Thames Water

Final Water Resources Management Plan 2015 - 2040

Main Report

Section 3: Current and Future Demand for Water

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Section 3 Current and Future Demand for Water

In this section we describe the current and future demand for water, including the population and property forecasts, taking into account the Census 2011 data, and the non-household demand forecast.

We explain how we calculate an annual 'water balance' to account for where all the water we put into supply from our water treatment works is used. This includes the breakdown of demand for water into its component parts, including water usage in households, non-household properties and leakage. We also explain the methods used for collecting data and we present the balance for the base year 2011-12.

We explain how we build a demand forecast looking 25 years into the future and examine the factors driving the forecast. We note the methodologies, data and assumptions that have been used in the development of our final Plan.

We serve over 9 million customers. This is forecast to increase by between 2.0 and 2.9 million people by 2040. We have included the effect of both upward and downward drivers in our forecast.

In total we supply over 9 million customers in over 3.4 million properties. Our population has been growing at approximately 0.1 million per annum every year for the last 7 years.

Demand is the term we use to describe the water that is supplied through our network. It comprises several components: water we use in our households, workplaces and schools; water used by industry; water used in maintaining the water network; and water that is lost through the treatment and distribution systems. We calculate and report these components on an annual basis in a process known as a 'water balance'.

Demand forecasting is the method by which water companies estimate future demand for water. We use mathematical models which use information such as population and property projections, water use data and trends, and a range of other information to forecast how the components of demand for water are likely to vary over the next 25 years. We produce forecasts every five years, with an annual review. We follow industry guidelines where possible supplemented with our own detailed analysis.

Over the planning period we face continued growth in demand. Upward pressures include:

- Population increase
- Decreasing household size (occupancy)
- Increasing water use per person, particularly for personal washing and external water use
- Climate change

These upward pressures are partially offset by downward pressures from:

- Modern low volume toilet cisterns
- Modern, water efficient dish washers, washing machines etc.
- Water efficient new housing resulting from design requirements of the Building Regulations

Over the forecast period, household water use is expected to increase by over 250 Ml/d. We forecast household water use on the basis of micro-components of demand (i.e. the ownership, frequency of use and volume per use of household appliances).

Non-household water use is forecast to remain broadly flat over the planning period. Increases in water use from service industries (e.g. offices, call centres) are being offset by reductions in demand from non-service industries (e.g. industrial sites, breweries).

Minor components are forecast to remain flat, leakage will be maintained at current levels through on-going maintenance by Thames Water.

Overall, the baseline demand forecast (before intervention) is expected to increase by 232 Ml/d in the period of 2015-2040. This represents a significant challenge, particularly in the face of reductions in our supply capability. As part of our plan we have looked at the potential to reduce demand and show how different levels of demand management affect the cost and performance of future plans and strategy. This is in accordance with the Water Resources Planning Guideline (WRPG) which state that the plan should address government policy including reducing the demand for water.

The remainder of this section is structured as follows:

- An introduction – guiding principles and drivers.
- Annual water balance – reporting the components of the water balance relevant to the base year, 2011/12.
- Demand forecasting – how we forecast demand to 2040.

3.1 Introduction

3.1.1 What is 'Demand'?

We calculate and report these components on an annual basis in our 'Annual Review'. This is known as the 'water balance'.

When reporting demand for water, we split it into the following categories:

- Household Use - water used in the home and garden
- Non-household Use - water used by businesses
- Operational Use - water used maintaining the network
- Water Taken Unbilled - water used without charge either legally (e.g. fire hydrant use), or illegally (e.g. usage in a property declared as void (empty)).
- Leakage - water lost from the distribution system

Demand forecasting is the method by which water companies estimate future demand for water. We use mathematical models which use information such as population and property projections, water use data and trends, and a range of other information to forecast how the components of demand for water are likely to vary over the next 25 years. We produce forecasts every 5 years, with an annual review.

3.1.2 Guiding Principles

The Water Resources Planning Guideline (WRPG) sets a clear framework for developing a demand forecast. There are industry standard methodologies, which we follow in preparing our demand forecast, including 'Demand Forecasting Methodology'[1], 'Forecasting Water Demand Components'[2], 'Peak Water Demand Forecasting Methodology'[3] and 'Customer Behaviour and Water Use: A good practice manual and roadmap for household consumption forecasting'[4].

The baseline demand forecast includes demand reductions from the promotion of water efficiency, leakage reduction and metering activities assumed in the price limits up to 2015, i.e. the demand management practices in place at the beginning of the new planning period. For the baseline forecasts it is assumed that beyond 2015 water efficiency activity will continue at the baseline target levels set by Ofwat, our economic regulator, for the period between 2010 and 2015 (known as AMP5). We have also assumed meters will only be fitted where customers request a meter and in new properties, and there will be no additional leakage reduction, although activity to maintain leakage at current levels continues.

AMP5 activity includes the progressive household metering programme, where we will fit meters to properties including those that have not requested a meter. 63,000 household properties are planned to have a meter fitted, with the aim that after a 2 year adjustment period the customer will be switched over to a measured tariff. This will deliver benefits through demand reduction and leakage detection and repair, as well as delivering long term efficiencies for network maintenance in metered areas.

Once all the steps in the water resource planning process have been completed, a range of demand reduction options will need to be included in the demand forecast, such as leakage reduction, progressive household metering and additional water efficiency measures. We call this final demand forecast the 'Final Plan' forecast to differentiate it from the 'Baseline' forecast described above.

3.1.3 Demand Drivers

Demand for water varies due to a number of factors. One of the most important of these factors is the weather. In hot dry weather, customer usage increases as more water is used for activities such as garden watering or filling paddling pools. Conversely, in cold weather, leakage will rise due to an increase in the number of burst pipes. This variation in demand can be seen in Figure 3-1.

[1] UKWIR/NRA (1995) Demand Forecasting Methodology – Main Report

[2] UKWIR (1997) Forecasting Water Demand Components – Best Practice Manual (ref: 97/WR/07/1)

[3] UKWIR (2006) Peak Demand Forecasting Methodology (ref: 06/WR/01/7)

[4] UKWIR (2012) Customer behaviour and water use – a good practice manual and roadmap for household consumption (ref: 12/CU/02/11)

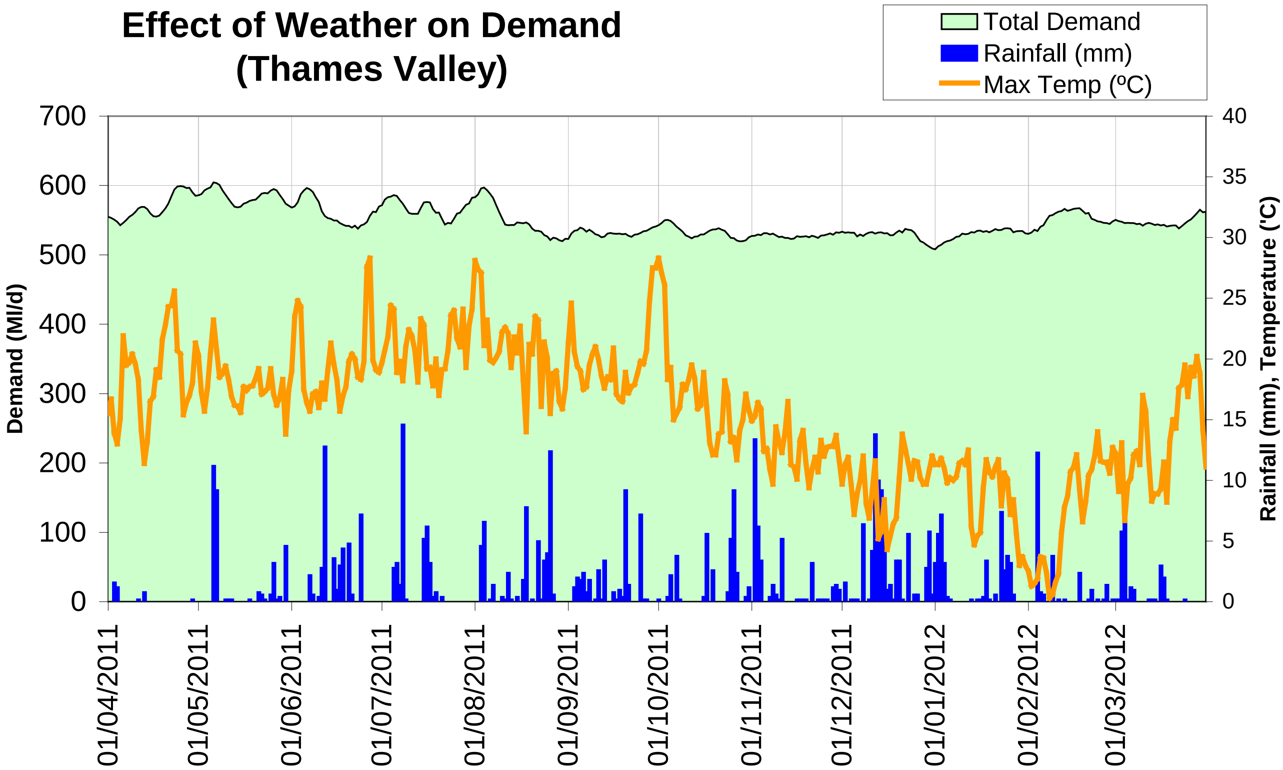


Figure 3-1: The effect of weather on demand

Demand will change over time in response to a range of drivers which also change over the planning period. The main drivers, which are included within demand forecasting models, are:

- Population and property growth, in line with the plans developed by local authorities
- Effects of climate change
- Demand in new properties and the effects of Building Regulations
- Changes in non-household consumption, including industrial and commercial use
- Changes in technology and water use of devices such as washing machines, dishwashers, showers, toilets etc. in the home.

Agricultural water use does not feature as driver for demand due to the small volume of water that is used for this purpose within the Thames Water supply area. Currently it is estimated that approximately 2.5% of all non-household demand within the Thames Water supply area is for agricultural water use.

Leakage is an important element of demand but in our baseline scenario leakage remains constant at its base year value across the entire forecast period.

These demand drivers are discussed in more detail within the remaining sections of this document and in Appendix E - Populations and Properties, Appendix F - Household Micro-Components, Appendix G - Non-households Demand, and Appendix H - Peak Factors.

3.2 Current Demand – The Water Balance

3.2.1 The Water Balance

Each year we report a water balance for the previous financial year (April 1-March 31). The water balance is used to understand how water is consumed across our supply area and to monitor performance.

The amount of water put into supply is measured and this forms one half of the water balance. The other half of the water balance is how water is used split into the components of demand (Figure 3-2).

The aim is to have the sum of the components of demand equal to the water put into supply within an acceptable margin, ±5%.

In order to calculate demand components, estimates for the population and properties within our supply area are also required.

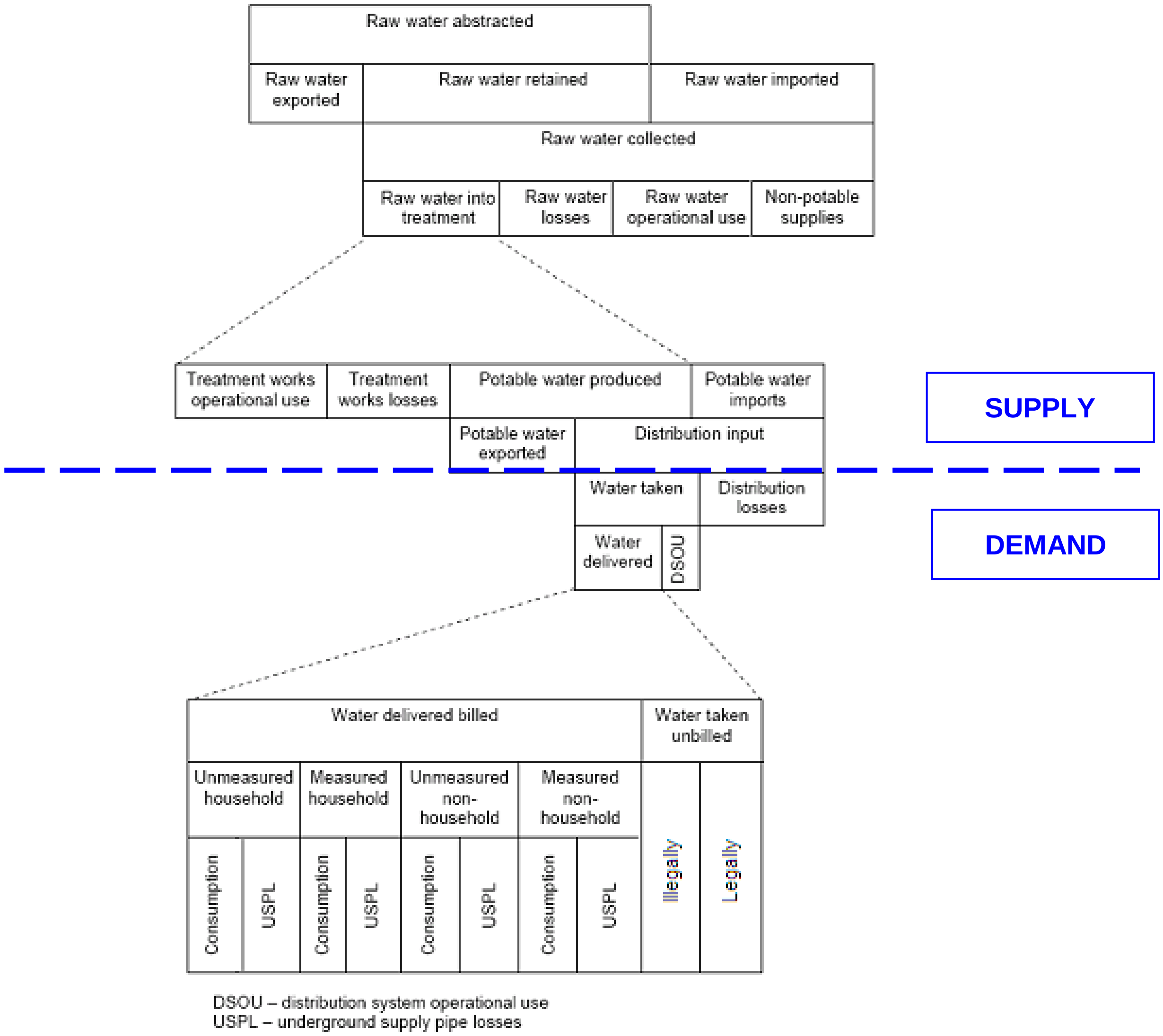


Figure 3-2: Components of the water balance[5]

Base Year Properties

Company level property numbers by type (measured/unmeasured, household/non-household, void household/void non-household) are derived from Thames Water's Customer Information System (CIS). These include adjustments to the unmeasured and measured household and non-household figures for missing properties. They also take account of properties that have moved to a measured tariff due to optant metering as well as the addition of new properties to the count of measured households.

The numbers of properties within each water resource zone (WRZ) are then calculated using a database called Netbase. Netbase takes property information from CIS and geo-references it, firstly to District Meter Areas (DMAs), this is a discreet area of the network where water supplied

[5] Water Resource Planning Guidelines Environment Agency 2007

is measured by a district meter, then Flow Monitoring Zones (FMZs), these are discreet areas of the network where the water supplied is measured by a zonal meter, and finally to WRZs. The proportions from this exercise are then used to apportion the property numbers from CIS to each WRZ.

The properties are summarised in Table 3-1.

Table 3-1: Base Year Properties (000s)

WRZ	Households			Non-households		
	Unmeasured	Measured	Void	Unmeasured	Measured	Void
London	1,924.191	630.471	47.940	33.469	128.858	19.342
SWOX	174.271	204.711	5.838	1.413	25.403	1.850
SWA	109.999	78.906	2.812	0.601	11.133	1.077
Kennet Valley	83.413	64.339	2.198	0.569	7.956	0.846
Guildford	32.533	24.751	0.940	0.335	3.881	0.410
Henley	8.371	11.157	0.258	0.092	1.170	0.111
Thames Water	**2,332.779**	**1,014.335**	**59.986**	**36.480**	**178.402**	**23.636**

Our household meter penetration in London is approximately 25%, and 50% outside of London.

Base Year Population

For the draft plan, the starting point for estimating base year population was the mid-2010 population estimates published by the Office of National Statistics (ONS)[6]. This featured an improved method of distributing inward international migration between Local Authority areas compared with previous ONS methodologies. This data was then updated to the base year of 2011/12 using projections from expert consultants, Experian. In this final plan, data from the 2011 Census has been used to estimate the base year population.

Due to data from the 2011 Census becoming available for inclusion in the 2013 annual reporting year, it was decided that the 2011-12 water balance would be rebased to include this data in the final plan. As population data is included in the calculation of other elements within the balance these also required updating. Although this will lead to several small changes between the numbers it ensured the inclusion of the most up to date data.

Not all population is accounted for in official statistics. To take account of “hidden” population, short-term migrants and second addresses we apply an additional allowance, based on a study by Edge Analytics. This allowance totals an additional population of 328,719, the majority considered to be within London.

[6] ONS (2011) indicative mid-year estimates 2006-2010 – Local Authority http://www.ons.gov.uk/ons/guide-method/method-quality/imps/improvements-to-local-authority-immigration-estimates/index.html

Non-household population is derived from the sum of two components:

- Population in communal establishments; and
- Metered subsidiary population – derived from regulatory finance accounts listing properties with domestic size pipes supplying them.

Total household population is derived by subtracting the total non-household population from the total population. This year, the number associated with communal establishments remains unchanged at 109,851. The number associated with metered subsidiary has increased from 325,309 to 331,158 following updates to the numbers of residential metered subsidiary properties. The non-household unmeasured population remains at zero.

The population split between measured and unmeasured households uses data obtained from occupancy questionnaires which were sent to 49,028 households, both unmeasured and measured, as research to inform our June Return 2010 (JR10) regulatory reporting, of which 11,482 were returned with valid data. All responses could be classified by property type, metering type, ethnicity and region enabling us to scale up responses according to the effective sampling rates of each category. We also adjusted for any occupancy bias in the responses by comparison with profiles of occupancy classes obtained from the Census 2011 for regions covering our London and Thames Valley zones.

To update population splits between measured and unmeasured households this year we have used the movement in properties, reductions in unmeasured properties as customers opt for a meter, and increases in measured properties associated with the optants in addition to newly built properties. To update this population split it is assumed that the occupancy of the additional measured properties is the same as the occupancy of the existing measured properties. The residual movement in population is assumed to be in the unmeasured population base. Base year populations are summarised in Table 3-2.

As with any company, large changes in government statistics on population estimates would affect our plan.

Table 3-2: Base Year Population (000s)

WRZ	Household Population		Non-household Population		Total Population
	Unmeasured	Measured	Unmeasured	Measured	
London	5,069.480	1,538.383	0	338.757	6,946.620
SWOX	478.038	473.192	0	48.766	999.996
SWA	308.476	174.396	0	24.755	507.627
Kennet Valley	227.928	143.002	0	19.016	389.946
Guildford	87.777	55.038	0	7.321	150.136
Henley	22.458	24.230	0	2.394	49.082
Thames Water	**6,194.157**	**2,408.241**	**0**	**441.009**	**9,043.407**

Household Demand

Household demand is normally described by the volume of water used per person each day, and is called ‘Per Capita Consumption’ or PCC. Unmeasured customer PCC is calculated from our Domestic Water Use Survey (DWUS), a panel of approximately 1,600 customers who have, voluntarily, had meters installed but are charged on an unmeasured basis. Measured customer PCC is calculated by totalling the volume recorded by all customer meters, allowances are then applied for supply pipe leakage, which is subtracted, and meter under-registration, which is added. This total volume of water is then divided by the total number of measured customers to give a measured customer PCC. As a result of the updated population between the draft and final plan, the measured and unmeasured PCC show a small change.

For 2011/12 the PCC for measured, unmeasured and average for each WRZ is shown in Table 3-3:

Table 3-3: Annual Average PCC for 2011/12 (litres per person per day)

WRZ	Unmeasured PCC	Measured PCC	Average PCC	% Metered
London	171	140	164	25%
SWOX	156	129	143	54%
SWA	161	142	154	42%
Kennet Valley	156	131	146	44%
Guildford	169	147	160	43%
Henley	158	149	153	57%
Thames Water	**169**	**138**	**160**	30%

Our average PCC is above the industry average (147 l/person/day). We also operate in an area designated as seriously water stressed. The Water Resources Planning Guideline (WRPG) states where PCC is above average and the company operates in an area designated as water stressed the company must make significant reductions in demand. As shown later in our preferred plan we have addressed this by including a significant programme of demand management.

Non-Household Demand

The vast majority of the non-household demand is measured. It is primarily water used by commercial, industrial and agricultural premises, however there is a small population whose consumption is included within the non-household category as they live in properties classified as 'mixed' (i.e. a flat above a shop).

Unmeasured non-household usage is estimated using a matrix which looks at the size of the property supply and the number of full time employees, calculating an estimated daily consumption.

Non-household demand was reported as shown in Table 3-4 for 2011/12.

Table 3-4: Non-household demand in 2011/12 (Ml/d)

WRZ	Measured	Unmeasured
London	364.61	19.18
SWOX	63.87	0.81
SWA	22.76	0.31
Kennet Valley	19.77	0.31
Guildford	8.15	0.22
Henley	2.27	0.05
Thames Water	**481.43**	**20.88**

Leakage

Leakage in 2011/12 was 637 Ml/d[7]. This was the lowest level of leakage reported since privatisation and was due to a combination of improved leakage management, a particularly mild winter and the impact of historic investment.

Leakage is split into two categories. Distribution losses, leaks on our own infrastructure make up approximately 72% of the total. The remaining 28% is water leaking from customer supply pipes, which is the responsibility of customers.

Table 3-5: Total leakage in 2011/12 (Ml/d)

WRZ	Total Leakage[8]	Revised Leakage[9]
London	513	505.9
SWOX	56	54.3
SWA	35	34.5
Kennet Valley	22	21.4
Guildford	12	12.3
Henley	3	3.2
Thames Water	**641**	**631.6**

The difference between the total leakage in 2011/12 for Table 10 [10] (637 Ml/d) and Table 10b [11] (641 Ml/d), is 0.6% and for the revised leakage data (631.6 Ml/d), is 0.8%. This is due to the statistical process maximum likelihood estimation (which is used to precisely reconcile the water balance), being applied at geographical level. For Table 10, it is carried out at company level. For Table 10b it is calculated at water resource zone level, and then totalled to company level.

Minor components

Minor components include the demand taken from the distribution system for Thames Water's operational use and that water which is taken but unbilled. Operational use includes water used by a company to maintain water quality standards in the distribution system such as mains flushing. Water taken unbilled includes public supplies for which no charge is made (sewer flushing etc.), fire training and fire-fighting supplies; it also includes water taken illegally.

At company level, minor components add up to approximately 38 Ml/d.

[7] Table 10 consistent

[8] Table 10b consistent

[9] This is calculated by the same method as Table 10b, using the new 2011 Census population data.

[10] Table 10 reports the total demand and how this is split between the components of demand at a company level

[11] Table 10b reports the total demand and how this is split between the components of demand at a water resource zone level

3.2.2 Summary for 2011/12

Figure 3-3 shows the breakdown of the total demand reported in the water balance for 2011/12 by component. Overall household water use accounts for 53%, leakage for just over 25% and non-household demand accounting for just under 20% of total demand. The remaining 2% is accounted for by the minor component of water take unbilled and operational uses.

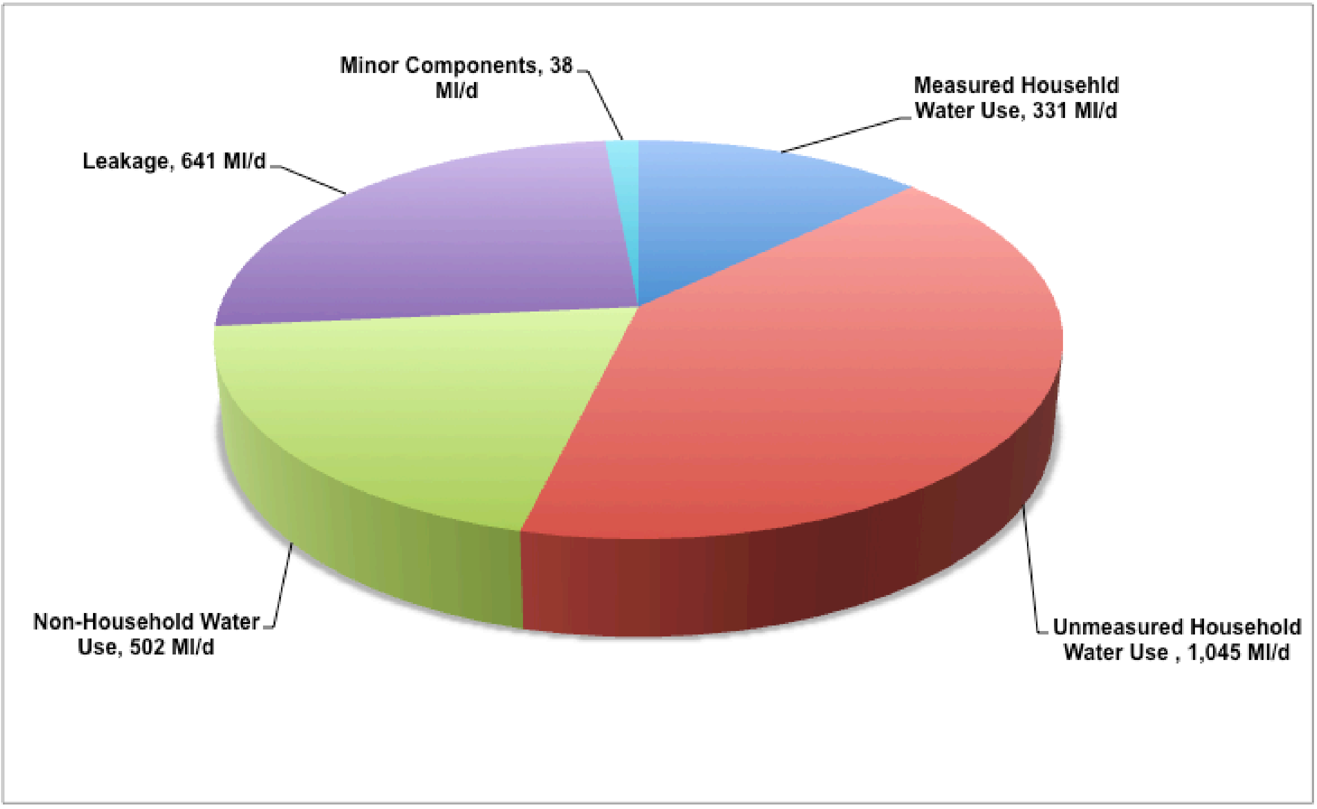


Figure 3-3: Base year breakdown of demand

This split of total demand and its sub-components form the base position for the demand forecast.

3.3 Future Demand – The Demand Forecast

3.3.1 Planning Scenarios

The water balance is reflective of the conditions experienced in that year. It may have been wet, dry, hot, cold or somewhere in the middle. From a planning perspective, we are interested in the demand that would be expected to be met up to the point that the system becomes stressed, as set out in our level of service. Therefore we need a demand forecast which is reflective of that level of service. We use planning scenarios to recreate anticipated demand levels.

Demand forecasts are developed for different conditions which describe demand in an average year and in a period in which peaks in demand need to be met. Table 3-6 summarises the scenarios constructed for each of our water resource zones. The table describes three different scenarios:

- The 'Dry Year Annual Average' scenario (DYAA): this is the forecast for a dry year (a period of low rainfall) where there are no constraints on demand.
- The 'Average Day Peak Week' scenario (ADPW): this describes the average daily demand during the peak week for water demand. The peak week is the critical period of demand which drives the need for water resource management options to be implemented.
- The 'Weighted Average' Average Demand scenario (WAAD): this describes the demand that is likely to be experienced on average over the planning period taking into account a mixture of 'normal' years, 'dry' years and 'wet' years. This is a new requirement for WRMP14.

Table 3-6: Planning scenarios used in each of our water resource zones

WRZ	Baseline			Final Plan		
	WAAD	DYAA	ADPW	WAAD	DYAA	ADPW
London	✓	✓	×	✓	✓	×
SWOX	✓	✓	✓	✓	✓	✓
SWA	✓	✓	✓	✓	✓	✓
Kennet Valley	✓	✓	✓	✓	✓	✓
Guildford	✓	✓	✓	✓	✓	✓
Henley	✓	✓	✓	✓	✓	✓

We do not report on ADPW demand for London WRZ. This is because peak demands in London can be met through the relatively large volume of surface water storage (reservoirs). The ability to meet peak demands is therefore not a resource availability issue at present but dictated by treatment and transmission capabilities.

All other zones are driven by summer weather-related peak demands and thus the ADPW scenario is the main driver for water resource investment.

All scenarios are produced by factoring up or down the demand reported in the base year, the approach used is described below.

3.3.2 Peaking factors

Peaking factors are used to uplift or reduce out-turn demand in any year to the WAAD, DYAA and ADPW planning scenarios. They are calculated using a model called OMSPred which uses historic weather conditions and the current year's base demand to recreate how current demand would vary in different weather conditions. The model uses the peaking factors to uplift or reduce base year demand to the desired level of service, and then calculates uplift volumes that are applied to the base year demand (distribution input) figures.

Comparing London annual average demand for 2011/12 with the modelled demand using weather data from the last 65 years, the levels in 2011/12 have been above that of a normal year, but below that of a dry year, being ranked 40th of the 65 available years. Thames Valley's demand for 2011/12 is ranked 31st of 44 available years.

The peak week in 2011/12 occurred very early in May and was below both the 1 in 10 and in the 1 in 2 year peak week coming in 12th of the 44 available years.

Demand is made up of usage and leakage. Due to the mild conditions in the base year of 2011/12 we refined our uplift process so that we are now able to uplift water usage and leakage separately.

The uplift volumes are shown in Table 3-7.

Table 3-7: Distribution Input Uplift Volumes (Ml/d)

WRZ	WAAD Uplift			DYAA Uplift			ADPW Uplift		
	Usage	Leakage	Total	Usage	Leakage	Total	Usage	Leakage	Total
London	-14.34	9.83	-4.51	-2.18	20.40	18.22	n/a	n/a	n/a
SWOX	-0.88	2.65	1.76	0.85	3.88	4.74	60.03	n/a	60.03
SWA	-0.50	0.38	-0.13	0.33	0.55	0.88	32.74	n/a	32.74
Kennet Valley	-0.23	1.85	1.63	0.27	2.73	3.00	21.64	n/a	21.64
Guildford	-0.19	0.24	0.05	0.23	0.35	0.58	17.31	n/a	17.31
Henley	-0.08	0.05	-0.03	0.08	0.07	0.15	6.19	n/a	6.19

These uplifts result in the overall demand, measured in terms of distribution input, shown in Table 3-8.

Table 3-8: Overall Demand (Distribution Input) post uplift

WRZ	WAAD (Ml/d)	DYAA (Ml/d)	ADPW (Ml/d)
London	1,999.80	2022.53	n/a
SWOX	260.85	263.83	319.12
SWA	133.27	134.29	166.14
Kennet Valley	98.71	100.08	118.72
Guildford	44.29	44.83	61.56
Henley	12.82	13.01	19.05
Thames Water	**2,549.74**	**2,578.57**	**n/a**

The impact on leakage values for the different forecast scenarios in each WRZ are given in Table 3-9.

Table 3-9: Uplifted leakage 2011/12 (Ml/d)

WRZ	Leakage WAAD	Leakage DYAA
London	515.71	526.27
SWOX	56.97	58.21
SWA	34.83	35.01
Kennet Valley	23.29	24.16
Guildford	12.55	12.66
Henley	3.28	3.30
Thames Water	**646.63**	**659.61**

More information can be found on peaking factors in Appendix H.

3.3.3 Population and Property Projections

Background

Base population and property projections for WRMP09 were based on government policy and regional spatial strategies. Since this time the regional spatial strategies have been revoked, and government policy upon which spatial planning is based, is now enshrined in the Localism Act.

With the exception of London, where the London Plan remains, information for population and property growth is now required to be compiled at a local authority level and local authorities are required to develop population and property forecasts as part of their local plans.

For London, population and property projections are to be based upon information in the London Plan[12], which is the spatial development strategy for Greater London written by the Mayor of London and published by the Greater London Authority (GLA).

Property and Population Projections – Methodology and Data Collection

Our property and population projections were undertaken by independent experts, Experian, as part of a collaborative project with other water companies[13].

Following a methodology developed in conjunction with the Environment Agency[14], Experian gathered information to produce three projections:

- Plan-based
- Trend-based
- An Experian own view of the 'most likely' forecast

The work with Experian has been designed in two phases. The first phase provided projections for inclusion in the draft Plan because the draft had to be completed before the publication of the Census 2011, so could not incorporate its outputs. The 2011 Census data has been incorporated into the final Plan. We believe our work on population and property forecasts gives a sound basis for developing our plan and strategy.

<u>Plan-based Projections</u>

Plan-based projections are founded on Local Authority plans. We have worked with Local Authorities in our area, via Experian, and also through our internal planning team. A log of contact for all Local Authorities has been produced.

For London, information has been derived from the London Plan.

[12] GLA (2011) The London Plan Spatial Development Strategy for Greater London, July 2011 (http://www.london.gov.uk/priorities/planning/londonplan)

[13] Experian (2012) Population, Household and Dwelling Forecasts for WRMP14 – Phase 1

[14] Environment Agency (2012) Methods of Estimating Population and Household Projections

Outside London information was requested from each Local Authority. There are 63 Local Authorities in our water supply area. For the draft Plan data was requested using a Data Collection Template, which was sent to all the Local Authorities on 26 April 2012 with a request for response by 12 May 2012. Follow up e-mails were sent in the following days and weeks depending on the responses received. E-mails were tailored to each Local Authority, by Experian, and were targeted to individuals within the Local Authority where a named contact could be provided. The contacts list was generated from a combination of water company contacts, Experian contacts and contacts provided by the DCLG. In the main, the template was sent to the planning departments. The information available varied between Authorities depending on the status of the projections. Where information was not supplied by the Local Authority directly, it was collected from alternative sources. A hierarchical system was used, with the most recent sources given preference if contact with an authority was not established.

All sources included:

- Directly from Local Authorities
- Directly from County Councils
- From Local Authority Plans, Core Strategies, Local Development Frameworks or Annual Monitoring Plans – depending on availability and date of publication.

Annual dwelling figures from each of the plans from 2011 onwards are converted to households and added on to the base year to produce a plan-based household forecast.

Estimates of district level plan based population are recalculated by applying projections of average household size from the trend-based projections to the plan based household projections.

Local Authority plans cover different periods of time, typically projecting only until 2025 or in many cases earlier. In order to predict beyond this date, the likely trajectory of the plan-based projections is estimated using information from the trend based projections.

The data collection exercise has been re-run in full for Phase 2 in June 2013. Data collection rates were higher for phase 2, as we have, throughout this process, established relationships with Local Authorities, and more Local Authorities have completed their local plans.

The WRPG recommends the use of plan based forecasts.

<u>Trend-based Projections</u>

Trend-based projections are neither a forecast of what is expected to happen, nor a statement of government policy. The trend-based district level projection of population and household targets are based on a combination of the latest sub-national estimates and population projections (2010) from ONS applied to Department of Communities and Local Government (DCLG) projections of average household size. The DCLG household projections are 2008-based, so have been re-based to ensure consistency with the latest 2010-based population projections. The ONS sub-national projections only extend to 2035 and have been extended to 2040 using a simple extrapolation of the last five years of the projection. The techniques used to re-base and extend the projections are in accordance with the Environment Agency methods report. Trend-based projections are a key input to producing plan-based projections.[15]

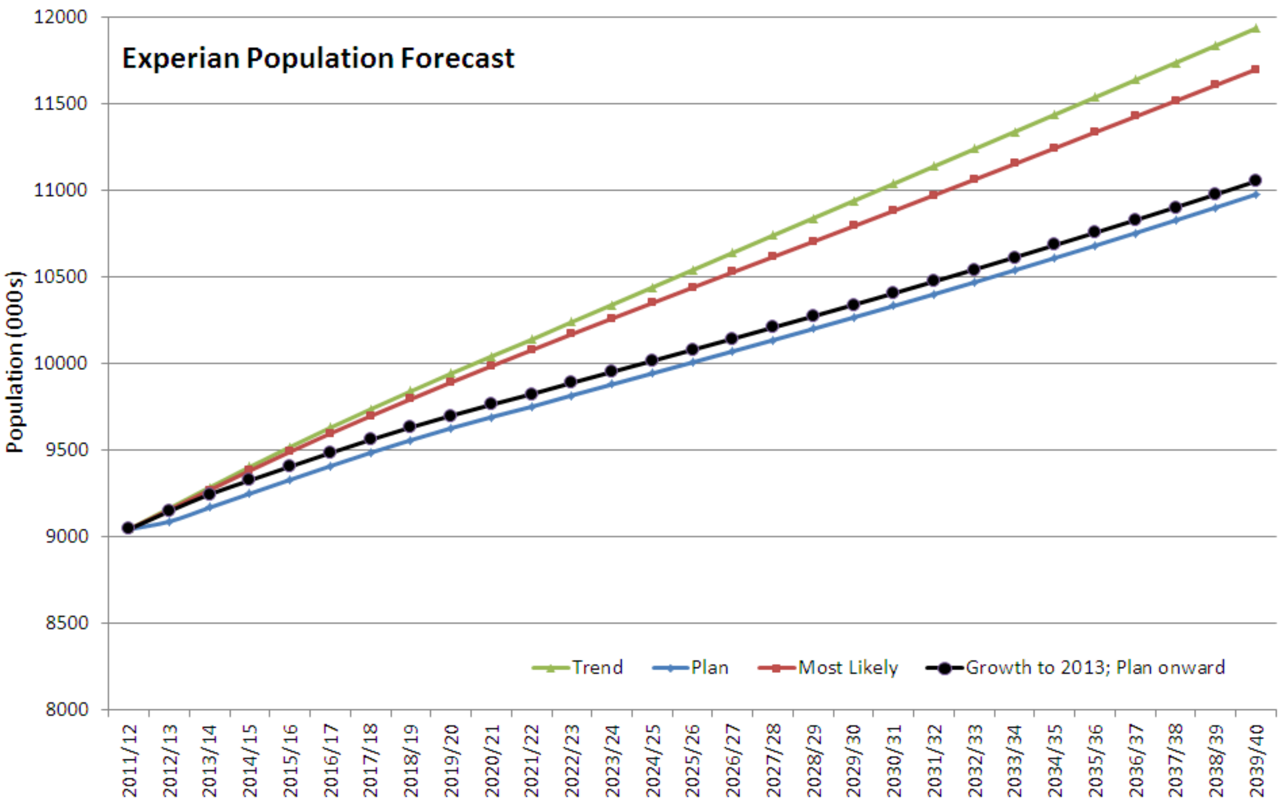
Most Likely Estimates

Experian reviewed a number of options for producing a most likely scenario, further details are documented in Appendix E. The methodology taken forward was to assume that trend-based population projections are achieved. This is supported by stochastic analysis which shows that the projections have generally been very close to outturn, and where they have been inaccurate the errors are biased to the upside, i.e. population is more likely to be higher than projected rather than lower. There also appears to be little evidence of population growth abating in recent statistics.

The rate of household formation has slowed in recent years and average household size has been falling at a slower rate and in some areas, notably London and the South East, has actually been increasing. We have therefore modelled average household size for each of the WRZs to produce new household targets for each local authority.

Population Projections

The projections of total population growth from the different scenarios are shown in Figure 3-4.



[15] Experian (2012) Population, Household and Dwelling Forecasts for WRMP14 – Phase 1

Figure 3-4: Population projections for Plan, Trend and Most Likely scenarios

The Guidelines recommend the use of the Plan forecast. However, publication of the recent 2011 Census figures shows that actual population growth in the short-term has exceeded the plan-based forecasts used in the draft WRMP. The updated forecast in the final WRMP has therefore used the actual reported population growth data to March 2013, and then follows the Plan-based projections thereafter.

The growth in population relative to the base year of 2011/12 is summarised in Table 3-10.

Table 3-10: Population growth relative to the base year of 2011/12 (000s)

Projection	Total Population 2011/12 (000s)	Population Growth above 2011/12					
		End AMP5	End AMP6	End AMP7	End AMP8	End AMP9	End AMP10
Plan[16]	9043.407	281.89	655.38	971.90	1295.51	1639.93	2009.03
Most Likely		338.14	847.68	1305.71	1749.67	2200.13	2655.11
Trend		359.43	898.31	1396.26	1895.69	2394.28	2892.79

Growth in the Most Likely and Trend scenarios are 0.65 and 0.88 million people higher respectively in 2039/40 compared with the Growth + Plan scenario. The Growth + Plan forecast is 75,000 people higher than the Plan forecast alone over the same period.

Population growth is a considerable uncertainty. In Section 9 and Section 10 we explore how changes in demand for water would affect our plan.

Property Projections

Property growth produced by the different scenarios is shown in Figure 3-5 and shown relative to the base year in Table 3-11.

[16] Actual reported population data used to March 2013 and then Plan-based projections followed thereafter

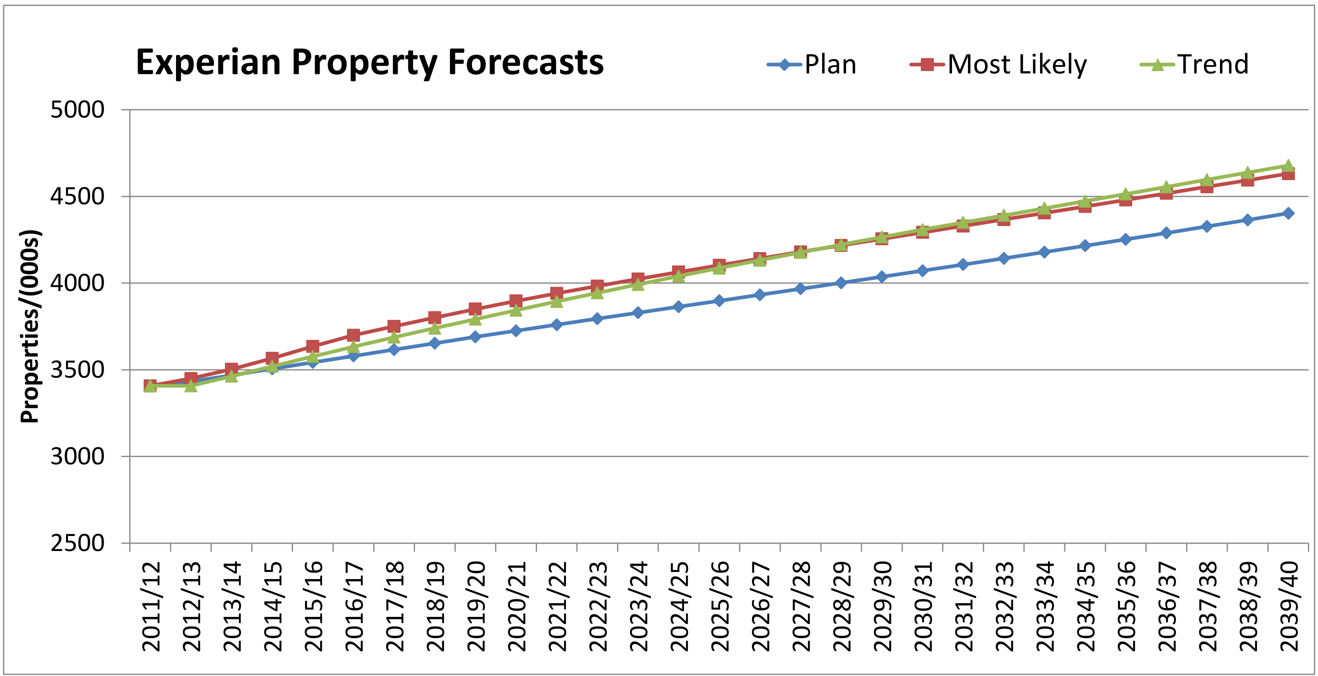


Figure 3-5: Projected total property growth in the Plan, Trend and Most Likely scenarios

Table 3-11: Property growth relative to the base year of 2011/12 (000s)

Projection	Total Properties 2011/12[17]	Property Growth From 2011/12					
		2014/15	2019/20	2024/25	2029/30	2034/35	2039/40
Plan	3,407.10	98.35	135.38	172.48	209.36	246.18	282.65
Most Likely		158.70	228.07	291.96	343.23	393.64	443.22
Trend		113.01	169.80	226.33	280.76	332.93	384.60

Again, differences can be seen between the Plan-based forecast and the other scenarios. The Trend-based forecast has 0.10 million more properties than Plan-based by 2039/40 and Most Likely has 0.16 million more properties than Plan-based by 2039/40.

[17] Connected households

Chosen Projection

We reviewed the different scenarios produced by Experian and have chosen to base both our population and property forecasts upon the Plan-based scenario, post March 2013. The key reasons for this are:

- The WRPG places a high emphasis on consulting Local Authorities and including their views. These are reflected in the Plan-based projection.
- The growth in trend and most likely scenarios, particularly for properties, are very high compared to historic levels (beyond the recent years impacted by the downturn).

We discussed our choice with the Environment Agency before originally publishing our draft WRMP and advised them of our intention to update the final WRMP using data from the 2011 Census.

Figure 3-6 and Figure 3-7 show how our population and properties are expected to change over the period of this plan.

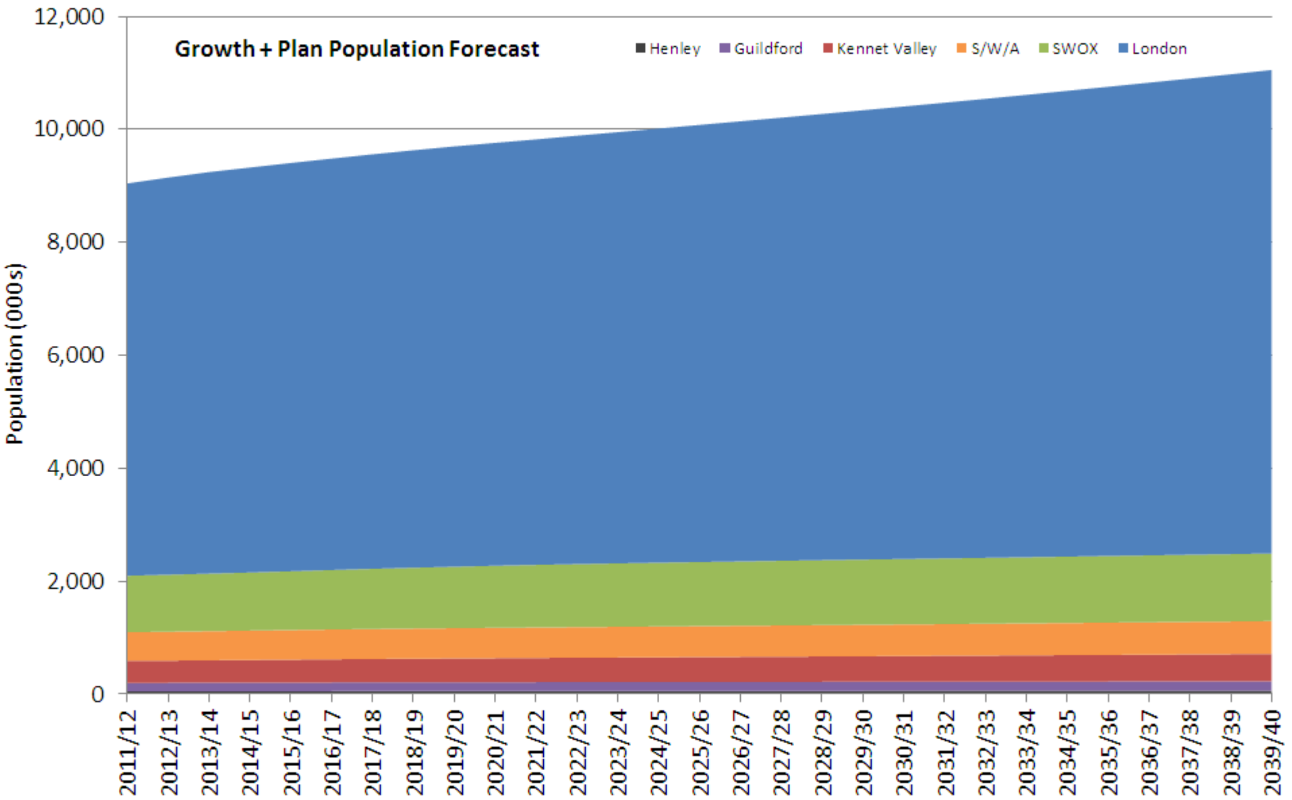


Figure 3-6: Plan Scenario population forecasts

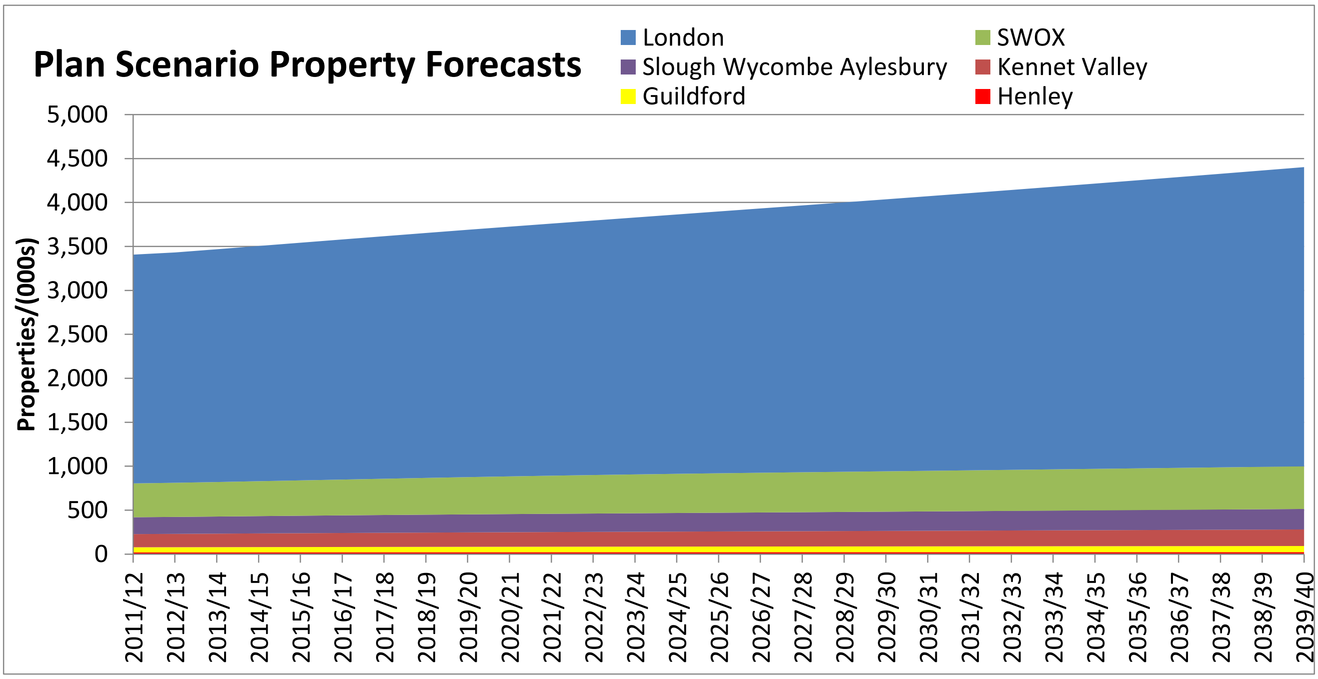


Figure 3-7: Plan Scenario property forecasts

The majority of growth is expected to occur within our London WRZ. Table 3-12 shows the population and property forecasts, and average occupancy derived from these values. This is consistent with historical data and forecasts and continues to point to the need for robust water resource planning for London. Table 3-13 summarises the growth in population and properties for each of our WRZs.

Table 3-12: Population, properties and average occupancy forecasts for each water resource zone

WRZ	Parameter	Type	11/12	14/15	19/20	24/25	29/30	34/35	39/40
London	Population (000s)	Unmeasured	5069.480	4929.575	4670.179	4463.996	4264.855	4035.924	3808.306
		Measured	1538.383	1903.027	2432.536	2883.886	3352.269	3872.460	4412.975
		Non Household	338.757	338.757	338.757	338.757	338.757	338.757	338.757
	Properties (000s)	Unmeasured	1924.191	1790.167	1671.223	1573.508	1475.793	1378.078	1280.363
		Measured	630.471	825.368	1082.376	1316.384	1557.061	1805.298	2061.010
	Occupancy	Unmeasured	2.635	2.711	2.756	2.795	2.845	2.880	2.921
		Measured	2.440	2.413	2.324	2.253	2.203	2.186	2.173
SWOX	Population (000s)	Unmeasured	478.038	459.857	441.778	421.583	402.289	383.784	363.233
		Measured	473.192	519.534	598.181	659.357	702.903	742.989	786.348
		Non Household	48.766	48.766	48.766	48.766	48.766	48.766	48.766
	Properties (000s)	Unmeasured	174.271	164.176	153.356	143.617	133.878	124.139	114.400
		Measured	204.711	229.254	266.387	298.917	323.014	345.253	367.900
	Occupancy	Unmeasured	2.743	2.801	2.862	2.915	2.982	3.067	3.147
		Measured	2.312	2.288	2.270	2.241	2.217	2.196	2.184
SWA	Population (000s)	Unmeasured	308.476	300.899	290.390	279.537	266.716	253.579	240.083
		Measured	174.396	194.282	220.887	241.771	265.807	290.753	316.959
		Non Household	24.755	24.755	24.755	24.755	24.755	24.755	24.755
	Properties (000s)	Unmeasured	109.999	105.709	99.846	94.032	88.218	82.403	76.589
		Measured	78.906	88.784	103.158	115.471	128.320	141.285	154.455
	Occupancy	Unmeasured	2.804	2.875	2.939	3.006	3.060	3.117	3.178
		Measured	2.210	2.187	2.154	2.122	2.115	2.112	2.114

WRZ	Parameter	Type	11/12	14/15	19/20	24/25	29/30	34/35	39/40
Kennet Valley	Population (000s)	Unmeasured	227.928	221.686	214.322	206.281	197.826	187.888	177.068
		Measured	143.002	161.092	188.803	212.283	235.344	260.534	287.338
		Non Household	19.016	19.016	19.016	19.016	19.016	19.016	19.016
	Properties (000s)	Unmeasured	83.413	80.107	75.568	71.065	66.563	62.061	57.559
		Measured	64.339	73.369	86.552	97.738	108.041	118.374	128.857
	Occupancy	Unmeasured	2.733	2.816	2.889	2.960	3.035	3.096	3.151
		Measured	2.223	2.198	2.175	2.148	2.132	2.132	2.139
Guildford	Population (000s)	Unmeasured	87.777	85.490	82.828	79.810	76.535	72.788	68.918
		Measured	55.038	60.669	67.318	73.055	78.344	84.192	90.279
		Non Household	7.321	7.321	7.321	7.321	7.321	7.321	7.321
	Properties (000s)	Unmeasured	32.533	31.248	29.485	27.736	25.987	24.238	22.489
		Measured	24.751	27.605	31.420	35.214	38.946	42.701	46.520
	Occupancy	Unmeasured	2.698	2.759	2.834	2.905	2.975	3.035	3.100
		Measured	2.224	2.202	2.179	2.150	2.139	2.142	2.149
Henley	Population (000s)	Unmeasured	22.458	21.747	21.154	20.422	19.660	18.833	17.861
		Measured	24.230	26.430	29.399	32.320	35.365	38.606	42.056
		Non Household	2.394	2.394	2.394	2.394	2.394	2.394	2.394
	Properties (000s)	Unmeasured	8.371	8.023	7.538	7.057	6.577	6.096	5.616
		Measured	11.157	12.410	14.052	15.134	15.754	16.462	17.180
	Occupancy	Unmeasured	2.683	2.774	2.876	2.971	3.075	3.185	3.289
		Measured	2.683	2.774	2.876	2.971	3.075	3.185	3.289

The decrease seen for measured occupancy and the increase in occupancy seen for unmeasured properties is due to continuing optant metering. Optants are more likely to have low occupancy as they benefit most from switching to a measured tariff due to their overall low consumption and it is the movement of low occupancy properties away from the unmeasured category that results in the occupancy trends seen in Table 3-12.

Table 3-13: Growth in population and properties for each of our water resource zones

		Change in Population/Properties from Base Year (000's)						
		2011/12	2014/15	2019/20	2024/25	2029/30	2034/35	2039/40
London	Population	0	224.739	494.852	740.019	1009.261	1300.521	1613.418
	Properties	0	60.873	198.936	335.229	478.191	628.713	786.710
SWOX	Population	0	28.161	88.729	129.709	153.961	175.543	198.352
	Properties	0	14.448	40.762	63.553	77.910	90.410	103.319
SWA	Population	0	12.309	28.405	38.436	49.650	61.460	74.170
	Properties	0	5.588	14.099	20.598	27.632	34.784	42.139
Kennet Valley	Population	0	11.848	32.195	47.634	62.240	77.492	93.476
	Properties	0	5.724	14.367	21.051	26.852	32.682	38.663
Guildford	Population	0	3.343	7.331	10.050	12.064	14.165	16.382
	Properties	0	1.569	3.620	5.665	7.649	9.655	11.725
Henley	Population	0	1.489	3.864	6.054	8.337	10.750	13.229
	Properties	0	0.905	2.062	2.664	2.803	3.031	3.268
Total	Population	0	281.888	655.376	971.902	1295.514	1639.931	2009.027
	Properties	0	89.107	273.846	488.76	621.037	799.275	985.824

3.3.4 Household Water Use

Micro-components of demand

Household water use can be described by a number of elements of water use called micro-components. Micro-components typically comprise appliances such as washing machines or dishwashers; personal washing by bath or shower; toilet use; and the use of internal or external taps.

Knowledge of these micro-components i.e. their ownership rates, frequency of use and volume per use, both now and in the future, can provide a reliable basis for demand forecasting.

As required by the WRPG, and in line with best practice as set out in UKWir report CU02[18], we followed a micro-component approach to forecast future domestic water use.

Micro-components are split into the following categories within our micro-component model:

- Toilet flushing
- Personal washing
    - Showers
    - Power Showers
    - Baths
- Clothes washing
    - Washing Machines
    - Washer Driers
    - Hand Clothes Washing (Internal taps)
- Dish washing
    - Dishwashers
    - Hand washing (Internal taps)
- Outside or external use
    - Watering Cans
    - Garden Sprinklers
    - Hosepipes
- Miscellaneous use
    - General internal tap use (cooking, cleaning etc.)
    - Wastage (eg. plumbing losses)

[18] CU02 Customer Behaviour and Water Use A good practice manual and roadmap for household consumption forecasting UKWIR 2012

Updating the Base Year micro-components

To update our micro-component assessment for the base year, a telephone survey was completed with 3,000 participants. Using the information gathered from the telephone survey verified and supplemented by other sources such as Defra's Market Transformation Programme and the Waterwise Evidence Base. Furthermore comparisons were made with the following sources:

- WRc Identiflow project CP187
- TW 2002 Identiflow study
- 2008 inter-company benchmarking study
- MTP/WRc new property microcomponents
- MTP modelling 2010

Base year micro-component values were derived for each water-using device and expressed in terms of ownership, frequency of use and volume per use. Volume per use is further split into a flow rate and time per use for micro-components such as hosepipes and showers.

Our estimate of how water is used for measured and unmeasured customers in the base year for London is shown in Figure 3-8:

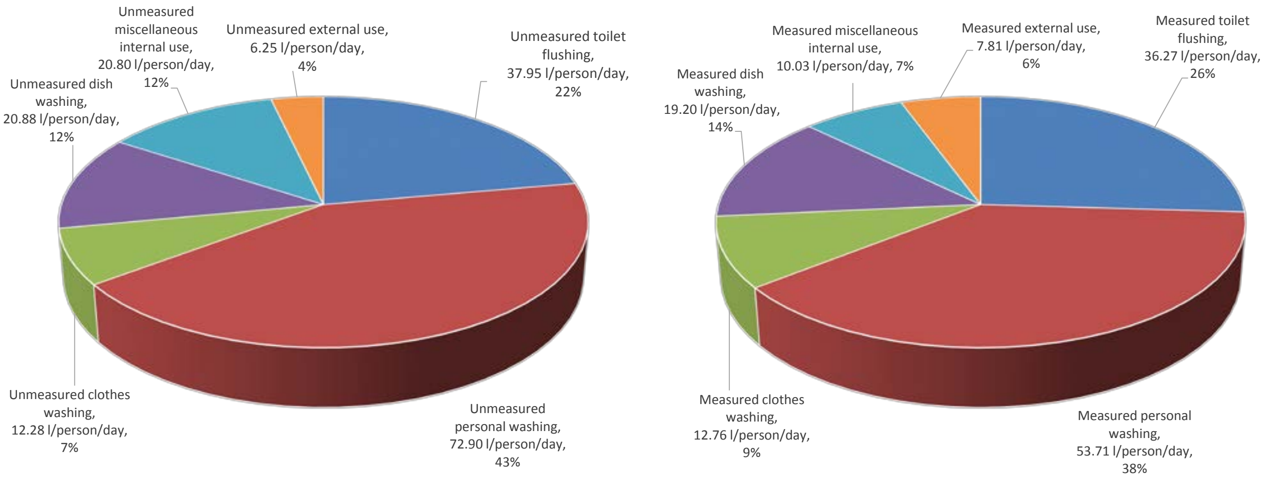


Figure 3-8: Base Year micro-component water use - London

The most noticeable difference between the charts is that unmeasured households on average use 18%, 30 l/person/day, more than measured households. Most of this difference is accounted for by the increased volume of water used in unmeasured households for personal washing and in the miscellaneous water use category. All other micro-components show little difference.

The increased volume for personal washing is attributed to longer shower times. The difference in the miscellaneous water use category is primarily attributable to customer wastage such as plumbing losses.

As stated above, our average per capita consumption in London is above industry average.

Further information on the results of the survey and sources of data, by component, are reported in Appendix F.

Forecasting Household Water Use

As with any form of forecasting there are always uncertainties and assumptions that need to be made. We use a wide range of data sources to help inform forecasts and we also participate in collaborative industry research projects. There are times where professional judgement is required and we have enlisted the help of external expert consultants to guide us in these circumstances. A large number of variables are used in the demand forecast models and more information regarding these can be found in Appendix F.

Having established a base set of micro-components and matched them to the reported measured and unmeasured PCC, we use our micro-component model to forecast rates of replacement, changes in volume per use, changes to total ownership and changes in frequency of use of each component. This gives us a view on how consumption may change in future.

The output from this model is an overall annual rate of change for measured and unmeasured households which are used in the calculations of the wider demand forecasting model.

The rates of change for each modelled micro-component for measured and unmeasured households are shown in Figure 3-9 and Figure 3-10.

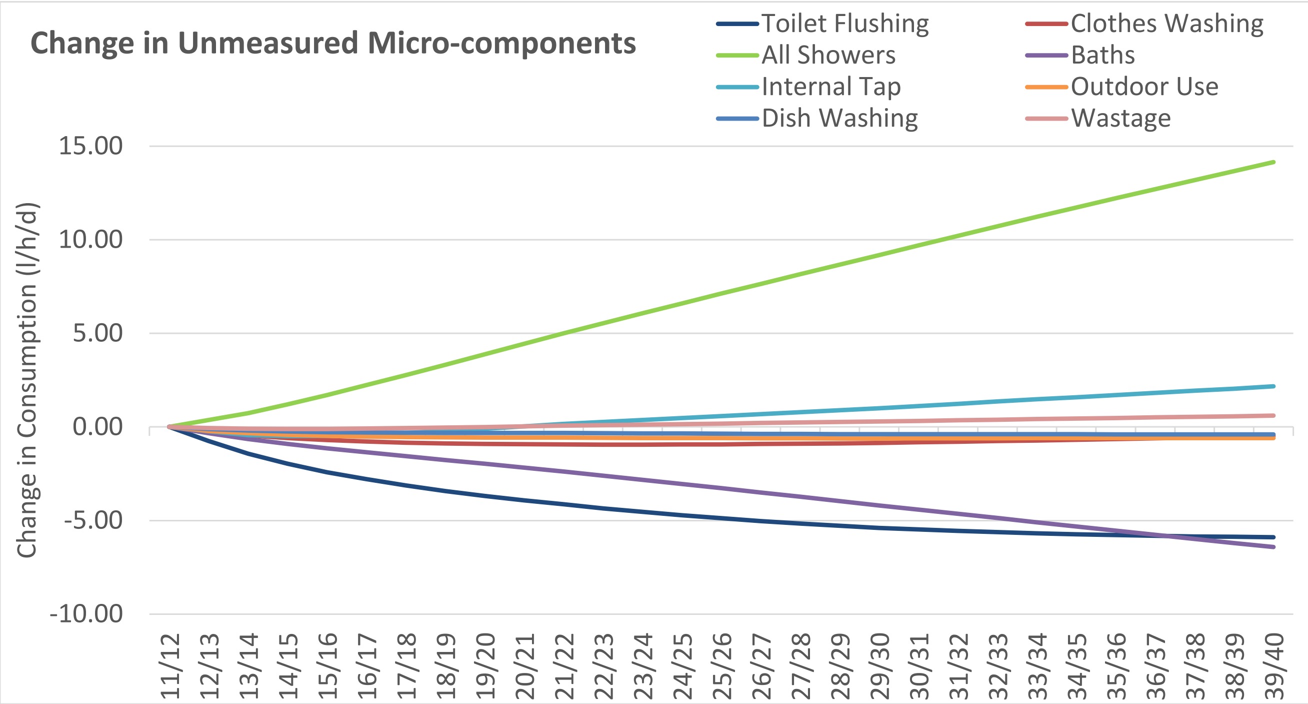


Figure 3-9: Change in micro-components for unmeasured households

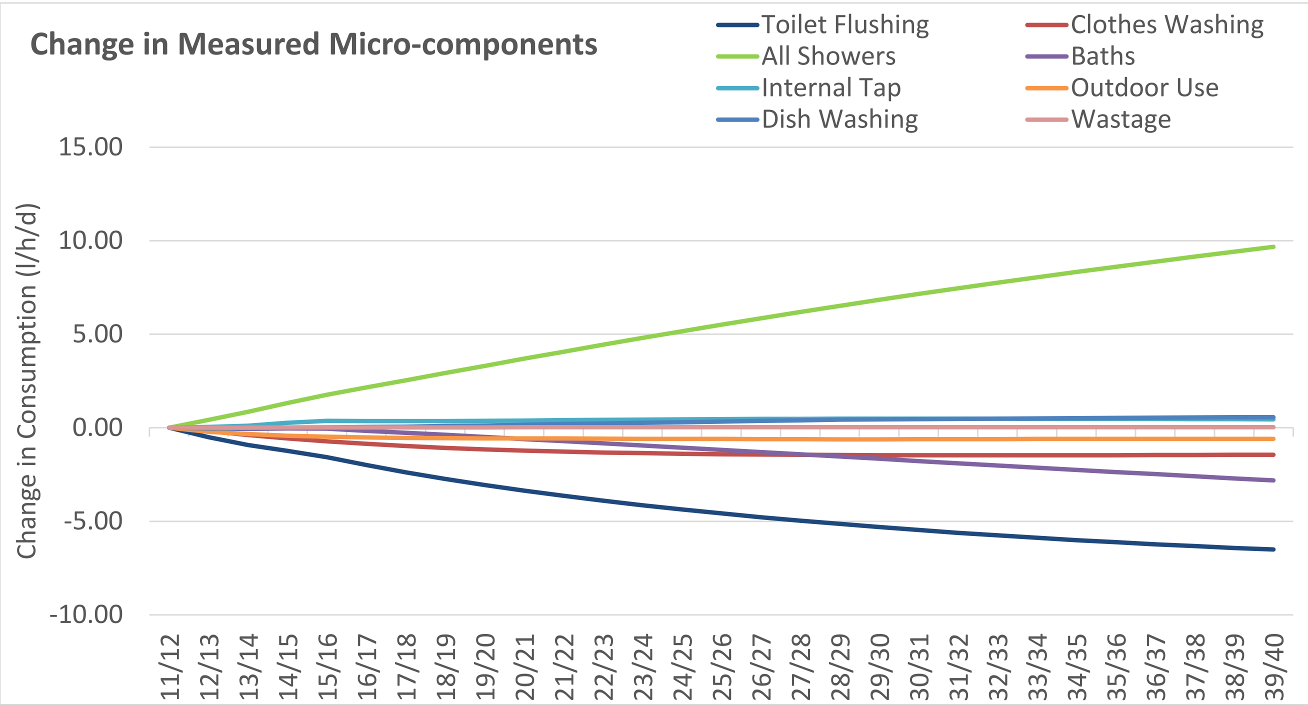


Figure 3-10: Change in micro-components for measured households

There is a continued trend in people choosing to have a shower instead of a bath. There is a small increase in showering time, equivalent to an increase of 0.5 seconds/shower/year. Both the continued trend away from bathing and the increase in shower time means that showering is the main micro-component driving an increase in PCC for both measured and unmeasured customers.

There is a slight upward trajectory in outdoor water use due to a small increase (0.1% per year) in the ownership of garden hoses and sprinklers.

There is a decrease in consumption relating to both toilet and bath use, exerting a significant downward influence on PCC. As discussed above, bath use is declining as people tend to take more showers than baths. The downward trajectory seen in water use in toilets is a result of people gradually replacing old toilets with large cisterns with modern toilets which have a much smaller cistern. This downward trend for water use in toilets is more pronounced for unmeasured than measured households because new houses which were built prior to the base year were built with meters installed and more water efficient toilets.

The overall rates of change for households were carried forward to the demand forecasting model where these rates of change were used to calculate how much water will be used throughout the planning period.

Further information on micro-component forecasting is available in Appendix F.

Water use in new homes

The water consumption performance of new properties is subject to the Building Regulations Part G. These include a whole building target in line with the joint Defra & Communities and Local Government (2007) statement of 125 l/h/d[19].

There is also a voluntary (for privately developed properties) Code for Sustainable Homes that has even lower guideline per property usage of 105 and 80 l/h/d.

In our forecasts we have assumed all new properties achieve 125 l/h/d, and remain at that level over time. We have not seen enough evidence that a consistently lower PCC can be achieved in the bulk of new properties to justify basing our forecasts on an even lower usage level.

Importantly, houses do not use water, people do, so meeting a per property target does not mean that the home will meet that standard when it is built and occupied. The actual delivered PCC will be influenced by occupancy and the water use behaviour of the occupants. This means that for an “average” home, with “average” occupancy and “average” behaviour, the water consumption should be in the region of 125 l/h/d.

[19] Water Efficiency in New Buildings
http://www.communities.gov.uk/documents/planningandbuilding/pdf/WaterEfficiencyNewBuildings.pdf

3.3.5 Demand management in the baseline forecast

Optant metering

Figure 3-11 shows optant meter installations since 2008.

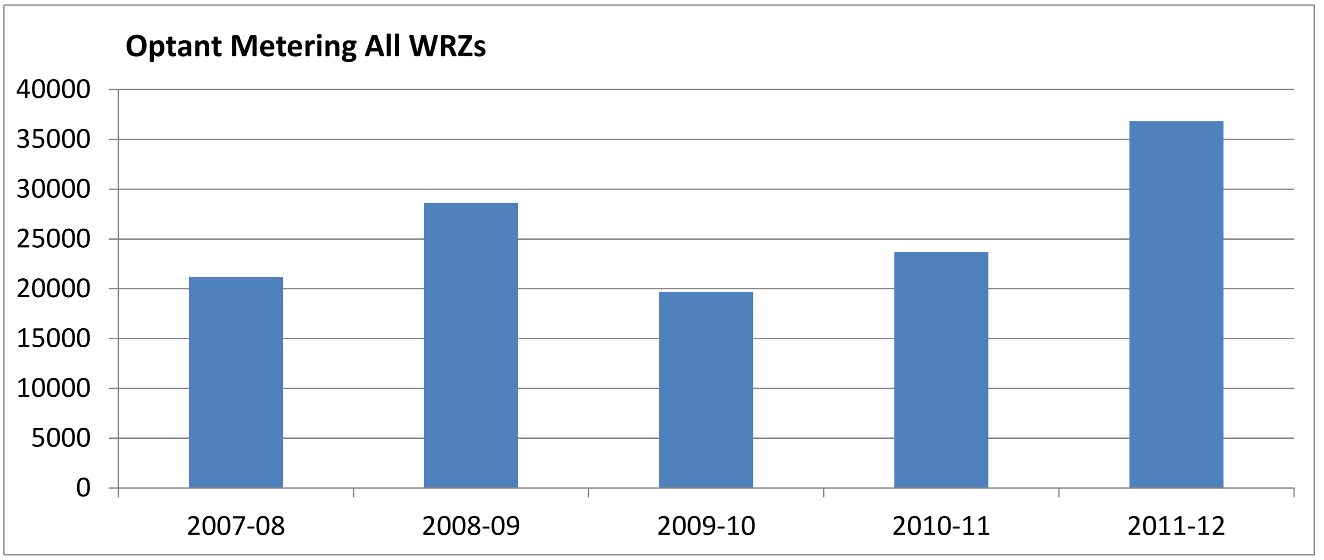


Figure 3-11: Optant meters installed in the last 5 years

The number of households opting to have a meter installed has varied from around 20,000 per year to over 35,000 optants in 2011/12. The relatively large number of optant metering in the reporting year 2011/12 was due to our proactively targeting customers who we believed would financially benefit by being billed on their actual usage rather than rateable value.

Without further intervention or targeting we expect numbers to revert to their normal range of between 20,000 and 30,000 per year over the forecast period and have chosen a value of 24,000 per annum from AMP6 onwards. We expect our campaign from 2011-12 to result in elevated numbers of installations for the remainder of AMP5.

Selective meters

There are no selective meter installations in the baseline demand forecast, other than those we intend to complete in the period up to the end of 2014/15, as discussed in section 2.

Water efficiency

The baseline forecast for water efficiency remains at 3.45 Ml/d in savings in domestic water use each year equivalent to 1 l/person/day. This was the AMP5 target determined by Ofwat, our economic regulator. A decay function, with a half life of 7 years for domestic water efficiency and 10 years for non-households, is used to model the reduction in water savings from the individual water efficiency measures across the forecast, based on a methodology published by

Waterwise[20]. This takes into account the propensity of devices to be no longer used over time or for them to not function effectively. This decay in benefits of water efficiency measures is in equilibrium with recurring new water efficiency where the rate of decay is equal to the new water efficiency measures being introduced.

We commissioned Artesia Consulting[21] to develop an upper, mid and lower estimate of savings that would be delivered by the baseline water efficiency programmes, which are shown in Figure 3-12.

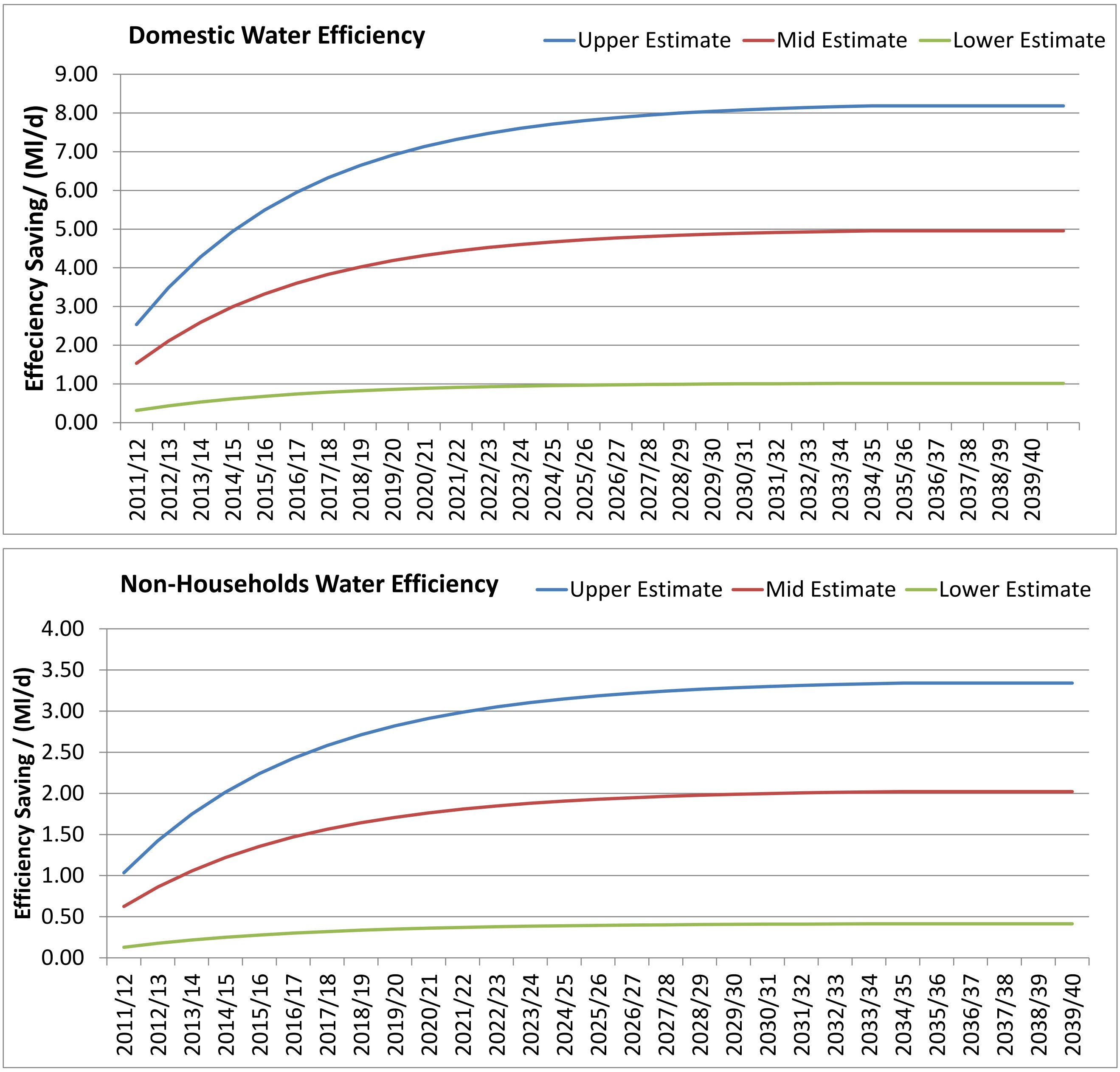


Figure 3-12: Estimates of water efficiency savings for domestic and non-household usage

[20] Waterwise, October 2008. Evidence base for large-scale water efficiency in homes, Phase I Report
[21] Artesia (2013) Domestic water use micro-component input values for PCC model for WRMP14. Ref: AR1067

The upper estimate assumes that the water efficiency programme delivers its full saving while the lower and mid estimates are based on the results of water efficiency trials. We have decided to include the upper estimate in our demand forecasts while the mid and lower estimates have been used in the calculation of headroom.

In developing our preferred programme we believe water efficiency is key to managing the long-term supply-demand balance (Section 9).

3.3.6 Climate Change Impact on Demand

We commissioned HR Wallingford to carry out a study[22] to estimate the likely impacts of climate change upon household demand. No climate change effects are assumed for other components of demand.

HR Wallingford undertook a statistical analysis of available data in order to derive empirical relationships that describe how weather and other factors affect household demand for water in our supply area.

We provided the following data sets:

- Domestic Water Use Survey (DWUS) Unmeasured PCC by property type (2000-2010)
- PCC by property type for testDWUS[23] panel (2002-2004)
- Demand data (distribution input – minimum night line, 1998 onwards)
- Climate data (temperature, rainfall and sunshine hours, 1998 onwards)

HR Wallingford used multiple linear regression to analyse data and to produce predictive equations.

Three climate variables were considered in the statistical analysis; temperature, rainfall and sunshine hours. However sunshine hours were removed as it was found to be highly correlated with temperature, and temperature provided a stronger and better understood climate change signal which would increase confidence in the model. Including both sunshine hours and temperature could have resulted in instability within the model. For the DYAA model both rainfall and temperature were included. For the ADPW model only temperature was included as an explanatory variable, this was due to insufficient data as for most years there was no rainfall in the peak period.

[22] HR Wallingford (2012) EX6828 Thames Water Climate Change Impacts and Water Resource Planning. Thames Water Climate Change Impacts on Demand for the 2030s

[23] testDWUS – A temporary panel of unmeasured customers used to validate DWUS

To estimate the impacts of climate change, the full sample of 10,000 UKCP09 climate change projections for maximum temperature and rainfall in the Thames Valley basin in the 2030s; medium emissions scenario, was used. These scenarios provide climate change factors that are applied to the regression models.

The climate change factors are reported as the change between the baseline period (1961-1990) and the future period (2021-2050). As the baseline for the WRMP is 2011 a scaling factor was calculated:

$$ScalingFactor = \frac{2035 - BaseYear}{2035 - 1975}$$

As the base year is 2011 this results in a scaling factor of 0.4, i.e. 60% of the climate change between 1975 and 2035 has already been assumed to have occurred.

These factors were then used with the regression relationships, described above, to provide estimates of PCC change due to climate change in the 2030s. The results of this gave 10,000 potential future PCC factors. The 10th, 50th and 90th percentiles of these factors were extracted to represent lower, mid and upper estimates of impact on PCC. The mid estimate was used in the demand forecasting models while the upper and lower estimates were used in headroom modelling (see Section 5).

The climate change profiles for lower, mid and upper estimates are shown for the DYAA in Figure 3-13 and the ADPW scenario in Figure 3-14.

Climate Change Impact for Dry Year Annual Average

The impacts of climate change for the DYAA scenario are shown in Table 3-14. These values are applied to all our WRZs.

Table 3-14: The impacts of climate change for the DYAA scenario

	Base Year	2014/15	2019/20	2024/25	2029/30	2034/35	2039/40
Impact (%)	0	0.1	0.2	0.3	0.4	0.5	0.6

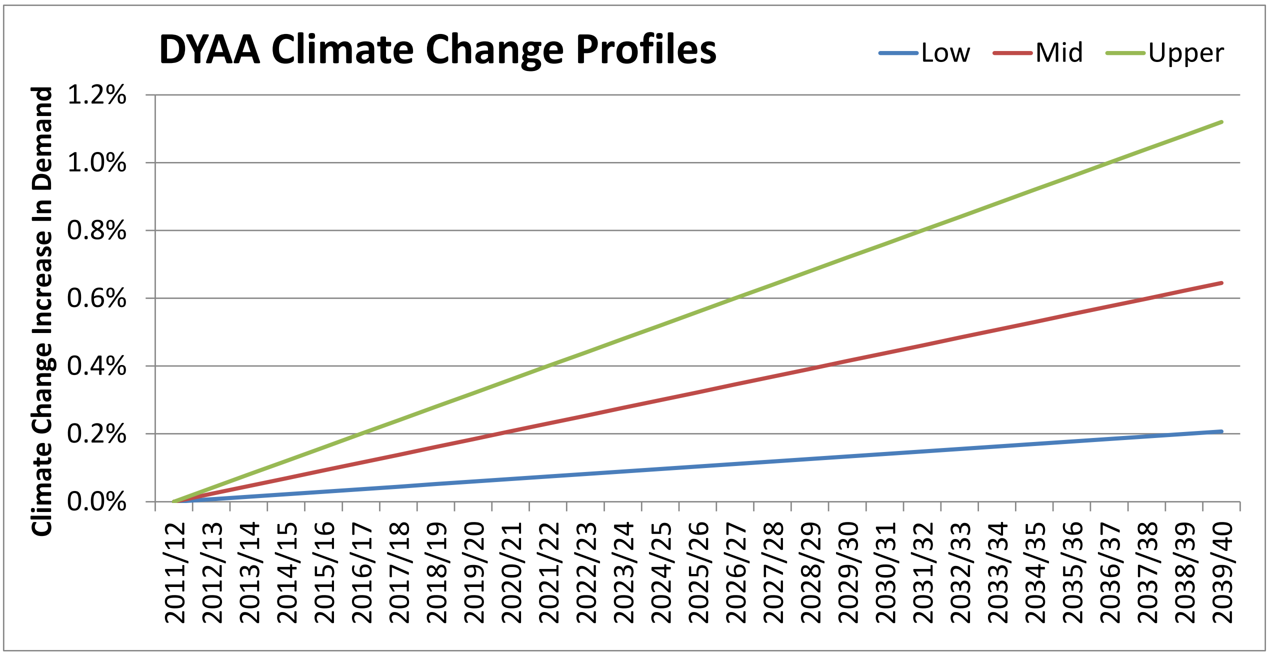


Figure 3-13: Climate Change impact on demand profile – DYAA

Climate Change Impact for Average Day Peak Week

The impacts of climate change for the ADPW scenario are shown in Table 3-15. These values are applied to all our WRZs.

Table 3-15: The impacts of climate change for the ADPW scenario

	Base Year	2014/15	2019/20	2024/25	2029/30	2034/35	2039/40
Impact (%)	0	0.4	0.9	1.5	2	2.7	3.3

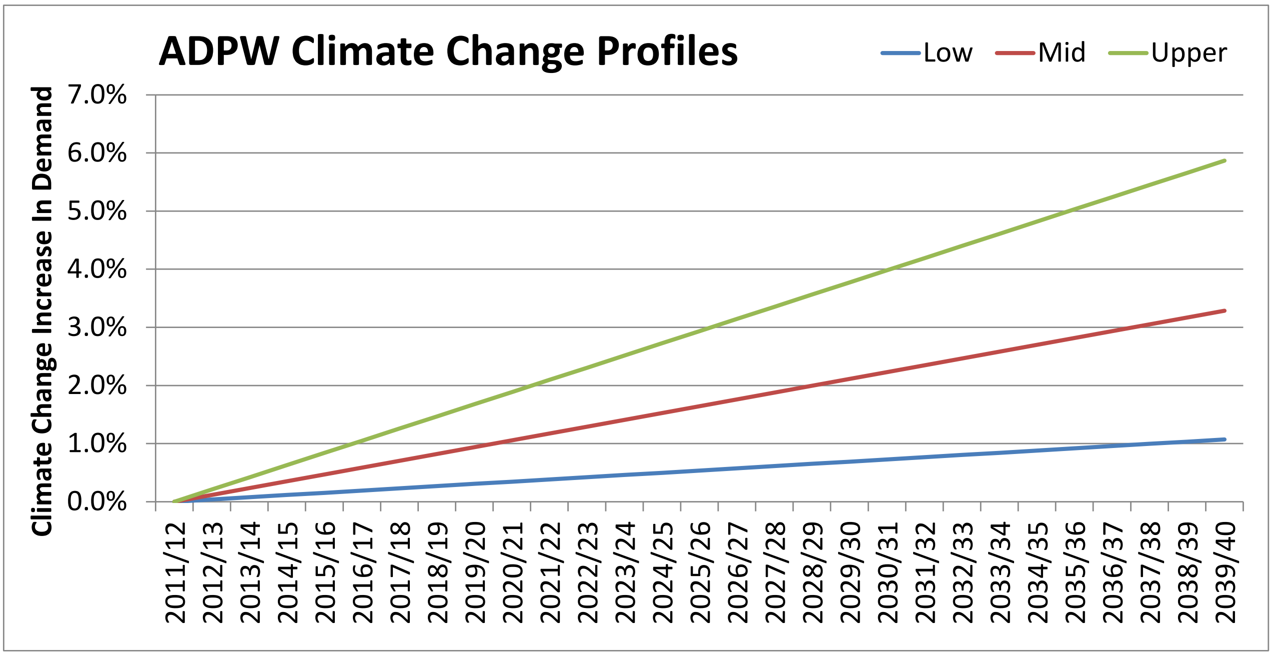


Figure 3-14: Climate Change impact on demand profile - ADPW

3.3.7 Summary - Household Water Use

Total household consumption is summarised in Table 3-16 for each WRZ and PCC shown in Figure 3-15.

Table 3-16: Total Household Consumption - DYAA (Ml/d)

WRZ	Total Household Water Use							
	2011/12	2014/15	2019/20	2024/25	2029/30	2034/35	2039/40	% change
London	1082.26	1091.69	1120.41	1155.41	1195.45	1239.20	1286.40	19
SWOX	135.83	137.88	145.20	151.05	154.98	158.64	162.50	20
SWA	74.42	75.26	77.16	78.66	80.45	82.38	84.45	13
Kennet Valley	54.26	55.14	57.56	59.72	61.87	64.15	66.55	23
Guildford	22.87	23.08	23.47	23.85	24.16	24.51	24.89	9
Henley	7.16	7.24	7.50	7.78	8.09	8.44	8.79	23
Thames Water	**1376.79**	**1390.30**	**1431.28**	**1476.47**	**1525.01**	**1577.32**	**1633.58**	**19**

Overall we forecast household demand to increase by approximately 250 Ml/d without intervention or approximately 19% against a population increase of approximately 22%. See Table 3-13.

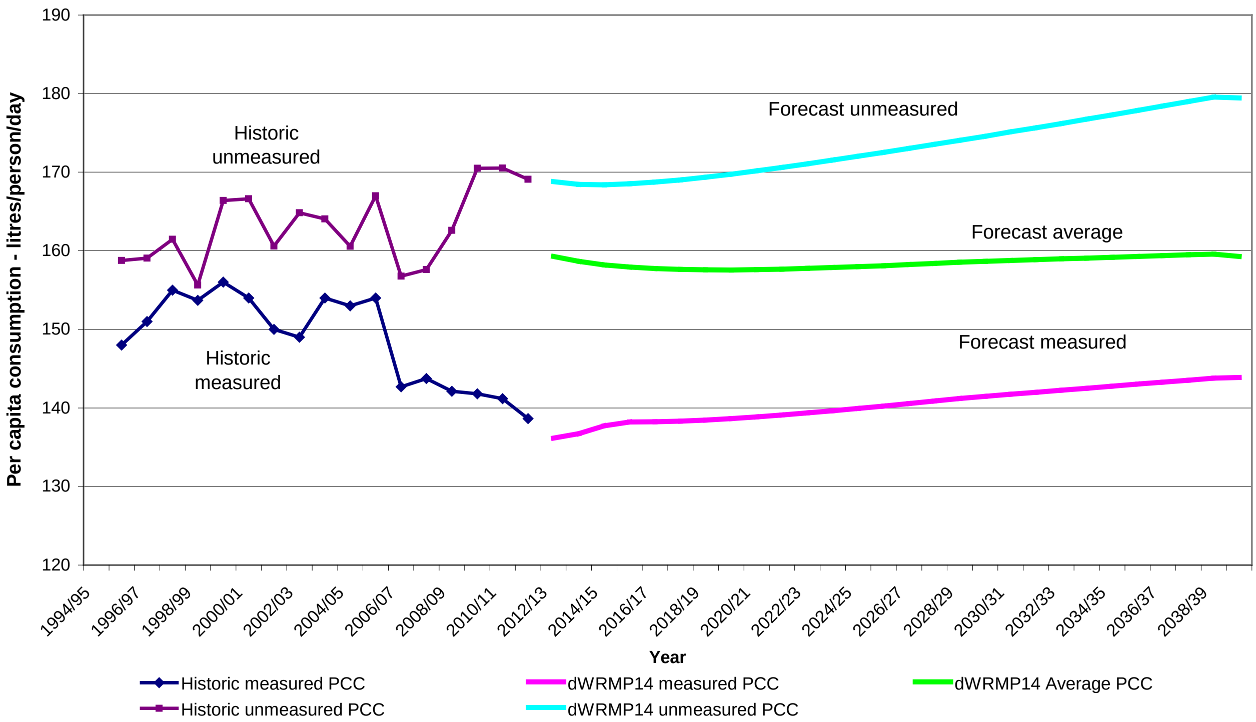


Figure 3-15: Company level historic PCC and Baseline forecast

Overall the baseline PCC forecast is largely flat. This is because the underlying increases in both unmeasured and measured PCC (as discussed in section 3.3.4) is being offset as more customers opt for a meter and reduce their water use.

Customers who choose to opt are generally low water users however this does not necessarily mean low PCC.

3.3.8 Non-Household Water Use

Non-household water use in our supply area tends to follow wider economic trends. In our supply area we do not have a large agricultural sector, as is found for example in East Anglia or a significant, declining industrial sector as has occurred in some other areas of the country. Consequently, our forecasts of non-household water use have remained fairly flat.

We contracted Experian to undertake econometric analysis to identify the historical relationship between non-household water demand and a range of explanatory factors including industrial output and employment, efficiency of water use and water charges. The results of this statistical analysis were combined with Experian forecasts of output and employment by industry to provide forecasts disaggregated by sector for our supply area.

The non-household demand for each WRZ is shown in Figure 3-16.

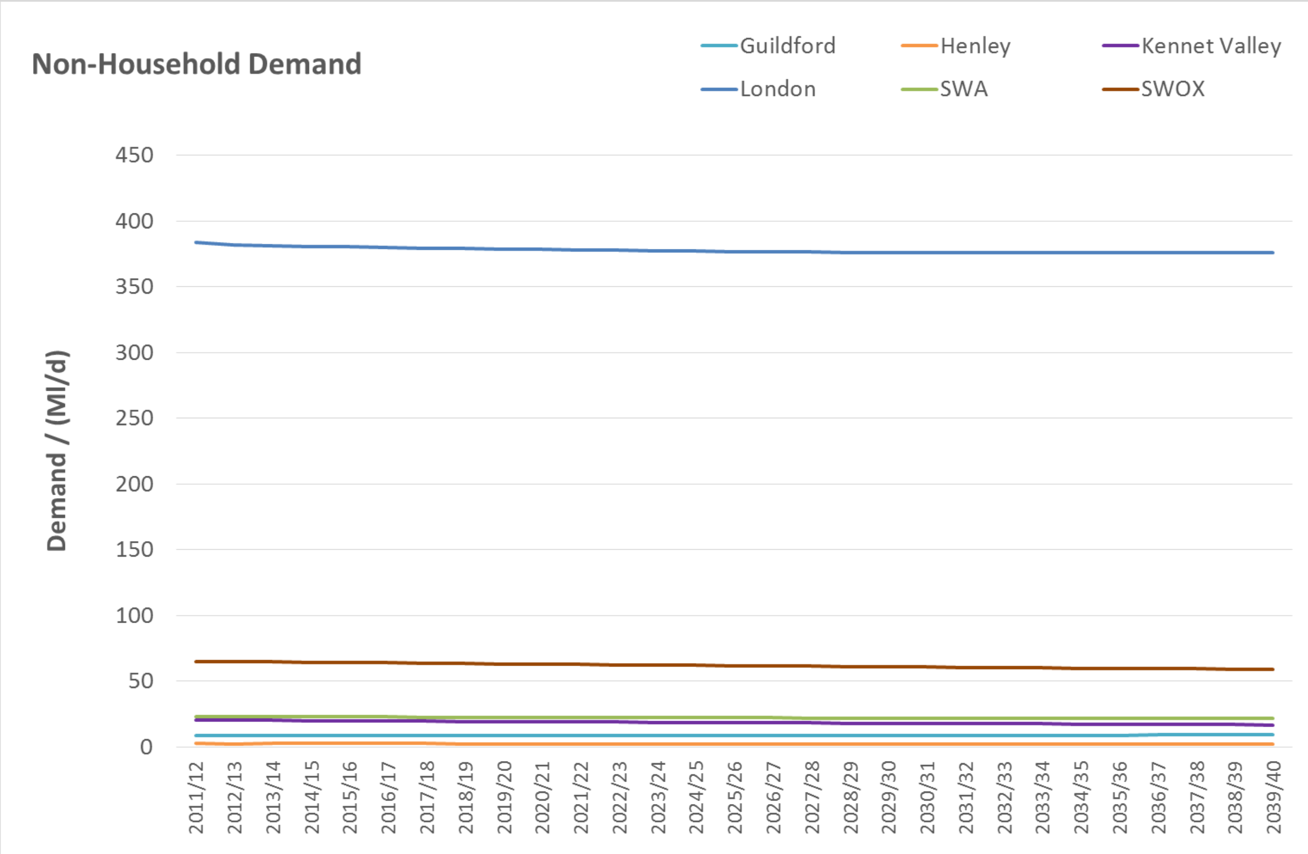


Figure 3-16: Non household demand by WRZ

When this forecast is broken down to service (e.g. call centres, offices) and non-service demand (e.g. breweries, industrial sites), as seen in Figure 3-17, it can be seen that service demand is expected to increase over the forecast and non-service demand is expected to decrease.

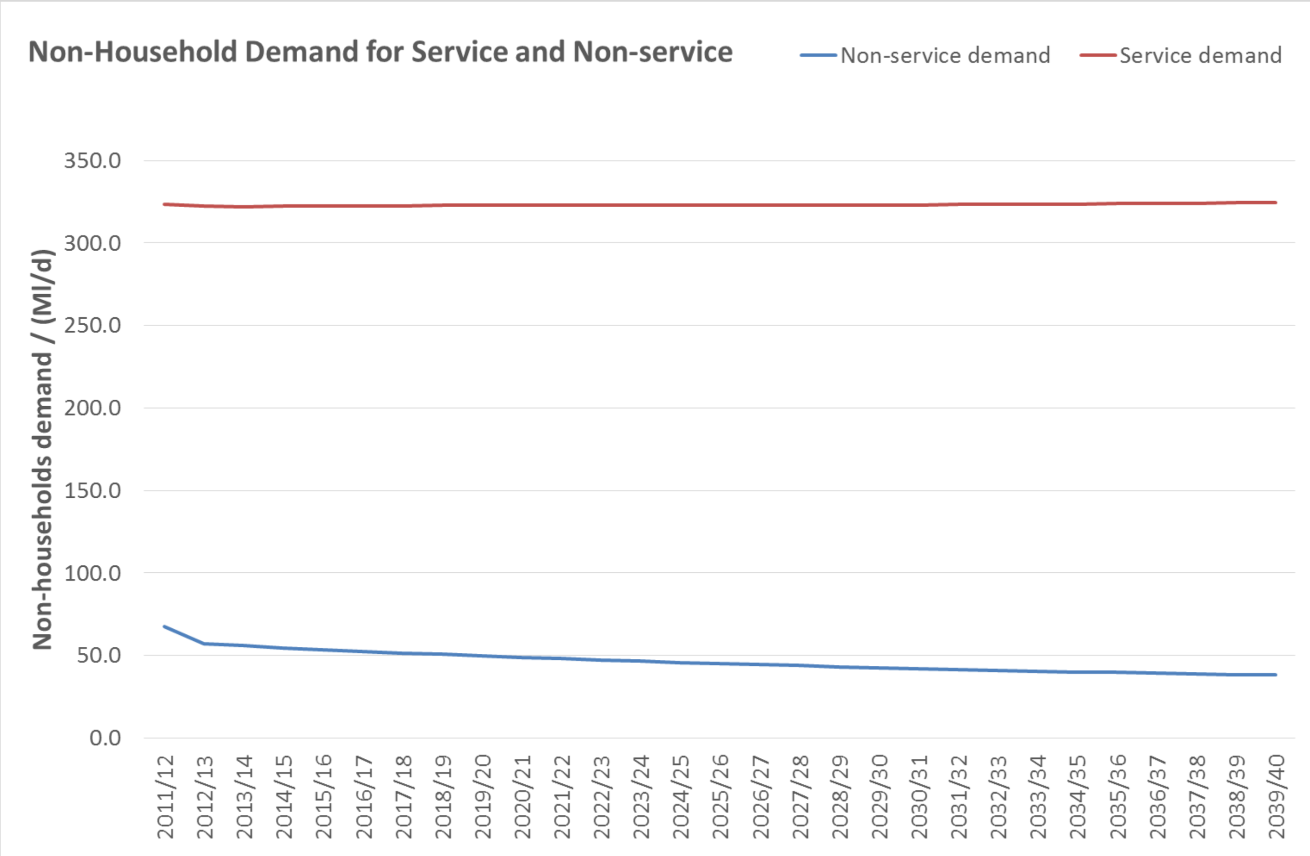


Figure 3-17: Non household demand (service and non-service)

These two changes in demand offset each other resulting in the flat profile seen for overall non-household demand.

Our forecasts do not show a material change in non-household demand. The introduction of the Water Bill and Competition Commission may influence long-term forecasts.

Further details can be found in Appendix G.

3.3.9 Baseline Leakage & minor components

In line with the requirements of the WRPG, leakage in the baseline demand forecast remains flat across the forecast period. Our Business Plan will include efficient and innovative approaches to maintain this target. As discussed in Section 9 we have looked at the synergies between the WRMP and other areas of investments, we have reduced our Business Plan forecast costs due to the synergy between the WRMP and maintenance expenditure.

We also forecast minor components as unchanged over the planning period.

3.4 Summary of our Baseline demand forecasts

The baseline DYAA demand forecast for each WRZ is shown in the following figures.

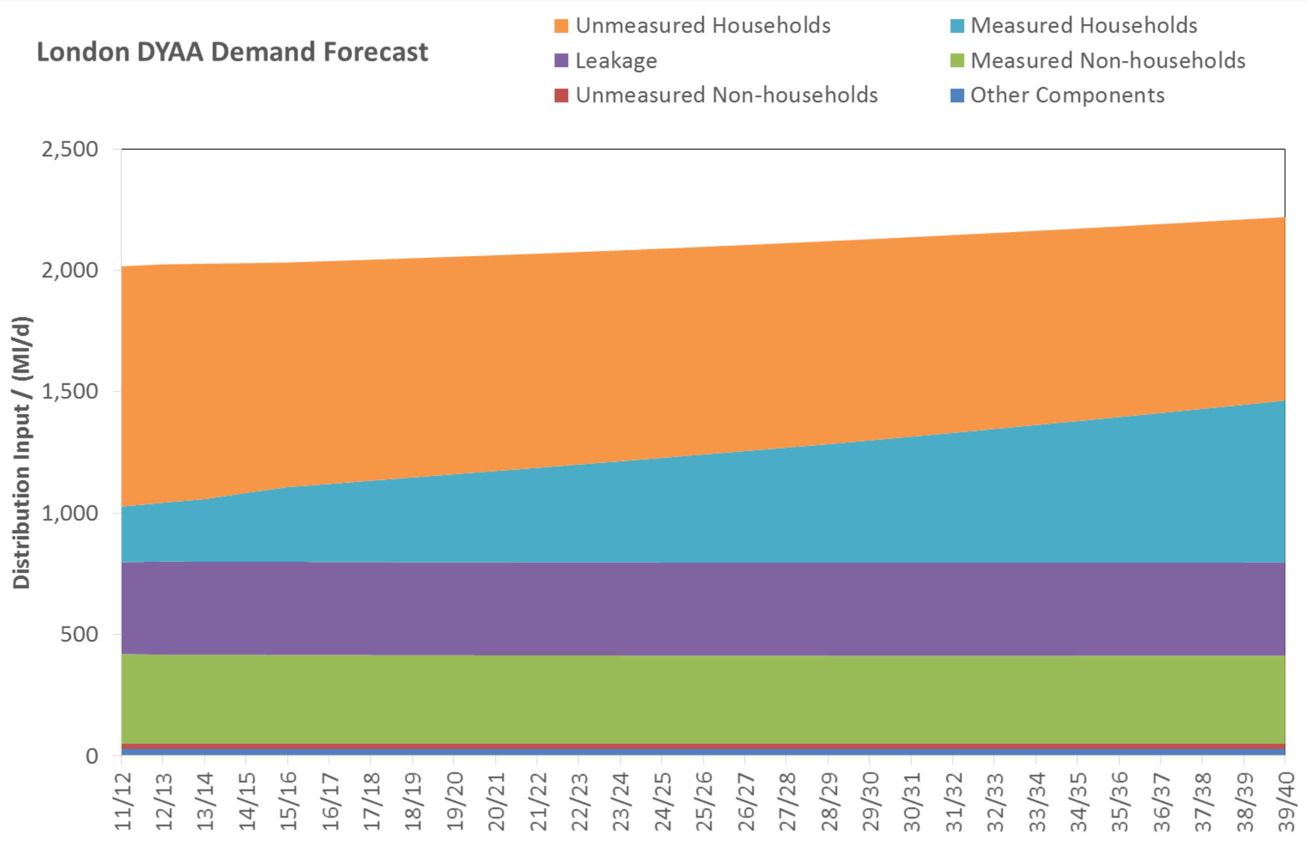


Figure 3-18: London DYAA baseline demand forecast by component

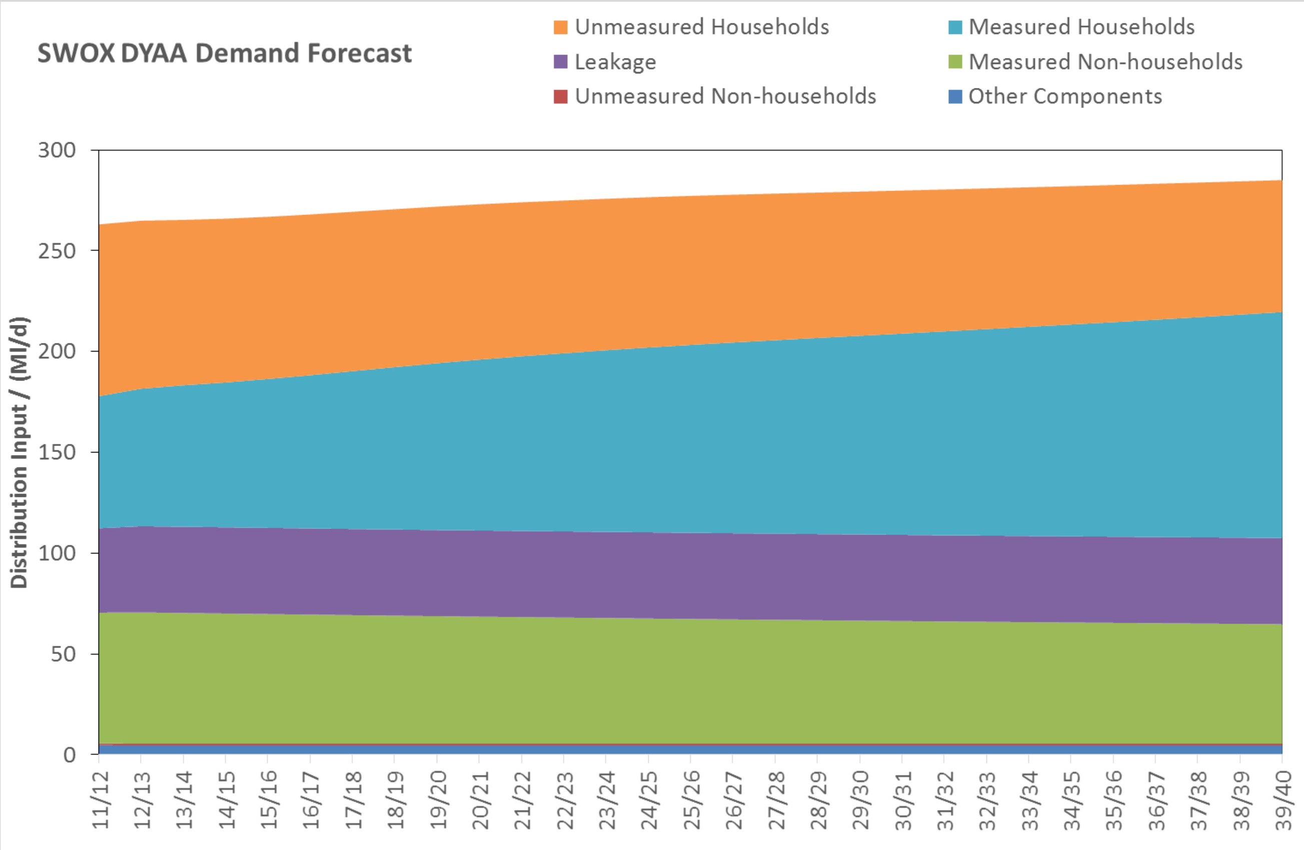


Figure 3-19: SWOX DYAA baseline demand forecast by component

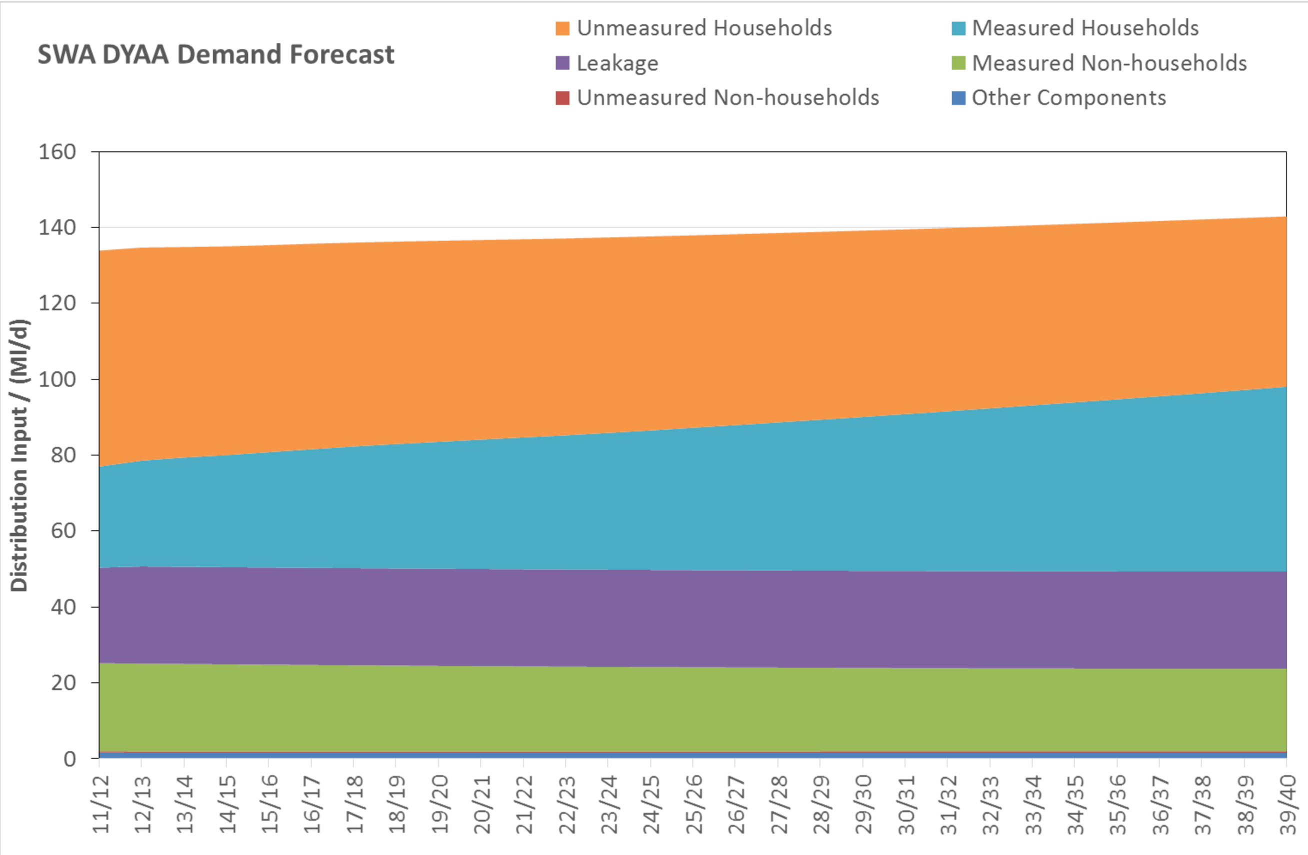


Figure 3-20: SWA DYAA baseline demand forecast by component

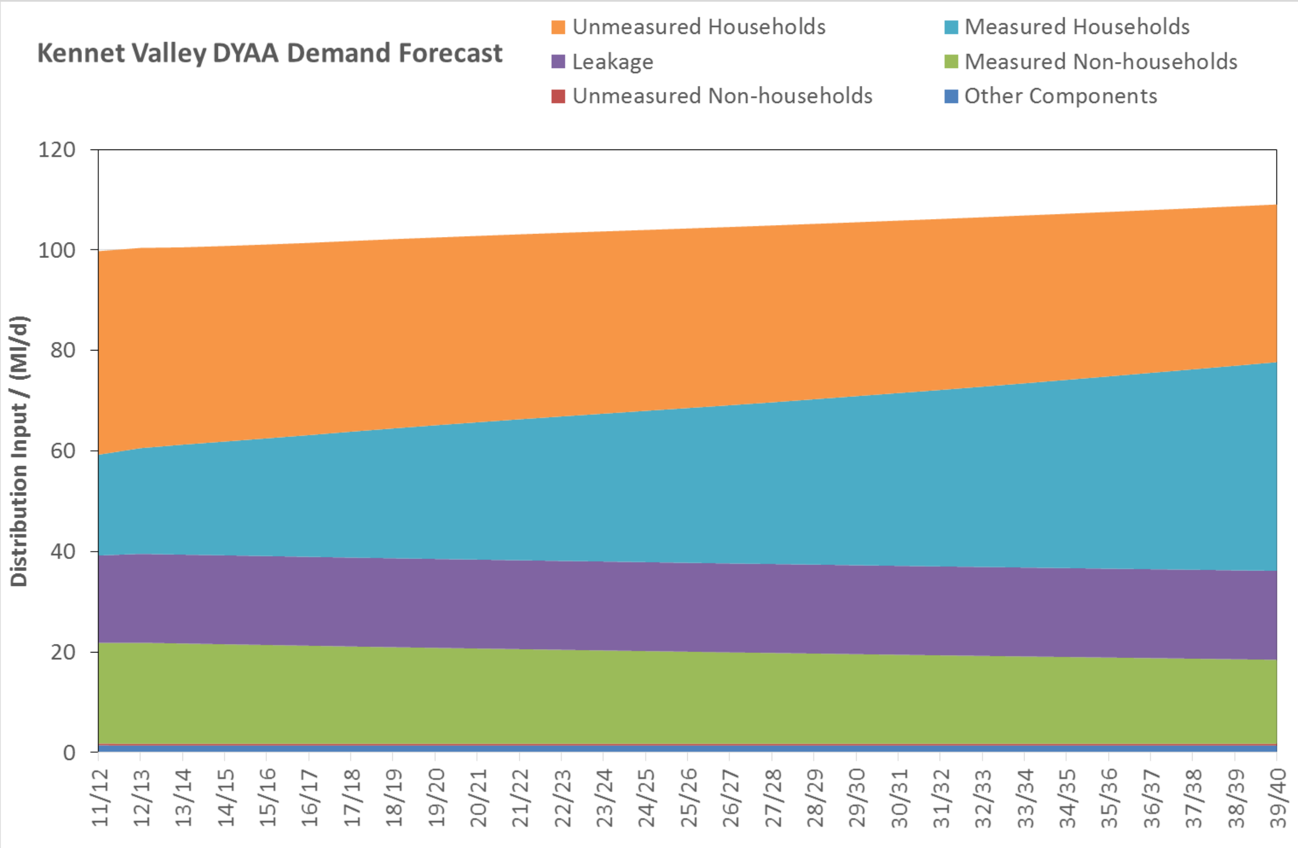


Figure 3-21: Kennet Valley DYAA baseline demand forecast by component

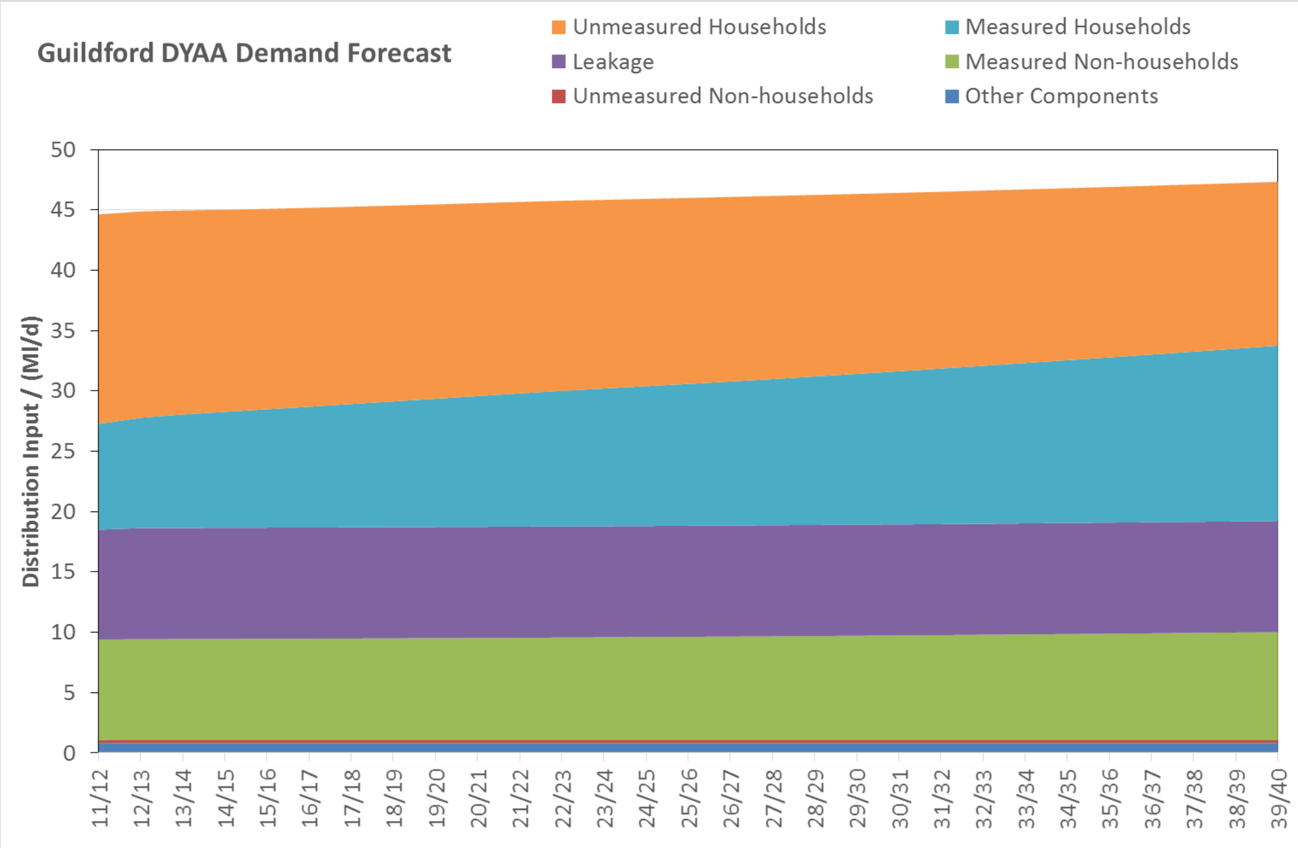


Figure 3-22: Guildford DYAA baseline demand forecast by component

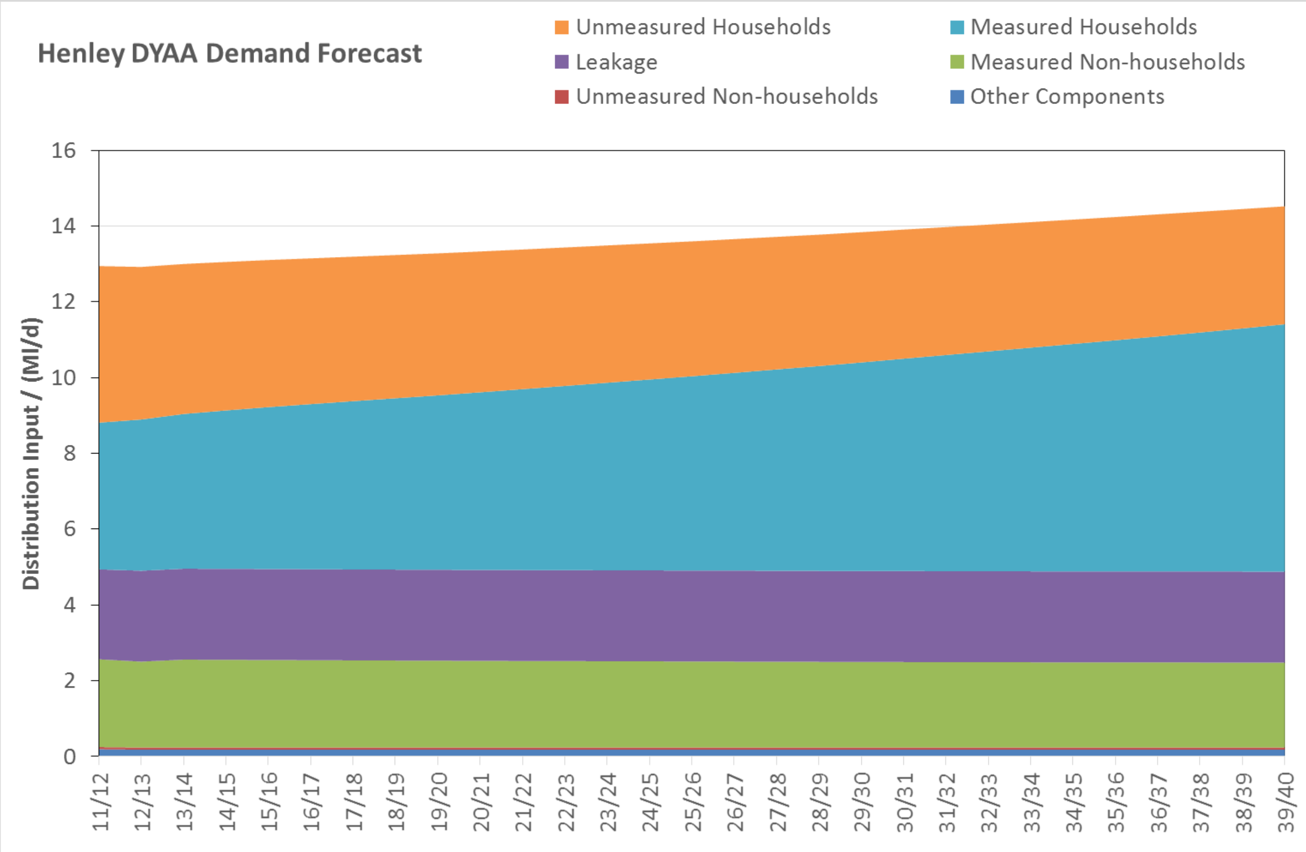


Figure 3-23: Henley DYAA baseline demand forecast by component

Summary points

- The demand forecast is based on the water balance calculated for 2011/12.
- We supply approximately 9 million customers in 3.4 million properties.
- This shows a split of demand components as follows: Household demand (53%), Non-household demand (20%), Leakage (25%) and Minor components (2%).
- For planning purposes we use certain normalised demand conditions or scenarios such as dry year and peak week. Therefore we 'uplift' demands in 2011/12 to meet these conditions.
- Upward pressures on the demand forecast include:
    - Population increase
    - Decreasing household size (occupancy)
    - Increasing water use per person, particularly for personal washing and external water use
    - Climate change
- Downward pressures on the demand forecast include:
    - Modern low volume toilet cisterns
    - Modern, water efficient dish washers, washing machines etc.
    - Water efficient new housing from design requirements of the Building Regulations
- Overall in the baseline demand forecast:
    - Population is expected to grow by 2.0 to 2.9 million people in our supply area by 2040. We are using the lower projection, based on local authority plans.
    - Household demand will increase significantly with increasing population and reducing household size. However, PCC will remain flat as people gradually opt for meters.
    - Climate change impact on demand is relatively minor, however it may change how and where we use water. For example more external use.
    - Non-household demand is expected to stay broadly level, increases in service industry use offset by reductions in non-service use.
    - Leakage and minor components will remain level.