply demand projection is based on the following strategies:

Supply Side

Ensure that we maximise the water resources available to the company

The company's principal aim is to ensure that the full potential of its licensed abstraction sites is always available. It will achieve this through a proactive and considered approach to capital maintenance, applied to both infrastructure and non-infrastructure assets. Timely capital maintenance programmes will help to ensure that planned outages are kept to a minimum.

Determine that our water supply activities do not have an undue impact on the environment

We will continue to work closely with the Environment Agency to deliver the National Environment Programme and to ensure abstractions do not harm environmentally sensitive sites. Working with the Environment Agency we will determine and understand the possible future impacts of the Water Framework Directive on the company's abstraction licences to ensure the objectives of the environment and public water supply are met by the most effective means.

Investigate water resources options and trades in the Anglian region in partnership with other water suppliers

Current forecasts do not show a need for new water resources in the next 25 years; however the lead-in time for the development of new sources of supply will be at least 10 years. The company therefore envisages a twin-track approach to the supply demand balance to include demand management measures and working with other water suppliers on trading of water resources. We will continue our involvement in wider projects such as Water Resources East

Anglia (WREA) and Water Resources South East (WRSE) to ensure long term effective regional planning for future water resources options. Where the company identifies a short to medium term surplus in supply, it will endeavour to make this resource available to neighbouring Water undertakers, where it is appropriate, practical and cost effective to do so.

Demand Side

Continue to meet the water supply needs for existing customers and forecast growth in the company supply area

There is considerable development planned in the company's area of supply over the next 25 years, and beyond this we expect growth to continue. While this may be less than previously expected in the now expired East of England Regional Spatial Strategy, there is considerable uncertainty over the long term, and we expect to see up to 47,000 new properties built in our supply area over the plan period.

All currently unmetered properties will be metered by 2050

The continuation of our current strategy to encourage unmetered customers to opt for a water meter without imposing this upon them, and of selective metering where appropriate, will with current high levels of meter penetration ensure universal metering by 2050. This strategy is designed to achieve the objective of controlling the underlying growth in demand from existing customers that has proved successful over the past 10 years. This will be achieved without the need to impose an accelerated rate of metering or compulsory metering on our customers.

Control of leakage

The company's objective is for total leakage not to exceed the current level of 14.0 Ml/d resulting in an effective reduction in leakage of 35% per property when the level of growth in households and the mains distribution network is taken into account. Where necessary we will consider new technology in the monitoring of the distribution network and increasing the level of mains renewals to tackle rising levels of leakage.

Deliver water efficiency for households and non-household in existing and new developments

The company has a duty to promote water efficiency. The company will continue to promote water efficiency through customer education and communication, and seek to develop our approach to water efficiency by understanding what changes the behaviour of our customers, and how they perceive water re-use and consumption reduction technologies. We will include a baseline annual target for water efficiency savings in our forecasts of 1litre/property/day.

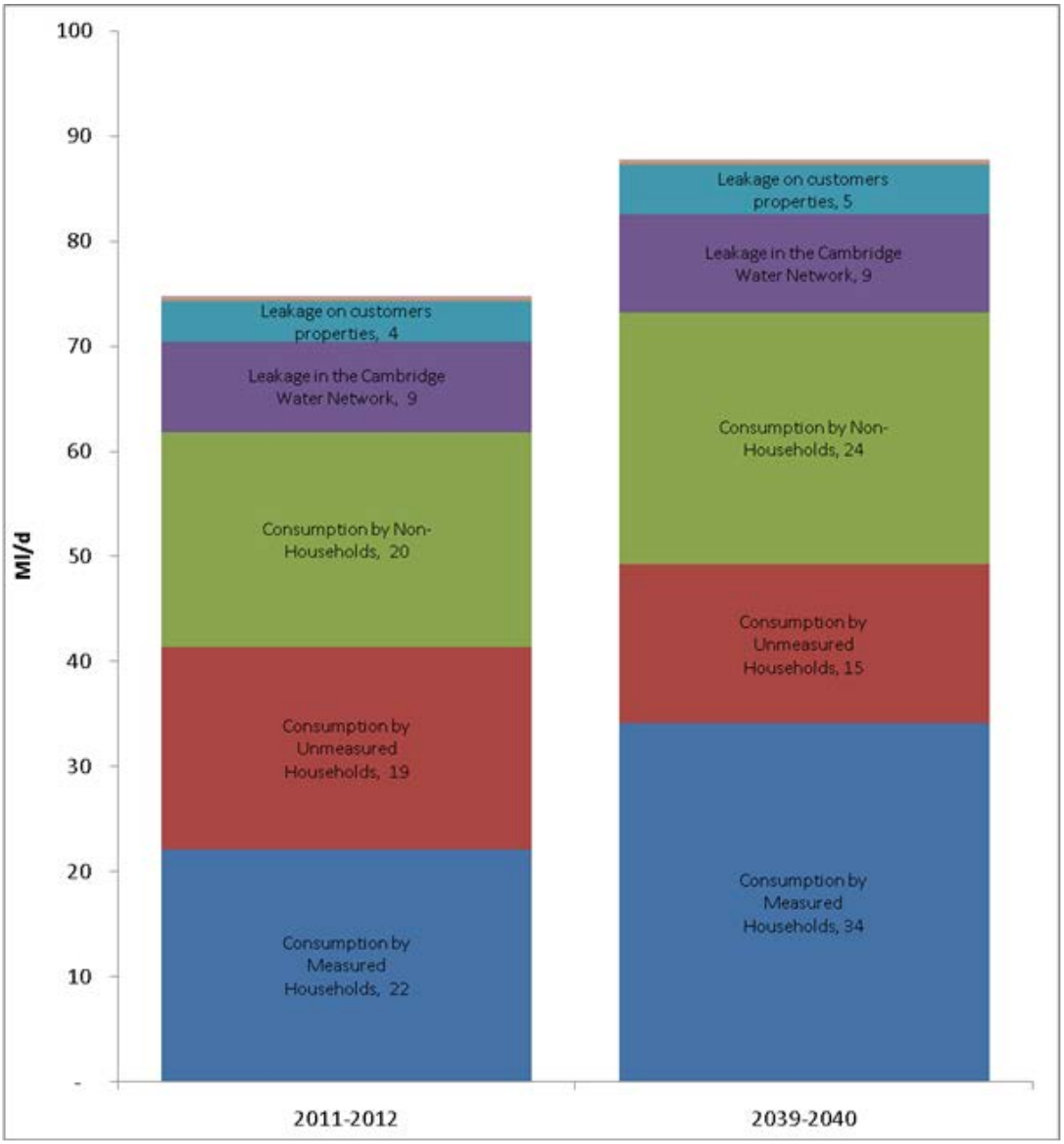
Reduce the per customer demand for water

Water demand in new dwellings will reduce, as these will be built to lower water consumption standards as a result of changes to the Building Regulations. In future new dwellings may also be constructed to the higher standards of the Code for Sustainable Homes, which dictate even lower consumption standards. Our water efficiency and metering policies will ensure that per capita consumption (pcc) reduces through the planning period, to below 125litres/head/day by 2040.

Supporting the development of water reuse in new developments

We believe that all major new developments should consider incorporating appropriate water re-use technologies to reduce demand for mains water from new housing. We will work with local authorities to promote the Code for Sustainable Homes at levels 3/4 and 5/6 for new housing beyond 2015. We are already actively involved with the North West Cambridge development, of 3,000 new properties on university land in Cambridge which will be built to the highest levels of sustainability.

Summary of change in demand components



3. Company policy and levels of service

The overarching company water resources policy is set out in its Strategic Direction Statement, published in 2007, which incorporates the guiding principles set out by Government and the Environment Agency alongside issues of importance to the company, our customers and other key stakeholders.

Our policies assist in providing a basis of our view on current and future issues for customers, and include our levels of service for restrictions, our approach to metering and water efficiency, and are set out in the following sections.

As a part of the customer engagement process leading into the next Price Review and Business Plan, the views of our customers and stakeholders have been incorporated into a revised long term strategy. This strategy encompasses the 5 outcomes that the Company will focus on for the next 25 years, and replaces the previous Strategic Direction Statement. The underlying themes include issues that are common to the South Staffordshire and Cambridge regions, plus differences where they apply. The overall aims of the 5 outcomes listed below, align with the policies that underpin this plan.

1. Excellent water quality – now and in the future

2. Secure and reliable supplies – now and in the future

3. Delivering an excellent customer experience to customers and the

community

4. Operations which are environmentally sustainable

5. Fair customer bills and fair investor returns

The summary issues and strategies relating to Water Resources highlighted in the strategy are reproduced in table 2, and the Strategy document presented in Appendix A.4

Table 2 - Summary of Company Long Term Strategy

Outcome	Strategy
Excellent Water quality – now and in the future	• Protecting raw water sources • Working with farmers and other stakeholders to manage the catchments of our water supplies, avoiding more expensive treatment options
Secure and reliable supplies – now and in the future	• Encourage customers to opt for water supply on a measured basis through our metering programme • Work with planning authorities and developers to meet the demand from new development and population growth • Work with the Environment Agency and other water suppliers to ensure the cost and environmentally beneficial use of water resources for the Anglian region including water trading where appropriate • Understand the effect of climate change on the supply demand balance • Reduce leakage where it is economic to do so.
Operations that are environmentally sustainable	• Work with the environment Agency to identify whether any abstractions may be damaging the environment • Provide customers with information on the benefits of saving water and how to use water efficiently • Deliver water efficiency for customers, and continue support for education in water efficiency • Maintain leakage below 14 Ml/d • Work with the Environment Agency and Natural England to mitigate the effects of abstractions on the environment and incorporate their priorities
Fair customer bills and investor returns	• Understand the acceptable frequency of drought restrictions • Balance the price charged for water and its value to customers with the needs of the environment • Satisfy customer expectations for a constant supply of safe, clean water at an appropriate cost •

3.1 Levels of service

The levels of service provided to customers in this WRMP is demonstrated by the relationship between supply and demand under various resource conditions, which demonstrates how we will supply customers on the basis of our planned levels of service (LoS) with the available Deployable Output (DO) under conditions which may require the conservation of water resources, such as during an extended drought. The levels of service are also part of the company's published Drought Plan.

It is a requirement set out in the guidelines to consider the following minimum base scenarios:

- **No restrictions**: A maintained supply in the water resource zone throughout the period without restrictions or drought actions being imposed.
- **Planned levels of service**: A maintained supply in the water resource zone to meet the company level of service, including any demand restrictions and other measures identified by the company to meet this level of service.
- **Reference levels of service**: A maintained supply in the water resource zone to meet specified levels of service of the following;
  - temporary customer use restrictions (TUB or hosepipe ban[14]) of 1 in 10 years
  - non-essential use restrictions of 1 in 40 years
  - no rota cuts or standpipes.

3.1.1 Proposed Level of Service

In developing the baseline supply demand balance the company has used the planned level of service as published in the previous WRMP 2010, and in our 2012 Drought Plan, which is:

- The requirement of a major publicity campaign above usual activity, requesting voluntary savings of water and customer restraint, not more than once in 10 years.
- A temporary ban on water use on average not more than once in every 20 years
- A restriction on non-essential usage not more than once in every 50 years
- The risk of rota cuts or use of standpipes on average less than once in 100 years

Our planned levels of service exceed the reference levels of service, with the exception of rota cuts or standpipes. We have discussed this with the Local Water Forum, which agreed that, while highly unlikely, we should indicate the slight possibility of extremely rare events leading to very serious restrictions.

The level of service is justified by maximising supply demand balance throughout the planning period, and is supported by the company's experience of the impact of previous drought conditions on its supply sources. In the recent drought of 2011-12 no temporary use ban was required and the company last resorted to a hosepipe ban in 1991-92, at a time when meter penetration was low and demand unconstrained. Since then we have accelerated metering, including the metering of sprinkler users. Early indications from customer research show that customers are satisfied with our levels of service, and pleased

[14] Temporary ban on water use, as defined by the Flood and water management Act 2010

that restrictions were not required in 2012. Therefore we do not intend to alter our proposed levels of service unless our willingness to pay surveys indicates otherwise for cost reasons.

The recent review of source reliable outputs used to inform the deployable output in this plan does not indicate any reason to modify this base level of service, based on resource and supply availability under dry conditions. We have no requirement at this time to consider varying our level of service as an option to improve supplies. This is discussed in further detail in section 6.2.

3.2 Metering

Our long term vision is that all customers are metered, and pay for what they use. We believe that this is the fairest method of charging for water, and our customer research indicates that they support this objective. We are in an area of water stress, so conserving available water is a priority and communicating water efficiency to our customers a fundamental part of what we do. This includes a strategy of encouraging our customers to switch to water meters.

As a result of metering initiatives in the 1990s to measure sprinkler users, registered hosepipe users and lone pensioners, at the end of the base year more than 65% of domestic customers are now metered. Despite an increase in population of approximately 40,000 since the early 1990s, average daily water into supply remains broadly the same. Due to this high meter penetration, and effective curbing of demands, our metering policy is unchanged.

Our metering policy is in accordance with the Water Act. All new properties are metered and we provide free meter options to all currently unmetered households. We selectively meter a small number of properties each year where they are found to have high discretionary use, such as sprinkler systems and swimming pools, but these are on an ad-hoc basis as required and we do not have an active programme to seek out these properties. In light of the current and future meter levels of penetration expected, the company does not intend to use its legal power, as prescribed in the Water Act (2003) to meter properties on change of occupancy. This may, however, become necessary later in the planning horizon, if the predicted meter optant take up is not as high as expected.

We are also keen to investigate the benefits of alternative tariff options to provide both resource conservation and social benefits, and will be undertaking customer research on this in AMP6.

Our Water-Care scheme offers assistance to metered customers who may face financial difficulty. Further details of the scheme are contained in our “Special Needs” leaflet, which is available on request, or may be downloaded from our website www.cambridge-water.co.uk

3.2.1 Compulsory metering

In accordance with the WRMP Direction 2012, we have assessed the requirement for companies to consider a compulsory metering programme for universal metering under the Water Industry (Prescribed Conditions) Regulation 1999 (as amended). As the Company’s water stress classification has been revised downwards from ‘serious water stress’ to ‘not serious stress’ there is no need to evaluate the need for a compulsory programme.

We have considered compulsory metering, and change of occupier initiatives as Part of our overarching water efficiency strategy to reduce consumption, however thses have been shown not to be cost effective, or for additional cost to be supported by Ofwat and our customers. Our baseline and final planning supply demand balance forecasts indicate that, with the continuation of meter optants at the expected rate and projected new household growth, the company will achieve effective universal metering by the end of the planning period, without requirement for further enhanced metering programmes Metered households will increase from 87,400 to 146,500 properties over the planning period, as a result of new development and 14,700 expected meter optants.

We expect to see a 10% reduction in water use from customers who switch to a meter, which is built into our demand forecast. The additional costs of introducing compulsory metering would be borne by our customers, and the results of initial consultation have indicated that this is not something they would support. Instead customers look to us to advise them of the benefits of switching, so that they are able to make their own decision, and not to have metering imposed by the company. This further supports our water efficiency approach of providing information, practical assistance and site-specific advice to encourage customers to transfer to a meter.

3.2.2 Metering Cost

Although the Company does not forecast a deficit over the planning period, and therefore does not propose options, in accordance with The Water Resources Management Plan Direction 2012, Part 3 sections (f), (h) and (j), the cost of our preferred baseline metering strategy for expected new household properties and meter optants has been estimated.

The table below indicates the cost of installation and operation of meters, at a 2012-13 cost base.

	AMP6	AMP7	AMP8	AMP9	AMP10
Total New Metered connections	8300	9563	10337	10163	8600
Installation Cost*	£458,184	£527,905	£570,632	£561,027	£474,745
Operational Cost	£24,900	£28,689	£31,011	£30,489	£25,800
Total Meter Optants	4000	3327	2820	2422	2130
Installation Cost	£773,333	£643,220	£545,200	£468,253	£411,800
Operational Cost	£12,000	£9,981	£8,460	£7,266	£6,390
Total Selective Meters	220	220	220	220	220
Installation Cost	£42,533	£42,533	£42,533	£42,533	£42,533
Operational Cost	£660	£660	£660	£660	£660

4. Water Efficiency

4.1 Background

Since 2008, the company has achieved a water efficiency target of 1litre/property/day, which equals a saving of 0.125Ml/d year on year. This was built into our demand forecast in previous WRMP (2010). This target was voluntary until 2010 and became mandatory from 2010/11, as set by Ofwat; however, a mandatory target will no longer apply for the planning period of this WRMP from 2015.

The company has a commitment to water efficiency activities to support demand reductions, and has met or exceeded the target set in previous years. As a water undertaker we have a duty to promote the efficient use of water, as prescribed in the Water Act, and as such will continue with water efficiency activities. Without an imposed target, we believe we should continue with a level of water efficiency activity to achieve a reduction of 1litre/property/day, as a minimum, in order to meet this requirement. As such we shall continue to set this as our target for water efficiency, and build this into our baseline supply demand balance. This approach is supported by the views of our customers.

4.2 Current initiatives

The company proactively promotes water efficiency to our customer base in a number of key areas, which are;

- Promotion via the company website
- Bill inserts and leaflets/newsletters in customer mailings
- Literature and display stands
- School and educational visits, road shows in population centres and retail areas
- Occupancy change welcome packs
- Free water saving devices
- Online Save Water Save Money shop selling water efficient products

Our water efficiency activity is monitored internally and savings are assessed using the Waterwise Water Saving Best Practice Register (2007), and the Ofwat guidance: Future Water Efficiency Targets (2008). The company will continue to undertake such initiatives, and quantify the benefits in terms of water saved in the context of our duty to promote water efficiency.

4.2.1 External organisations

In addition to the above initiatives, the company actively engages with other external organisations such as local authorities, developer groups, the East of England Water Partnership and Sustainability East. It also supports Waterwise, an independent non-governmental organisation (NGO) established by the UK water industry. Waterwise has

produced a “Best Practice Register” that identifies a wide variety of initiatives, and establishes costs and benefits of each. We also have a discretionary fund within our corporate social responsibility fund, which is used to support local initiatives for water conservation projects. For example, the River Mel Restoration Group has received a grant from the company towards a community project to restore the River Mel at Meldreth by installing soft revetments, which will be planted with native plants to increase biodiversity.

4.2.2 Publicity campaigns

Cambridge Water regularly runs environmental and water efficiency road shows. These are designed to educate the general public (both adults and children) regarding ways to save water, sustainability within the home and garden and other environmentally friendly messages. Information boards are displayed in various public locations, such as, central libraries, schools, garden centres, churches and park & ride facilities.

4.2.3 Enhanced communications

From time to time, in response to media interest, or where there is potential for a short term water shortage in the region possibly affecting the company, we instigate additional initiatives to raise customer awareness of water efficiency. As an example in 2006, following two successive dry winters and the possibility of a third, we contacted customers to warn them that restrictions may be necessary, and in 2012 when a similar situation was emerging, we launched our ‘Help out in the drought’ campaign, which included press releases and customer updates.

Cambridge Water also runs winter campaigns, for example in 2012 we launched a ‘Wrap up for Winter’ advice campaign to raise awareness of burst pipes due to colder weather. This included press releases, advice provided by leaflets and on the company website and free pipe lagging protection for customers.

4.3 Required activity

To meet the proposed water efficiency target of 1litre/property/day, which equates to 0.125Ml/d, will require both hard and soft measures (hard measures are physical devices, and soft measures are education and promotional activity). The savings expected from these in a typical year are indicated in table 3, below. This is based on our usual annual initiatives in these areas, and the indicative volume saved, as reported annually. The total savings expected, of 0.156Ml/d each year, exceeds the target, and allows for some variance in savings achieved in each year to meet the 1 litre/property/day target throughout the planned period.

Table 3 - Proposed baseline water efficiency saving measures

Initiative	Volume	Efficiency saving [15]	Ml/d
Hard measures			
Household Hippos	800	2.4 litres	0.013
Household Save-a-flush	325	2.4 litres	0.002
Non household Hippos	50	1.0 litres	0.00.
Non households Save-a-flush	40	1.0 litres	0.001
School Hippos	500	2.4 litres	0.034
School Save-a-flush	250	1.0 litres	0.007
ShowerSaves	800	30 litres	0.017
Showerheads	250	30 litres	0.005
Tap Inserts	2500	18 litres	0.063
Soft measures			
School events	100	2.6 litres	0.001
Household self audits	200	10 litres	0.002
Non household self audits	50	10 litres	0.005
Water regs inspections (household)	3000	-	-
Water regs inspections (Non household)	200	-	-
Welcome packs	1500 (250 acted on)	10.0 litres	0.003
TOTAL			**0.156**

In calculating the Ml/d savings outlined in the table above, the company has taken into consideration the guidelines outlined in “Future Water Efficiency Targets: A Consultation,” published by Ofwat in June 2008, and the UKWIR report 12/CU/02/11.

[15] Per device savings, daily savings calculated takes account of use.

4.4 Customer feedback

The customer engagement process is on-going, and will continue after the publication of this draft plan. Early discussions indicate our customers regard water efficiency as being of high importance, and that they look to us to assist and guide them in becoming more water efficient. This provides further justification for the basis of our current baseline activities. We will further engage with our customers to discuss the cost of enhancing our water efficiency activities beyond the baseline activity, and seek to develop our understanding of customer behaviours and consumption patterns that are most affected by certain water efficiency innovations through customer research.

4.5 Development of future initiatives

Over the longer term, the savings from simple hard and soft water efficiency measures are likely to become less definite and able to be sustained. The company has identified a number of areas where we believe further gains in water efficiency can be achieved and fully realised over the longer term.

4.5.1 Pilot greywater scheme in Cambridge

In collaboration with Cambridge City Council, the company has sought to partner on the development of a communal water recycling scheme for a small number of flats. It is expected this scheme will provide real time data on how a grey water recycling installation can provide high level water savings, in properties built to the Code for Sustainable Homes (CSH) Level 5/6. It will also provide valuable insight into the costs and benefits of such schemes, in addition to how these are perceived by the end consumers.

4.5.2 BestWater Project

Working together with other water companies in the East of England, the Environmental Agency and Sustainability East, a joint project on behavioural change and consumption patterns has been submitted as an EU Life+ match funded research project. The company is committed to research and innovation, to determine the perceptions of customers to changes in water using devices in the home, and of developments in new technology around water using products. This project is expected to begin in AMP5/6, and will provide a valuable evidence base for future WRMPs and targeted water efficiency initiatives, in addition to ensuring we maintain the savings from our baseline water efficiency activity. Regardless of the success of the EU fund bid, Cambridge Water and the collective water companies are committed to progressing this project in some form.

4.5.3 Summary of water efficiency

We have reviewed the demand management water savings options published by UKWIR[16]and referenced in the Water Resources Planning Guidelines to identify initiatives that we could undertake to build on our water efficiency activity. These are set out in the following table.

Table 4 - Water efficiency initiatives

Activity	Initiatives	Current initiative	Future initiative	Detail
Water use audit and expectation	Domestic water audit	Y	Y	Included basic advice on regulations inspections, mainly currently self-audits
	Domestic property retro fit	N	N	
	Domestic self water audit	Y	Y	Facilitated audits are being considered
	Commercial water use audit	Y	Y	Currently self audits, and key customer liaison. E.g. Project being undertaken to reduce water usage at Cambridge University. More facilitated audit service being considered
	Institutional property water audit	N	Y	More engagement with schools and local authorities for self audits, and facilitated audits planned
	Water regulations inspections	Y	Y	Carried out regularly as matter of course
Targeted water conservation information and advice on water use	Commercial customers	Y	Y	Service to install data loggers on large users of water to allow both parties to understand usage on a timely basis.
	Household customers	Y	Y	Continue to repair domestic supply pipes free of charge in a timely manner.
	Schools	Y	Y	Continue to provide literature and promotional activities as described above. School visits also undertaken to educate on water efficiency
	Recreational facilities	Y	Y	Liaise with specific groups, for example, garden centres and sports facilities, particularly in dry conditions
	Public sector (hospitals etc.)	N	Y	Planned engagement similar to activities outlined above
	Taps and appliances	N	N	

[16] WR27 Water resources planning tools, UKWIR 2012

Activity	Initiatives	Current initiative	Future initiative	Detail
Water saving devices	Appliance exchange programmes (washing machines, dishwashers toilets)	N	N	
	Encouraging use of water saving technology in new buildings (domestic and commercial)	Y	Y	Work with local authorities to promote this via local plans and to individual developers. Also actively promoted in company literature and on website
	Encouraging use of water saving technology in existing buildings (domestic and commercial)	Y	Y	Actively promoted in company literature and on website
	Subsidy to customers to purchase devices	N	Y	Will consider costs and benefits of small subsidy for appliances
	Subsidy to appliance manufacturers	N	N	
	Low volume shower heads	Y	Y	Offered to customers free of charge via literature, events and on our website
	Low flush toilets	Y	Y	Promoted on website and through Save Water Save Money web shop
	Composting toilets	N	N	
	Waterless urinals	N	N	
	Flush controllers for urinals	N	N	
	Timing devices	Y	Y	Promoted on website and through Save Water Save Money web shop
	Self closing taps	N	N	
	Spray Taps	Y	Y	Promoted on website and through Save Water Save Money web shop
	Cistern displacement devices	Y	Y	Continue to distribute Hippos and Save a flush devices on request
	Research and development into water saving technology	Y	Y	We have conducted research in this area, and are committed to do more. We support WaterWise.

Activity	Initiatives	Current initiative	Future initiative	Detail
Water Recycling	Encourage or require water recycling in commercial and public sector	Y	Y	Promote water efficient buildings, by working with local authorities and developers. Currently involved in two major schemes
	Encourage or require water recycling in households	Y	Y	Promote water efficient buildings, by working with local authorities and developers. Currently involved in two major schemes
	Fitting recycling systems to new properties	N	Y	Support and encourage this through website, and intend to collaborate on schemes in the future
	Fitting recycling systems to existing properties	Y	Y	Support and encourage this through website, and have been involved in a scheme with the local council
Water efficiency enabling devices	Water butts	Y	Y	Promote water collection devices including water butts on request / via our website and at external events
	Rainwater harvesting	Y	Y	Support and encourage this through website, and intend to collaborate on schemes in the future
	Re-washering customer's taps	Y	N	We no longer provide this service to customers
	Enforcement of water regulations	Y	Y	Regular inspections made and advice provided. High risk categories inspected and enforcement made if required
	Influencing planning policy	Y	Y	Input into the development of council local plans with respect to water policy. Lobby on water issues.
Advice and information on leakage detection and fixing techniques	Commercial sector	Y	Y	Provide advice on leakage detection and offer a service to log/monitor private supplies to aid in leakage reduction
	Public sector	N	Y	Provide advice on leakage detection and offer a service to log/monitor private supplies to aid in leakage reduction
	Agricultural sector	N	N	
Compulsory metering	Commercial and public sector premises	N	N	
	Swimming pool owners	N	N	
	Sprinkler/hose pipe users	Y	Y	A programme has been carried out
	Households with an outside tap	N	Y	May consider this option in the future
	Households in serious water-stressed areas	N	N	
	Change of occupier	N	Y	

Activity	Initiatives	Current initiative	Future initiative	Detail
Enhanced metering, Smart metering	Targeted installation of water meters and a promotional campaign to increase optant rates and change of occupancy switchers	Y	Y	Trial latest metering technology, including smart meters at appropriate new developments within the supply area. Continue to promote free meter optants in all literature and during the debt counselling process
Meter Installation policy	Commercial and public sector	Y	Y	Policy in place
	Households	Y	Y	Policy in place
	Installation when premises change ownership	N	Y	No policy. May consider in the future if required to increase the rate of metering
Changes to existing metered tariffs	Introducing summer/winter or other seasonal tariffs	N	Y	We would like to establish the benefit of sophisticated tariff structures, to deliver resource and social objectives, with the support of customers
	Introducing daily/peak/off-peak tariffs	N	N	
	Flow restrictor charging (tariff reduction for a restriction in domestic supply water pressure)	N	N	
	Additional fees for sprinkler users, hose pipe users, outside tap users, swimming pools	N	Y	We will seek to understand the benefit of changes in fee structures
	Introducing lower charges for major users with significant storage	N	N	
Introduction of special tariffs for specific users	Introducing interruptible commercial supplies	N	N	
	Introducing higher cost ban-free sprinkler or hose pipe licences	N	N	
	Introducing spot pricing for selected customers	N	N	

Reference: WRPG Appendix 9 and UKWIR WR27 water resources planning tools, 2012

4.6 Leakage

Cambridge Water aims to assess all leaks within 48 hours of these being reported, and we prioritise our repairs according to the severity. We also monitor our mains network daily to identify where leaks may be occurring and to prioritise our own leak detection teams. Further detail on our leakage management is explained in section 8.4.

We offer a number of services to customers as part of our commitment to controlling leakage, which are;

- Free leak detection service – a basic leak detection service provided for most customers
- Leakage tests - we carry out a free leak repair check when a meter is installed, and in most situations, will repair any leak found.
- Free leak repair scheme – we repair the first leak on customers' supply pipes free of charge.

5. Water Resources Management Plan

5.1 Plan content and development

This Water Resources Management Plan develops on the previous plans published in 2004 and 2010, and continues to develop on key principles, which are outlined in sections 1.4 to 1.5. The basis of this is to ensure that we are able to maintain secure supplies for customers through the twin track approach of:

- Maximising the amount of water available for use, within current abstraction licensing and aquifer constraints;
- Influencing distribution input through a combination of active leakage control and demand management

The company is committed to ensuring water resources in the region are utilised in the most effective manner, by sharing spare resources, and to offer solutions for reducing deficits and that all stakeholders in water resources in the region have the opportunity to comment on this plan. As such, and in accordance with the EA Water Resources Planning Guidance (WRPG), an indicative supply demand balance was published in September 2012, the purpose of which was to determine a likely available surplus or deficit using updated WRMP data available.

This exercise determined that it was very likely the company would remain in a position of surplus supply over demand through the planning period, and these conclusions were circulated to neighbouring companies so that they would be able, if appropriate, to consider trading as an option to reduce any deficit in their own supply demand balance. This publication began the process of discussions around future company trades which are covered later in this document, subsequent to the baseline supply demand balance calculations.

5.2 Planning period

The period of this plan is 25 years, running from 2014/15 to 2039/40. The 'base year' from which planning forecasts have been derived is 2011/12. The base year data used in this updated plan has been collated by the company for the submission of annual Key Performance Indicators to Ofwat for 2011/12. The data collected is in line with data collected for previous June Return reporting.

5.3 Water resource zone definition

As in previous plans, the company has a single water resource zone (WRZ) in which it manages the supply and demand for water. The zone meets the UKWIR/ Environment Agency definition for a water resource zone of:

"The largest possible zone in which all resources, including external transfers, can be shared and, hence, the zone in which all customers will experience the same risk of supply failure from a resource shortfall"[17]

The company operates a fully integrated supply and distribution network, which operates as a single water resource zone, and we have assessed the integrity of this zone in preparation for this plan. During this process the company consulted with the Environment Agency, which is satisfied the water resources zone meets the definition provided. The evidence produced as part of the water resource zone integrity assessment is included as a technical report in appendix A5. The boundary of the water resource zone in practicable terms, matches the company area of supply boundary, and the parishes supplied are indicated on the map shown in Figure 4.

The assessment of the water resource zone has determined that, subject to de-minimus rules, the company's supply and distribution network is fully integrated, and all resources can be shared effectively within our single resource zone. Therefore, no further review of the water resource zone has been required for this plan.

[17] Water Resources Planning Guideline The Technical Methods and Instructions, June 2012, The Environment Agency

Figure 3 - Area of supply showing civil parishes

5.4 Planning Scenarios

This plan has been developed through the consideration of a number of different supply demand scenarios, and includes those specified in the Water Resources Planning Guidelines. These are outlined in the table below.

In accordance with the Water Resources Planning Guidelines the company uses the dry year annual average scenario for water resources planning, which is adjusted from the normal year scenario. As the company forecasts a supply demand surplus, and is not therefore considering options, a utilisation forecast is not required. The weighted average scenario is a new requirement, which represents the most likely demand that will be experienced over the planning period, and will be used to inform Ofwat in setting PR14 price limits.

Table 5 - Planning scenario summary

Planning Scenario	Included in plan	Details
Normal year (annual average)	Yes	The base year of 2011/12, normalised as appropriate to allow for weather impacts on customer demand
Dry year annual average	Yes	A dry year, representing low rainfall and unconstrained demand, as defined by a dry year multiplier uplift applied to the base year
Dry year critical period	Yes	A critical period forecast, which for the company is a peak week. An average day peak week (ADPW) forecast derived from a critical period factor based on historic peak week demands
Weighted average	Yes	A revenue forecast of demand that incorporates the likelihood of dry and normal year's occurrence and frequency within the planning period.
Utilisation	Not applicable	As no options are required this has not been calculated

5.5 Sensitivity analysis

Producing a forecast over the long term will invariably involve an amount of uncertainty. Within our supply demand forecast the most uncertain components are housing growth and demand, and the potential impact of future environmental considerations arising from the Water Framework Directive on the supply side.

The following sensitivity analysis has been carried out to assess the impact of changes in the housing growth demand forecast components:

- New household build rate using the highest forecast growth for new housing in addition to our baseline consumption assumptions;
- A building rate of +/- 20% on the baseline growth forecast applied. We consider this to be of low probability
- The baseline growth forecast for new housing with consumptions at Code for Sustainable Homes level 5/6, a low demands outcome.

The impact of the sensitivity analysis on the supply demand balance is detailed in section 8.5.

Some allowances are made for data uncertainties in the target headroom calculation which provides a minimum buffer to allow for these in the supply demand balance. This includes uncertainties such as climate change, and the data sources used for a demand forecast. The headroom factors and calculations are discussed further in section 9.

Alongside these base sensitivities, we have chosen to include a number of possible scenarios in addition to our baseline forecasts to provide a comparison for information purposes. These will aid in the consultation process by identifying the results of attempting to achieve different outcomes beyond our baseline forecast. The impact of a range of less certain factors is included in these scenarios, to demonstrate the influence they could have on the supply demand balance. Our scenario modelling is presented in section 13.0, and includes an evaluation of potential impacts from Water Framework Directive on the availability of supplies in the future.

5.6 Climate change

The company has assessed the possible impacts of climate change on both the supply and demand element of our forecasts. We have included estimated impact in our forecast, and addressed the uncertainty around estimating climate change impacts in our headroom calculation. The vulnerability of our supplies to climate change and the impact from demand has been calculated, and these have been determined to be relatively minor. The approach used in assessing the impacts of climate change and those related uncertainties follows the Water Resources Planning Guidelines on the assessment of climate change and dealing with uncertainty. In this plan, climate change is not a driver for the development of any water resources options. We believe that future work in determining the impact of climate change on our most vulnerable supply sources would be beneficial to understand the magnitude of potential impacts in more detail, but not essential for this plan. The details of how climate change has been incorporated into the supply demand balance are included in section 10.

5.7 Strategic Environmental Assessment

The Strategic Environmental Assessment (SEA) directive places a requirement for certain strategic plans and programmes to assess their environmental impact in the decision making process, and ensures consideration and identification of significant environmental effects resulting from a plan. Annex II of the directive describes criteria to guide a plan maker through the process. The competent authority producing the plan is responsible for deciding whether an SEA is required. The SEA Regulations[18] require the environmental assessment of plan or programmes that:

a) Are prepared for… water management… and,
b) Set the framework for future development consent of projects… or
c) Which, in the view of the likely effect on sites, have been determined to require an assessment pursuant to Article 6 or 7 of the Habitats Directive

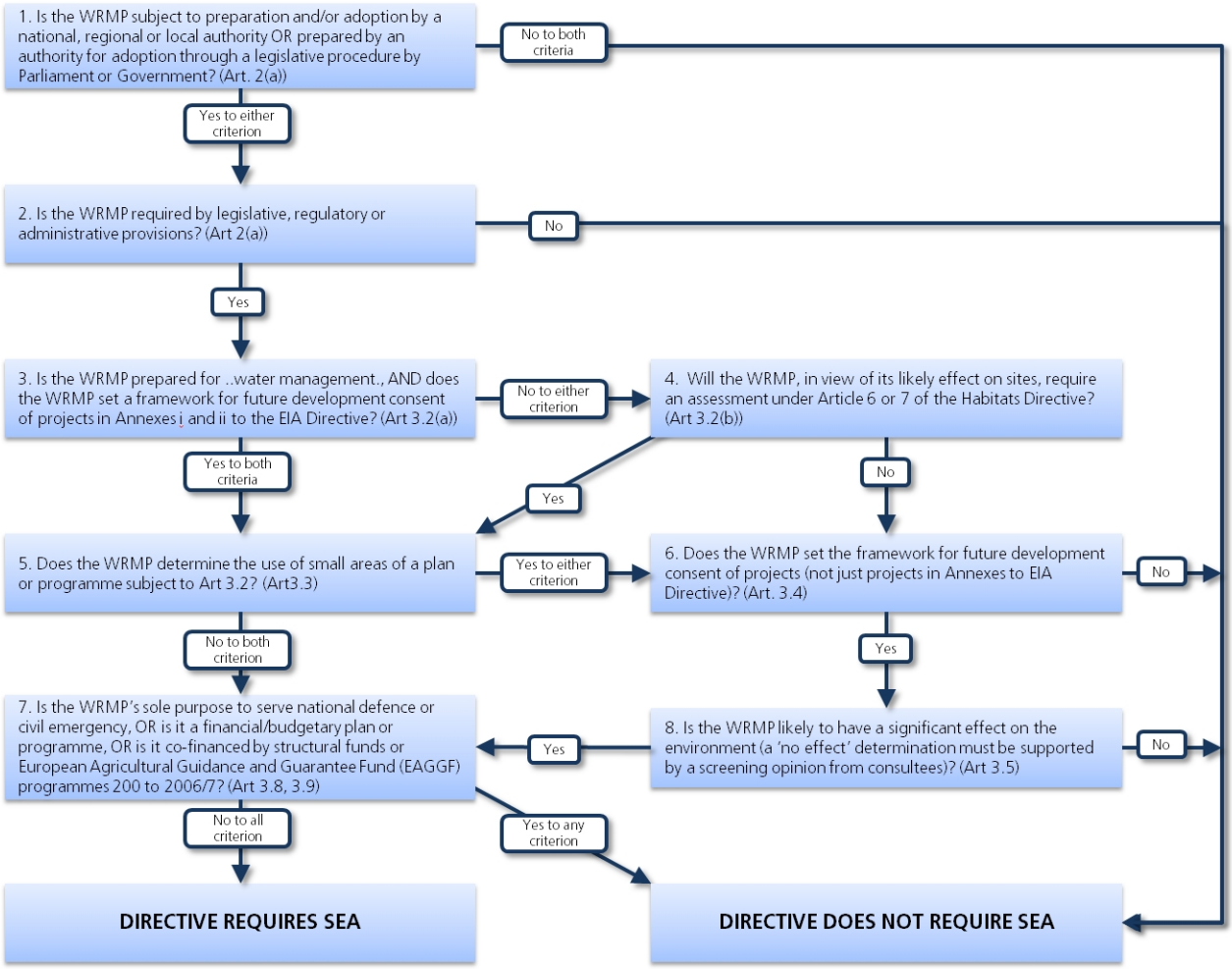
Using the above criteria, SEA can apply to water company WRMPs, however it is recognised in the Water Resources Planning Guidelines that small WRMPs, which do not propose any options in order to meet a supply demand balance deficit, do not necessarily require an SEA. Measures or options proposed to deal with a deficit, or chosen by a company for other reasons can be assessed using SEA to aid selection; however none are proposed in the plan.

The company has followed guidance set out in the SEA – Guidance for Water Resources Management Plans and Drought Plans[19], as set out in the decision matrix reproduced in figure 5, and concluded that, on the basis this plan does not propose options or set a framework for development, and is not likely to have a significant effect on the environment, that a full SEA is not required in this case.

[18] The Environmental Assessment of Plans and Programmes Regulations 2004 (SI 2004No. 1633)

[19] UKWIR, 2007

Figure 4 – SEA Decision Matrix



5.8 Environmental issues

We have a commitment to ensure that our operations do not impact unduly on the environment, and to minimise any impact wherever possible. We recognise that abstraction of water from the environment for public water supply can reduce the water available in the wider environment. This supports our commitment to ensuring that water supplied to our customers is used in the most efficient manner possible through the promotion of water efficiency and by charging customers on a metered basis, together with leakage management and efficient water supply and distribution operations.

Where the company's abstractions are considered to have a potential impact on environmentally sensitive sites, the company works closely with the Environment Agency and Natural England to implement the requirements of the National Environment Programme. Underpinned by legislation, the National Environment Programme provides the appropriate framework for identifying where investigations, impact assessment and mitigation measures are required to ensure these sensitive sites are not damaged by abstractions. Details of the programme are explained further in section 6.3.1.

The company does not have many land holdings, but does in particular own land at Fowlmere Watercress Beds SSSI, which is managed on our behalf by the RSPB.

In producing our statutory water management plans we have previously received representations from environmental groups, expressing concerns about the potential impact of our abstractions on local sites. Where these sites are non-designated and of mainly local amenity value, it is less likely that these will appear as sites identified in the National Environment Programme. We have in particular previously received representations from The River Mel Restoration Group, The Little Wilbraham River Protection Society, and Hobson's Conduit Trust, and recognise the concerns over these local sites as being of importance to our customers. We will endeavour to work with these local groups to assess the impacts of our operations and seek a mutually acceptable solution to the concerns over local sites.

5.8.1 Assessment of Water Framework Directive

The updates to Phase 3 of the National Environment Programme have resulted in 29 Water Framework Directive sites under investigation by the Environment Agency being closed, and 4 remain unknown. This significant reduction of sites with unknown sustainability changes has reduced some of the uncertainty around future reductions to licences from future sustainability changes.

However, the NEP Investigations are assessed against recent actual abstraction, and significant increases in abstraction may need to be investigated to determine the risk of deterioration to WFD water body status.

The Company is required to assess the Water Framework Directives objectives set out in the Water resources planning guideline and the Environment Agency advice note[20], and whether our abstractions may impact on WFD water body status

Discussions with the Environment Agency have identified some residual risk against WFD objectives for abstractions at fully licenced volumes, where increases in abstractions above recent actual may impact on flows which are required to support the ecology in some water bodies. These sites are identified in the National Environment Programme, however there remains considerable uncertainty around the impacts and as such, no sustainability changes can be proposed.

The Company is responsible for assessing the risk of deterioration in water body status that may arise from increases in abstractions. Whilst the Company has proposed no significant increases to abstractions at sites where abstractions may compromise WFD objectives, expected growth will required additional licenced volumes to be used in future.

Accordingly the Company has reviewed its abstractions and decided that it will undertake investigations into abstraction at the Company's Thetford sources to remove uncertainty with respect to WFD 'No Deterioration' and these sources. These abstractions have been considered for potential trades with neighbouring companies, abstraction would increase over time in order to meet expected growth in the supply area, and are sources where a significant difference from recent actual to fully licenced volumes exists. As a result it is intended to undertake a programme of investigations commencing in 2014 in order to remove the uncertainty in the AMP6 period.

The Company also included a scheme in AMP6 to reduce the uncertainty in meeting WFD objectives before any increases in abstractions are required. This will be an Options Appraisal type investigation at one or more of the remaining unknown NEP schemes.

5.8.2 Catchment Management & Biodiversity

The abstraction of water for public water supply reduces the water available for environmental demands, and the Company is committed to reducing the impacts of its abstractions on the environment, both through the statutory frameworks such as the National Environment Programme, but also through promoting water efficiency, encouraging paying for water on a measured basis, and the optimisation of its operations.

The Company recognise that wider impacts on the environment and biodiversity can be mitigated in a number of ways, including catchment management schemes and by the protection and enhancement of localised biodiversity.

The Company has recently reviewed our approach its Biodiversity, and in collaboration with local Wildlife Trusts and other stakeholders will be assessing its land holdings for opportunities to conserve and enhance biodiversity in AMP6, to develop a programme of measures targeted at priority sites.

The Company has also included a number of catchment management schemes in AMP6 focused on determining water quality improvements, but also recognising the additional

[20] Preventing Deterioration of the water environment – technical briefing, Environment Agency, May 2013

environmental benefits that can be realised from application of a catchment approach. The Company is committed to working with stakeholders in the catchment such as the NFU and River Trusts in catchment partnerships and other collaborative work.

6. Water supply

6.1 Overview

This section explains the process followed to determine the water supply available to Cambridge Water under average and peak demand conditions. All of the company's supplies are obtained by abstracting from groundwater, and the available yield at any time is determined by the licences to abstract that we hold, and the physical ability of the sources to produce the licensed volumes. An assessment of these factors, allowing for our levels of service provides a total deployable output volume for the company's resource zone.

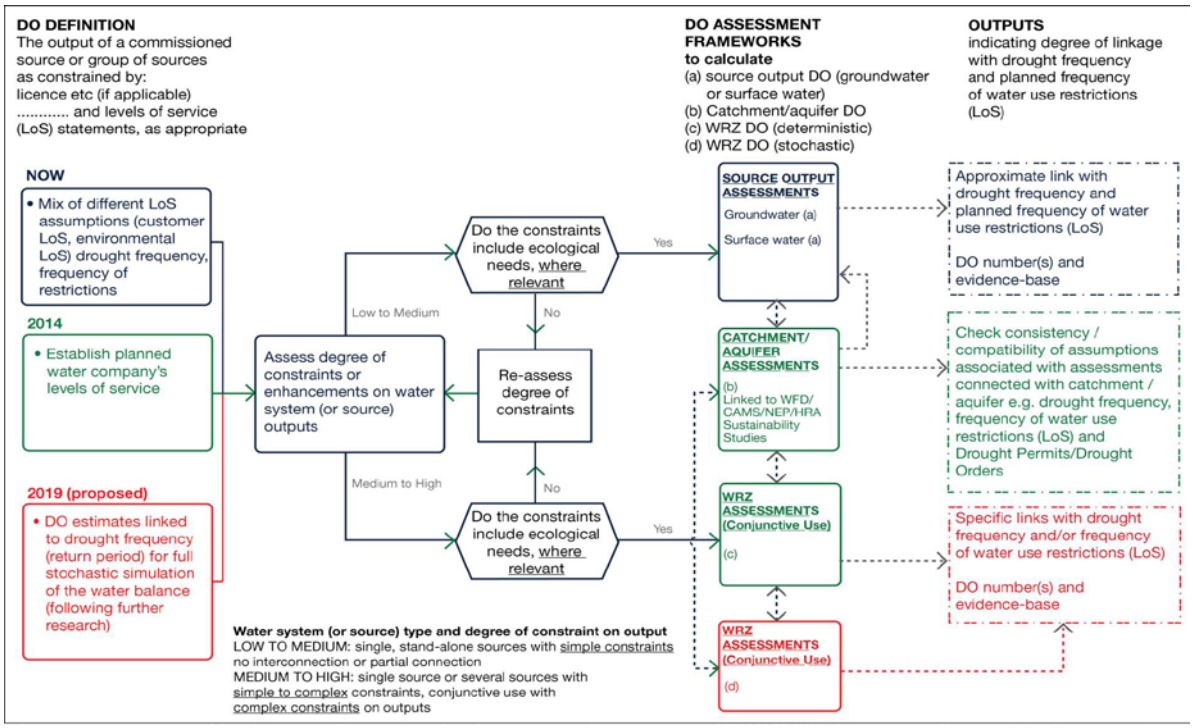
Following determination of total deployable output, we must make some allowances for reductions to this total volume, in order to account for uncertainty in maintaining the total deployable output at all times through the planning period. These include an allowance for outage, sustainability changes, and other reductions to deployable output, in addition to some uncertainty which is included in the minimum target headroom calculation, and are explained in detail in the following sections.

6.2 Deployable output

The deployable output total used in the plan is an aggregate of the deployable outputs derived from the company's Source Reliable Output (SRO) study. First undertaken in 1997, and periodically updated to reflect changes to sources, the SROs for all sources were updated during 2012, partly as a consequence of the emerging drought through 2011-12, but also to ensure the most current data available had been used for determining available supply for this plan.

The SRO studies determine the quantity of water available from each of the company's sources to satisfy average and peak demands, under drought conditions. The deployable output from our sources has been assessed on a source output basis, using the UKWIR 1995 Methodology, and with reference to the UKWIR WR27[21] revisions. The approach is in accordance with the deployable output assessment framework for groundwater sources shown in Figure 5 below

Figure 5 - Deployable output assessment framework



6.2.1 Constraints on deployable output

The source output basis approach is used to assess the maximum predicted output under drought conditions that a source can maintain using water levels vs. total output assessment, before including other constraints upon the deployable output. This approach is appropriate as the company sources have simple constraints on output, being single standalone sources with limited or no interconnection. At sites with multiple boreholes, these are considered as a single source operating as duty and standby in most instances, and physically in close proximity. The constraints on output for the company borehole sources are generally;

[21] UKWIR Report Ref No 12/WR/27/6

- Yield of aquifer, well or aquifer properties
- Licence constraints
- Operating constraints such as pumping plant or treatment capacity

At most sites the constraints on deployable output, in particular at annual average demand conditions, are hydrological or licence constraints, and there is therefore little scope for increasing deployable output by any operational means within the control of the company.

6.2.2 Data records

Borehole level data used in the study includes water level data recorded during the 1991/92 drought, the most severe drought of 1995/96 drought and other subsequent dry periods including 2011. Records used in the calculation of deployable output go back to the origin of each source, not necessarily to 1920 as recommended in the Water Resources Planning Guideline. Any further hind casting of rainfall records is not deemed appropriate considering the surplus position in the supply demand balance, the robustness of the sources to drought and changes in yield, and the unlikelihood that todays developed aquifer conditions would be accurately represented back to the1920s. Detailed records of water level and assessment of total output using, in most cases pumping tests, have been applied to determine Deployable Outputs, and the majority of sources are constrained by licence and not by yield

6.2.3 Deployable output results

The total deployable output calculated is in line with previous plans; however there have been some minor changes to the component sources of the total as a result of the recent re-assessment of yields. The revised deployable output values and the total for the water resources zone are indicated in Table 6.

During 2012, work was carried out to recommission the company's Horseheath sourceworks - previously out of use due to a Cryptosporidium risk - in order to enhance the deployable output. This activity was undertaken in light of the emerging drought situation, and probable future licence reductions within the supply zone, from sustainability reductions described in section 6.3.2. St Ives source remains temporarily out of use because of a Cryptosporidium risk, it is included in the table, as it does feature as a supply side option in the company's drought plan.

Table 6 - Deployable outputs - 2012 SRO Revision

Licence No.	Source name	Deployable output average daily demand		Deployable output peak demand	
		Limit Ml/d	Constraint	Limit Ml/d	Constraint
6/33/28/50	Abington Park	1.00	Annual licence	4.44	Pump rating
6/33/28/7	Babraham	9.09	Annual licence	9.09	Annual licence
6/33/44/221	Brettenham	11.34		15.00	
6/33/30/161	Croydon	1.99	Annual licence	1.99	Treatment
6/33/34/203	Dullingham	3.60	pump rating	3.63	Pump rating
6/33/30/160	Duxford Airfield	4.56	Annual licence	5.68	Daily licence
6/33/30/191	Duxford Grange	3.41	Annual licence	3.95	Peak yield
6/33/42/107	Euston	8.00	Annual licence	10.00	Daily licence
6/33/34/24	Fleam Dyke 12"	3.27	Annual licence	3.27	Daily licence
6/33/34/24	Fleam Dyke Main Site	12.30	Annual licence	12.70	Peak yield
6/33/30/26 & 168	Fowlmere	3.60	Annual licence	5.40	Daily licence
6/33/34/179	Fulbourn	1.49	Annual licence	1.80	Pump capacity
6/33/30/192	Great Chishill	1.06	DAPWL peak yield (as licence)	1.06	DAPWL peak yield
6/33/34/26	Great Wilbraham	5.67	Annual licence	8.65	Pump capacity
6/33/30/169	Heydon	1.13	Annual licence	2.13	Pump cut out
6/33/27/39	Hinxton Grange	5.77	Annual licence	6.82	Daily licence
6/33/28/52	Horseheath	2.30		2.88	
6/33/32/7 & 20	Kingston	1.00	Annual licence	1.18	Daily licence
6/33/28/12	Linton	1.93	Annual licence	2.73	Daily licence
6/33/30/193	Lowerfield	3.41	Annual licence	4.27	Daily licence
6/33/30/156	Melbourn	7.94	Annual licence	9.15	DAPWL
6/33/30/171	Morden Grange	1.50	Pump capacity	1.50	Pump capacity
6/33/28/51	Rivey	2.20	Annual licence	2.75	Daily licence
6/33/28/13&38	Sawston	1.49	Annual licence	2.16	Pump capacity
6/33/26/20	St Ives		NOT IN SERVICE		
6/33/34/110	Westley	11.39	Annual licence/peak yield	11.39	Peak Yield
6/33/34/179	Weston Colville	2.92	DAPWL	2.92	DAPWL
Total		**113.36**		**136.54**	

Deployable outputs for each of the individual sources within the company's single resource zone are also listed in the Environmental Agency data table WRP1a BL licences presented in appendix A13.

6.2.4 Deployable output and levels of service

The existing methodology applied to calculate deployable output is the UKWIR 1995 Methodology, which does not take into account the level of risk associated with long term seasonal impacts, such as prolonged drought, by assessing levels of service or return periods. The company's published levels of service (LoS) are based on the frequency of droughts previously experienced, and the likelihood of water use restrictions becoming necessary, and it is on this basis that we plan for. We are also required to demonstrate that we can achieve the included reference levels of service from the Water Resources Planning Guidelines. The levels of service to be assessed against deployable output are shown below:

Restriction	Company proposed levels of service (LoS)	Reference level of service (LoS)
Temporary use bans (formerly hosepipe ban)	1 in 20 years	1 in 10 years
Non-essential use	1 in 50 years	1 in 40 years
Rota cuts or standpipes	1 in 100 years	Not applicable

6.2.5 Drought frequency and level of service

The decision to implement restriction measures impacting on customers is informed by monitoring the company's drought indicator sites. Our drought triggers have been developed using data obtained from previous drought sequences and the statistical analysis of effective recharge and observed borehole levels at key indicator sites. Additional detail on these can be found in the company's Drought Plan, published in 2012, which also provides narrative on the historical droughts informing the selected level of service and our response in a drought situation.

It should be noted that the trigger for imposing a restriction on non essential use is a combined trigger (RWL5) for which there is no historical precedence, as the company has not needed to impose such restraints. This trigger is set by physical constraints on borehole output as defined by the deepest advisable pumping water level (DAPWL). This is the main constraint on the company's ability to supply from these sources, where other constraints such as licence or pumps, does not define the available deployable output. Breaching this trigger would indicate exceptional circumstances of drought, in excess of three dry winters or longer, and has not been experienced in the company's history. An appraisal of the cumulative impact of drought on available supply reproduced from the company's Drought Plan is presented in table 7.

Table 7 – Drought impact on supply[22]

Trigger	Drought action	Gain/loss in deployable output Ml/d
Spring following a second dry winter, >120mm recharge deficit	Appeals for restraint	+ 3[23]
April following a third dry winter	Introduce temporary ban on water use	+ 5[24]
Melbourn PS < 2m above DAPWL	Reduce output by 50%	- 5
Duxford PS < 2m above DAPWL	Reduce output by 50%	- 2.5
W/Colville PS < 2m above DAPWL	Reduce output by 50%	- 1.5
Morden Grange PS < 2m above DAPWL	Reduce output by 50%	- 1.5
Fleam Dyke PS < 2m above DAPWL	Reduce output by 50%	- 8
Fowlmere PS < 2m above DAPWL	Reduce output by 50%	-2.5
September following a third dry winter *RWL5 trigger exceeded*		
Fulbourn PS < 2m above DAPWL	Reduce output by 50%	- 1
Gt Wilbraham PS < 2m above DAPWL	Reduce output by 50%	- 2.5
Gt Chishill PS < 2m above DAPWL	Reduce output by 50%	- 0.5
September following a third dry winter;	*Initiate non-essential use drought order application process* *(3 months lead time)*	+ ~5[25]

The preceding table demonstrates that, in the event of a future drought of similar magnitude to that experienced in the 1920s, which was the worst in almost 100 years of records, the company would be able to maintain a healthy surplus of supply over demand, and ensure security of supply for its customers. The table indicates a loss in deployable output of 25Ml/d before a non-essential use drought order is required. When this is compared with dry year demands curbed by appeals for restraint and by a temporary ban on water use, it indicates that surplus would be maintained through the planning period. Resorting to non-essential drought orders would be unprecedented and very unlikely over the planning period. This is shown graphically in figure 6.

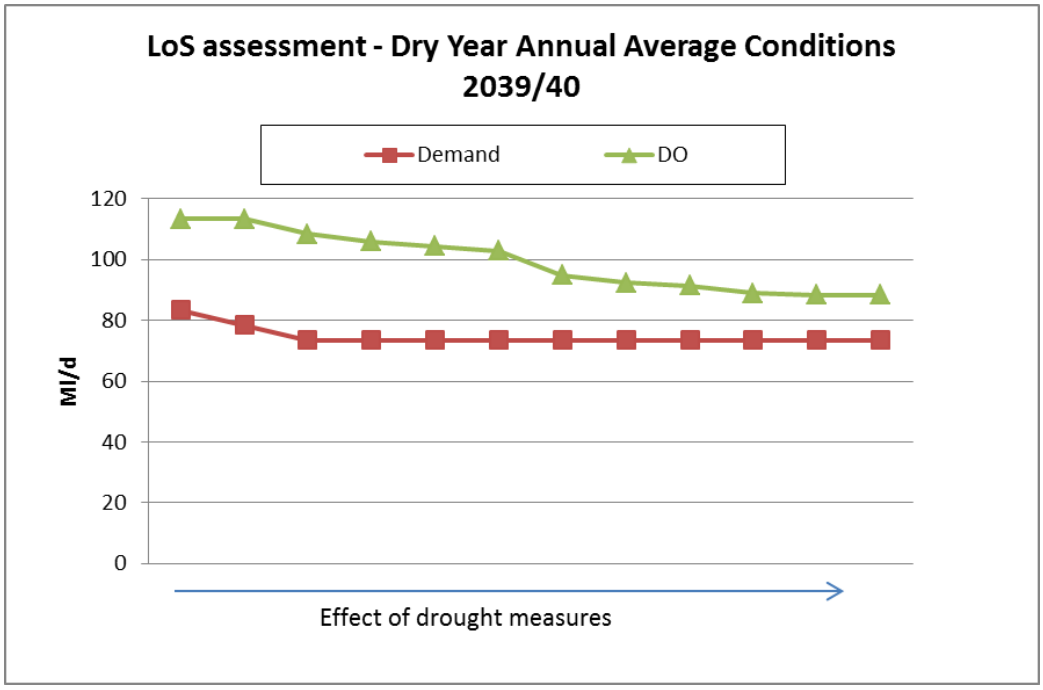
[22] Reproduced from Cambridge Water Company Final Drought Plan 2013

[23] based on actual reductions seen during previous droughts

[24] based on UKWIR CoP estimates (5–9.5% - expected to be greater than previous h/pipe ban)

[25] based on UKWIR CoP estimates

Figure 6 – Temporary use ban level of supply - LoS of 1 in 20 years



As surplus headroom can be maintained, the proposed levels of service are more than achievable. This analysis is based on available deployable output under average conditions, and the fact that additional resources could be available under peak conditions with current licences. As there is little available data on the potential impact of drought orders for non-essential use on further reducing demand, this has not been included as a further demand reduction, as this level of service can also be maintained with the available surplus.

6.2.6 Reference levels of service

The company's proposed levels of service exceed the reference levels of service, therefore the reference levels of service can implicitly be achieved on the basis of available surplus demonstrated in 6.2.4. The risk of rota cuts or standpipes is extremely low; however this is included in our level of service, as it cannot be ruled out as a possibility in very extreme circumstances. As peak week demands have been curbed through the metering of registered hosepipe users since the peak week demand experienced in 1998, a drought of similar magnitude to the worst experienced would now have less of an impact on demands. The need for drought orders and the frequency of customer restrictions is therefore now less likely. The robustness of the company's supply position is demonstrated by the inclusion of a single supply option in its drought plan, as an expected requirement of a drought situation lasting more than 3 dry winters.

In addition the Company has assessed the baseline deployable output for each level of service scenario and this is presented in table 7a below.

Table 7a –Available Deployable Output for Level of Service scenarios

Levels of Service Scenario	Available Average DO	Available Peak DO	Reason for change
No Restrictions	88.36	111.28	Reductions in source outputs to maintain levels above DAPWL No demand management
Planned Levels of Service	103.36	126.28	Appeals for restraint Introduce Temporary ban on water use Introduce non-essential use restrictions Implement Supply side drought option
Reference Levels of Service	103.36	126.28	As above for planned levels of service

The data in table 6 demonstrates that at annual average conditions most of the company sources are constrained by licence or infrastructure, therefore the current level of service, or any changes will not significantly affect deployable output. The exceptions are Weston Colville and Great Chishill, where yields can be constrained by the modelled deepest advisable pumping water level (DAPWL), and at which there may be a minor impact on available deployable output in drought conditions. These sources, together with a number of other sources at which the yield can be protected by reduced pumping when groundwater levels are low, may have outputs reduced under the Company's planned levels of service. However, as these account for a small proportion of overall available deployable output, the Company can maintain supply at the deployable outputs indicated in table 7a above for each level of service scenario.

6.3 Reductions in Deployable Output

6.3.1 Sustainability Changes

The Environment Agency believes that some water company abstractions may have an impact on environmentally sensitive sites or water bodies. Where this may be the case, the Environmental Agency and water companies will investigate these abstractions, in order to determine if there is an impact, the order of magnitude of impact, and measures required to implement a solution. This is done through the Environment Agency Restoration of Sustainable Abstraction and the National Environment Programmes, which list the affected sites, and implicated Public Water Supply licences.

In order to protect designated sites under the Habitats Directive and the Wildlife and Countryside Act, and sites such as Sites of Special Scientific Interest (SSSIs), Biodiversity Action Plan sites (BAPs) or locally important sites such as Local nature reserves (LNRs), and to deliver Water Framework Directive (WFD) objectives, the Environment Agency may require Sustainability Reductions to water company abstractions. Where proven to be cost effective options, these sustainability changes will eventually become changes to the conditions of abstraction licences. Until this time, where the Environment Agency has designated a change as ‘likely’ or ‘confirmed’ a reduction in company deployable output is made for the purposes of water resources planning.

Where sustainability changes are indicated, but not definite, no reduction to deployable output has been made, in accordance with the Water Resources Planning Guidelines. The Environment Agency have indicated that there may be future WFD related reductions at some sources which remain unknown at the time of planning, however in discussion with the Agency, we have undertaken scenario planning to assess potential future risks to deployable output, which are discussed further in section 13.

6.3.2 National Environment Programme

Cambridge Water has undertaken a number of investigations and option appraisals as identified by the Environment Agency under the National Environment Programme, the conclusions of which are included in the National Environment Programme tables provided by the Environment Agency and reproduced in appendix A17. Of most note is the River Granta & catchment scheme for which an options appraisal was completed in August 2012, this report proposes and examines options to mitigate the impacts of abstraction on the site. Sustainability reductions that have arisen as a result of investigations at this site are included in our supply forecast. The latest National Environment Programme Phase 3 tables were issued by the Environment Agency in August 2013, and the revised sustainability reductions are included in this plan.

Included sustainability reductions

The latest indications of possible sustainability reductions were advised by the Environment Agency in August 2013, updated from those provided in February 2013 which were included in the draft plan.. These are derived following investigation work carried out by the company throughout AMP3,AMP4 and AMP5 to determine the impact and effect of our abstractions on environmentally sensitive sites.

The environmentally sensitive sites and the licenced company sources to which sustainability reductions classified as 'Likely' or 'Confirmed', are indicated in table 7 below. In accordance with the Water Resources Planning Guidelines these reductions have been included in the plan as reductions to the company's deployable output. Prior to any definite licence changes at these volumes, we shall work with the Environment Agency to ensure the most effective solution is implemented, with the least impact on supplies. We have not reduced our deployable output figure to take account of any other potential future sustainability changes where these are unknown, as per the guidance. This includes the possible future impacts from Water Framework Directive requirements.

Table 8 - Sustainability reductions included

Site	Designation	Licence	Indicative reduction
River Granta & catchment	Water Framework Directive	Linton	1.75Ml/d
River Granta & catchment	Water Framework Directive	Rivey	1.75 Ml/d
Hobsons Brook (Ninewells)	Water Framework Directive	Babraham	1.92 Ml/d
Dernford Fen	SSSI, Water Framework Directive	Sawston Mill	0 Ml/d

The revised NEP Phase 3 tables include notification of 2 schemes requiring further Options Appraisal by the Company where abstractions are the most probable cause of impact on flows, and these are included in table 8a below:

Table 8a – NEP options appraisal requirements

Site	Designation	Licence	Indicative reduction
Cherry Hinton Brook	Water Framework Directive	Fleam Dyke	1.2Ml/d
River Shep	Water Framework Directive	Fowlmere	0.03 Ml/d

The complete listing of sites provided by the Environment Agency is included in appendix A17. Further investigations have been identified from this list for inclusion in the company's AMP6 programme of work, and are discussed in the next section

NEP Schemes in AMP6

River Granta & Catchment

We have included a scheme in AMP6 to further devlop our options appraisal and the feasibility of an option to augment flow in the River Granta at times of low flows. This has the potential to reduce the licence changes required to protect the river flow and provide some flexibility for future operation of Linton and Rivey.

Hobsons Brook

Options appraisal in AMP5 identified options to protect the spring flows at the Ninewells Local Nature reserve (LNR), and hence the flows in Hobsons Brook which is fed by the springs. Whilst the scheme may require some re-evaluation against appropriateness for the augmentation of Hobsons Brook, a scheme has been included along the principles of the proposed option for Ninewells.

Dernford Fen

Whilst there are no sustainability reductions associated with this NEP scheme as the Sawston Mill sources is not currently used for abstraction, there is a high risk of impact from the Sawston Mill source if operated. We have agreed with the Environment Agency to voluntarily remove this abstraction point from the licence, under a Section 51 licence variation agreement (Water Resources Act 1991 part 2, s51). This will remove risk from abstraction impacts to the water levels in the Dernford Fen SSSI

Cherry Hinton Brook and River Shep

Both sites are included for Option Identification and Appraisal in AMP6, on the basis of similar previous options appraisals carried out in AMP5.

6.3.3 Time limited licences

A number of the company's licence to abstract water are time limited, and are due to expire in 2015. These are for Euston, Brettenham and Fowlmere, and contribute significantly to the company s deployable output. The Water Resources Planning Guidelines state that only time limited licences with likely or confirmed sustainability changes should be included as sustainability reductions, therefore the potential reductions on these licences have not been included.

The Environment Agency have been instructed by the Government to ensure that time limited licences do not present a risk to the security of supply and that notice given for any change will provide sufficient time to restore the supply demand balance, and this is explicit in the Water Resources Planning Guidelines[26].

The Environment Agency has not indicated to the company that there is any likelihood of these licences not being renewed. In its *Managing Water Abstraction: Interim Update - June 2008.* It also confirms that it applies a 'presumption of renewal' when licences reach the end of their time limit, provided the three tests of environmental sustainability, continued justification of need, and efficient use of water, can be demonstrated. In agreeing the current

[26] WRPG, Section 5.3, page 95

extension to the Euston and Brettenham licences, the company undertook considerable environmental assessment to assess the impact on nearby environmental wetland sites.

The conclusion of this work was that abstractions at the current licensed quantities have no significant effect, and this was accepted by the Environment Agency. This outcome is not expected to change when these licences are renewed at the beginning of the planning period in the final plan.

6.3.4 Abstraction Incentive Mechanism

To reduce the impact of abstractions on the environment that are not covered by the Environment Agency's Restoration of Sustainable Abstractions programme, Ofwat is developing an Abstraction Incentive Mechanism (AIM). This was identified as a priority in the Ofwat price setting methodology; however detailed proposals are still being developed. Ofwat has made a commitment to introduce the AIM in the next price review cycle. This will provide incentives for water trading and disincentivise abstractions that damage the environment. The Water Resources Planning Guideline instructs that companies should not factor any potential implications from the introduction of such a scheme into plans or reductions of deployable output; and accordingly this has not been included.

6.3.5 Nitrates

The company has investigated the potential impact of nitrate levels at its sources, which are expected to continue rising. It has invested in catchment modelling studies for catchment management solutions and also evaluated treatment solutions. As a result of these studies nitrate removal treatment has been installed at two sources and is planned at a third which have shown a short term expectation of exceeding allowed nitrate parameters. We have also investigated options for a catchment based approach through catchment management interventions to reduce the nitrate leached from the land into groundwater. Our studies have shown that the properties of the aquifer and levels of nitrate already in the aquifer mean this approach would lead to an unacceptable risk of exceeding the nitrate levels, hence treatment being required to ensure security of supply. There are, therefore, no anticipated threats to deployable output arising from nitrates.

6.3.6 Other Reductions to deployable output

We are currently investigating the treatment regime at our two greensand sources at Croydon and Kingston, which are susceptible to iron and manganese raw water quality issues. The current treatment to maintain water quality is approaching the end of its life. The cost of replacing the treatment is being assessed, however early indications are that the costs will be prohibitive, particularly while the company has sufficient deployable output and is showing surplus in its supply demand balance. Therefore it is likely that these sources will be decommissioned for the medium term, and once this is confirmed to be the case, the company's deployable output will be reduced by 1.99Ml/d, and 1.0Ml/d respectively.

Abstractions of water can have an environmental impact, and it is important that these impacts are assessed against the need for public water supplies. The Environment Agency is responsible for ensuring abstraction licencing is appropriate, and regard is taken to environmental impact, through the Catchment Abstraction Management Strategy, and under The National Environment Programme.

The results of investigations can eventually lead to changes in abstraction licences. This could potentially reduce the deployable output available to the company at some sources. The catchments that our sources are in have been designated as 'over abstracted' or 'over licensed', which means that no additional development of water resources is likely. Water Framework Directive sites are to be included in the National Environment Programme, and this legislation requires that the environmental conditions and capacity of rivers should be improved, or subject to no further deterioration in condition. The measurement is based on river flows required to support ecological conditions, and it is recognised that groundwater abstractions can reduce the flows in rivers, and may have an impact on the condition of these rivers. We have made an initial assessment of the impacts from possible future sustainability reductions in section13 of this plan.

As these possible reductions in deployable output are highly uncertain, no adjustment has been made to the deployable output figure included in this draft plan. This is in accordance with the planning guideline.

6.4 Outage

Within our WRMP we must include an allowance for outage, which is to accommodate potential short term loss of the amount of water available for supply (deployable output) through plant failure, power outages, pollution incidents and quality failures, and for planned maintenance which cannot be delayed. The company's policy is to minimise the potential for and impact from such unplanned and planned outages at sources through an effective capital maintenance strategy, and mitigation measures, such as standby power generation, however, it is recognised that some events are outside of our control.

6.4.1 Calculation methodology

Our maintenance records show planned and unplanned outages at sites, and this has been stored in electronic format since 2009. This data of actual failures, together with experience from production operation managers to estimate the likelihood of less frequent outage, or where records are sparse, has been used to inform the calculation of an outage allowance. The data is screened to include only legitimate outage events in the modelling, which is performed for both annual average conditions and peak demand conditions.

The assessment of outage used in this plan builds upon the approach used for the WRMP 2010, using the same probabilistic modelling method, as described in the UKWIR 1995 Methodology[27], and recommended in the Water Resources Planning Guidelines. The calculation of outage utilises the input data in a Monte Carlo-based simulation, using Crystal Ball® software in a model developed for the company by consultants for the previous WRMP, an approach endorsed by the Environment Agency. The model has been updated to include changes to outage data, deployable output, and available sources, and run for 5,000 iterations to provide a range of percentiles for outage allowances.

6.4.2 Outage Results

The approach followed to update the outage allowance calculation is described in full in appendix A6, and a summary of the results is presented in table 9. The development of the modelling approach together with the results applied for the WRMP 2010 is explained in the consultant's report[28] and is available on request.

[27] Outage Allowances for Water Resources Planning, UKWIR 1995

[28] Outage Allowances for Water Resources Plan, Final Report, Entec UK, 2009

Table 9 - Summary of outage allowance - average conditions

Zone Outage Allowance	95 percentile	90 percentile	85 percentile	80 percentile	75 percentile	50 percentile
Draft WRMP 2013 outage allowance %	7.48%	6.72%	6.31%	5.95%	5.64%	4.70%
Draft WRMP 2013 Ml/d of deployable output	8.48	7.62	7.15	6.74	6.39	5.33
Final WRMP 2010 outage allowance %	11.70%	11.00%	10.60%	10.20%	9.90%	8.90%
Final WRMP 2010 Ml/d of deployable output	12.88	12.11	11.67	11.23	10.90	9.80

6.4.3 Risk profile

The company has chosen to use the 95%ile as the preferred level of risk to adopt; this gives an outage allowance of 8.5Ml/d. This would account for outage in 95% of all cases.

In preparing this draft plan, the company has considered reducing the risk percentile towards the end of the planning period, but has decided not to apply this approach for the draft plan. In the past, a number of events have resulted in particular sources being unavailable for prolonged periods, notably, Fleam Dyke and Brettenham, which are two major single borehole sources vulnerable to outages.

During the summer of 1990, in the middle of a serious drought, the company suffered a major outage at Fleam Dyke, which lasted for several days, as a result of two successive failures of the downstream delivery main. It proved impossible to maintain storage reservoir levels by increased pumping from other sources, and appeals had to be made to customers through the local press to use water for only emergency purposes until repairs had been affected. At Brettenham, in early 2007, a planned outage lasted for a number of months, while pumping equipment was upgraded. At the end of the year, the new pump suffered an unexplained failure, resulting in a further, unplanned, outage.

While these are considered extreme events that cannot be foreseen, and therefore, according to the Water Resources Planning Guidelines should be excluded from the outage allowance calculation, they represent a worst case outage situation comparable to the real loss of our strategically most important source, Fleam Dyke, which was the basis of the outage figure used prior to the WRMP 2010. Until a means of reducing the risk of this magnitude of outage has been introduced, by way of drilling additional boreholes to improve security of supply, the company does not believe that additional risk from reducing the outage percentile is acceptable.

7. Bulk transfers and water trades

7.1 Raw and potable transfers and bulk supplies

The company will always endeavour to utilise transfers or bulk trading of water resources where it is the most cost effective and efficient means of ensuring robust water resources for supply to our customers, and where appropriate, those customers of neighbouring water undertakers.

We currently have a number of cross-border metered supplies with Anglian Water and Affinity Water both into and out of the company's area. These serve small numbers of properties only, and are not the subject of formal agreement. The volumes concerned are small and do not significantly impact on the overall supply demand balance, nevertheless, these are included in our calculations.

The company also currently operates a raw water transfer to supply natural mineral water to a local bottled water facility. This is also included in our supply side calculations.

7.2 Water trading

The recent guiding principles and government aspirations encourage water companies to consider trading water with neighbouring companies as an option for addressing deficits in the supply demand balance. This builds upon the Company's commitment to trade and its collaborative work with regional water companies, as highlighted in the report Trading Theory for Practice (2011).

Although not foreseeing any supply deficit, in accordance with best practice in the Water Resources Planning Guidelines on the publication of a statement of need, the Company published an indicative supply demand balance in September 2012 identifying potential surplus water available for trading with neighbouring companies.

Discussions with neighbouring companies have focused on the consideration of two trades with Anglian Water from the Companys Thetford main;

1. Barnham Cross: A 1.3 Ml/d trade to support the Anglian Water Thetford to Bury St Edmunds transfer. This would be from a developed emergency transfer connection on the Company's Thetford main, required by Anglian Water for AMP8 (2025) in its draft WRMP.

2. Snailwell: A 5Ml/d at annual average and 8Ml/d at peak demand trade, as a replacement for the Anglian Water's Beck Row source supplying the Ely area, which would be required under an AMP5 quality scheme. This would be from a developed emergency transfer connection, also on the Thetford main, and was proposed by Anglian Water to begin in AMP6 (2015).

These trades are as yet unconfirmed. They would be conditional on approval from the Environment Agency and Natural England with respect to environmental impact requirements and those of WFD No deterioration assessment; together with the renewal of time limited licences specifically in relation to the Company's Euston and Brettenham sources

Due to the uncertain nature of these potential trades, and following more detailed discussions with the Environment agency, and the publication of the Environment Agencys guidance[29] on how to review the impact of the 'no deterioration' objectives of the WFD we have determined that further information is required before these trades can be made at the stated volumes.

Through applying a risk based approach, and with the support of the Environment Agency, we have agreed the following trade with Anglian Water to be included in this plan;

1. A 0.25Ml/d at average bulk supply to support an AMP5 Thetford to Bury St Edmunds transfer at Barnham Cross.

This transfer has been included following confirmation from the Environment Agency that there is a low risk of deterioration from the 0.25 Ml/d increase over the next 5 year period.

[29] Preventing Deterioration of the water environment – technical briefing, Environment Agency 2013

We plan further assessment in AMP6 to review the impact of further increases in abstraction to ‘no deterioration’ objectives before reviewing any further future trades, which will only be included in WRMP19 if appropriate.

The trading scenarios assessed for the draft plan indicating the possible effects these would have on the overall supply demand balance, are presented in section 13.

8. Water demand

8.1 Overview

The expected growth of new properties in the region is the main influence on the demand for water. We currently supply approximately 131,000 properties covering a population of around 315,000, and are expecting a further additional 47,000 properties and an increase in population to 416,000 over the planning period.

All of these new properties will be metered, but there is still some uncertainty around the consumptions that we will see. We can plan for dwellings which are designed to use less water, and indeed the company supports buildings designed for low water consumption, however, these are factors outside of our control. As well as buildings designed to use less, it is also uncertain how customer behaviour towards water use will change over time.

We have taken these factors into account in forecasting demands, but regardless, if the expected growth continues, demand for water will increase. In our demand forecast we consider all of the following:

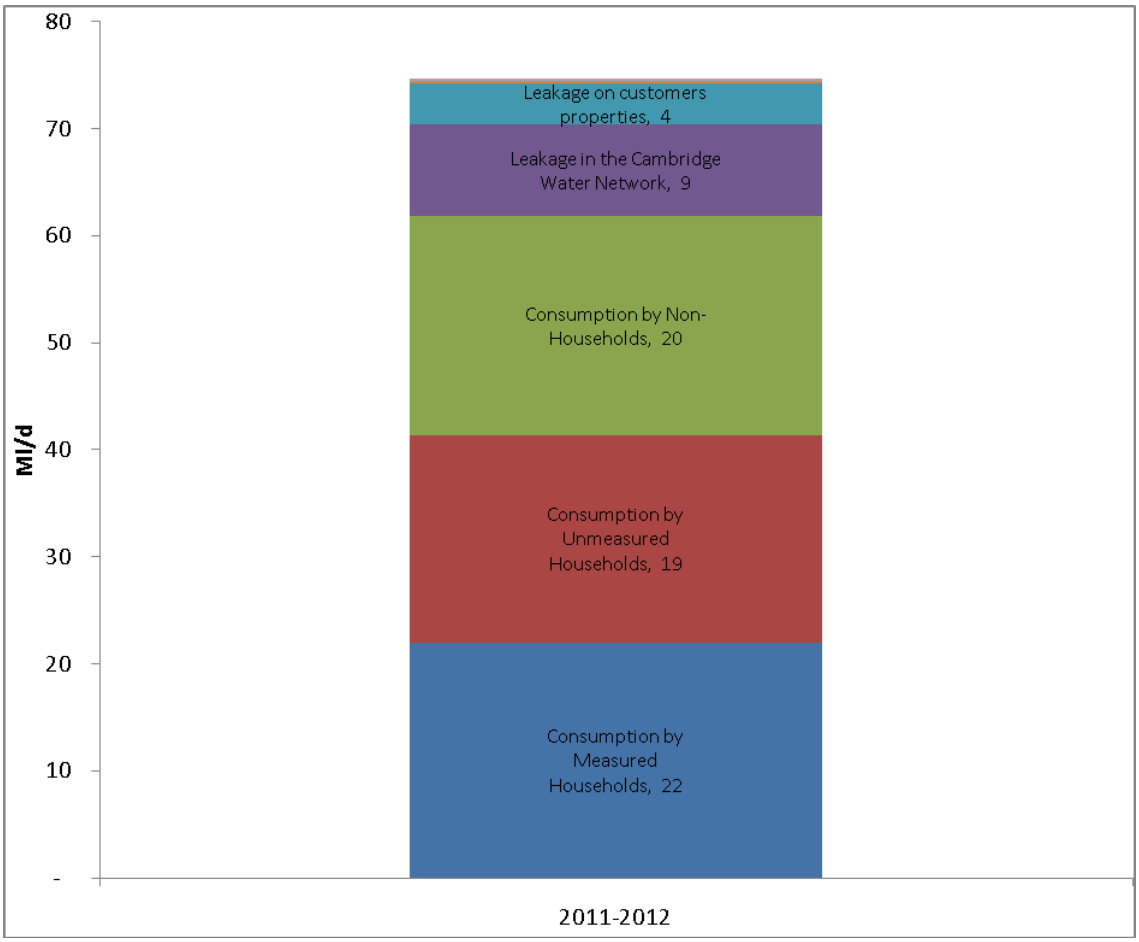
- Impacts of customers changing to a metered supply
- Our water efficiency activities
- Growth in housing and population
- Levels of consumption in new properties

8.2 Methodology

The demand for water is made up of several components. Cambridge Water's average daily demand in the base year April 2011 to March 2012 was nearly 75 million litres.

How the components make up total demand for the base year is demonstrated in figure 7 below which shows the average daily value of the major components for the year 2011-12 in millions of litres per day (Ml/d).

Figure 7 - Components of demand



The forecast demand in this plan is derived from the expected values for the individual components year on year over the planning horizon.

In order to achieve these forecasts we need to consider the following:

- Growth from new customers; including the Code for Sustainable Homes
- Metering
- Leakage
- Minor demand components
- Customer behaviour; technology change, water efficiency
- Climate change

So that we are starting from a sensible position, the base year data used to start the forecast from requires analysis to determine that it was not a remarkable year in any way. This is

referred to as ‘normalisation’ and ensures that we are not over or underestimating any components at the beginning.

The planning guidelines require water companies to plan for a dry year - one in which rainfall is significantly lower than average, and demands are unconstrained by any demand management interventions the company could make. To do this we inflate the normalised base year demand components by a dry year factor to convert the normalised base year into a ‘dry’ year annual average value.

8.2.1 Base year normalisation

We have reviewed the base year of 2011/12 against company records of historic weather and demand to determine if it was a typical year. Although the observed weather was not typical, the base year has been determined as normal in terms of demands, with minimal normalisation required. The details of our analysis are presented in appendix A7.

In conclusion the following has determined the base year:

Metered household demand in the base year was normal. This was unusual as the year saw drier and warmer than average weather conditions compared with other years for which we have demand component data. The average property consumption did not increase as a result of the weather as might have been expected. This lack of noticeable response of demand to weather is likely to be due to a combination of factors, these are; limitations of the size of the data set, and that the previous dry and warm weather effects on demand were experienced in years prior to our enhanced metering policies in the late 1990s. We can therefore conclude a significantly warmer and drier year would be needed to promote a similar effect on demand as previously seen. As a result, adjustment on the metered household component was required.

Metered non-household demand was below average. Again the weather conditions experienced may have suggested that an increase in demand would be expected. Again the limitation in a noticeable effect may be the size of the data set available; however we suspect that the demand of this customer population is more sensitive to the economic situation than weather effects. No adjustment for normalisation can be justified on non household demand.

Unmetered properties do not require analysis for base year normalisation as our method of annual calculation of demands uses the changes in the metered population as the basis for any adjustment. As a result the same adjustment outcome as that for metered properties would apply, and thus no adjustment is required.

One area where a normal year was not reflected is leakage, as the average daily value of leakage was significantly below normal. For the base year the average daily value was 12.4Ml/d, whereas our target or ‘normal’ situation is 14.0Ml/d. Lower leakage in the year was a result of increased activity and investment by the company to reduce leakage in mitigation of the emerging drought situation in 2012. As this was a short term operational response and not expected to be maintained, we have normalised leakage back to 14Ml/d for the base year.

8.2.2 Dry year multiplier

In order to derive a dry year uplift, the company has further developed the methodology applied in previous water resource plans of comparing summer and winter demands. Analysis of weather data from 1974 to 2012 shows that six years were significantly drier than normal but only 1995-96 represents one of those years with unconstrained demand and a noticeable impact.

Five years show dry spring/summer periods, but only two have preceding dry autumn/winter periods and above average temperatures, which would be the worst case dry year experienced. This was seen in 1976 and 1996; however as demand component data only exists for 1996, this has been used to derive a dry year demand multiplier.

Data for 1996 was compared with the base year demand. The demand from metered properties has been used for the comparison as this is the most certain factor in the overall water balance. The differences in demands have been extrapolated for unmetered properties, using the assumption these would behave in a similar way in response to a dry year.

The difference seen was an uplift of 12 litres/property/day for metered households and 73 litres/property/day for metered non households, which represents a 3.5% and 2.3% uplift respectively, on the base year demand. These factors have been applied at the component level in producing our baseline dry year demand forecast.

We recognise that the period used coincides with the start of our enhanced metering policies in the mid-late 1990s, and that perhaps this degree of uplift may not be experienced again, however, the approach cannot reasonably be revised until another appropriate dry year's data is available.

The methodology applied is detailed in appendix A8.

8.3 Demand Forecasting

8.3.1 Household per capita consumption

Consumption is calculated using a bottom up approach and validated from a top down view. Data on metered consumptions is available from our billing system at a property level and can easily be extracted. Unmetered properties have no records of consumption and in the past consumptions have been calculated using consumption monitors. As a result of significant take-up of household meters we were forced to abandon our unmetered domestic consumption monitors a number of years ago as the information provided was no longer reliable. (This problem for companies in maintaining property numbers within their consumption monitors to ensure robust consumption estimates are maintained, is acknowledged by Ofwat in its Security of Supply, Leakage and the Efficient Use of Water, 2003/04 Report, which states that "…this is proving a significant difficulty for many companies as more properties become metered.") Our current methodology to determine unmetered consumption is to use the company's metered households (which during the base year 2011/12, accounted for over 65% of billed households) as a surrogate consumption monitor.

In our last plan we committed to developing a joint consumption monitor with Anglian Water (SoDCon), which has now been established. This allows us to access an appropriately sized monitor that we can utilise for estimates of unmetered household consumption. Unfortunately the monitor was not in place for verification of the base year data, however, preliminary 2012-13 data appears to support our estimates on consumptions.

In addition to utilising our billing records from each year we conduct a maximum likelihood estimation (MLE) to compare distribution input data against demand component data, to determine whether the component data is reliable. This indicates if any adjustments are required.

In calculating consumption forecasts, we also use an occupancy rate to drive per property consumptions, and to determine per capita consumptions. Occupancy rates for the base year are derived from historic census data, currently the 2011 census data, updated for each forecast year based on new development numbers and category of change.

Cambridgeshire County Council publishes the census data on population by parish and ward, and this can be easily mapped to our area of supply. In between census results, the council releases an annual update which we use to correct our total population value. We have applied the 2011 Census revised view of population to the base year, from which we have rebalanced our population estimates/ occupancy rates. Following the 2011 census update we have seen a 2% increase to total population for the base year from our draft plan.

As part of the SoDCon survey with Anglian Water data on occupancy rates has been gathered and this will be reviewed along with revisions to the census data to determine if any rebalancing is required. The data has not fully been audited but the unaudited values of occupancy rates are similar to that seen in the base year estimates.

Metered households

Annual consumption is derived from the company's billing records for metered households. For externally metered households, an assessment of underground supply pipe leakage is removed from consumption since this leakage has passed through the customer's meter. Meter under-registration is also taken into account. After these adjustments the base year Metered Household Consumption totalled 22.05 Ml/d.

We are also able to derive the number of metered households from our billing system. Every property in the billing system is identifiable as either a household or non household, and whether it is metered or unmetered using the previous OFWAT annual return definitions.

In the base year we had 78,146 metered households of which 76,952 were occupied and billed. The population of the occupied properties was estimated to be 167,521. Our population estimate is updated annually by including the population of newly built households which are all metered and including the population of the unmetered households that elect to be charged via metered consumption.

From this analysis, we have estimated the metered household occupancy rate to be 2.18

Unmetered Households

The annual consumption for unmetered households is derived from the previous year value adjusted for the change seen in the metered consumption and the change caused by customers electing for metered charges.

In the base year unmetered household consumption totalled 18.51 Ml/d, and we had 42,893 unmetered households of which 41,916 were occupied and billed. The population of the occupied properties was estimated to be 120,691. Our population estimate is updated annually by removing the population of the unmetered households that elect to be charged via metered consumption, to contrast the calculation for metered households

From this analysis, the base year the unmetered household occupancy rate is estimated to be 2.88.

In conclusion, as a result of the data analysed for base year consumptions, the following per capita consumptions can be derived for 2011/12.

Component	PCC (litres/head/day)
Metered households	131
Unmetered households	153

8.3.2 Non household demand

Metered non household consumption

As is the case for metered households we are able to utilise our billing records to calculate the consumption at these properties. Again those properties with external meters have an allowance from the assessment of underground supply pipe leakage removed as it has passed through the meter, and also meter under-registration is accounted for.

In the base year metered non household consumption totalled 21.3 Ml/d, and we had 9,100 properties occupied and billed.

This analysis provides an average daily consumption of 2,341 l/prop/day for metered non-households

Unmetered non household consumption

The company assumes a consumption of 800 litres per property per day based upon an historic survey. In practice, little is known about unmetered non household consumption, but it is a very small component of distribution input (<2%) and has no significant impact on the other components. Whether 400 or 1,200 l/prop/d were to be assumed, unmetered non household consumption would remain an insignificant component of the overall water balance.

In the base year there were 899 unmetered non households of which 860 were occupied and billed, which provides an estimate for unmetered non household consumption totalling 0.64 Ml/d.

8.3.3 Growth forecasts

Growth is the largest factor that will affect our demand forecast. In the previous WRMP we included growth projections from the Region Spatial Strategies, however these have now been revoked through Localism Act and local authorities now produce their own view on growth.

Within our area of supply there are four local authorities; Cambridge City Council, South Cambridgeshire District Council, Huntingdonshire District Council and Cambridgeshire County Council. Each of the smaller authorities (City, South Cambs and Hunts) produces a view on growth in their area, and these growth projections are freely available.

To establish a reasonable view of expected growth we have also reviewed data from two further sources; the Oxford Economics East of England Forecasting Model (EEFM) which is provided by Insight East, which forecast economic data to allow decision makers understand the East's economy, and the East of England Plan Policy H1 document which was put together in 2010 after the Regional Spatial Strategy was revoked.

The Cambridgeshire County Council plan, based on local authority plans, shows that up to 2031 we should expect to see an additional 36,350 properties, and the East of England Plan Policy H1 data suggests 38,000. The EEFM have produced three scenarios:

- A base line,
- 'The lost decade' (a view that the last five years has seen low economic growth and that will continue for the next five years) and;
- 'High migration' (this takes the national view of migration and says that we have continually seen higher levels than forecast and this will continue).

The EEFM scenarios forecast growth from 38,600 to 43,300 properties up to 2031.

We have also reviewed the predicted historical growth for each forecast against actual growth experienced in order to determine the most reasonable view as a basis for this plan. The results are shown in table 10.

Table 10 - Available growth forecasts

Growth forecast source	Predicted change 2001-2010	Actual growth 2001-2010
Local authorities	12,280	12,168
Oxford Economics East of England Forecasting model (EEFM)	14,100	12,168
East of England Plan Policy H1	No forecast	n/a

The best match was the local authorities' forecast; therefore we have adopted the current ward by ward data as the basis for our growth forecast with our best reasonable assumptions for the period beyond 2031, which is the limit of the local authority planning horizon.

Table 11 - Local authority growth projection

Plan period	2010-15	2015-20	2020-25	2025-30	Total
Number of new homes	13,000	10,450	6,200	6,700	36,350

The local authority projections were last updated in 2010, and will not be revised until later in 2013-14, when consultation on local plans is complete. We will review the growth projections in the updated local plans when available, and if appropriate, will amend our forecast accordingly for the final Water Resources Management Plan. We will also run sensitivity analysis for upper and lower growth projections.

New Household properties

The Local Authority plans weigh a lot of the development in earlier years, and in the current AMP they anticipate 2600 new homes per annum, whereas in the first three years we have only seen approximately 1200 per annum. This is likely to be a result of the economic downturn and the fact these plans were formed before the full extent of it could have been anticipated.

On reviewing the developments that are in the local authority plans we concur that they are happening or likely to happen, and that the total number of properties will be built, but that the timing of the build will vary. We have reviewed the timing of the major developments with our network development team who understand rates of development, and liaise with developers to understand the changing market forces driving developments. As a result, we have adjusted the timing of development to reflect a more realistic phasing of significant development. Table 12 indicates our revised view of growth phased across the planning period.

Table 12 - Cambridge Water's growth projections

Plan period	2015-20	2020-25	2025-30	2030-35	2035-40	Total
Number of new homes	8,300	9,563	10,338	10,163	8,600	46,964

This forecast is still significantly driven by the timing of 10,000 new homes at Northstowe, however, we have adjusted the majority of the development into the mid/later years as we do not expect that the development will accelerate as rapidly as the original local authorities' forecast.

New household consumption

The consumption in newly built homes is set by designing to a level of standard, which is determined by the planning requirements as stipulated by the local planning authority. The current minimum national standard included in the Building Regulations[30] is for 125 litres/person/day. Many local authorities are developing their local plans to set more rigorous

[30] Building Regulations 2010, Part G Regulation 36

requirements to ensure sustainable development, and require new homes to meet higher standards as set out in the Code for Sustainable Homes[31] (CSH).

The Code for Sustainable Homes has been developed to facilitate a change in sustainable building practices for new homes and is intended as a single national standard. The code assesses new properties across a number of categories, including water consumption, and a number of minimum standards have to be met to achieve differing code levels from one to six. The minimum standards for water consumption at each level are indicated in table 13.

Table 13 - Code for sustainable homes standards

Code for sustainable homes level	Consumption (litres/person/day)
1-2	120
3-4	105
5-6	80

Note: The code includes consumption for each level at the stated volume, however, additional points can be awarded under Code for Sustainable Homes for further consumption reductions between each code level. A code standard applied guarantees the above consumptions.

The standard that new homes are built to is not within the control of water companies. We can only influence local authorities and developers to build to levels identified within the code. As such we have taken a prudent view in our forecast to plan for Building Regulations consumption at 125l/h/d as this is currently the only guaranteed level of consumption that new buildings will be constructed to achieve. An exception to this is the development at North West Cambridge (3000 new homes) where we have planned for Code for Sustainable Homes level 5/6 consumptions as we are confident that this development will achieve this, as it is supported by the developer and planning requirements.

To determine the consumption of new properties at any level of the code, we also require an occupancy rate for new households. The occupancy rate that we have used in calculating consumptions in our plan has been derived from the local authority. Alongside expected growth, the local authorities publish their expectations of population change, by ward or parish. We have analysed the population data and mapped this to our area, which implies an expected occupancy rate of 1.97 persons per property. We have adopted this occupancy rate for our plan, as we consider this to be based on the most accurate available data.

We have reviewed the possible impact on our forecast demands of new development achieving higher levels of the code and presented this in our scenarios, and the potential savings are summarised in table 14 below. This shows that increased demand from new households could be 4Ml/d less by the end of the planning period, if the highest level of Code for Sustainable Homes was implemented in new developments.

[31] Code for Sustainable Homes, Department for Communities and Local Government, 2006

Table 14 - Forecast demand increase at Code for Sustainable Homes standards

Standard for new property water consumption	Increase in demand over the planning period to 2039/40, (Ml/d)
Building Regulations[32]	12.3
Code for Sustainable Homes 1/2	11.6
Code for Sustainable Homes 3/4	10.1
Code for Sustainable Homes 5/6	7.7

While we are confident that in time most new properties will be constructed to improved standards of water consumption, this cannot be guaranteed at this time, hence our use of Building Regulations standards which are a statutory minimum standard. This position has the support of the Environment Agency and the Local Water Forum.

With only North West Cambridge at Code for Sustainable Homes level 5/6, our view is that household demand will increase by around 12.3 Ml/d over the planning period. This does not include the effect of water efficiency, meter optants and other factors on reducing total consumption.

New non household properties

The local authority development plans only provide a forecast of growth in new household dwellings, and there are no consolidated forecasts of non household growth. Local authorities set the' type of use' for areas to be developed, and when developers propose new developments any new non household types will be outlined in planning proposals. Until each planning proposal is made, there is no indication of the number or type of any new non households there will be within a development.

In the absence of any consolidated or reliable forecast we have used our average annual value to forecast non household properties, of an additional 98 per annum, this will allow for the expected increase due to growth.

New non household Consumption

We have reviewed the types of new non households in our area over the last few years, and these have been consistent with our normal blend of non household types. This is made up of educational accommodation, office facilities, R&D facilities and retail units. There is no significant industrial use. We have no reason to believe this will fundamentally change based on the development and growth expected, indeed developments currently scoped such as Northstowe, and North West Cambridge show no indication of this changing.

Non household consumptions for these types of properties is likely to be driven by a blend of economic circumstance and weather. Therefore we have applied our annual average consumption since the year 2000. This gives a per property value of 2,238

[32] with NW Cambridge at CSH5/6

litres/property/day which we believe appropriately represents a range of circumstances and matches the likely blend of property types in this category.

New non household properties and expected consumptions will add a further 5.5Ml/d across the planning period.

8.3.4 Household optant metering

Metering has played a large part in our demand management over the last 20 years. The average daily distribution input for 2011/12 was broadly the same as in 1992/93, despite an increase in population of approximately 40,000.

Prior to 1989, virtually all of the company's household customers were unmetered. 1989 saw the introduction of metering of all new households, and during the 1990s the company had various domestic metering policies, for example:

- 1993 – All sprinkler uses to be metered
- 1995 – Free meters for lone pensioners plus those customers affected by mains renewals schemes
- 1997 – Free meters to pensioner couples
- 2000 onwards – free meters for household optants

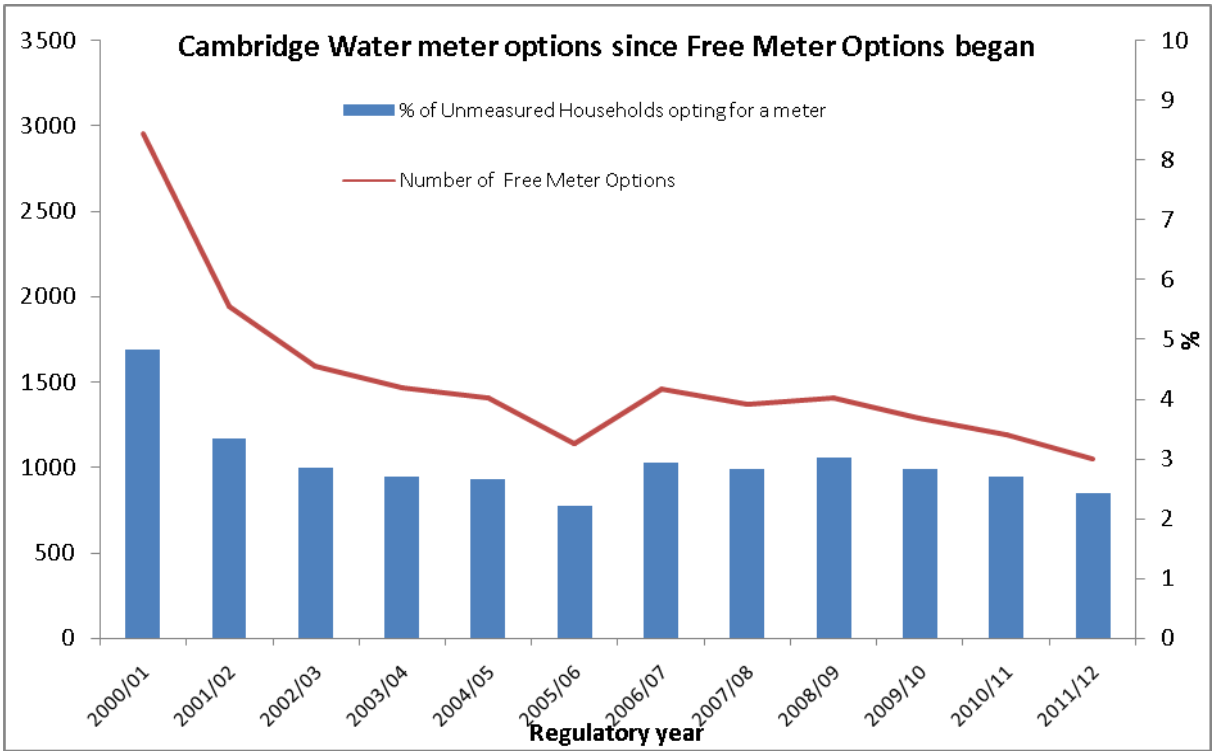
As a result, across that period household metering penetration has risen from 5% to 65%.

Our current policies are in line with the requirements of the Water Act. All new development is metered and we provide a free meter option to all unmetered households. We selectively meter a small number of properties each year where they are found to have high discretionary use, such as sprinkler systems and swimming pools, on an ad-hoc basis. There is no active programme to identify these properties. Due to our high penetration of household metering we do not currently utilise the compulsory metering power given in the Act to meter unmetered properties on the change of an occupier, nor do we have any universal metering programme. We propose to continue these policies through the planning period.

All new development is metered and a forecast of the expected properties and consumptions made on this basis, as discussed in sections 8.3.3.1 to 8.3.3.2. Existing unmetered customers opting to become metered plays an important part in our metering policy and managing future demands. We have forecasted the expected number of optants using data analysis of the historic trends experienced.

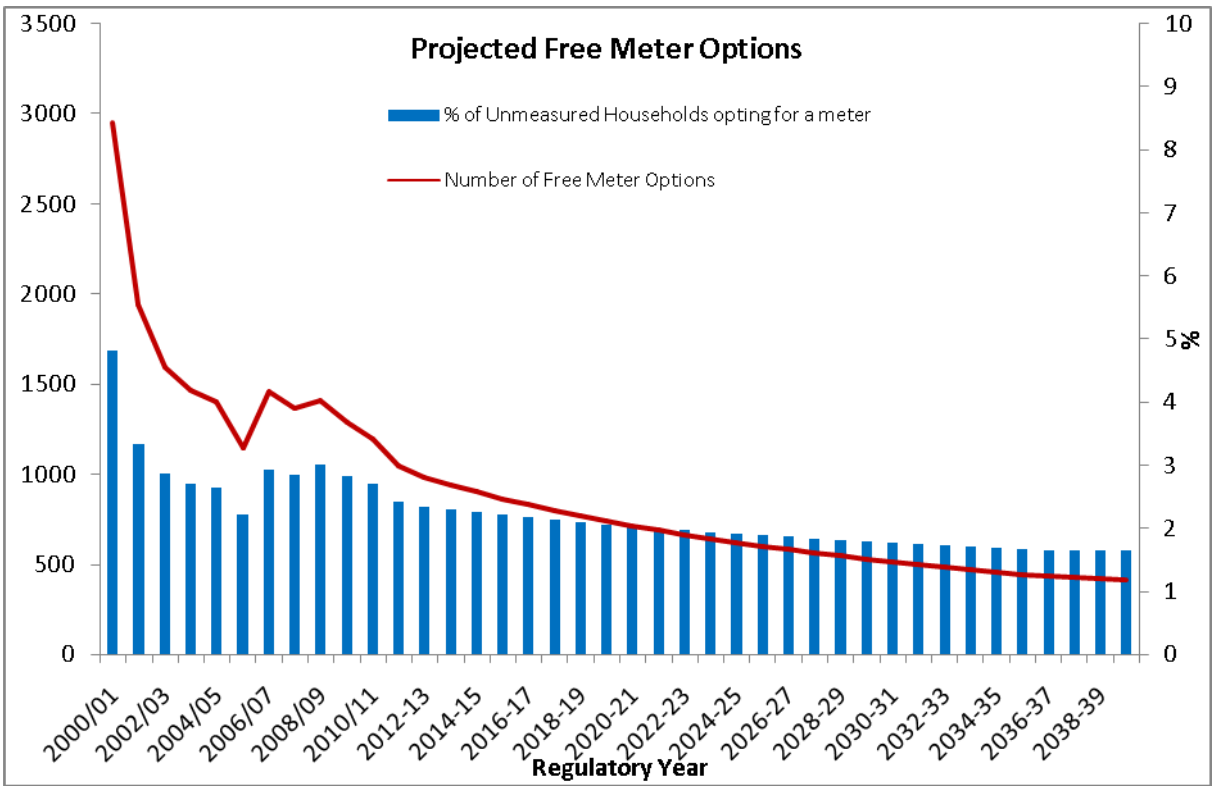
There has been a reducing trend in absolute numbers and in the percentage of unmetered households, as indicated in figure 7. The only exception was a reversed trend in 2006/07 as a result of significant energy price changes coupled with intense media coverage on metering generally.

Figure 7 - Free meter options installed



We have applied regression analysis to calculate the forecast for annual free meter options that we would expect over the planning period, and these results are presented in figure 8.

Figure 8 – Result of free meter option regression analysis



Our analysis indicates that we would expect the addition of a further 14,698 metered households across the planning period, which will take our meter penetration level to 87%. Universal metering is normally assumed to be achieved at 90% of meter penetration.

The effect of a property opting for a meter is widely considered to be a 10% reduction in consumption, and we have assumed as in previous plans, that the occupancy rate of the properties that opt for a meter will be lower than the average of the unmetered population. Properties that opted in the base year confirm an occupancy rate of 1.7, compared to the average of 2.9, and we have applied this occupancy rate of 1.7 per household in the base year. This increases over the planning period by 0.05 each year, as it is expected that occupancy rates will increase over time as more customers opt for a meter.

As a result of these assumptions, the impact of the company's meter optant policy is to reduce overall demand by 0.5Ml/d.

8.3.5 Non household Optant Metering

At the end of the base year we still had 899 unmetered non household properties, representing 8.6% of total non-household properties. Although we previously proposed to compulsory meter these remaining properties, this was not supported at the last price review so we remain reliant upon the customers deciding to opt for a meter.

By assuming an optant rate of 22 each year, and in combination with numbers of demolished non household properties each year, we expect to have almost removed this category by the end of the planning period.

Since these properties are unmetered, we do not have a clear understanding of their use, nor how this may change on becoming metered. However, using our prior assumption of unmetered non household consumption at 800 litres/prop/day consumption in this category has very little bearing upon total demand. In fact a +/-50% difference per property would have no material effect, on total demand. We have therefore assumed no reduction in consumption as a result of non-households opting to become metered.

8.3.6 Selective metering

Within our Charges Scheme we identify certain circumstances where we reserve the right to install a meter and charge a customer on a metered basis. This selective metering is in addition to the normal meter optant process and any compulsory powers under the Water Act to meter on occupier change.

In such circumstances unmetered charges may not be representative of the type of water use, or volume used at a property. Examples of these circumstances are:

- Mixed use properties (home and business) - The occupier of a property, which is primarily used as a home, but also used for business, may elect to continue to be charged on an unmetered basis. Cambridge Water has the right to meter the whole property where the principal use of the premises is for business. Examples of this include hotels where the landlord also lives, or properties which contain a caretaker's flat, or shops containing a flat for the shopkeeper
- Properties that have been split or merged into a different number of premises
- Premises that do not have a rateable charging value
- Properties with swimming pools/garden ponds
- Fishing lakes
- Environmental water areas
- Public houses
- Short-stay accommodation - guest houses, hotels and other short-stay accommodation
- Properties with sprinklers and automatic watering devices

The number of selective meters we install each year is variable as these situations are generally identified through normal operational activity and not actively sought out. We have used the annual average number of selective metered properties since 1995 in this plan, 44 households and three non-households. This results in a 0.07 Ml/d reduction in demand over the planning period.

8.3.7 Demolished properties

Each year a number of properties are disconnected from our network, mainly to make way for new development. The removal of these properties will result in a reduction in demand, which we consider may be material in our forecasting.

We have reviewed our billing system records of demolished properties to gain an understanding of the magnitude, and table 15 shows the number of properties moving from a live billing status to a demolished status. A number of additional demolished properties that were void in the year prior to being demolished have been removed from the analysis, as they would not have contributed to demand.

Table 15 – Summary of annual demolished properties

	Household		Non household	
Year	Metered	Unmetered	Metered	Unmetered
2006-07	53	54	131	7
2007-08	45	21	77	8
2008-09	72	35	65	3
2009-10	49	53	51	3
2010-11	41	66	82	8
2011-12	52	45	115	4

The number of demolished households is insignificant when compared to the total number of properties and the new households that we expect to connect each year. For metered non households, however, the annual average number demolished almost equals the number of new connections each year over the same period. As a result the impact of accounting for demolished properties in this category counteracts the increased demand of new non households, almost removing any demand increase.

The overall impact of accounting for demolished properties is to reduce demand by 6.9 Ml/d by the end of the planning period. This assumes that the volume removed is the per property average for the category.

8.3.8 Per capita consumption and micro-components

So that a water company can understand the use of water by its customers, and identify where demand savings can be made, the planning guidance recommends micro component surveys to understand the consumption of the existing customer base. Micro components are developed through the collection of specific household use data at each point of water use in a household. The collection of this data is complex and expensive, both to set up and continually monitor, and to obtain a statistically significant number of households for Cambridge Water would require a survey size equivalent to that of much larger companies. This would represent a disproportionate cost to our customers in order to generate data on consumptions that we already understand relatively well.

The guidance does allow for companies to determine the most appropriate approach, and refers to the good practice manual and roadmap for household consumption forecasting[33], which provides a tiered approach to analysis of customer consumptions. A company's approach and level of detail will reflect their supply demand balance position, and while Cambridge Water can demonstrate a positive supply demand balance without the requirement to develop options, including any detailed demand management programmes, we have concluded that developing our own micro components would not be appropriate.

We believe that generic changes in customer behaviour will be seen at the top level of total water consumed and that a bottom up approach to consumption monitoring is not required, and as such we will be using the joint Survey of Domestic Consumption (SoDCon) project alongside Anglian Water to validate our top down per-household consumption values with bottom up data. This project is on-going and limited data has been collected, however, early signs are that the actual per household and per capita consumptions closely reflect those we have previously assumed from our billing consumption data.

In completing the WRP table WRP2 for demand, we have apportioned the calculated per capita consumption across the micro component categories according to the percentage apportioned in outputs from the Micro-F model provided by South Staffordshire. This provides a view of changes in behaviour at the micro component level for each category of use across the planning period. We will seek to develop our approach to micro components using the Micro-F model in a more detailed manner over the next planning period.

The following micro components have been distributed across our calculated per capita consumption, and these are set out in table WRP2 BL Demand in appendix A13.

- WC flushing
- Clothes washing
- Personal washing
- Dishwashing
- External use
- Miscellaneous internal use

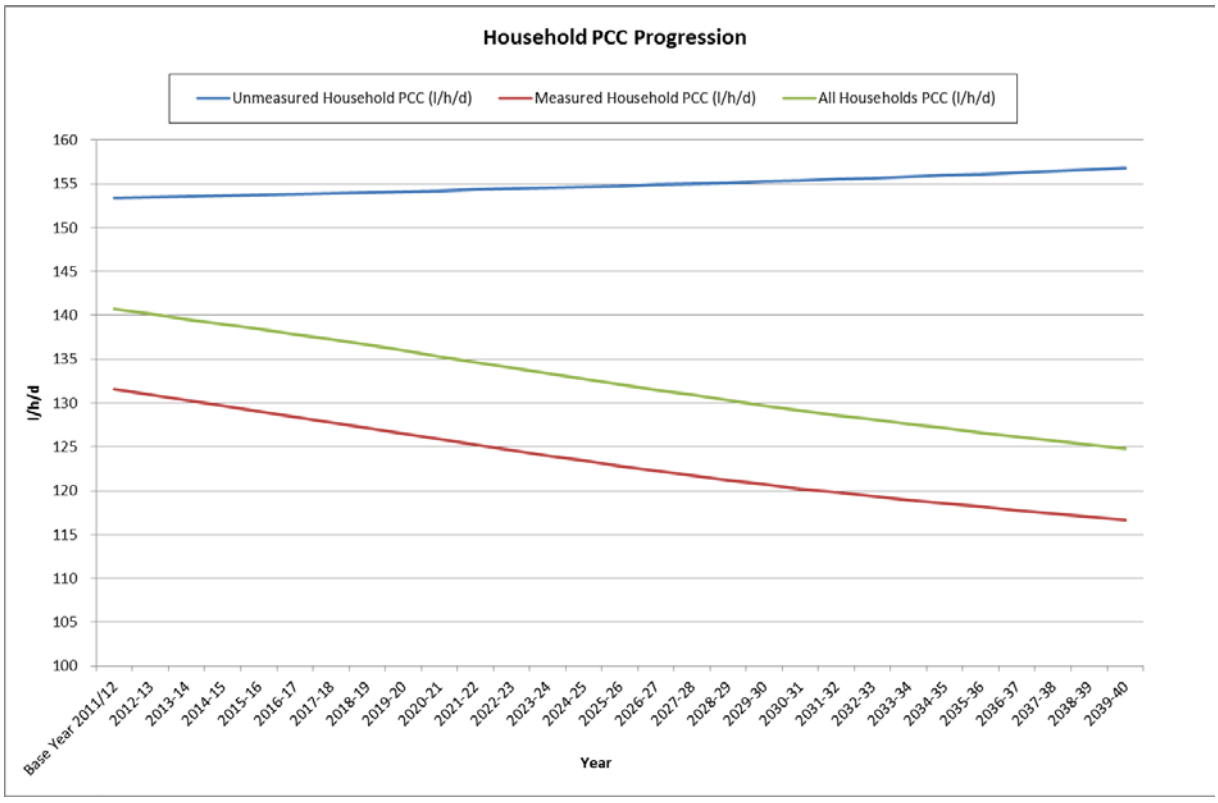
[33] UKWIR project 12/CU/02/11

8.3.9 Per capita consumption

The combination of continuing our existing metering policies, growth in housing at lower household consumptions and water efficiency activities will result in change over the planning period to the per capita consumption for households. The few remaining unmetered households will tend to demonstrate higher consumptions per occupant, while metered households will move towards lower consumption per occupant. The effects of this on pcc over the planning period are indicated in figure 9 below.

Overall, the effect will be of a reducing per capita consumption for all households over the planning period, from 140 litres/person/day to 125 litres/person/day. This change in per capita consumption meets the Government expectations included within the Water Resources Planning Guidelines for reducing overall demands by demonstrating a downward trend in per capita demands, particularly for companies in areas of water stress.

Figure 9 - Change in household per capita consumption



8.3.10 Miscellaneous water use

Included in our demand calculations are a number of minor demand components, which we need to consider in our forecast.

Distribution System Operational Use (DSOU)

In performing our duty as a water undertaker and to ensure a continuous supply of water for our customers, from time to time we need to use water from the distribution system as part of our water supply operations. This includes conducting works such as the flushing of mains to maintain water quality, commissioning and testing of new mains, and maintenance on our reservoirs.

DSOU is normally a relatively small volume of demand at around 0.1Ml/d and this is anticipated to continue.

Water taken unbilled

We are required by the Water Act to provide water free of charge for fire fighting activities. The fire services are permitted to extract water at any fire hydrant in our distribution system, and to use the volume they require for emergencies. The fire hydrants in our network are not metered, and there is no way to monitor this volume of water taken so an assumption of 0.13Ml/d is made, based on our experience.

There have in recent years been an increasing number of supplies being connected for building sprinkler systems, which fall under the same Water Act requirement to provide water free of charge for fire fighting. There is currently no policy to meter these supplies to monitor the volume used for fire fighting, system testing, or for illegal connections made to a supply. We shall monitor this growth and determine if in future, an additional allowance should be made.

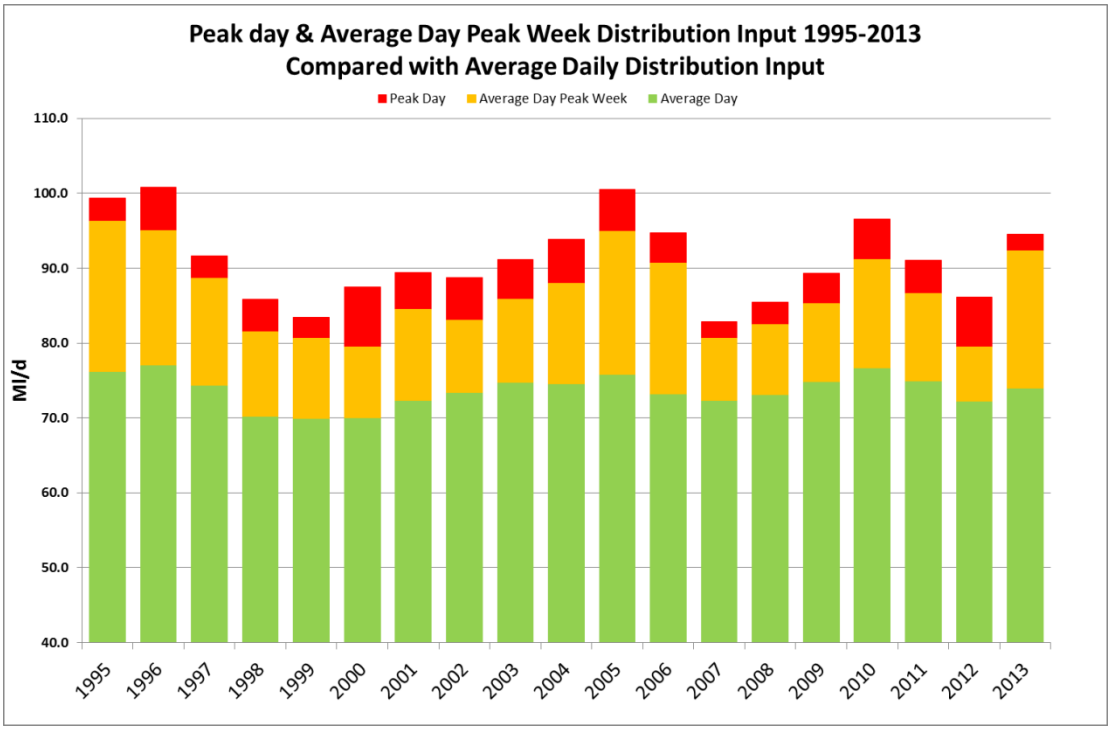
Water taken illegally

We are aware that water is taken illegally from our systems on occasion, although we do not know how much is actually taken in this way. We have in the past discovered theft of water from hydrants for activities such as road sweeping, bin cleaning services and car washing, we will continue to seek out and terminate this illegal use which poses a water quality risk. We assume a nominal amount of 0.1 Ml/d for the theft of water from our system.

8.3.11 Critical period scenario

For Cambridge Water, the critical period is the peak week during a dry year, the seven day period when average demand is at its highest. Analysis of the Average Day Peak Week (ADPW) demand data for 1995-2012 indicates that on average ADPW demand is 18% above average daily demands. This is shown in graphically in figure 10.

Figure 10 – Critical period peak week analysis

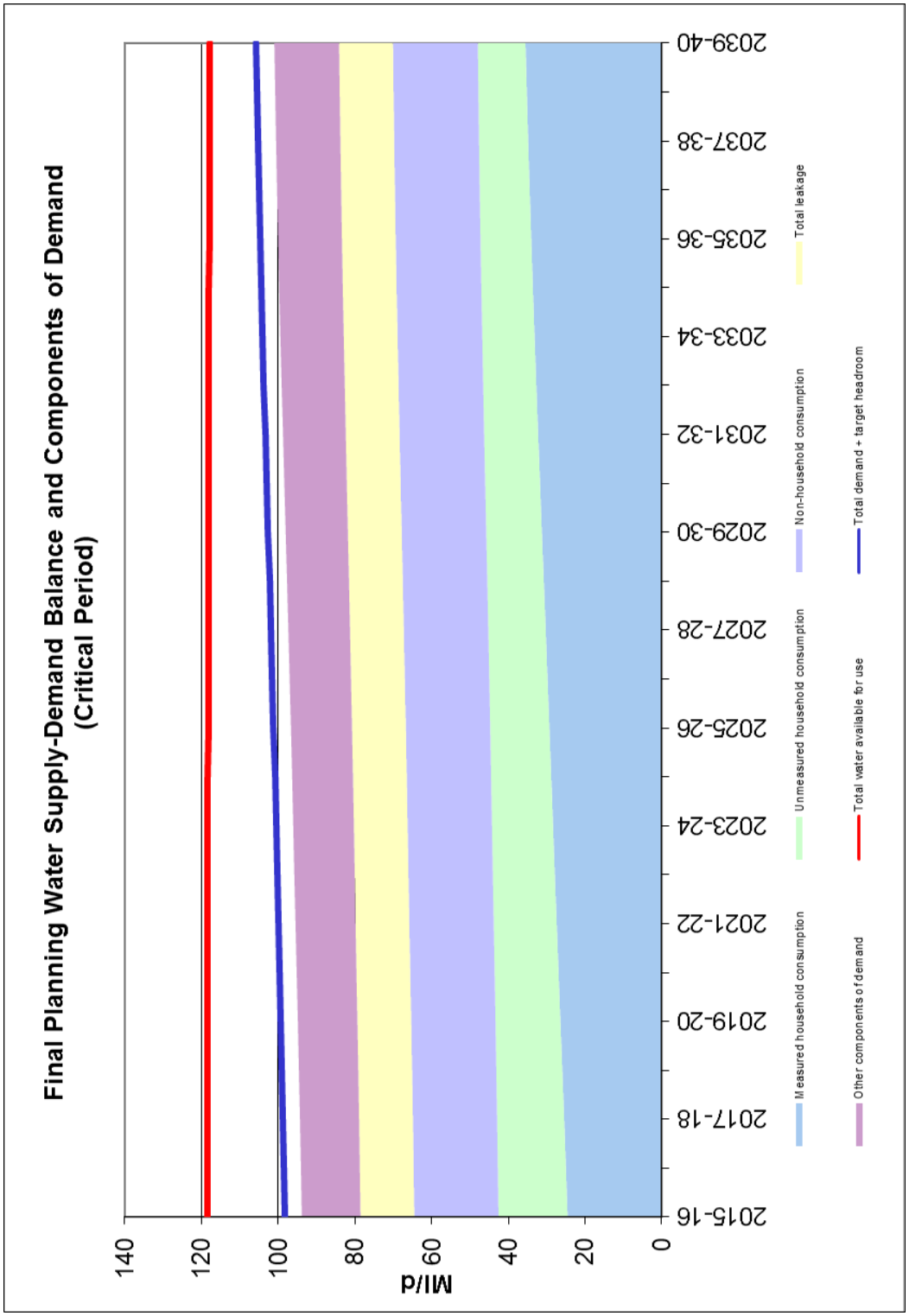


However ADPW demands were 25% above the average daily demand in four years, and of these, only 1996 met the criteria of a dry year, as defined in section 8.2.2. A worst case critical period factor of 1.25 can be applied to determine unconstrained dry year demands in a peak week scenario.

This factor has been applied to the relevant demand components and used to produce a supply demand balance for the critical period. In this forecast we have applied our peak licenced deployable output together with the peak outage allowance to the supply components.

As a result, the critical period supply demand forecast indicates that peak demands can be met without supply problems. This is indicated in figure 11, and the tables for this scenario are provided in appendix A14 to this plan.

Figure 11 - Supply demand balance and components of demand - critical period

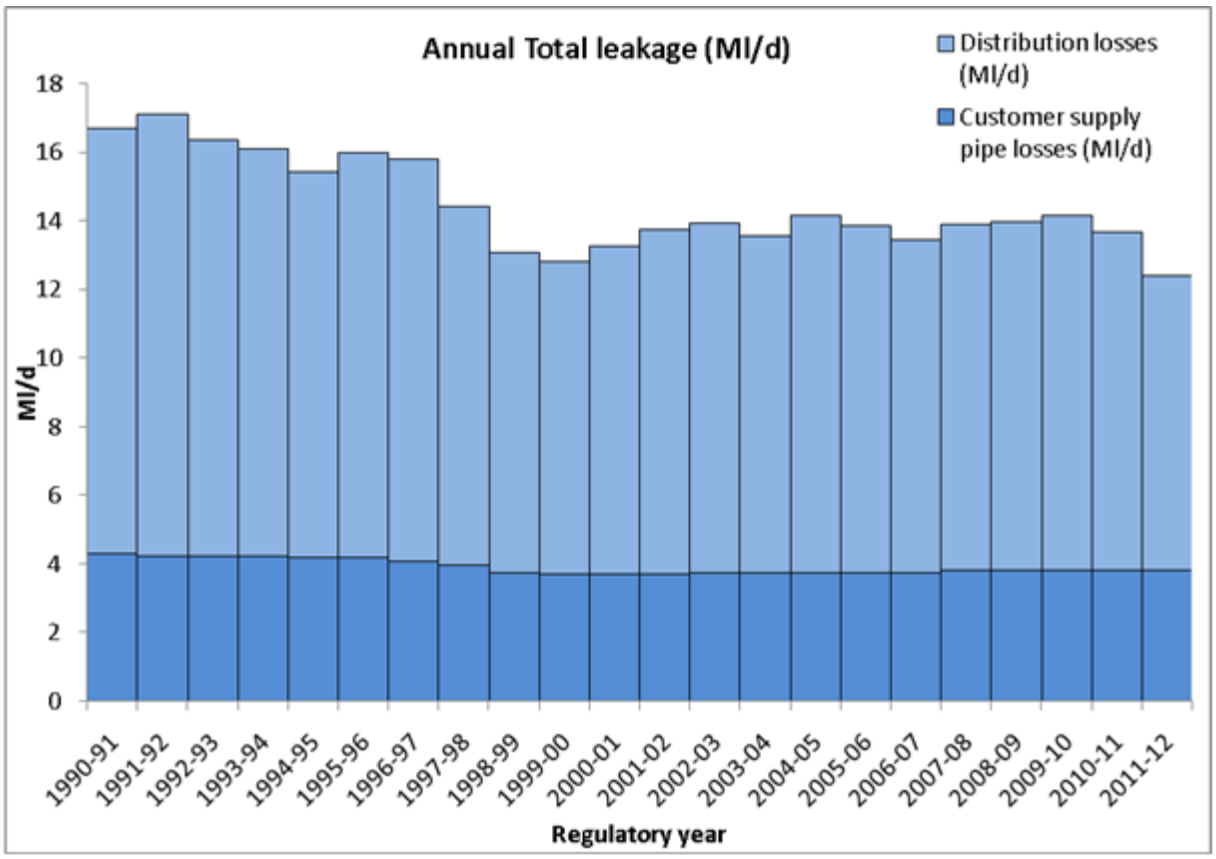


8.4 Leakage

8.4.1 Background

Leakage has fallen significantly, by 35% over the last 20 years across the water industry, and figure 12 shows how Cambridge Water has progressed in our performance since 1990.

Figure 12 - Cambridge Water's annual leakage performance 1990-2012



From 2000, the industry regulator Ofwat, set companies a binding target for total leakage, which for Cambridge Water was set at 14.0Ml/d. We have been unable to achieve this target twice, in 2004/05 and 2009/10 on both occasions by a very small margin. We take our performance in this area very seriously, and failure in 2004/05 prompted a significant review of the company's approach to leakage. As a result a leakage action plan was prepared and instigated in agreement with Ofwat, which adopted a more proactive approach to leakage control.

At the core of the company's leakage action plan was a commitment to the creation of a comprehensive network of district meter areas (DMAs) in and around Cambridge to improve our monitoring of the distribution network and leakage. The project required a significant financial investment by the company in establishing DMAs surrounding Cambridge in 2006 and following this, another 36 new DMAs to cover Cambridge, were commissioned in 2008.

Completion of this project originally saw 85% of the company's area covered by DMAs, and radically changed the way in which we detect and report leakage. Since the last plan this has been extended to cover 99% of the company's area.

The DMAs not only provide a more robust leakage figure; they also provide early warning of the occurrence and location of leaks, enabling us to direct our leakage effort more effectively, ensuring we are best placed for achieving our leakage target in the future. This is despite a total leakage target becoming more challenging as a result of the anticipated growth in our distribution mains network. DMAs will also help us to target our mains refurbishment programme more effectively, at the worst performing areas of our distribution network infrastructure.

8.4.2 Managing leakage

Prior to implementing DMAs, our annual leakage calculation had in the past been derived from bi-annual bulk waste tests. Following concerns expressed by Ofwat, and in a move to a best practice approach, we agreed that from 2010, our reported leakage figure would be based on DMA data.

Leakage is now monitored and controlled on a daily basis within our DMAs, which cover 99% of connected properties and over 95% of the supply network, enabling us to prioritise and effectively target our leakage detection activity. While we now have an improved understanding of leakage occurrence, the change to DMA monitoring does require a more rapid response to emerging leakage to achieve our target as it is now calculated from daily data as opposed to bi-annual bulk test data.

The methods used for finding leakage in the field have remained the same; listening, logging, correlating and conducting step tests are the main techniques used. Methods applied vary based on the individual circumstances of an area. Outside of DMAs, we perform bi-annual waste tests for service reservoirs, some distribution and trunk mains and some customer supply pipes, plus an annual test on our Thetford trunk main. We estimate that areas outside of DMAs account for only 2% of total leakage.

The target by which we are metered and report on is total leakage however, it is important to note that this comprises losses from the Cambridge Water network and losses from our customers' supply pipes. We estimate that the customers' pipework accounts for approximately 25-35% of all leakage, yet we have little control over this area. Our Strategic Direction Statement describes our long term view that companies should own supply pipes, and we welcome recent Government statements to this effect. This varies annually based on leakage assumptions made using charging status, and meter location (internal or external) for properties taken from our billing records. For example, externally metered customers will have less supply pipe leakage as a leakage test is conducted when meters are installed. As a result, variation on the annual total leakage figure is attributed to distribution losses, and excludes the effect of changes in customer supply pipe leakage. To manage this area of leakage, we provide a free supply pipe repair service, and will review this area as more data becomes available, as expected from the SoDCon project.

8.4.3 Sustainable level of leakage

Our leakage targets are agreed with Ofwat on a five yearly basis in line with the business planning and price setting cycle. The preferred industry method of determining a target is to use the Sustainable Economic Level of Leakage (SELL). This method takes account of the costs of the production water and the costs of finding or preventing leakage, including the social and environmental costs. It establishes the level of leakage which represents the least cost.

We review our sustainable level of leakage (SELL) each year, and in the last Water Resources Management Plan (2010) the calculated value was 14.1Ml/d. The calculation has been updated for this plan to include revisions for the marginal cost of water, cost of active leakage control (ALC), minimum level of leakage policy, and the social and environmental costs, in accordance with recommendations[34] from Ofwat, the Environment Agency and Defra.

As a result, the revised SELL value has been calculated at 15.5Ml/d. As this represents a significant increase in Cambridge Water's SELL value, we have had the review independently checked. The analysis was found to be appropriate, and a report on this is included in appendix A14.

The reason for the upward change is due to changes in our methodology for calculating and managing leakage, brought about through our commitment to implement DMAs and to report using DMA data. As we now monitor leakage on a continual basis we are required to respond to changes more effectively to ensure that the leakage target continues to be met. While this is a more focused and accurate way of managing leakage, it does mean that additional resources have been required to continue meeting the target.

To meet the requirements of the new approach, the cost of finding leakage has increased by 400% since the last plan, but the cost of producing the water has only increased by 40%. As we have made this transition in the last five years, future SELL calculations should have a reducing value as the cost for producing water increases.

Despite the results of our economic evaluation of leakage targets, Government has instructed in the Water Resources Planning Guidelines, that total leakage should not increase over the planning period. We are also aware from preliminary customer research that our customers believe maintaining leakage at low levels should be a high priority for Cambridge Water. We are committed to ensuring the views of our customers, regulators and Government are incorporated into our water resources planning, and as a result, in our draft plan we assume that total leakage will remain at 14.0Ml/d across the period.

Leakage at this level will become more challenging to achieve due the increasing length of our mains network which is required to meet the growth of 47,000 new customers. Total leakage at 14.0Ml/d across the period actually represents a reduction in leakage of 30 litres/property/day.

We have reviewed our leakage value for this final plan following the results of our on-going customer research, and consultation representations. Whilst reducing leakage was regarded

[34] 'Review of the calculation of sustainable economic level of leakage and its integration with water resource management planning', October 2012

as important, the economic basis of maintaining the current target below the SELL was deemed acceptable.

8.5 Uncertainty in data and sensitivity analysis

It is important when forecasting for the future to understand the possible impact of variations and uncertainty in the data used to derive a forecast. This applies to the assumptions made in both the supply and demand components used to calculate our supply demand balance. To determine how changes to the information we have might affect the future forecast, we have looked at the sensitivity of elements in our forecast, such as housing growth projections, to changes in the future.

Additionally, a specific allowance must be made in our forecast, in accordance with the planning guidelines, to account for uncertainty. This provides a 'target headroom' – the minimum headroom between supply and demand to allow for uncertainty in the data used. This is calculated according to defined methodologies within the planning guidelines.

These are discussed further in the following sections.

8.5.1 Sensitivities assessed

The key area requiring sensitivity assessment is that of the growth in demand component, as this has the largest impact on the supply demand balance. We have in addition, and on the advice of the Environment Agency and good practice detailed in the Water Resources Planning Guidelines, assessed the future potential impacts from environmental considerations on available supply, and these are presented as scenarios in section 13.

The areas that we have tested for sensitivities are;

1) Growth projections
2) Consumptions of new properties

The results of the sensitivity testing are shown in figures 13-15. It can be seen that the overriding influence on demand by the end of the planning period is that from the total magnitude of expected growth, and that the variations of growth have an effect on demand towards the end of the planning period. None of the sensitivities tested result in demand exceeding the available supply and the supply demand balance remains in surplus.

A lower forecast of growth, with new properties at higher levels of the Code for Sustainable Homes and lower consumptions, would reduce increases in demands by the end of the period, as indicated in figure 15.

Figure 13 - sensitivity analysis – High and low growth forecast

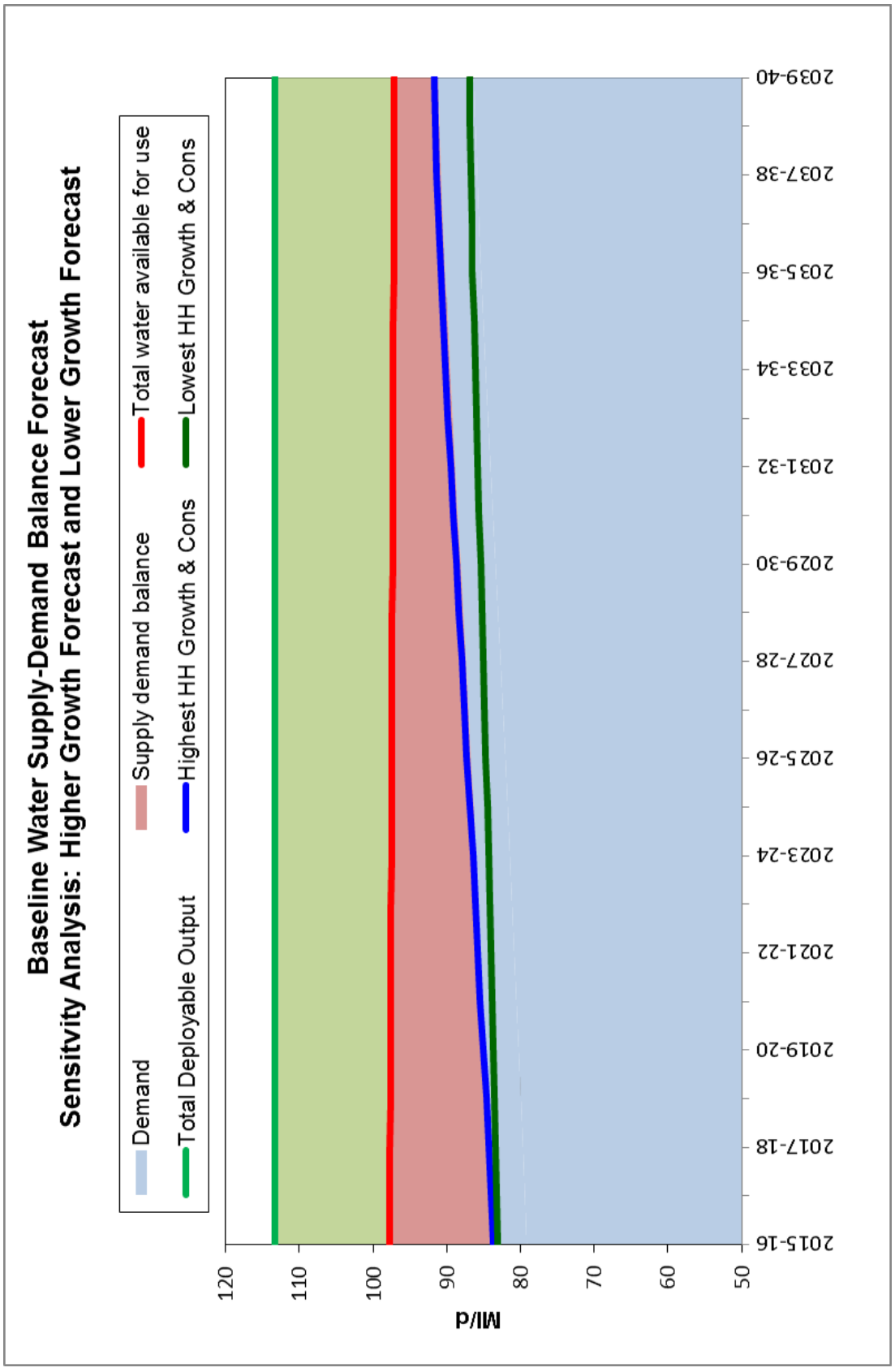


Figure 14 - Sensitivity analysis – Baseline growth forecast -/+ 20%

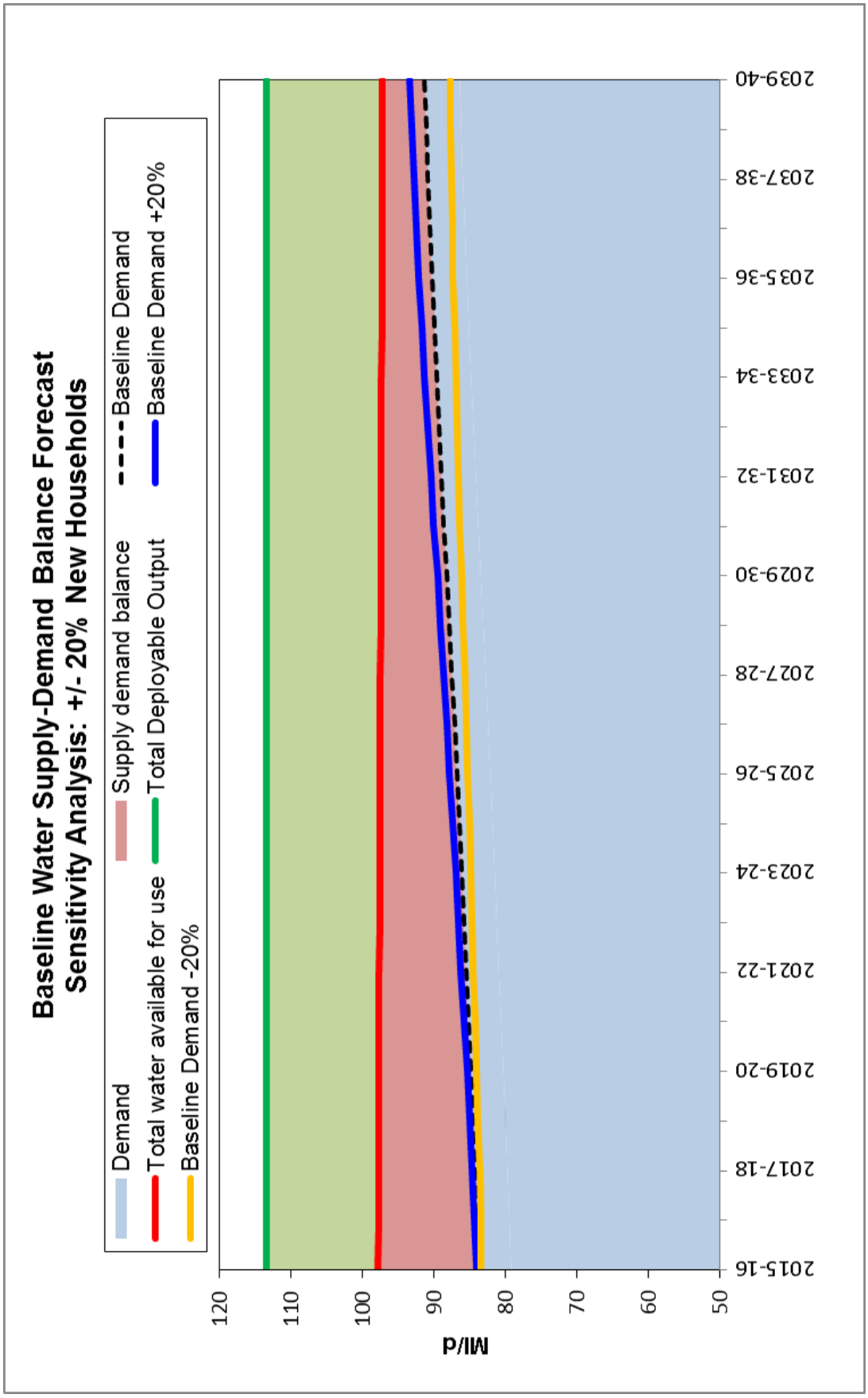
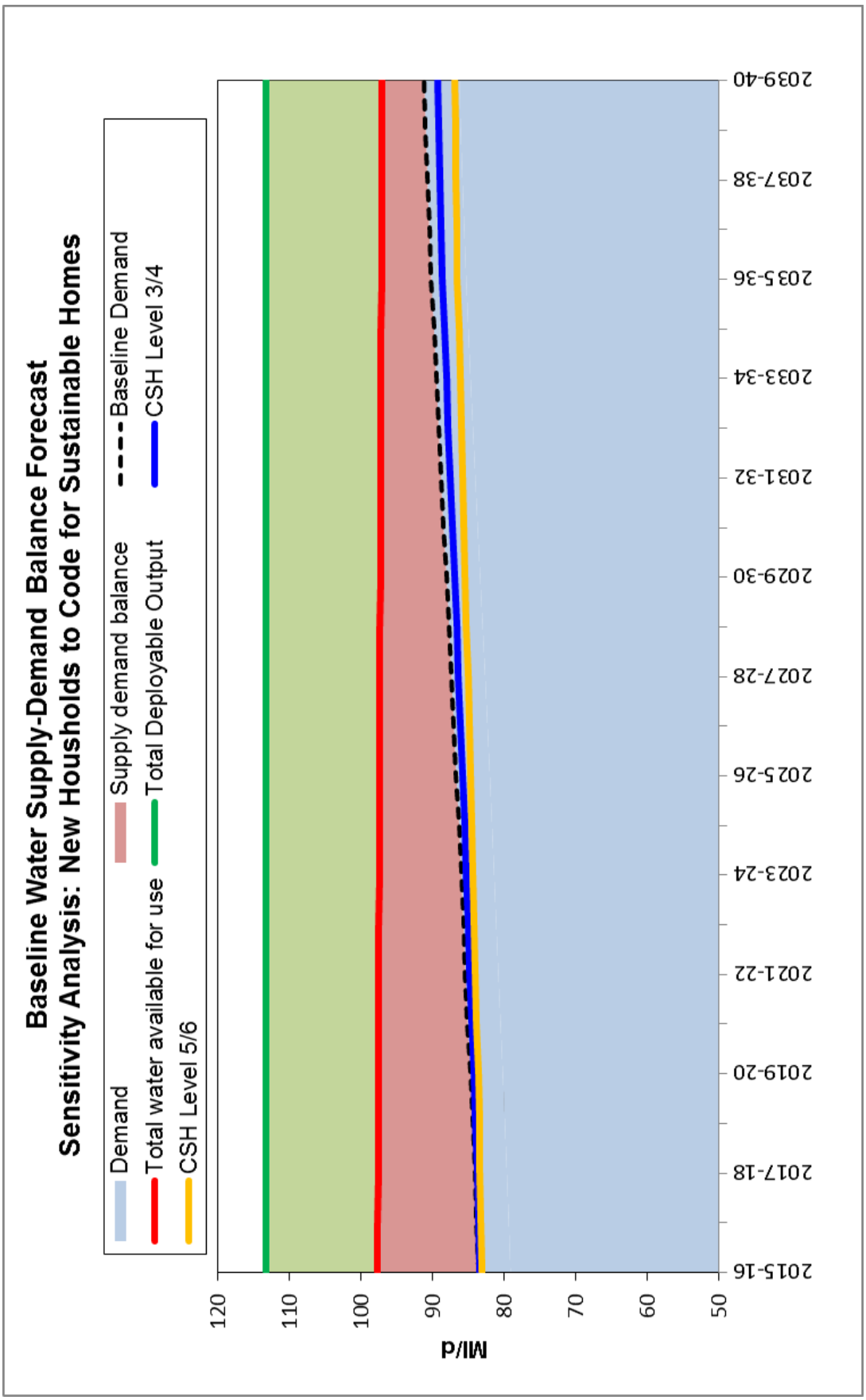


Figure 15 - Sensitivity analysis – Baseline growth forecast and consumptions at different levels of the Code for Sustainable Homes


Baseline Water Supply-Demand Balance Forecast
Sensitivity Analysis: New Housholds to Code for Sustainable Homes
Demand
Total water available for use
CSH Level 5/6
Supply demand balance
Total Deployable Output
Baseline Demand
CSH Level 3/4
Ml/d
120
110
100
90
80
70
60
50
2015-16
2017-18
2019-20
2021-22
2023-24
2025-26
2027-28
2029-30
2031-32
2033-34
2035-36
2037-38
2039-40

9. Target headroom

Target headroom is the minimum buffer that a company should plan for, between supply and demand, in order to allow for specified uncertainties. This addresses data accuracy and uncertainties in the forecast used in defining the supply demand balance assumptions. The full calculation of target headroom is included in appendix A15, and summarised in the following sections.

9.1.1 Approach

There are two recognised methodologies available to estimate headroom, the UKWIR Practical Method for Converting Uncertainty into Headroom 1998 and the UKWIR Improved Methodology for Assessing Headroom 2002.

The UKWIR 2002 method applies probabilistic simulation of uncertainty at each component level for each source, and is highly detailed. On the supply side, the method applies at the resource zone level, and is least appropriate for Cambridge Water's supply situation. The approach used in this plan to assess target headroom has been to use to the 1998 UKWIR method, which was used in the previous Water Resources Management Plan, and in which a low score was applied to the supply side factors. This approach is suitable for resource zones which show a supply demand balance with a surplus for at least 10 years into the planning period, and where headroom is not used to justify or influence expenditure.

The 1998 UKWIR methodology requires consideration of a number of factors leading to uncertainty in the forecast supply demand balance. These and the reasons for inclusion or otherwise in the target headroom calculation are listed in the following sections.

9.1.2 Supply side risk and uncertainty

Uncertainty factor	Included in calculation	Explanation
Vulnerable surface water licences	N	The company has no surface water licences
Vulnerable groundwater licences	N*	No groundwater licence are thought to be vulnerable[35]
Time limited licences	N	Although the company holds some time limited licences, no allowance has been made in accordance with the WRPG which states no allowances should be included in target headroom (see also section 6.3.5)
Bulk transfers	N	There are no bulk transfers into the company's WRZ
Gradual pollution causing reduction in abstraction	N	There is no evidence to support any gradual pollution will cause a reduction in abstraction
Accuracy of supply side data	Y	The company has accurate data records of accurate records for the last 30 plus years which are used to calculate source yields. A small score is calculated
Single source dominance and critical periods	Y	The company's Fleam Dyke source accounts for 12% of the water available for use (WAFU), and is included for this factor. The critical period for the WRZ is the peak week, also included. Both these factors contribute to a small score.
Uncertainty of climate change on yield	Y	Climate change vulnerability assessment using 23 emissions scenarios has indicated uncertainty of <5%, and a likely impact from climate change on deployable output of less than 1Ml/d. This is reflected in the low headroom score calculated.

9.1.3 Demand side risk and uncertainty

Uncertainty factor	Included in calculation	Explanation
Accuracy of sub component data	Y	The company uses data from its billing system for property counts and consumption of existing metered customers. Domestic household occupancies are derived from the local authority population for new dwellings and meter optants
Demand forecast variation	Y	We have considered a range of growth forecasts in determining the number of new properties, and this aligns with a higher estimate of 2%, and a lower estimate of 5% on the baseline forecast
uncertainty of climate change on demand	Y	We have applied a score based on the demand uplift factor used as recommended in the WRPG.

[35] There is uncertainty around WFD No Deterioration impact on a number of licences which could be considered as vulnerable licences under this definition. The WRPG does not, however, advocate the approach of including this in target headroom.

9.1.4 Results of Assessment

The results of the Target Headroom calculation are presented in table 15 below, for each five year time step in the planning period. These have been applied directly to the supply demand balance forecast.

Table 16 - Target headroom results

Uncertainty factor	2011/12	2015/16	2019/20	2024/25	2029/30	2034/35	2039/40
Water available for use (WAFU) Ml/d	101.1	95.6	95.4	95.3	95.2	95.0	94.9
Target headroom %	4.5%	4.6%	4.7%	4.8%	4.9%	5.0%	5.1%
Target headroom Ml/d	4.5	4.4	4.4	4.5	4.6	4.7	4.8
Available headroom Ml/d	22.7	16.7	15.7	14.4	13.0	11.5	10.4

The factors of uncertainty included lead to a minimal score for target headroom, and the results are similar to those previously applied to the Water Resources Management Plan 2010, despite improvements in the availability of data for climate change and supply, and changes to water available for use. The headroom applied therefore, can be considered the minimum risk the company should allow for uncertainty at any point in the planning period. While the planning guidelines encourage companies to accept higher level of risk in future periods, we do not believe that the uncertainties included in our forecast can be justifiably and robustly reduced further; therefore the level of risk adopted with target headroom remains the same over the 25 year period.

10. Climate change

10.1 Supply

The company abstracts all of its water from groundwater sources, and historically these are shown to be robust sources in dry conditions, as discussed in detail in the company's Drought Plan. The impact of climate change on groundwater sources and resource availability will be experienced from changes in yield at individual sources. The output from the company sources is not necessarily constrained singularly by the yield. In some cases the constraint on deployable output is the abstraction licence or pumping capability.

The critical factor for groundwater source and maintaining yields is the quantity of effective rainfall that occurs over the main recharge period; generally this is from September to April. Rainfall seen in the summer rarely contributes to groundwater recharge in any significant quantity.

The previous WRMP (2010) assessed the impact of climate change utilising global and regional climate models to assess the impacts of climate change on recharge and hence, groundwater levels. The modelling approach assessed which sources would see an impact from climate change, and quantified this as a reduction in deployable output from climate change. The range of impact was 1 to 5Ml/d.

10.1.1 Approach

Since the previous WRMP, a revised and improved set of climate projections has been published by the UK Climate Impact Programme, referred to as the UKCP09 Projections. In addition, the company has reviewed and revised its assessment of source deployable output which is implicit in understanding groundwater level changes and yields at sources. Due to these factors the company has reassessed the impact of climate change on supply to use the best available evidence and science.

The approach used for this draft has followed the planning guidelines and the principles set out in Climate Change Approaches in Water Resources Planning – Overview of New Methods (EA, 2011). Our assessments indicate that, at the company deployable output and water resource zone level; there is an aggregate low vulnerability to climate change. The required level of detail in climate change modelling to quantify the expected impacts has been determined through the following stages:

1. Determination of vulnerable sources
2. Regression analysis of groundwater level and rainfall
3. Evaluation of climate change projections
4. Application of climate change to predict groundwater levels
5. Vulnerability and impact assessment

The full report on the climate change assessment is included in appendix A16 with the approach summarised in the following sections.

10.1.2 Vulnerability assessment

The vulnerability assessment from the previous WRMP (2010) was updated in light of the review of the company deployable output through revision of the source reliable output (SRO) studies. The SRO studies identify the constraints on deployable output at each source, and those sources where the deployable output is constrained by yield or deepest advisable pumping water level (DAPWL) could potentially see changes in deployable output due to climate change.

Two sources for which the deployable output is included in the company deployable output have not been assessed; these are St Ives and Horseheath. St Ives is currently de-commissioned and the deployable output is not included in the WRMP, but is a supply side option in the company's Drought Plan. As the drought option would not be invoked until drought indicators are triggered which is likely to be after a second dry winter, and there is limited data, the source is not considered in this analysis. Horseheath source was out of service for a number of years due to treatment requirements; however, this source has been recommisioned during 2012-13. It has not been included in the climate change assessment due to unavailability of data for the source, however, the company intends to perform pump testing subsequent to commission, and this will inform a revised SRO study for the source. This will determine if climate change impact assessment is required for Horseheath at a future date.

10.1.3 Vulnerable sources

Of the 28 groundwater sources where the company is licensed to abstract water, eight have been identified through the vulnerability screening as suitable for further assessment. This is based on the principal constraint on the deployable output being climate related, and availability of data.

Table 17 - Sources assessed as vulnerable to climate change

Source	Deployable output average conditions Ml/d	Deployable output peak conditions Ml/d
Dullingham	3.6	3.6
Duxford Grange	3.4	3.9
Fleam Dyke 36	12.3	12.7
Great Chishill	1.1	1.1
Great Wilbraham	5.7	8.7
Melbourn	7.9	9.2
Westley	11.4	11.4
Weston Colville	2.9	2.9

10.1.4 Predicted groundwater levels

The impact of climate change on sources is a function of the change in recharge, and minimum groundwater levels. In order to simulate future rainfall and recharge effects on the eight sources, the UKCP09 climate projections for Cambridgeshire have been used to develop 15 scenarios. These were selected to include the low, medium and high emission future climate scenarios, for the 2030s, 2050s and 2080s. The predicted change in minimum groundwater level can then be assessed at each source for the emissions scenarios.

10.1.5 Impact assessment

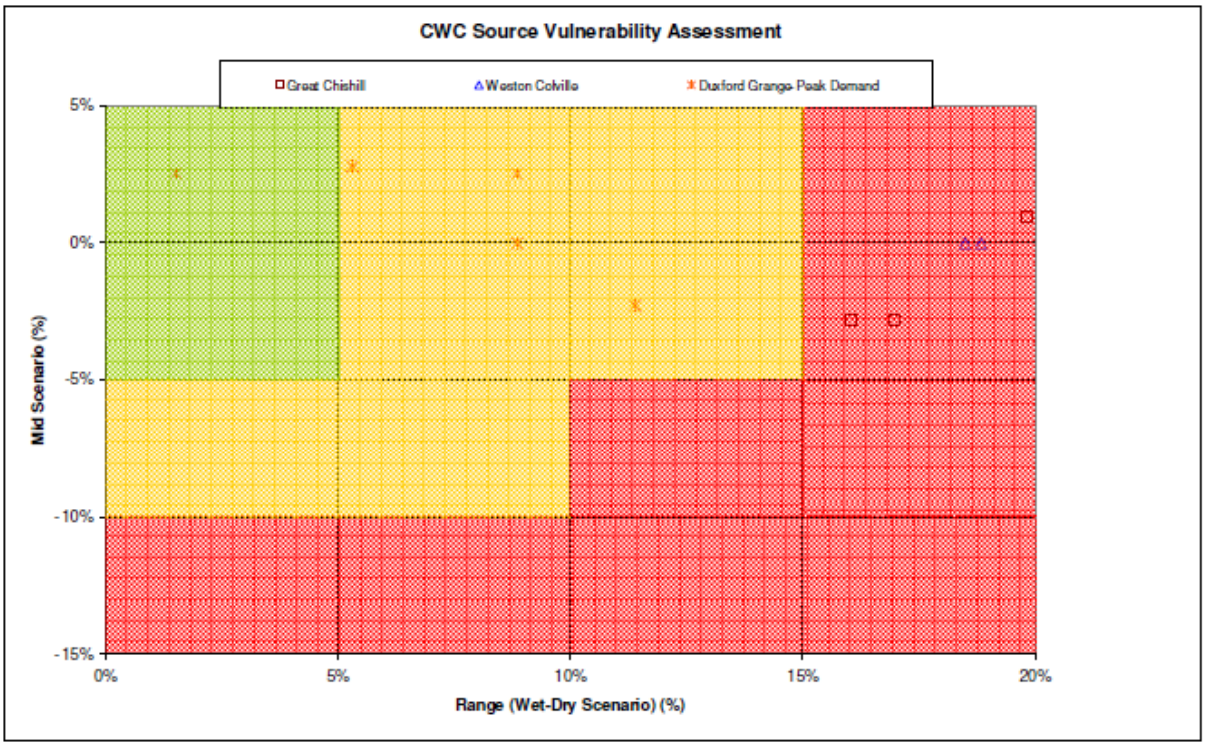
Results of the assessment on the eight sources indicate that three sources fall into the medium – high vulnerability category, as defined by the Environment Agency Water Resources Guidelines approach. These sources are Duxford Grange, Great Chishill and Weston Colville. The remaining five sources are assessed as low and considered to be within the range of uncertainty in the model. These findings are presented in table 18 below.

Table 18 - Results of assessment of climate change impact on supply

Source	Vulnerability	Average			Peak		
		Current DO (Ml/d)	Minimum climate change DO (Ml/d)	Percentage change between current and minimum modelled DO	Current DO (Ml/d)	Minimum climate change DO (Ml/d)	Percentage change between current and minimum modelled DO
Dullingham	Low	3.6	3.5	-2.2%	-	-	-
Duxford Grange	Med				3.9	3.6	-8.9%
Fleam Dyke 36	Low	12.3	12.7	+3.3%	12.7	13.1	+3.2%
Great Chishill	Med-High	1.1	0.9	-13.2%	1.1	0.9	-13.2%
Great Wilbraham	Low	-	-	-	8.7	8.6	-1.2%
Melbourn	Low	-	-	-	9.2	8.9	-2.7%
Westley	Low	11.4	11.4	0.0%	11.4	15.9	+39.7%
Weston Colville	High	2.9	2.1	-28.1%	2.9	2.1	-28.1%
total		31.3	30.6	-2.1%	49.8	53.1	+6.5%

For the three sources assessed as medium-high vulnerability, a magnitude - sensitivity plot has been produced in accordance with the planning guidelines, and this is presented in figure 16 below. The Water Resources Planning Guidelines[36] also recommends further modelling for resource zones with a medium – high vulnerability to climate change using the Environment Agency regional groundwater models.

Figure 16 - Source vulnerability assessment



Overall, the company's water resource zone has a low vulnerability to climate change impact on the total deployable output, and no further analysis has been completed for this draft plan. The three sources identified as medium-high vulnerability only have a small net impact on the available deployable output through the planning period. The company recognises that the impact of these three sources may be better quantified through further detailed modelling, and if appropriate, will develop its assessment of these sources further in subsequent plans.

10.2 Sensitivity analysis of climate change impact

The vulnerability assessment indicates the worst case risk to the deployable output of supplies is less than 1Ml/d, and that this is attributable mainly to 2 medium-high vulnerable sources. These 2 sources provide 2.3% of total deployable output at annual average. The Company has assessed the sensitivity of the supply demand balance to climate change to determine the appropriate timing of undertaking further detailed analysis of the impacts.

[36] EA WRPG, Fig 3 Page 52

The sensitivity of the supply demand balance to climate change has been assessed against an immediate 5% reduction to total DO, and a gradual reduction towards 10% of total DO. This demonstrates that a 5% total reduction to DO would not impact the supply demand balance within the planning period, and that a 10% reduction would not impact the supply demand balance until the later part of the planning period.

Given the projected supply demand balance surplus the Company is confident that the risk to supply from climate change is very low and considers the scale of work required to further quantify this with additional modelling to be high. As such an appropriate and proportionate approach to climate change risk would be to assess the risk fully for subsequent WRMPs as necessary.

The result of the sensitivity analysis is shown in figures 16a and 16b.

Figure 16a – Sensitivity of Supply to Climate Change at -5%

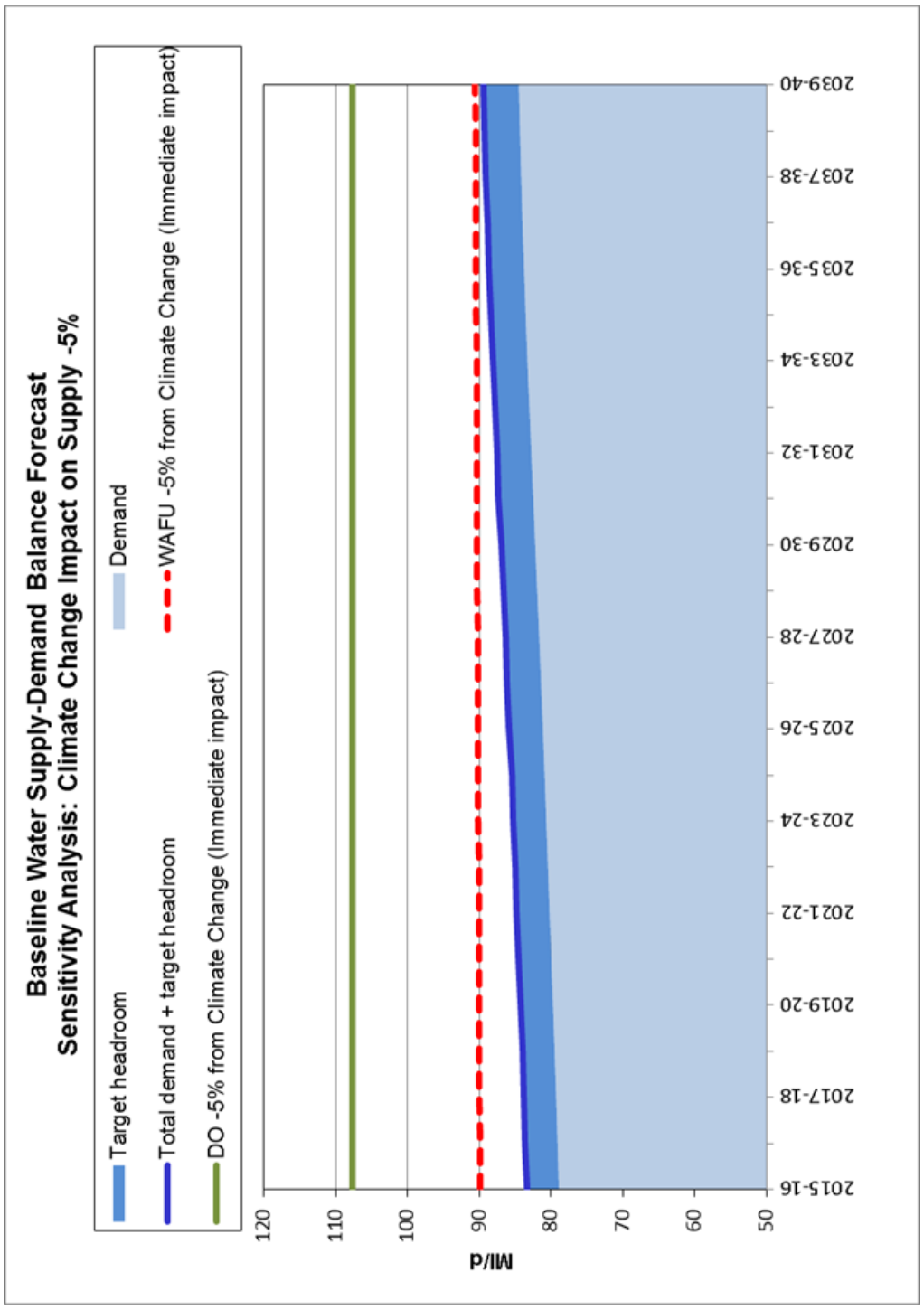
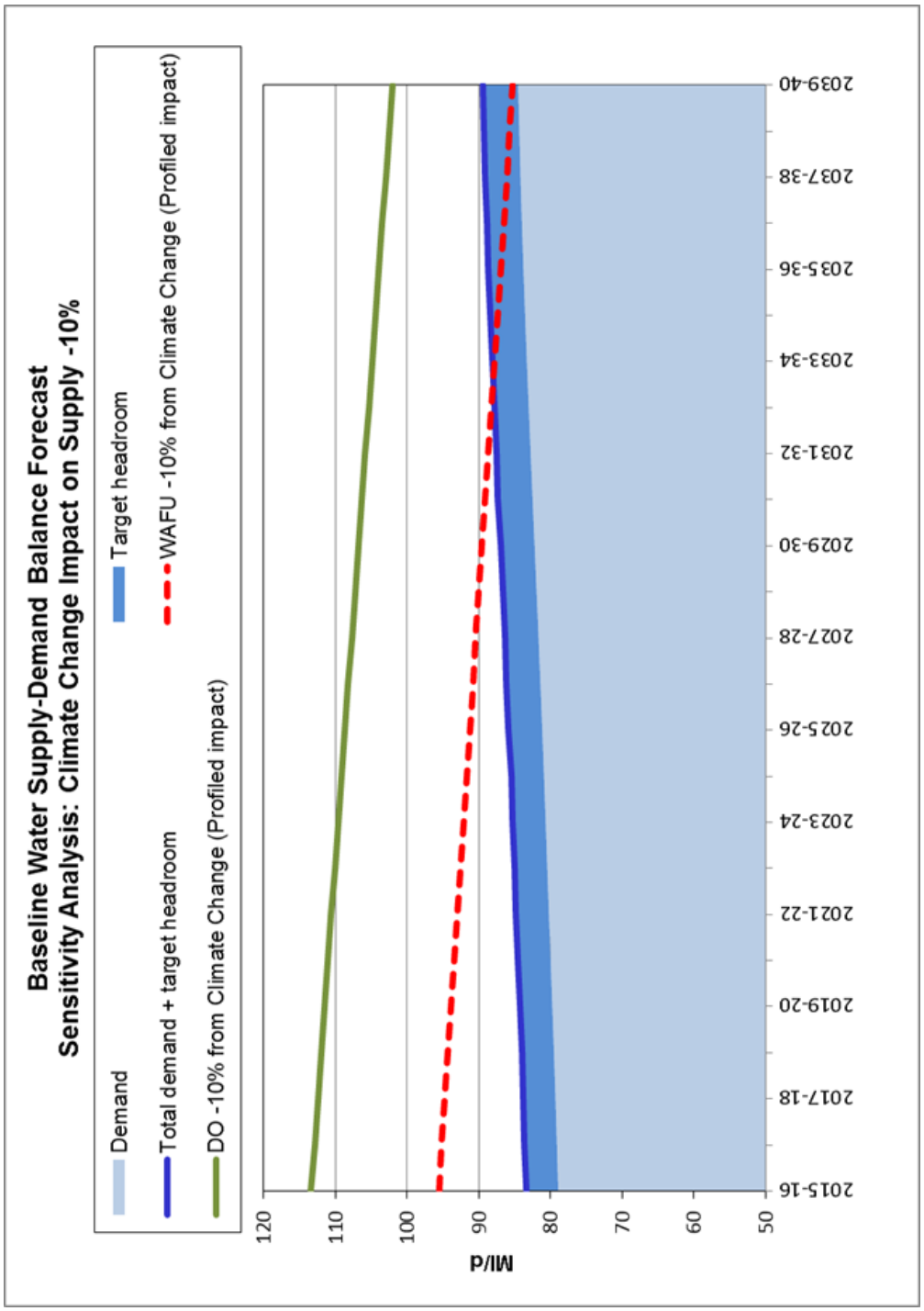


Fig 16b: Sensitivity of Supply to Climate Change at -10%



10.3 Demand

The Water Resources Planning Guideline recommends a revised approach to allow for the impact of climate change on demand since the method applied in the 2010 WRMP. The methods to estimate the impact of climate change on demand are set out in the UKWIR Impact of Climate Change on Water Demand project[37], and these are the methods the Company has applied. The effect of climate change on demand is shown below:

Demand component	Impact by 2039/40	Annual climate change uplift
Households	1.2Ml/d 0.6% (0.4Ml/d)	0.032% (0.01Ml/d)
Non households	0Ml/d	00
Distribution losses + misc	-	0.00%

[37] UKWIR 13/CL/04/12

10.4 Impact on the supply-demand balance

The impacts of climate change on both supply and demand have been explicitly included in our supply demand forecast, and account for a small reduction in available headroom by the end of the planning period.

There is some uncertainty associated with predicting climate change impacts. On the supply side the impact is likely to be minimal, yet to quantify the impact in more detail would require considerable further work. The demand related impacts have been assessed in accordance with the guidelines and best available evidence, however, further research is being undertaken by UKWIR to improve upon this area and update the methods employed to determine demand impacts. We await the outcome of this research.

The uncertainty associated with the climate change assumptions used in our plan has been included in the target headroom assessment, in accordance with the guidelines. We have applied a minimal allowance for uncertainty as we do not believe that the impacts would be significant, and to ensure the target headroom figure is not unnecessarily inflated by climate change uncertainty.

10.5 Future work

The guidance and methodology for assessing the impacts of climate change, in particular on supply, and calculating the deployable output available for groundwater sources, provides a framework for assessing the impacts of climate change on groundwater recharge using different methods. For a water resource zone with medium to high vulnerability, a detailed approach utilising the Environment Agency's groundwater model and UKCP09 climate scenarios is recommended.

Overall our assessment has determined that within our resource zone, few sources and a small percentage of the total deployable output would fall into the medium to high vulnerability category, and therefore the impact of climate change on supply is small. It is unlikely that the suggested detailed methods would significantly change this assessment.

However, we would like to further develop our prediction and understanding of impacts on those more vulnerable sources, and will endeavour to undertake further modelling using the more detailed methods subsequent to publication of this plan. There remains no immediate risk to supplies from climate change impacts, or over the planning period, and we do not envisage any climate change driven investment to enhance supply.

10.6 Greenhouse gas emissions

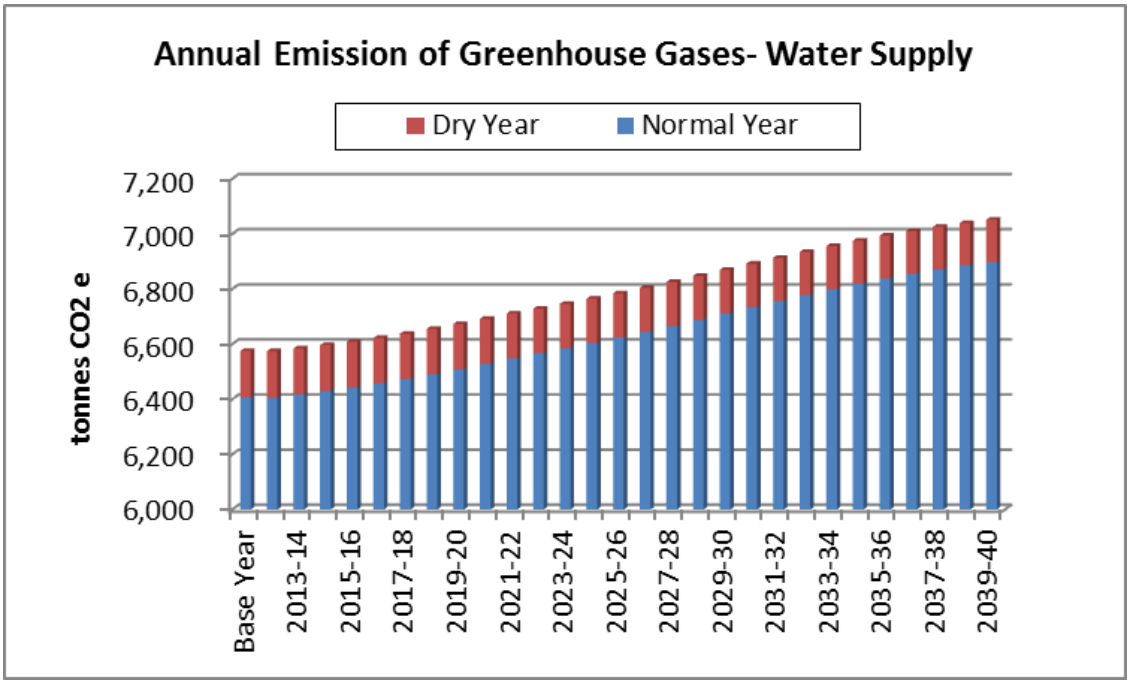
The emissions associated with the supply of water to our customers are largely dependent on the electricity that we require to abstract and pump water. This will increase as a result of higher demands, and we have assessed the likely emissions from water supply activities to supply customers in a normal year over the planning period. This excludes emissions as a result of transport as these are expected to remain relatively stable.

The figures for CO_2 equivalent have been calculated using the 2012 UKWIR Carbon Accounting Tool (v6.1), and are presented in table 19, and in figure 17. The intensity ratio for tCO2e per Ml supplied is from the base year, of 223kgCO_2 equivalent per Ml.

Table 19 – Annual greenhouse gas emissions, normal year

Normal year per annum	Base year 2011/12	Final planning year 2039/40
Total volume of water/Ml	28,638	30,835
Pumping and treatment emissions/ tCO2e	**6,239**	**6,894**

Figure 17 – Annual greenhouse gas emissions, normal and dry years



11. Baseline supply demand balance

Cambridge Water is able to demonstrate a surplus in deployable output, and therefore available headroom, in the baseline supply demand balance for the next 25 years. No deficit is forecast at any time during the planning period.

We have adhered to the Environment Agency planning guidelines in arriving at this conclusion. The assumptions that we have made to produce our supply demand balance are explained in detail in this document and its appendices. The keys points are:

- No major impacts are expected on deployable output, although future risk from Water Framework Directive legislation will need to be suitably managed
- An appropriate allowance for outage and an approach to outage risk has been included
- Minor changes to headroom from climate change impacts are included in the calculations
- 47,000 new properties are expected in the planning period
- A maintained metering policy will see optants continue, with a resulting meter penetration of 87% by 2040.
- Consumption in new properties will be less, at least to Building Regulations standards
- Water efficiency will continue to play a major part in managing demands
- The combination of metering and water efficiency will result in a decline in per capita consumption to below 125litres/person/day by 2040
- Total leakage will remain constant at 14.0Ml/d

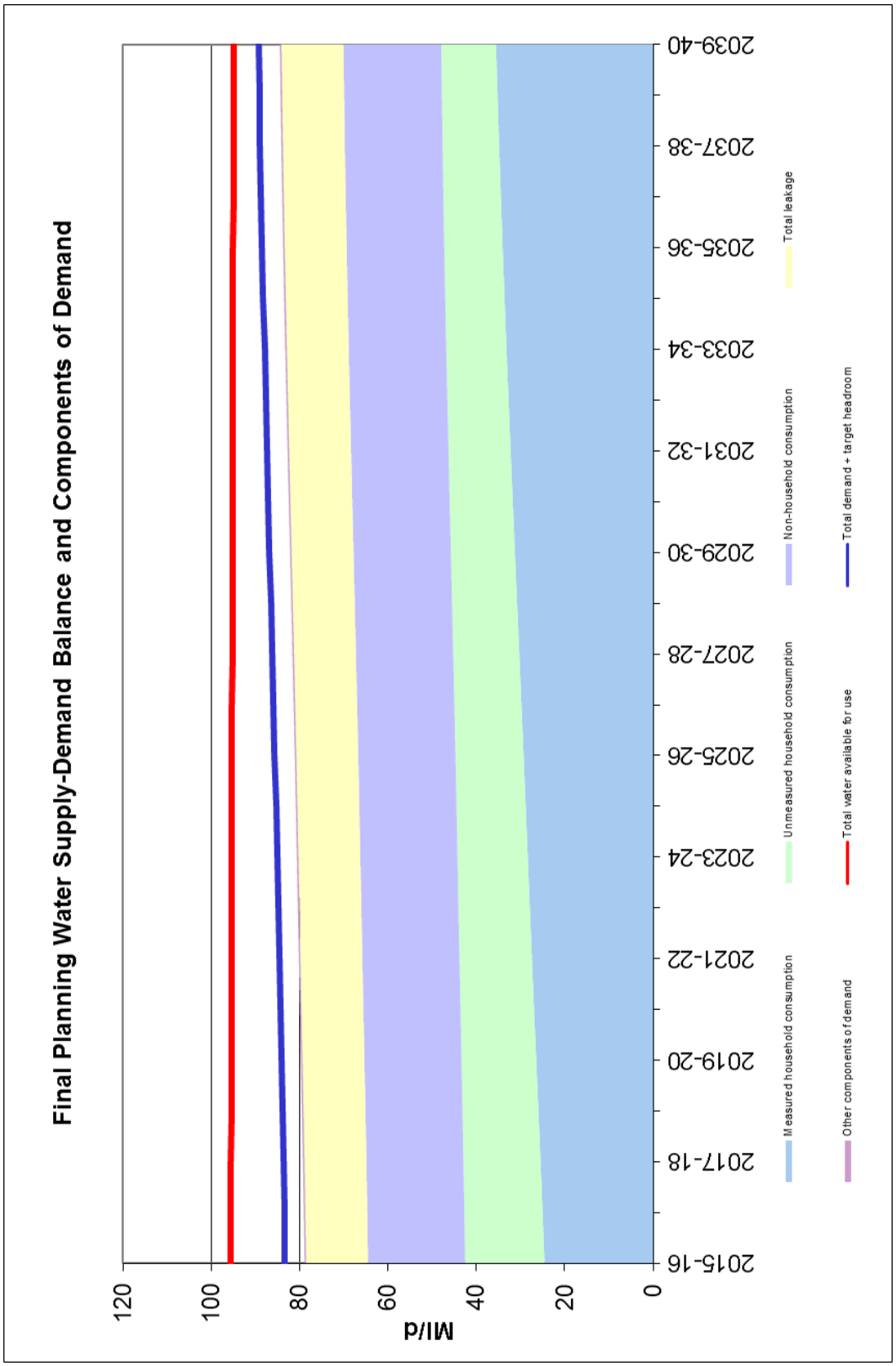
The baseline supply demand balance and components of demand is presented in figure 18 of the plan.

As the baseline scenario forecasts no deficit at any point in the planning period, the company does not propose any actions to resolve a deficit. With the information and data available, we are confident we can maintain a surplus in headroom without the requirement to develop options in our plan. Therefore in accordance with the guidance, we have not carried out detailed option identification and appraisal at this time.

During consultation on the preparation of this plan we have considered the views of our customers and other stakeholders and through our customer engagement process have determined that the planning solution presented in our final WRMP is acceptable.

In preparing this plan, we have provided an evaluation of options that might be considered in a final planning solution with the appropriate support, and these are described in the next section.

Figure 18 - Baseline supply demand balance and demand components



12. Option appraisal

12.1 Continuation of existing measures

The continuation and improvement of the company's existing policies in metering, water efficiency and leakage to control demands will ensure that we maintain a positive supply demand balance throughout the planning period, taking into account the planning guidelines and the requirements specified within.

Towards the latter of the period, however, we would expect that maintaining these will become more challenging, in particular continuing water efficiency reductions and maintaining total leakage levels, as a result of changes from growth in the network and in our customer base. Therefore, we shall need to continue to review, improve and develop these areas in successive price reviews in order to maintain the targets we have set.

The company has made commitments to understanding its customers' behaviour in water use, and in making reductions in what they use, thorough monitoring as part of our joint SodCon project and other collaborative water efficiency projects. We will continue to develop and apply demand management options as a pre cursor to the development of any additional supply options in response to environmental pressures on abstractions in the region.

While we are able to demonstrate a supply demand surplus and options are not required to address a deficit, it will be for our customers to decide if additional measures should be funded to further reduce demand or leakage for example. These could further improve the supply demand balance situation, thus protecting future supplies for the benefit of customers.

12.2 New measures

While we have not proposed new measures in our baseline supply demand balance as these are not required to ensure that we maintain headroom, we have reviewed options appropriate to Cambridge Water options that could improve available headroom. These are additional options that have been explored through the willingness to pay survey of customers, and the consultation process, and are set out in table 20. The measures identified here are not intended to be exhaustive, nor do they consider economic, environmental and social costs for appraisal purposes. They do not include any detailed supply side options that may be required as a consequence of future and as yet unknown sustainability reductions, but are intended to illustrate enhancements to the baseline supply demand balance, mainly through demand management.

Table 20 – Options appraisal

Measure	Explanation	Comment
Outage	Measures to reduce our allowance are already proposed for future AMPs, by construction of additional boreholes at single borehole sites to improve security of supply. The actual effect of these on outage is yet to be quantified. Further improvements to reduce outage would require investment in duplication of plant and additional contingency, for which the costs would outweigh the benefits in this planning period.	Likely to be AMP7-8
Supply pipe ownership	By taking ownership and responsibility of customer supply pipes, we would be in an improved position to control a proportion of customer side leakage. This would aid in maintaining or improving total leakage.	May occur across the industry as a whole, but legislation required. Not likely before AMP7-8
Compulsory metering	Due to the classification of serious water stress the company has legal powers to undertake a programme of enhanced metering if required. Current metering penetration and future projections do not indicate that this is necessary at this time.	May be required if expected meter optant rates do not occur, and will be reviewed at next WRMP
Consumption of new household properties	Working with developers and local authorities we could guarantee some or all of new development is built to higher levels of the Code for Sustainable Homes. This may involve influencing planning policy, or subsidising fittings used in developments	Cost may be prohibitive and policy outside of company control. Maintaining consumption levels difficult to control and therefore guarantee in future
Reduced leakage target	Reducing leakage would improve supply demand balance, however we are already operating below our SELL	Uneconomic, but could be supported by customers
Additional water efficiency	Options have been identified (section 4.5) and a combination of these could be applied.	Costs, benefits and longevity need to be assessed, during AMP6

13. Scenario testing

The company has produced a baseline supply demand balance that demonstrates the most likely water resources situation based upon the best and most up to date available information. This demonstrates that headroom can be maintained throughout the planning period, and includes reasonable allowances for uncertainty around the factors included in the baseline calculation, using appropriate methods in accordance with the planning guidelines. Our target headroom calculation does not indicate that there is significant risk in the sensitivity of any of the included factors that could have a large impact on the on the supply demand balance.

In preparation of this plan, the factors we have identified to have the most influence on the plan are growth, the impact of trading opportunities and potential future sustainability changes due to the Water Framework Directive. We have tested the sensitivity of the growth forecast, in section 8.5, and consider that any possible likely variations would not impact the supply demand balance sufficiently to remove available headroom even by the end of the planning period. The potential impact of trading and sustainability changes due to the Water Framework Directive (WFD) on available supply, however, are excluded from our target headroom calculation and sensitivity analysis as these are not included in our baseline supply demand balance. This is due to the considerable uncertainty around both these factors, and as the guidelines specifies, uncertain factors that may drive the need for investment should be excluded.

Due to the potential significance of these factors, we have chosen to include scenarios exploring their potential impacts. These are summarised below in table 21 and the scenario results are presented in the following sections.

Understanding future uncertainty through scenario testing allows Cambridge Water to manage risk and uncertainty in an adaptive and flexible manner by reducing risk at the appropriate point in the planning cycle.

Table 21- Scenarios

Reference	Scenario
S.1	Potential trade with Anglian Water on baseline supply demand balance
S.2	Potential trade with Anglian Water with new property growth at CSH 5/6
S.3	Potential trade with Anglian Water and reciprocal trade to Cambridge Water
S.4	Residual Risk - WFD No Deterioration in status impact on available deployable output
S.5	Residual Risk - WFD No Deterioration in status impact on available deployable output with new property growth at CSH 5/6

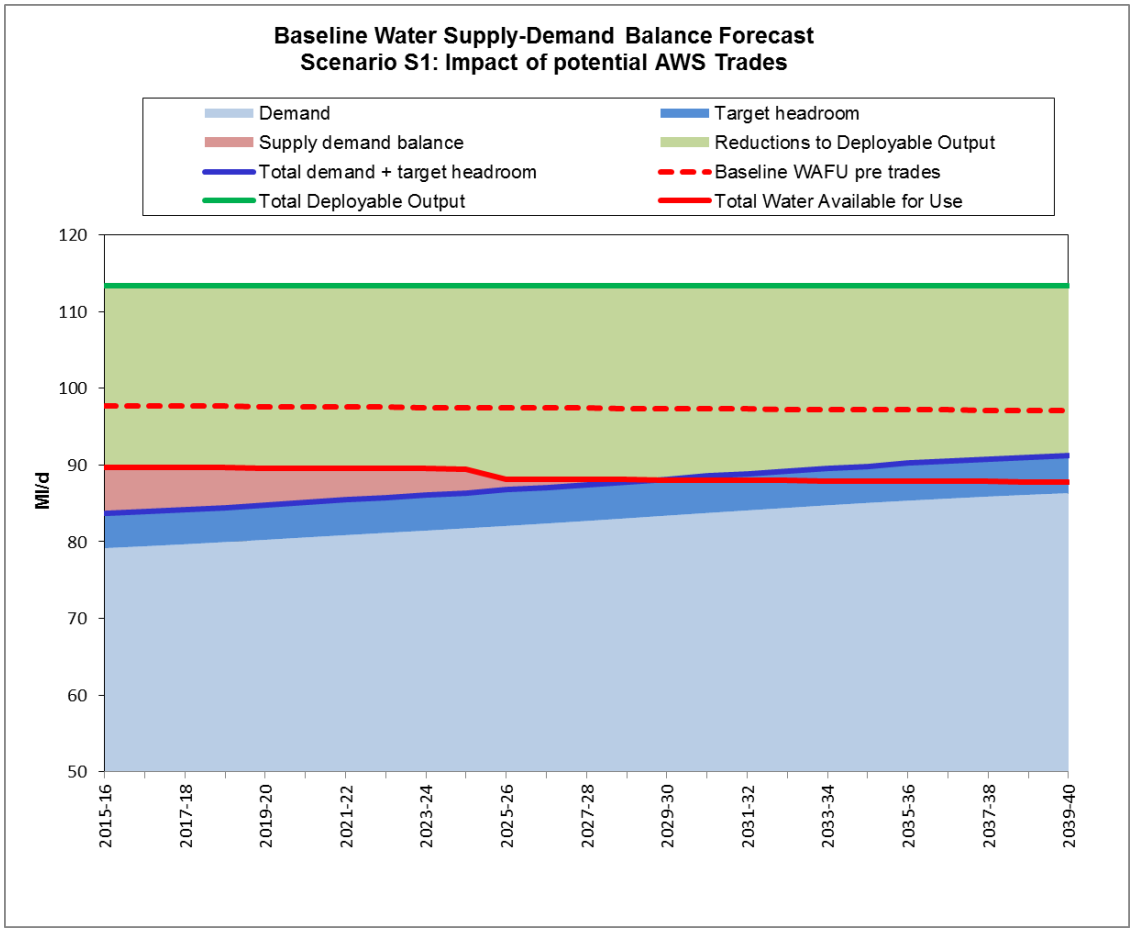
13.1 Scenario conclusions

While it would not be considered appropriate to plan at this time for highly uncertain changes, our scenario testing indicates some considerable risk, in particular associated with uncertain sustainability changes to our baseline assumptions. It is important to note that much of the assessment in defining future sustainability changes is incomplete and that the WFD scenarios in particular represent a highly precautionary evaluation of impact.

13.1.1 Scenarios S1 to S2

The impact of possible trades with Anglian Water would put Cambridge Water into deficit in 2030. The trades could be accommodated until this time with current licensed deployable output. For this reason, and for those discussed in section 7.2, we have not included a definite trade in our baseline supply demand balance. Whilst we believe that the trades proposed would be an effective utilisation of regional water resources, these will first need to be assessed under water Framework Directive No Deterioration criteria for environmental impact, and trades would require to be time limited, and to be appraised on this limited use basis when considering investment in infrastructure.

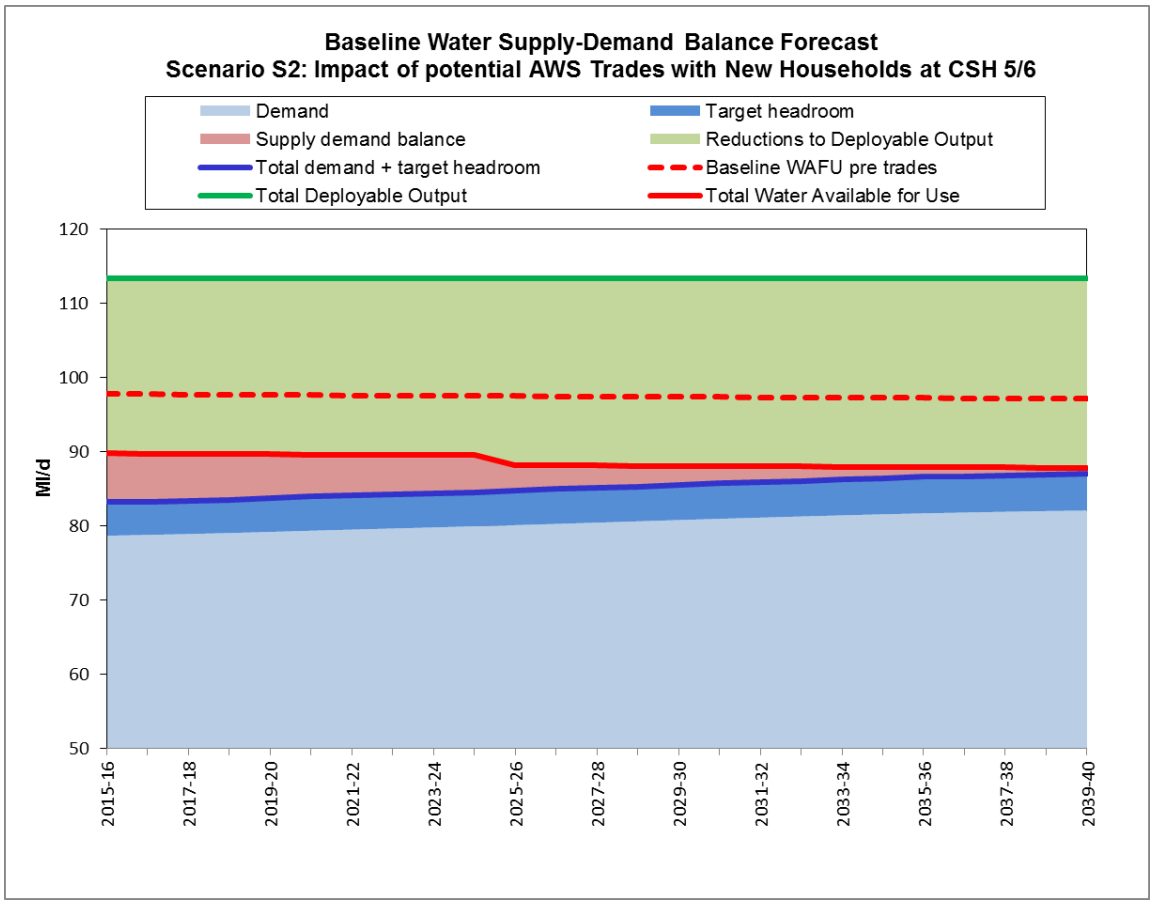
Figure 19 - S1: Impact of trades on baseline supply demand balance



With a variation on scenario S.1 in which new development in the Cambridge Water area is constructed to low consumption standards at Code for Sustainable Homes Level 5/6, the

proposed trades with Anglian Water could be sustained through the planning period. The design of new properties is not within the control of water companies, so it is unlikely that this scenario could be easily achieved. It does, however, provide a view of how additional water efficiency activity or other demand reductions such as a reduced leakage target may enable trading where appropriate. These have not been explored further at this stage as the trades are not included in the baseline or final planning supply demand balance, and the cost effectiveness would need to be appraised alongside other options to trades.

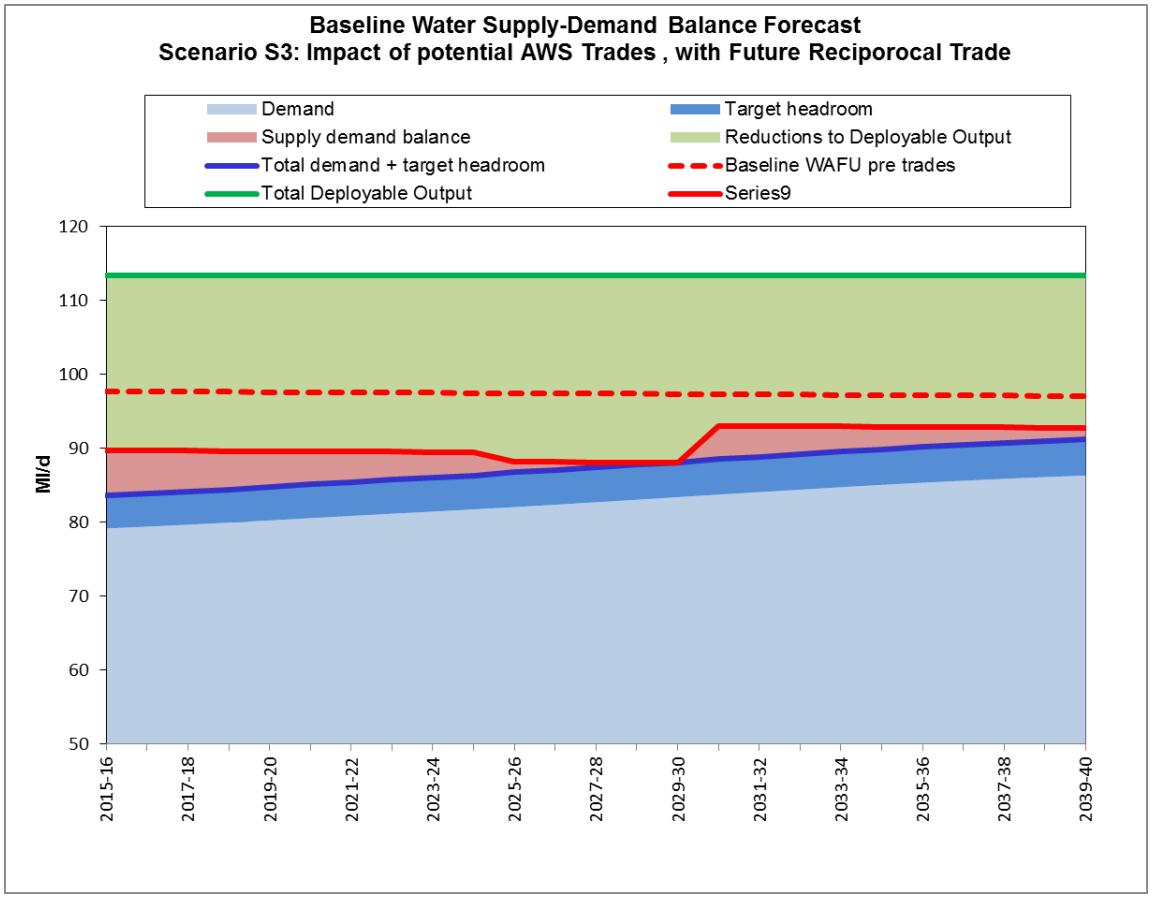
Figure 20 - S2: Impact of trades on supply demand balance with households at CSH 5/6



13.1.2 Scenario S3

This scenario, exploring the impact of trades on the baseline supply demand balance, demonstrates that a reciprocal trade in return would allow Cambridge Water to maintain headroom in our supply demand balance. This option has been discussed with neighbouring Anglian Water, although not in detail, as it could provide resource to the north of Cambridge Water's supply zone in a cost effective alternative to recouping the trade resource from the east, where it is most useful for Anglian Water.

Figure 21 - S3: Impact of trades, including reciprocal trade



13.1.3 Scenarios S4 to S5

The Environment Agency has provided information on its view of the Water Framework Directive 'No Deterioration' assessment as set out in Article 4 of the Directive, and those Cambridge Water sources that have a component of residual risk that may lead to deterioration of Water Framework water bodies. These have been categorised as at medium risk for failing WFD criteria in relation to actual available licence volumes.

All the sites implicated in the National Environment Programme table have a sustainability change status of unknown, and accordingly cannot be included in the reductions shown in our plan, as the guidelines instruct that only confirmed and likely sustainability reductions are to be included. Therefore, any future impact from WFD principles on the company's deployable output is not included in our supply demand balance

The element of residual risk that may impact on the company's deployable output is the difference in recently abstraction from licensed abstraction. As such, and due to the company's policy of ensuring availability of maximum licensed volumes, together with demand management to ensure the availability of supplies for future growth expected in the region, this represents a considerable volume of our available licensed deployable output. In addition, we have been operating some sources below normal outputs to ensure source blending maintains nitrate quality parameters while treatment plants are constructed. Nevertheless, we have included scenario testing to assess the impact of Water Framework residual risk, although the evidence on impacts is inconclusive at this time, and these scenarios should be considered as highly over precautionary.

Figure 22 - S4: Water Framework Directive no deterioration impact on deployable output

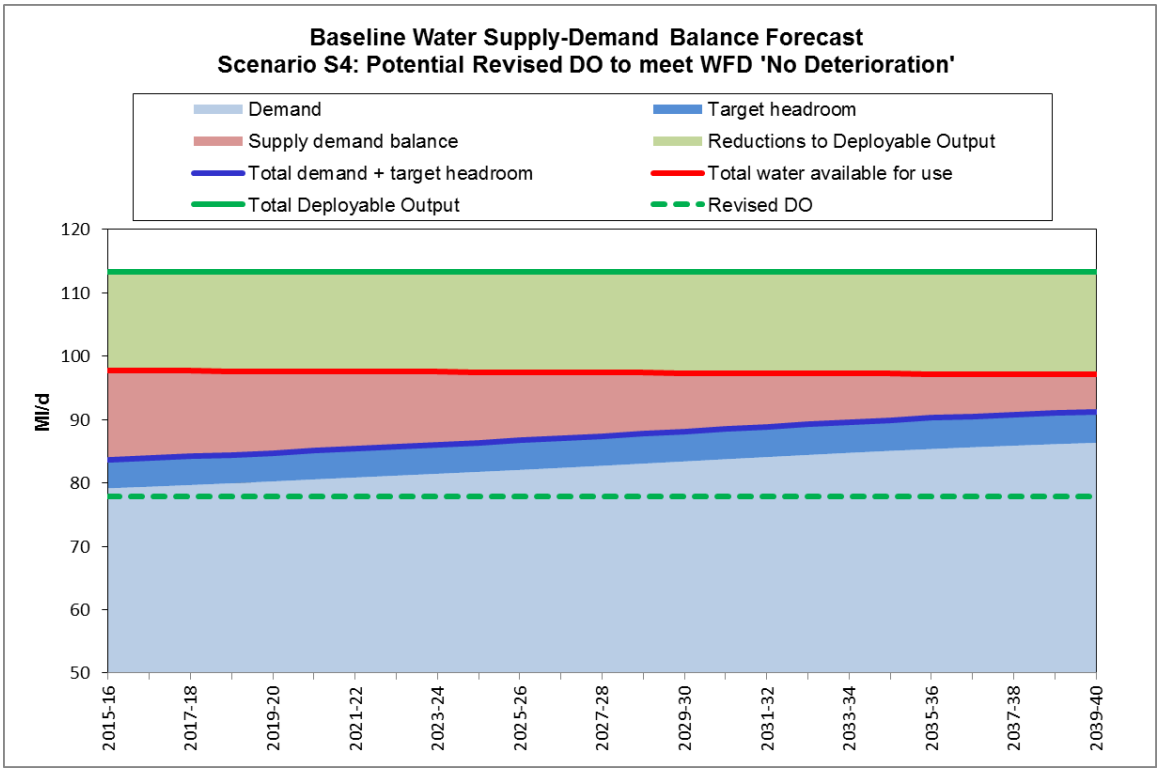
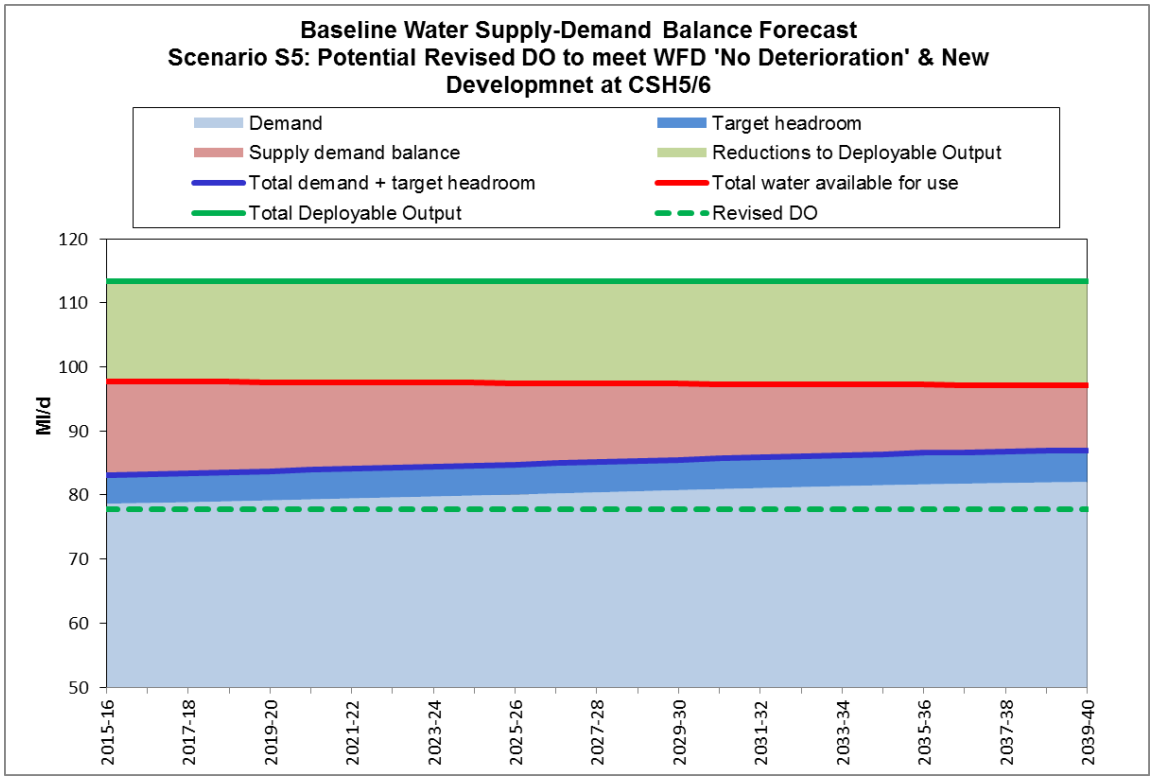


Figure 23 - S5: Water Framework Directive no deterioration impact on deployable output with CSH 5/6 Demands



14. Final water resources strategy

14.1 Overall strategy

In preparing this plan, the company has considered the influence of a range of factors on the supply demand balance, and the uncertainty surrounding these. We have adhered to the Water Resources Planning Guidelines and determined that our baseline water resources position provides the most cost effective method of maintaining the required supply demand balance. We have taken a proportionate approach to any apparent risk to this position, and where necessary and justified, pledged to embark on further work.

Cambridge Water believes this is a realistic view of the influences on the supply demand balance and that we have taken due regard of the uncertainty around planning forecasts, and the requirements of the legislation. This plan represents the most cost effective approach to ensuring we maintain a surplus of supply over demand.

As such our final planning forecast does not differ from that of our baseline forecast, for this plan. However, we will continue to engage with our customers and develop further options if these are supported and justified, in future plans, and to review the available data used for our assumptions whilst this plan is in effect. The final planning supply demand balance and the components of demand is presented in figure 18.

We have concerns in relation to the risks to our supply position from reductions to abstraction licences as a result of the Water Framework Directive, which could be greater in scale than all of the other risks assessed in our planning. We have made an assessment of the potential impact, however, there is a need for further information and certainty from the Environment Agency on these, as replacing any losses in licenced supplies would be costly. We will continue to work with the Environment Agency to manage this risk and make our customers aware of the potential cost implications over the long term.

14.2 Weighted average demand

The weighted annual average demand provides our view of the most likely demands over the planning period, and this is used to aid in determining our revenue forecast for setting price limits. It incorporates the likelihood of frequency of dry years and wet years and the influence these would have on demand.

We have analysed our data and determined that a dry year would be expected one in every 21 years, and this is the basis of our weighted demand average. No allowance has been made for the return period of a wet year, which could have the effect of suppressing demand. The weighted average demand is presented in Table 22 and figure 26 below, and in table WRP2b in appendix A13.

Table 22 - Weighted average demands

	2015	2020	2025	2030	2035	2040
Dry year annual average demand	79.2	80.6	82.1	83.8	85.4	86.3
Normal year annual average demand	77.1	78.6	80.1	81.8	83.4	84.4
Weighted annual average demand	77.2	78.7	80.2	81.9	83.5	84.5

Figure 26 - Weighted average demand chart

14.3 Risks and uncertainty

This plan has been prepared in accordance with the planning guidelines, and in doing so has addressed the sensitivity and uncertainty required to determine the company's baseline and final supply demand balance. Our review of the uncertainties outside of the company's control which are not appropriate to include in the planning scenarios has identified the uncertainty and considerable potential risk from WFD implications, and these could possibly lead to deficit in the supply demand balance sooner than planned. However, there is considerable uncertainty around the timing and magnitude of impacts.

As a result of these Water Framework Directive considerations the company will include environmental investigations in the 2014 price review, so that we can reduce the uncertainty surrounding the impact on our supplies at the earliest possible stage in the planning period.

15. Tables

The Environment Agency workbook including all completed tables has been included in the submission of this plan to the Secretary of State, and is available on request to interested parties. The data contained in the tables includes supply demand balance forecasts for normal year, dry year and critical period scenarios. At this draft stage, as the company has no supply demand balance deficit, the final planning solution is the dry year baseline scenario. Any options supported by customers and accepted by the company as options will be included in a final planning solution in a revised draft, subject to the consultation phase.

The included tables are listed below, and form appendix A13 to the plan.

15.1 Baseline supply demand balance

WRP1a

The company's licences and available deployable output for each water supply source, and in total for the resource zone

WRP1

The baseline water supplies, after allowing for including reductions to deployable output, imports and exports and other factors to calculate the total Water Available for Use (WAFU) for the Resource Zone

WRP2

A breakdown of the demand components for metered and unmetered households and non households, with a breakdown of consumption from metered households according to their water using characteristics. Leakage and other distribution losses are included

WRP2a

Details of the existing customer population, changes in population and properties, and category of customers

WRP2b

The weighted baseline demand forecast

WRP3-6b

These tables are not required and have not been completed – no options are being considered at this time, and therefore the final planning supply demand balance is unchanged from the baseline supply demand balance

WRP3 Feasible options

WRP4 Preferred options

WRP5 FP Supply

WRP6 FP Demand

WRP6a FP Customers

WRP6b Weighted FP Demand

16. Appendices

A.1 Consultation communication and contact plan
A.2 Pre consultation responses
A.3 Customer focus group report
A.4 Long Term Strategy
A.5 WRZ integrity assessment
A.6 Outage allowance update
A.7 Base year normalisation technical methodology
A.8 Dry year multiplier technical methodology
A.9 Growth forecast CC dwellings
A.10 East of England forecasting model projections
A.11 New household consumption - county council population forecasts
A.12 SELL review by Beale Assoc.
A.13 WRP tables
A.14 Critical period scenario table
A.15 Target headroom calculation
A.16 Climate change impact on supply technical memo
A.17 National Environment Programme tables
A.18 Compliance with guideline checklist
A.19 WREA Project summary Memo
A.20 Customer Engagement Methodology