# Draft Water Resources Management Plan 2024

## Section 3 – Demand

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## Background and Introduction

In this section we explain how we calculate current and forecast future demand for water. This is one of the foundations of our plan as it provides the information that enables us to define the supply-demand balance we need to manage in the future.

Production of demand forecasts has been done in partnership with the five other Water Resources South East (WRSE) water companies. WRSE set out requirements for demand forecasts within their Demand Forecast Method Statement[1]

Where feasible we have aligned our methods across WRSE and areas of alignment include:

- Forecasts of population and property growth
- Non-household demand forecasts
- Leakage forecasts beyond AMP7
- Inclusion of potential Covid-19 impacts within uncertainty analysis

WRSE member companies have opted to retain their own household demand models as there is a not a consistent dataset across companies which can be used to produce a robust household demand model. We also continue to use our existing methods for water that is taken unbilled and water used in maintenance of our distribution system.

We estimate that in our 'base year' (2019-20), we supplied water to more than 3.8 million households and 218,000 businesses. The average current household demand is 143.1 litres per person per day.

The base year demand calculation presents our current level of demand and is reported as part of our Annual Return. Part of this reporting is accounting for the impact that weather conditions had on demand during the base year, and normalising to remove the biasing impact that weather has on demand for water. We do this through the use of scenarios and we produce forecasts for 'Dry Year Annual Average' (DYAA) and 'Dry Year Critical Period' (DYCP) scenarios.

We are required, by guidance set out by the Environment Agency, to plan for the property growth projected by the 95 local authorities in our supply area. Based on their plans, we estimate that the number of customers in our area will grow by more than two million people to 12.2 million by 2050.

Because local authority plans only plan 15-20 years into the future, WRSE engaged demographic experts to develop projections to the end of the century. We forecast that the number of people in our area could reach up to 13.5 million by 2100.

Finally, we forecast demand for each of the five water balance components for each of our six water resource zones (WRZs). The uncertainty regarding the demand forecasts is then estimated and presented alongside our supply-demand balances in Section 6 – Uncertainty & Baseline Supply Demand Balance.

3.1 We are responsible for the supply of wholesome water to more than 10 million customers in over 4 million properties. Over the past ten years the population we serve has been growing at an

3.1

[1] Method Statement: Demand Forecast Version 5 August 2021 https://www.wrse.org.uk/media/vuwpqxft/method-statement-demand-forecast-august-2021.pdf

average rate of more than 100,000 people a year This means that we now need to supply water to more than 1 million people more people than a decade ago.

3.2 To ensure we can provide a safe and secure supply of water to all our customers, we produce forecasts of what the likely demand for water will be in the future.

3.3 'Demand' is the term we use to describe the water that is supplied through our network to households, workplaces and schools; water taken illegally and legally unbilled; water used by industry; water used in maintaining the water network; and water that is lost through the distribution systems.

3.4 Demand forecasting is the method by which we 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 80 years.

3.5 For the draft Water Resources Management Plan 2024 (draft WRMP24) we have produced multiple different forecasts of demand for use in investment modelling. We have adopted an adaptive planning approach, along with our neighbouring water companies in the Water Resources in the South East (WRSE) Group, which allows multiple different futures to be considered. These forecasts of demand are intended to understand the impact of both higher and lower growth on demand and produce an adaptive plan which provides a best value solution across these scenarios.

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

- Population increase
- Climate change
- Increasing commercial demand

3.7 These upward pressures are partially offset by downward pressures from:

- The improving efficiency of water fixtures and fittings such as toilets, dish washers, washing machines, etc.
- Water efficient new housing resulting from design requirements of building regulations
- Customers opting for a meter to better manage their consumption
- Customers being more efficient in their use of water

3.8 For the draft WRMP24, we continue using the methods identified from the UKWIR project "WRMP19 Methods – Household Consumption Forecasting"[2]. Using these methods, we estimate an increase in household demand of more than 200 Ml/d by 2050 and a total increase of approximately 260 Ml/d by 2100.

3.9 Non-household water use is forecast to increase by more than 20 Ml/d over the planning period to 2050 and a total increase of 43 Ml/d by 2100, although it should be noted there are differing trends across our six WRZs. Generally, increases in water use from service industries (e.g. offices,

3.1

[2] UKWIR 2015 WRMP19 Methods – Household Consumption Forecasting 15/WR/02/9

call centres) are being offset by reductions in demand from non-service industries (e.g. industrial sites, breweries).

3.10 The baseline demand forecast is the starting position for the future supply demand balance without any planned interventions from 2025. It includes demand reductions from the promotion of water efficiency, leakage reduction and metering activities assumed in price limits up to 2024-25, i.e. the demand management practices in place at the beginning of the new planning period.

3.11 Water taken unbilled, operational use and leakage are forecast to remain at current levels in the baseline forecast.

3.12 Overall, the total baseline demand forecast (before intervention) is expected to increase by more than 210 Ml/d in the period of 2025-2050 and an additional 163 Ml/d by 2100. This represents a significant challenge. As part of our plan, we have looked at strategies to reduce demand (Section 8) and show how different levels of demand management affect the cost and performance of future plans and strategy (Section 10). This is in accordance with the Water Resources Planning Guideline[3] (WRPG) which states that the plan should address government policy including reducing the demand for water.

3.13 The remainder of this section is structured as follows:

- An introduction to the concept of 'demand'
- Guiding principles and drivers of demand
- Annual water balance – reporting the components of the water balance relevant to the base year, 2019-20
- Demand forecasting – how we forecast demand to 2050 and then to 2100

## What is 'demand'?

3.14 'Demand' is the term we use to describe the water that we use that is supplied through our network.

3.15 When reporting demand for water it is split 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

3.16 We calculate and report these components on an annual basis in a process known as the 'water balance'.

3.1

[3] Environment Agency, Ofwat and Natural Resources Wales Final Water Resources Planning Guideline, December 2021

3.17 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 80 years. We produce updated forecasts every five years, with an annual review in the intervening period. We follow industry guidelines supplemented with our own detailed analysis.

## Guiding principles

3.18 The WRPG sets a clear framework for developing a demand forecast. We have followed the latest UKWIR guidance[4] in developing our forecasts.

3.19 For the baseline forecasts it is assumed that beyond 2024-25 water efficiency activity delivered in AMP7 will continue to be maintained across the forecasting period. Our baseline assumptions are also that meters will only be fitted where customers request a meter and in new properties, and that there will be no additional leakage reduction, although activity to maintain leakage at current levels continues.

3.20 AMP7 activity includes the progressive household metering programme in London to 2025, where we will fit meters to properties including those that have not requested a meter. Our progressive metering programme assumes that after a one-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.

3.21 Within the Thames Valley area (our WRZs other than London) we have brought forward our plans for progressive metering as part of the Green Economic Recovery programme[5]. We now plan to install 200,000 meters in our Thames Valley area in AMP7.

3.22 Once all the steps in the water resources planning process have been completed, a range of demand reduction options will be included in the demand forecast, such as further leakage reduction, progressive household metering and additional water efficiency measures (Section 8: Appraisal of demand options, Section 10: Programme appraisal and Section 11: Preferred programme). We call this final demand forecast the 'Final Plan' forecast to differentiate it from the 'Baseline' forecast described above.

## Demand drivers

3.23 Demand for water varies due to several factors. One of the most important of these factors is the weather. In hot, dry weather, customers use additional water for activities such as garden watering or filling paddling pools. On the other hand, in cold weather, leakage will rise, because pipes can contract causing joints to break, resulting in leaks. The effect of weather on demand is shown in Figure 3 - 1.

3.1

[4] UKWIR, WRMP19 Methods – Household Consumption Forecasting, 15/WR/02/9, 2015
[5] Green-economic-recovery-final-decisions.pdf (ofwat.gov.uk)

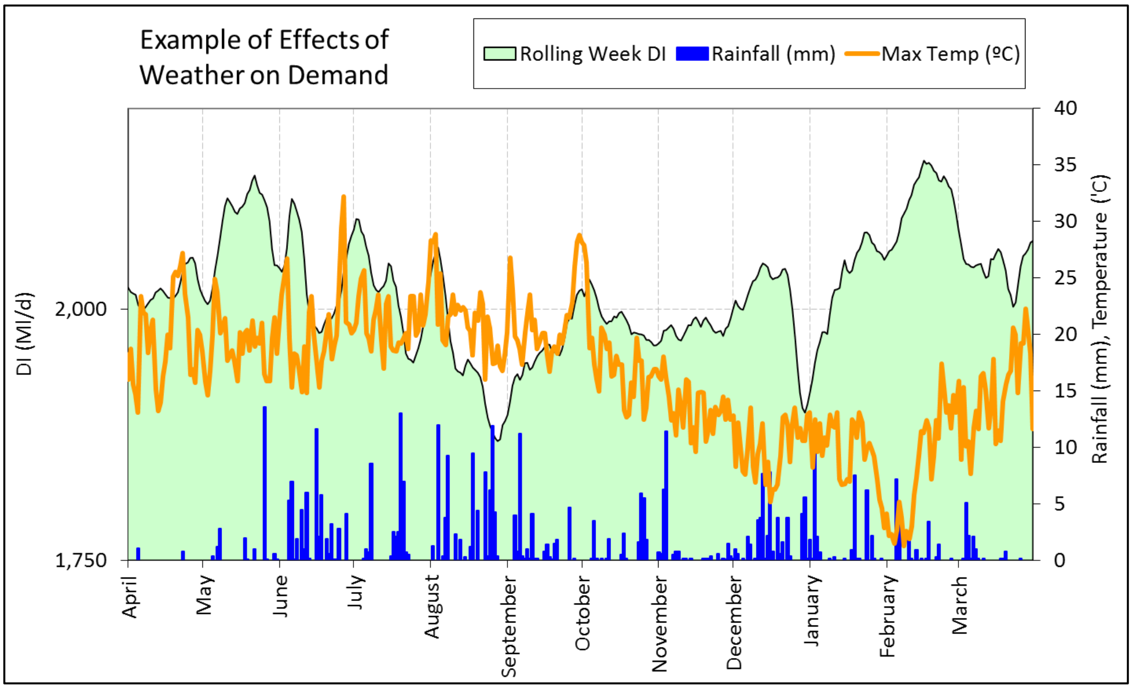


Figure 3 - 1 Effect of weather on demand (measured by Distribution Input)

3.24 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
- Effects of climate change
- Changes in non-household consumption, including industrial and commercial use
- Trends in household water use linked to behaviour and technological development of water using devices

3.25 Leakage is an important element of demand but in our baseline scenario leakage remains constant after 2025-26 as required by the WRPG, at the target level as set by Ofwat with their 2019 Final Determination, including the conditional allowance[6] and Green Economic Recovery.

- Demand drivers are discussed in more detail within the remaining sections of this document and in Appendix E: Populations and property projections, Appendix F: Household water demand modelling, Appendix G: Non-household water demand and Appendix H: Dry year and critical period forecasting

3.1

[6] Thames Water final determination PR19-final-determinations-Thames-Water-final-determination.pdf (ofwat.gov.uk)

# Base Year Demand

## The water balance

3.26 To understand how water is used across our supply area in a year, we use a water balance. An overview of the water balance is shown in Figure 3 - 2 below.

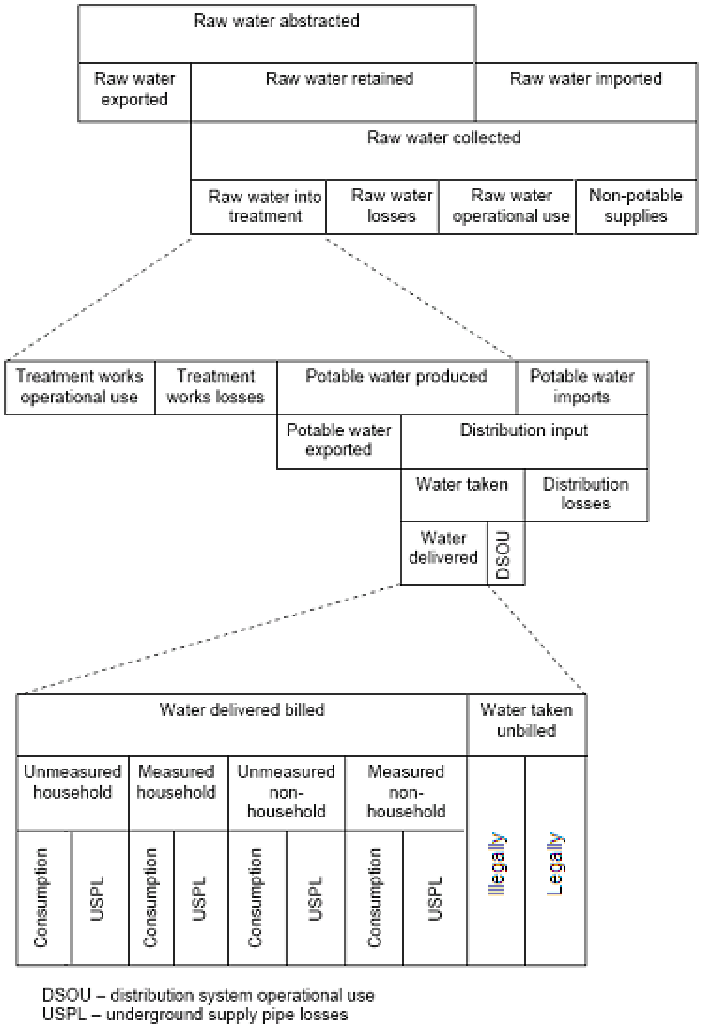


Figure 3 - 2 Overview of water balance

3.27 The water balance is split into components as shown in Figure 3-2.

3.28 The sum of the household, non-household, leakage and minor component volumes should equal the distribution input volume. As some components are estimated, a mathematical method called maximum likelihood estimation (MLE) is used to reconcile the components with the distribution input.

## Choice of base year and Covid-19 impacts

3.29 The base year of a demand forecast is normally the reporting year prior to which the forecasts are developed. For this plan that would be reporting year 2020-21. However, on 23rd March 2020 the UK was put into lockdown in an unprecedented step to limit the spread of coronavirus. Over the following year this had the impact of reducing non-household demand but increasing household demand, as businesses were closed, and people were asked to work at home where possible.

3.30 As part of a multi water company project analysing water use in 2020, Artesia Consulting reported[7] the following impacts across England and Wales:

- An increase in total demand of around 2.6%
- An increase in total household consumption of between 9% and 13%
- A decrease in non-household consumption of approximately 25%

3.31 The impact of Covid-19 can be clearly seen in Table 3 - 1 below. The household demand impact was over 100 Ml/d increase in use. The reduction in unmeasured use is due to progressive metering meaning there were fewer unmeasured customers. However, on a per capita basis unmeasured customer water use increased by more than 6 l/person/day.

3.32 A notable decrease in measured non-household water use was also observed with a reduction of 88 Ml/d, a 20% reduction compared to the previous year.

Table 3 - 1 Thames Water - Variance between AR20 and AR21

| Household Use – Measured | AR20 | AR21 | Variance |
|---|---|---|---|
| Water delivered billed measured households (Ml/d) | 587.51 | 703.76 | +116.24 |
| Measured household PCC (l/h/d) | 128.21 | 140.32 | +12.11 |
| Water delivered billed unmeasured households (Ml/d) | 1,018.74 | 1,004.93 | -13.81 |
| Unmeasured household PCC (l/h/d) | 156.77 | 163.06 | +6.29 |
| Water delivered billed measured non-household | 444.23 | 356.17 | -88.06 |
| Water delivered billed unmeasured non-household | 15.89 | 14.78 | -1.11 |

3.33 Given these impacts from Covid-19 on reported demand in 2020-21 reporting period and the uncertainty it will have on demand in the future we do not consider that using the 2020-21 reporting year is a robust base for future forecasts. Therefore, we have opted instead to use the 2019-20 reporting year as the base year for our draft WRMP24.

3.34 Data since AR21 has indicated that, as the UK moves out of lockdown and returns to normality post Covid-19, household demand is showing reductions from the peaks seen at the start of the pandemic. What impacts will be seen in the long term is unknown.

## Base year properties

3.35 Company level property numbers by type (measured/unmeasured, household/non-household, void household/void non-household) are derived from our SPRING billing system. 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.

3.36 The number of properties of each type within each WRZ is then calculated using a database called Netbase. Netbase takes property information from SPRING and geo-references it, firstly to District Meter Areas (DMAs), a discrete area of the network where water supplied is metered, then to Flow Monitoring Zones (FMZs), discrete areas of the network where the water supplied is

3.1

[7] The impact of Covid-19 on water consumption during February to October 2020 – Artesia Consulting 21/05/2021

measured by a zonal meter, and finally to WRZs. The proportions from this exercise are then used to apportion the property numbers from SPRING to each WRZ.

3.37 The base year property values are summarised in Table .

Table 3 - 2 Base year properties (2019-20)

| WRZ | Households (000s) | | | Non-households (000s) | | |
|---|---|---|---|---|---|---|
| | Unmeasured | Measured | Void | Unmeasured | Measured | Void |
| London | 1,614.129 | 1,221.332 | 113.527 | 29.711 | 106.338 | 30.698 |
| SWOX | 144.418 | 269.613 | 10.574 | 1.409 | 21.235 | 4.164 |
| SWA | 95.079 | 109.277 | 5.570 | 0.608 | 8.783 | 1.865 |
| Kennet Valley | 67.962 | 87.559 | 5.144 | 0.561 | 6.627 | 1.384 |
| Guildford | 27.904 | 32.204 | 1.607 | 0.329 | 3.108 | 0.600 |
| Henley | 6.528 | 14.014 | 0.511 | 0.083 | 0.944 | 0.175 |
| Thames Water | 1,956.02 | 1,734.00 | 136.93 | 32.702 | 147.035 | 38.887 |

## Base year population

3.38 The starting point for estimating base year population is the mid-2018 population estimates published by the Office for National Statistics (ONS). This data was then updated to the base year of 2019-20 using projections from expert consultants, Edge Analytics, and the Greater London Authority (GLA) for areas within London. Edge Analytics has worked with us to develop a more granular distribution of population for the draft WRMP24. This has been done using census output areas giving a better occupancy distribution and population split across WRZs. Insight from this work has been incorporated in our plan.

3.39 Not all population is accounted for in official statistics. To take account of "hidden" population, for short-term migrants and second addresses we apply an additional allowance, based on a study by Edge Analytics[8]. This allowance totals an additional population of 665,170, the majority of which are within London.

3.40 Non-household population is population residing in communal establishments; based on the Ofwat eligibility criteria released in July 2016 [9].

3.41 The total household population is derived by subtracting the total non-household population from the total population. The 2020 Annual Return (AR20) estimated the population associated with communal establishments at 103,843. The unmeasured non-household population remains at zero.

3.42 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, 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[10] for regions covering our London and Thames Valley zones.

3.1

[8] Clandestine and Hidden Populations Edge Analytics February 2020
[9] Eligibility guidance on whether non-household customers in England and Wales are eligible to switch their retailer – Ofwat July 2016
[10] Census 2021 detailed statistics will not be available until at least summer 2023

3.43 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 optants, in addition to newly built properties[11].

3.44 It is assumed that the occupancy of the additional measured properties is the same as the occupancy of the existing measured properties. This plan also considers the impact of population in bulk billed blocks of flats (subsidiary properties), taking account of the population in the measured/unmeasured household split rather than in non-household population. This should provide a more reflective view of the population distribution. The residual movement in population is assumed to be in the unmeasured population base. Base year populations are summarised in Table . As with any company, large changes in government statistics on population estimates would affect our plan.

Table 3 - 3 Base year household population (2019-20)

| WRZ | Population (000s) | |
|---|---|---|
| | Unmeasured | Measured |
| London | 4,738.05 | 3,085.02 |
| SWOX | 431.47 | 604.88 |
| SWA | 280.49 | 256.62 |
| Kennet Valley | 203.17 | 202.70 |
| Guildford | 81.63 | 75.30 |
| Henley | 19.79 | 29.36 |
| Thames Water | 5,734.81 | 4,224.52 |

## Household demand

3.45 Household demand is normally described by the volume of water used per person each day and is called Per Capita Consumption (PCC). Unmeasured customer PCC is calculated from our Domestic Water Use Survey (DWUS); a panel of 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[12], which is added. This total volume of water is then divided by the estimated total number of measured customers to give a measured customer PCC.

3.46 For 2019-20 the average, measured, and unmeasured PCC for each WRZ is shown in Table .

Table 3 - 4 Per capita consumption (2019-20) (l/person/d)

| WRZ | Unmeasured PCC | Measured PCC | Average PCC | % Metered |
|---|---|---|---|---|
| London | 156.5 | 122.0 | 142.9 | 43 |
| SWOX | 150.7 | 140.7 | 144.9 | 65 |
| SWA | 144.8 | 138.3 | 139.9 | 53 |
| Kennet Valley | 146.6 | 135.2 | 141.0 | 56 |
| Guildford | 154.2 | 144.8 | 149.7 | 54 |
| Henley | 135.2 | 162.1 | 156.0 | 68 |

3.1

[11] All newly built properties are required to be fitted with a water meter. In our supply area these will be smart meters
[12] Water meters on average under record volumes of water used and therefore a correction is applied to improve the accuracy of of water used in measured properties

| WRZ | Unmeasured PCC | Measured PCC | Average PCC | % Metered |
|---|---|---|---|---|
| Thames Water | 155.1 | 126.9 | 143.1 | 47 |

## Non-household demand

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

3.48 Assessed non-household[13] usage is estimated using a matrix which looks at the size of the property supply and the number of full-time employees as well as the business type, calculating an estimated daily consumption. Unmeasured non-household usage is assigned by billing band type and number of billed units supplied by the Central Market Operating System (CMOS).

3.49 Non-household demand for 2019-20 was reported as shown in Table .

Table 3 - 5 Non-household consumption (2019-20) (Ml/d)

| WRZ | Measured | Unmeasured |
|---|---|---|
| London | 350.71 | 12.66 |
| SWOX | 42.81 | 0.64 |
| SWA | 24.26 | 0.22 |
| Kennet Valley | 13.76 | 0.23 |
| Guildford | 5.82 | 0.16 |
| Henley | 1.14 | 0.04 |
| Thames Water | 438.51 | 13.94 |

## Leakage

3.50 The reported leakage value for our AR20 was 626.57 Ml/d, consistent with the guidance contained within the 2017 UKWIR report "Consistency of Reporting Performance Measures" (17/RG/04/5). As the WRMP is required to plan for a dry year scenario we use the DYAA uplifted leakage value of 651.70 M/d as the base year value.

3.51 Leakage is split into two categories:

- Distribution losses: these are leaks on our own infrastructure and make up approximately 72% of total leakage
- Supply pipe leakage: this is water leaking from customer supply pipes, which are the responsibility of customers, although we offer a free leakage repair service to household customers who meet eligibility criteria

3.52 Leakage for each WRZ, as reported within Appendix A of AR20, is shown in Table .

Table 3 - 6 Actual leakage (2019-20)

| WRZ | Total Leakage (Ml/d) |
|---|---|
| London | 491.42 |
| SWOX | 75.48 |
| SWA | 37.98 |

3.1

[13] Non-household properties where it is impractical to fit a meter

| WRZ | Total Leakage (Ml/d) |
|---|---|
| Kennet Valley | 26.22 |
| Guildford | 16.53 |
| Henley | 4.07 |
| Thames Water | 651.70 |

## Minor components

3.53 Minor components include the demand taken from the distribution system for our operational use and any 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.

3.54 At the company level, minor components add up to 90 Ml/d in the base year.

## Summary for 2019-20

3.55 Figure  shows the breakdown of the total demand reported in the water balance for 2019-20 by component. Overall household water use accounts for 53%, leakage for just over 27% and non-household demand accounting for approximately 18% of total demand. The remaining 2% is accounted for by minor components, water taken unbilled and operational use.

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

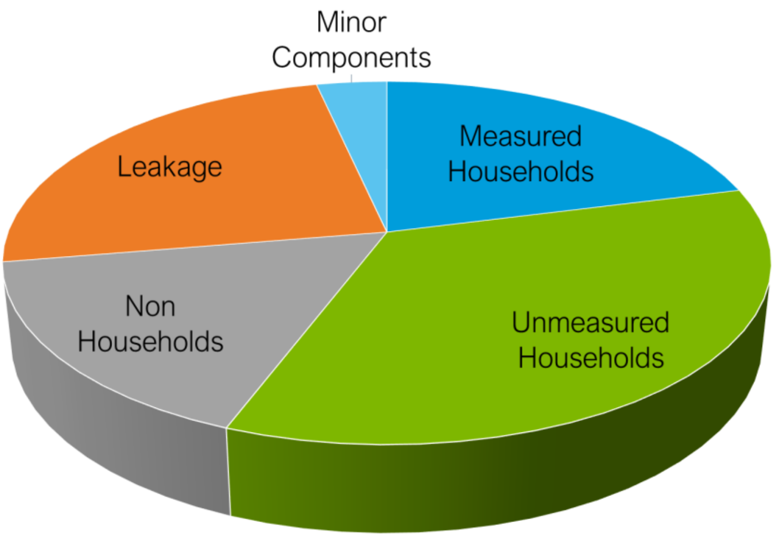


Figure 3 - 3 Sub-components of demand (2019-20)

3.57 Since AR20 we have continued to work to deliver reductions to leakage and for AR22 we have reported that we have achieved our leakage target and that leakage has now reduced to 23% of total demand.

# Future demand – the demand forecast

## Planning scenarios

3.58 Demand reported in the water balance reflects the conditions experienced in that year. It may have been, looking at the year as a whole, 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.

3.59 The planning scenarios we use are:

- Dry Year Annual Average (DYAA) scenario: this describes the average daily demand in a dry year (a period of low rainfall) where there are no constraints on demand
- Dry Year Critical Period (DYCP) scenario[14]: this describes the average daily demand over the critical period, which for some of our WRZs is during the peak week for water demand
- Normal Year Annual Average (NYAA) scenario: this describes the average daily demand in a normal year. We produce this forecast for investment planning purposes. It allows us to better model the utilisation and costs of operating potential future options

3.60 Table  summarises the scenarios constructed for each of our WRZs:

Table 3 - 7 Planning scenarios used in each of our WRZs

| WRZ | Baseline | | Final Plan | |
|---|---|---|---|---|
| | DYAA | DYCP | DYAA | DYCP |
| London | ✓ | × | ✓ | × |
| SWOX | ✓ | ✓ | ✓ | ✓ |
| SWA | ✓ | ✓ | ✓ | ✓ |
| Kennet Valley | ✓ | ✓ | ✓ | ✓ |
| Guildford | ✓ | ✓ | ✓ | ✓ |
| Henley | ✓ | ✓ | ✓ | ✓ |

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

3.62 All other zones could be driven by summer weather-related peak demands. Thus we calculate both the DYAA and the DYCP scenario in order to establish the planning scenario which drives the need for investment.

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

3.1

[14] The point where demand and supply are most closely matched

## Peaking factors

3.64 Peaking factors are used to uplift or reduce out-turn demand in any year to the DYAA and DYCP planning scenarios.

3.65 As in previous WRMPs, the level of demand in all planning scenarios has been derived using analysis of the impact of a range of weather scenarios on demand using a long time-series of weather data. Models of how demand varies as a function of weather have been developed and calibrated using a number of years of weather and demand data.

3.66 The model explains the weather dependent variability of both usage and leakage. Once trained, the models are given inputs of measured distribution input (DI) from 01/04/2019 to 31/03/2020 and weather conditions over the same period, in order to estimate the amount of demand attributable to the prevailing weather conditions. The difference between this year's modelled demand and that of the desired planning scenario is reported as the peaking factor. The normal year peaking factor is that which is required to match a 1 in 2 return period DI. The dry year peaking factor is the sum of uplift to 1 in 5 usage and 1 in 5 leakage.

3.67 The peaking factors, described below as uplift volumes, for each component, are shown in Table . These volumes are applied to the outturn demand volumes.

Table 3 - 8 Distribution input uplift volumes (Ml/d)

| 2019-20 | | | |
|---|---|---|---|
| AR20 Dry and Normal Year Distribution Input Uplifts | | Normal Year uplift (Ml/d) | Dry Year uplift (Ml/d) |
| London | AA | 6.12 | 19.74 |
| | CP | | |
| SWOX | AA | -0.02 | 2.28 |
| | CP | | 50.43 |
| SWA | AA | -0.02 | 1.07 |
| | CP | | 26.02 |
| Kennet Valley | AA | 0.12 | 1.00 |
| | CP | | 16.59 |
| Guildford | AA | -0.1 | 0.42 |
| | CP | | 12.65 |
| Henley | AA | -0.05 | 0.15 |
| | CP | | 4.88 |

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

Table 3 - 9 Overall demand (Distribution Input) post uplift

| WRZ | NYAA (Ml/d) | DYAA (Ml/d) | DYCP (Ml/d) |
|---|---|---|---|
| London | 2036.95 | 2045.04 | N/A |
| SWOX | 277.82 | 278.71 | 330.17 |
| SWA | 138.72 | 141.56 | 166.38 |
| Kennet Valley | 98.56 | 100.40 | 116.25 |
| Guildford | 47.85 | 47.68 | 60.36 |
| Henley | 13.18 | 13.31 | 18.06 |
| Thames Water | 2613.08 | 2626.71 | 691.23 |

## Covid-19 Impacts on Demand Forecasts

3.69 As we have had to consider the impacts Covid-19 related lockdown had on our choice of base year we also have to consider how we evaluate the longer term impacts the epidemic may have on future demand.

3.70 Artesia consulting noted within their study "Understanding changes in household water consumption associated with Covid-19"[15] that to understand how domestic water use patterns will change as a result of the Covid-19 pandemic will:

> *"require long term monitoring with both qualitative and quantitative data to know whether the changes in dynamics reflected during this lockdown reflect only a temporary disruption, or represent a longer-term change to the patterns and rhythms of the everyday practices that underpin and influence domestic and garden water use."*

3.71 This leaves us in the position whereby we are unable with any confidence to predict a most likely outcome to include within our demand forecast.

3.72 Given this uncertainty we consider the most prudent way forward is to consider the potential for longer term impacts within target headroom and to not include any actual Covid-19 impacts within the demand forecast directly.

3.73 How we have allowed for this Covid-19 related uncertainty is discussed within Section 6.

3.1

[15] Understanding_changes_in_domestic_water_consumption_associated_with_COVID_19_in_England_and_Wales

## Population and property forecasts

### Introduction

3.74 Throughout this section, the term 'forecast' is used as a generic term to encompass both population projections (trend-based outcomes) and population forecasts (policy-based outcomes, e.g. housing-led forecasts).

3.75 Robust population and property forecasts are a key underpinning of the WRMP24 process. A sustained period of new housing growth, ageing population profiles and an uncertain future for international migration continue to be important considerations for industry planners.

3.76 The WRPG includes guidance on the key requirements for population, property and occupancy forecasts to support the WRMP24. In addition to this Ofwat has proposed common reference scenarios[16] which includes guidance for which growth forecasts should be considered.

3.77 Both sets of guidance require water companies to use Local Authority plan (LAP) based forecasts and also consider Office of National Statistics (ONS) trend-based projections.

3.78 Section 6.3 of the WRPG states:

> *"Your planned property and population forecasts, and resulting supply, must not constrain planned growth. For companies supplying customers in England you should base your forecast population and property figures on local plans published by the local council or unitary authority."*

3.79 Therefore, our central forecasts use projections produced by the local authorities.

3.80 In addition to the LAP and ONS forecasts we have also produced maximum and minimum scenarios in the production of demand forecasts for use in adaptive planning scenarios.

3.81 All forecasts have been produced for us by Edge Analytics Ltd who are experts in demographic analytics and scenario forecasting.

### Regulatory Guidance

3.82 The WRPG provides a framework for water companies to follow when developing our WRMPs. The guidelines summarise the key requirements for population, property and occupancy forecasts that feed into WRMP evidence, emphasising the importance of using housing growth evidence from Local Plans.

3.83 Edge Analytics have within their report [17] Section 1 Regulatory Guidance described how they have ensured that the projections they have produced comply with the requirements of the Water Resources Planning Guideline. This report is published in full within Appendix E - Population and Property Projections.

### Area definition

3.84 The Thames Water area in which it provides its water and sewerage services encompasses a total of 95 local authority areas (either in full or in part); a mix of London Boroughs, Unitary Authorities and non-metropolitan districts.

3.1

[16] Ofwat April 2022 PR24-and-beyond-Final-guidance-on-long-term-delivery-strategies_Pr24.pdf (ofwat.gov.uk)
[17] Population & Property Forecasts: Methodology & Outcomes Edge Analytics July 2020

3.85 The six WRZs are covered by a sub-set of these local authority areas, as shown in Figure 3 - 4, again either in full or in part. This sub-set of local authority areas has provided the basis for the development of our WRMP24 population and property forecasts.

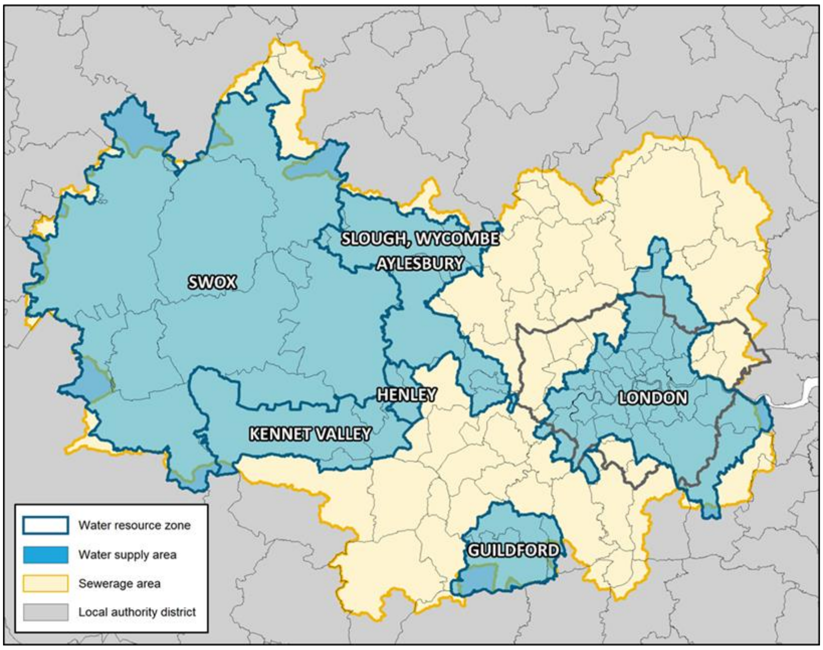


Figure 3 - 4 Area definition of Thames Water operational areas and local authorities

3.86 Population and property forecasts developed for each local authority area have been scaled to ensure consistency with the WRZ geography. This scaling process has been based upon the proportional distribution of properties, using digital map data and Geographical Information System (GIS) technology to ensure the most accurate process of estimation.

3.87 The development of growth forecasts to inform WRMP24 plans is underpinned by evidence on Local Plan housing growth for those Local Planning Authorities (LPA) that are within our WRZ geography.

3.88 Our consultants, Edge Analytics', have developed a database, Consilium, to enable the collection, processing, organisation and delivery of Local Plan evidence, for all LPAs across the UK (including National Parks and Development Corporations). Data is collected both at a macro level, providing Local Plan evidence for individual LPAs, and at micro level, providing site-specific housing growth locations.

3.89 For each LPA that falls within WRZ boundaries, Consilium provides a summary of all Local Plan housing evidence, presenting information on:

- Local Plan status
- historical and planned housing growth trajectories (including LPA and MHCLG completion statistics)
- housing need
- housing requirements and targets
- housing growth locations (site data)

3.90 The site data provides geocoded information on housing growth locations, the number of planned units and the likely phasing (timing) of development. This information is key to the configuration and calibration of the micro-level, 'bottom-up' forecasts.

3.91 The data sourced is from LPA published documentation/statistics or directly from Councils, if not readily available.

### Local Authority Forecasts

3.92 Local authority forecasts can be described as "housing-led" in that they provide a housing driven perspective on future population growth. Under these scenarios, the population impact of a pre-determined trajectory of housing growth is considered.

3.93 The starting point for a housing-led scenario is a trend projection, which is modified year-on-year to ensure reconciliation between population change and the capacity of the housing stock. The relationship between housing growth and population change is determined by the changing age-structure of the population, projected household representative rates (occupancy), a vacancy rate, plus the changing size of the population not-in-households.

3.94 In a housing-led forecast, if the demographic trend does not match the capacity of the housing stock, then the trend is altered, through higher or lower migration. If the capacity of the housing stock exceeds the population growth trend, then additional growth through migration will result. Likewise, if the capacity of the housing stock does not meet the requirements of the population growth trend, then growth is reduced through out-migration.

3.95 A key component of any housing-led scenario is the average 'occupancy' associated with the changing housing stock. The general 'ageing' of the UK population results in a reduction in average household size, with the older population typically having smaller household sizes compared to the younger population. Since the financial crash of 2007-08, a counter trend brought about by both financial constraints and a mismatch between demand and supply of new homes, has seen a reduction in the speed at which young adults are able to form new households, resulting in a dampening of the rate of occupancy reduction. These factors are considered in the housing-led scenario analysis.

3.96 The WRPG has mandated that water companies need to consider population and property forecasts derived from the Local Plans published by LPAs. Local Plan development encompasses a complex mix of processes, documents and data. Consilium collates evidence from all LPAs, enforcing a consistent classification on the derived data (Table 1), enabling the formulation of scenarios that consider housing need, housing requirement and planned delivery.

3.97 Local Plan evidence on future housing growth is typically formulated for a 10-15-year period, shorter than the 2025–2050 outlook required by the WRMP. Under each scenario, following the final year of plan data available, we assume that projected housing growth in non-London local authority areas returns to a long-term annual growth average by 2050.

3.98 The GLA includes its own housing-led outcome in its suite of scenarios[18]. Its scenario is based on data from the 2016 Strategic Housing Land Availability Assessment (SHLAA) providing housing growth totals, with phasing, for each London Borough. Beyond 2041, housing growth is aligned to the 2035– 2041 average.

3.1

[18] Population and household projections – London Datastore

3.99 The GLA Housing scenario adopts an alternative method for determining occupancy rates in the changing housing stock, setting upper and lower bounds for average household size in each local authority. Plus, whilst the housing-led approach is applied to each London Borough, the population projection for Greater London, in total, remains consistent with the GLA-18-Central scenario.

3.100 This scenario includes projections for London Boroughs only and is combined with the GLA-18-Central scenario for all other local authority areas when aggregated to WRZ geographies.

## OxCam Arc Scenarios

3.101 The OxCam Arc covers 26 Local Authority Districts, extending between Oxford, Milton Keynes and Cambridge. It has been identified as an area of huge economic potential. To support the Arc's economic growth potential, a requirement for up to one million new homes has been estimated to 2050, together with improvements to the transport infrastructure of the region. However, with the UK's exit from the European Union and the unprecedented, short-term effects of the Covid-19 crisis, there is considerable uncertainty around the timing of infrastructure and housing delivery.

3.102 Councils within the Arc are already seeking to manage significant increases in the rate of house building to meet targets set out in current Local Plans. Achievement of one million homes by 2050 would present a further step-change in housing delivery requirements.

3.103 Further details on the development of OxCam Arc Scenario can be found in Appendix E - Population and Property Projections. A summary of the growth scenarios we have used in developing our forecasts can be seen in Figure 3 - 5 Oxcam Scenarios.

| Scenario | Scenario Variant Housing Distribution | |
|---|---|---|
| | New Settlements (a) | Expansion (b) |
| **OxCam-1** (23k dpa) | Cherwell (20%), Aylesbury Vale (20%), Central Bedfordshire (40%), South Cambridgeshire (20%) | Milton Keynes (30%), Luton (15%), Bedford (15%), Oxford (10%), Cambridge (10%), Northampton (10%), Peterborough (10%) |
| **OxCam-2** (30k dpa) | | |

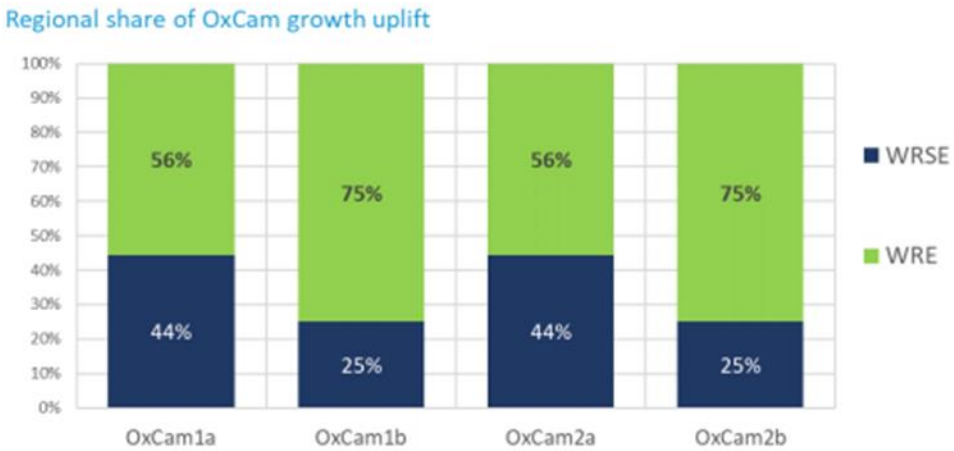


Figure 3 - 5 Oxcam Scenarios

## Long-term Scenarios

3.104 For each of the scenarios presented in Table a long-term growth outlook is considered, extending the scenario horizon to 2100[19]. Growth scenarios for the 2050–2100 period are aligned to the ONS 2018-based National Population Projection (NPP), configuring a principal, low and high growth outcome (Table ).

Table 3 - 10 Long Term Growth Scenario Assumptions

| Scenario | Description |
|---|---|
| Low ('-L') | The Low long-term scenario incorporates the mortality and fertility assumptions of the ONS 2018-based NPP Principal scenario, plus a Low net international migration assumption of +90k p.a. for the UK in total. |
| High ('-H') | The High long-term scenario incorporates the mortality and fertility assumptions of the ONS 2018-based NPP Principal scenario, plus a High net international migration assumption of +290k p.a. for the UK in total. |
| Principal ('-P') | The Principal long-term scenario incorporates the mortality and fertility assumptions of the ONS 2018-based NPP Principal scenario, plus its Principal net international migration assumption of +190k p.a. for the UK in total. |

3.105 The key determinants of growth rates under these scenarios are assumptions relating to fertility, mortality and international migration. In each of the three long-term outcomes, fertility and mortality rates trends are consistent with the NPP Principal scenario. For international migration, the Principal scenario is based on an assumption of +190k annual net growth through international migration, with the High and Low variants assuming +290k and +90k per year respectively.

3.106 Where data on site level housing developments is available, the housing-led forecasting approach is able to utilise both a combined 'top-down' and 'bottom-up' methodology. This means that micro-level forecasts of population change can be directly linked to the location of planned housing growth and the phasing over time of that growth.

3.107 A 'top-down' forecast is produced providing an indication of population and property growth for an aggregate area (local authority district). This is used as a constraint for a 'bottom-up' forecast which takes account of micro-level housing intelligence. The Consilium data provides information on the extent of new housing growth and its likely spatial and temporal distribution.

3.108 Using these approaches Edge Analytics have taken available information and use this to produce multiple forecasts of growth, in population and properties, for each of our WRZs. The growth forecasts as produced by Edge Analytics are then aligned with base year values of population and properties as reported with AR20. Table shows the different scenarios for which forecasts have been produced.

3.1

[19] Due to modelling practicalities at a regional level the investment programme described in Section 11 extends to only 2075 however we will continue to discuss demand forecasts to 2100

Table 3 - 11 Edge Growth Scenarios Alignment With WRSE Scenrio

| WRSE Scenario Name | London | Guildford | Henley | Kennet Valley | SWA | SWOX |
|---|---|---|---|---|---|---|
| Maximum Growth | Housing-Need-r-H | Housing-Plan-r-H | Completions-5Y-H | Completions-5Y-H | OxCam-2a-r-H | OxCam-2a-r-H |
| Median | ONS-18-10Y-P | Housing-Plan-L | Employment-2-H | ONS-14-P | Housing-Need-r-L | ONS-18-High-P |
| Minimum | ONS-18-Low-L | ONS-18-Low-L | ONS-18-Low-L | ONS-18-Low-L | ONS-18-Low-L | ONS-18-Low-L |
| Completions-5Y-P projection | Completions-5Y-P | Completions-5Y-P | Completions-5Y-P | Completions-5Y-P | Completions-5Y-P | Completions-5Y-P |
| Housing-Need-H projection | Housing-Need-H | Housing-Need-H | Housing-Need-H | Housing-Need-H | Housing-Need-H | Housing-Need-H |
| OxCam | OxCam-2a-r-P | OxCam-2a-r-P | OxCam-2a-r-P | OxCam-2a-r-P | OxCam-2a-r-P | OxCam-2a-r-P |
| OxCam | OxCam-2b-r-P | OxCam-2b-r-P | OxCam-2b-r-P | OxCam-2b-r-P | OxCam-2b-r-P | OxCam-2b-r-P |
| OxCam | OxCam-1a-r-P | OxCam-1a-r-P | OxCam-1a-r-P | OxCam-1a-r-P | OxCam-1a-r-P | OxCam-1a-r-P |
| OxCam | OxCam-1b-r-P | OxCam-1b-r-P | OxCam-1b-r-P | OxCam-1b-r-P | OxCam-1b-r-P | OxCam-1b-r-P |

3.109 From these we have a range of potential future growth for both population and properties across the forecasts period. Figure  shows minimum, maximum, plan-based and ONS 18 based forecasts while Figure  shows the same for forecasts of household properties. The forecasts that the maximum and minimum forecasts are based on can be seen in Table  above.


Figure 3 - 6 WRZ Population Growth Scenarios


Figure 3 - 7 WRZ Property Growth Scenarios

3.110 The rate of population change is relatively high within the plan-based forecasts, consistent with higher housing growth in Local Plans while a significantly lower rate of growth is predicted by the ONS projections. Once the period covered by the local plans, typically 10 to 15 years, the growth slows within these forecasts as we revert to ONS based forecasts.

3.111 Incorporating the range of forecasts shown above into demand forecasts and investment modelling allows a robust consideration of multiple possible futures and ensures a resilient plan. For the rest of this section we focus on the local authority plan-based and the ONS-18 forecasts as these provide a good representation of upper and lower forecasts and focussing on two scenarios will remove the complexity of presenting five – nine different scenarios.

3.112 For the six WRZs in combination, the plan-based forecast estimates a population growth of 2.2 million (22%) for the 2020-2050 plan period and 3.6 million (35%) by 2100. The ONS forecasts predict population growth of 1 million (10%) by 2050 and 2.2 million (22%) by 2100.

3.113 Household property growth is forecast to increase by 1.4 million properties (37%) by 2050 and 2.3 million properties (60%) by 2100 for the plan-based scenario. The ONS forecast predicts an increase of 0.9 million properties (22%) by 2050 and 1.7 million properties (44%) by 2100.

3.114 The forecast growth for population and properties, for both ONS and plan-based forecast, across the entire forecasting period can be seen in Figure  below.

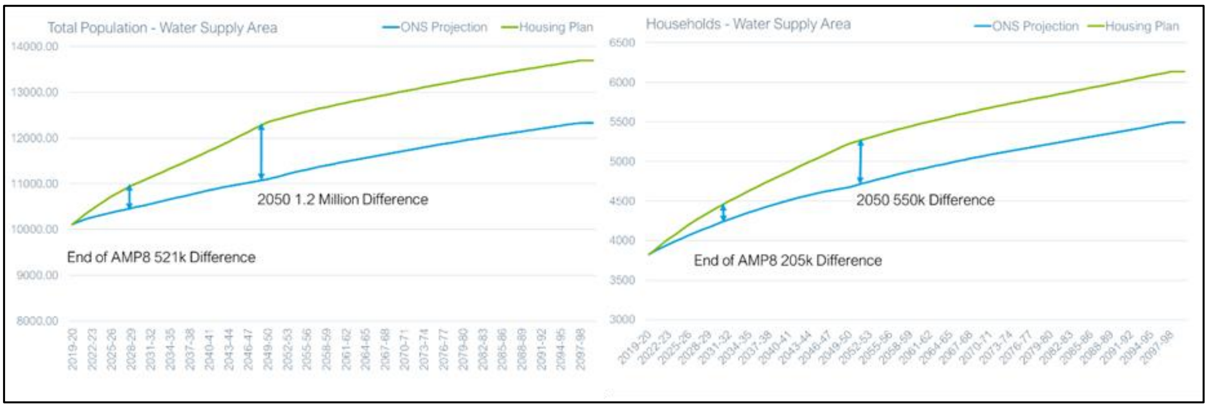


Figure 3 - 8 Difference in Population and households between ONS and Housing Plan Scenarios

3.115 The growth in both population and household properties varies by WRZ and the growth in each WRZ is presented in Table  and Table  below.

Table 3 - 12 Housing Plan Based Population Summary

| WRZ | Total Population | Plan-based Change in Population from Base Year | | | | | % Change in Population from Base Year to 2100 |
|---|---|---|---|---|---|---|---|
| | 2019-20 | 2024-25 | 2029-30 | 2049-50 | 2074-75 | 2099-2100 | |
| London | 7,875 | 8,232 | 8,496 | 9,554 | 10,212 | 10,632 | 35% |
| SWOX | 1,069 | 1,158 | 1,230 | 1,369 | 1,426 | 1,494 | 40% |
| SWA | 542 | 577 | 605 | 673 | 714 | 748 | 38% |
| Kennet Valley | 413 | 434 | 447 | 486 | 511 | 534 | 29% |
| Guildford | 164 | 178 | 186 | 204 | 213 | 223 | 35% |
| Henley | 49 | 52 | 53 | 59 | 62 | 65 | 32% |
| **Total** | **10,112** | **10,631** | **11,017** | **12,345** | **13,137** | **13,697** | **35%** |

Table 3 - 13 ONS Based Population Summary

| WRZ | Total Population | ONS Change in Population from Base Year | | | | | % Change in Population from Base Year to 2100 |
|---|---|---|---|---|---|---|---|
| | 2019-20 | 2024-25 | 2029-30 | 2049-50 | 2074-75 | 2099-2100 | |
| London | 7,875 | 8,054 | 8,182 | 8,676 | 9,284 | 9,674 | 23% |
| SWOX | 1,069 | 1,098 | 1,122 | 1,193 | 1,243 | 1,303 | 22% |
| SWA | 542 | 551 | 555 | 575 | 610 | 641 | 18% |
| Kennet Valley | 413 | 416 | 418 | 428 | 450 | 470 | 14% |
| Guildford | 164 | 165 | 166 | 167 | 175 | 182 | 11% |
| Henley | 49 | 52 | 53 | 57 | 59 | 63 | 27% |
| **Total** | **10,112** | **10,337** | **10,496** | **11,096** | **11,821** | **12,333** | **22%** |

### Measured and unmeasured property forecasts

3.116 Now that we have a total population and property forecast for each WRZ we look to disaggregate this to produce estimates for measured and unmeasured household properties, and measured, unmeasured and non-household populations for the baseline forecast.

3.117 The first stage in this process is to calculate the change in measured and unmeasured households each year which is done using simple arithmetic.

3.118 The increases in the total number of household properties each year is attributable to new households being built and, as all new household properties have a meter, these are added to the measured category.

3.119 The effects of metering are also accounted for. The total of optant and progressive meters are calculated for each year and this number is subtracted from the unmeasured household category and added to the measured household category.

3.120 These simple calculations allow us to produce household property forecasts segmented by their metering status.

3.121 The calculation of populations for metered and unmetered properties is more complex. Forecasts of population are not available for measured and unmeasured property types and therefore need to be calculated. An algorithm is used to forecast the changing occupancy for measured and unmeasured population as metering progresses. This algorithm is initiated by calculating the change in population expected from shifts in metering status and new build properties for both measured and unmeasured populations. These are then used with forecast population changes to reconcile the two calculations against total population on an annual basis.

3.122 The calculated occupancy can then be multiplied by the total number of households in each segment giving a total population value for each. Population totals for each segment and their associated occupancy are shown in Table . Forecasts of properties and population for each WRZ and each segment are used in the production of demand forecasts.

Table 3 - 14 Plan-based Growth Statistics

| WRZ | Parameter | | 2019-20 | 2024-25 | 2029-30 | 2049-50 | 2074-75 | 2099-2100 |
|---|---|---|---|---|---|---|---|---|
| London | Population (000s) | Measured | 3,085.022 | 4,670.074 | 5,148.854 | 6,832.927 | 8,130.823 | 9,057.133 |
| | | Unmeasured | 4,738.050 | 3,507.715 | 3,290.425 | 2,642.314 | 1,980.908 | 1,461.639 |
| | | Non-Household | 51.443 | 53.856 | 56.898 | 78.850 | 100.070 | 113.724 |
| | Properties (000s) | Measured | 1,221.332 | 1,867.538 | 2,113.250 | 2,952.128 | 3,614.001 | 4,096.771 |
| | | Unmeasured | 1,614.129 | 1,207.072 | 1,162.132 | 982.372 | 757.672 | 568.924 |
| | Occupancy | Measured | 2.53 | 2.50 | 2.44 | 2.31 | 2.25 | 2.21 |
| | | Unmeasured | 2.94 | 2.91 | 2.83 | 2.69 | 2.61 | 2.57 |
| | | Overall | 2.76 | 2.66 | 2.58 | 2.41 | 2.31 | 2.25 |
| SWOX | Population (000s) | Measured | 604.884 | 1,030.722 | 1,103.223 | 1,240.077 | 1,295.412 | 1,362.779 |
| | | Unmeasured | 431.470 | 93.962 | 92.419 | 88.056 | 86.081 | 83.902 |
| | | Non-Household | 32.589 | 33.577 | 34.837 | 40.677 | 44.299 | 47.563 |
| | Properties (000s) | Measured | 269.613 | 426.605 | 464.237 | 547.676 | 585.243 | 631.664 |
| | | Unmeasured | 144.418 | 29.204 | 29.204 | 29.204 | 29.204 | 29.204 |
| | Occupancy | Measured | 2.24 | 2.42 | 2.38 | 2.26 | 2.21 | 2.16 |
| | | Unmeasured | 2.99 | 3.22 | 3.16 | 3.02 | 2.95 | 2.87 |
| | | Overall | 2.50 | 2.47 | 2.42 | 2.30 | 2.25 | 2.19 |
| SWA | Population (000s) | Measured | 256.622 | 423.780 | 456.435 | 539.806 | 596.119 | 644.882 |
| | | Unmeasured | 280.491 | 147.631 | 142.585 | 124.876 | 107.355 | 91.955 |
| | | Non-Household | 5.281 | 5.642 | 6.091 | 8.239 | 10.159 | 11.556 |
| | Properties (000s) | Measured | 109.277 | 173.068 | 188.867 | 232.711 | 263.074 | 290.598 |
| | | Unmeasured | 95.079 | 47.994 | 46.966 | 42.854 | 37.714 | 32.985 |
| | Occupancy | Measured | 2.35 | 2.45 | 2.42 | 2.32 | 2.27 | 2.22 |
| | | Unmeasured | 2.95 | 3.08 | 3.04 | 2.91 | 2.85 | 2.79 |
| | | Overall | 2.63 | 2.58 | 2.54 | 2.41 | 2.34 | 2.28 |
| Kennet Valley | Population (000s) | Measured | 202.699 | 369.755 | 386.132 | 428.724 | 453.712 | 477.200 |
| | | Unmeasured | 203.171 | 57.141 | 53.398 | 48.108 | 46.995 | 45.873 |
| | | Non-Household | 6.791 | 7.013 | 7.309 | 8.782 | 9.900 | 10.768 |

| WRZ | Parameter | | 2019-20 | 2024-25 | 2029-30 | 2049-50 | 2074-75 | 2099-2100 |
|---|---|---|---|---|---|---|---|---|
| | Properties (000s) | Measured | 87.559 | 148.285 | 157.152 | 181.022 | 196.112 | 211.311 |
| | | Unmeasured | 67.962 | 17.745 | 16.829 | 15.730 | 15.730 | 15.730 |
| | Occupancy | Measured | 2.31 | 2.49 | 2.46 | 2.37 | 2.31 | 2.26 |
| | | Unmeasured | 2.99 | 3.22 | 3.17 | 3.06 | 2.99 | 2.92 |
| | | Overall | 2.61 | 2.57 | 2.53 | 2.42 | 2.36 | 2.30 |
| Guildford | Population (000s) | Measured | 75.297 | 162.111 | 169.745 | 187.503 | 195.998 | 205.128 |
| | | Unmeasured | 81.631 | 8.721 | 8.604 | 8.221 | 8.048 | 7.842 |
| | | Non-Household | 7.468 | 7.611 | 7.769 | 8.552 | 9.091 | 9.551 |
| | Properties (000s) | Measured | 32.204 | 63.163 | 67.036 | 77.504 | 82.755 | 88.879 |
| | | Unmeasured | 27.904 | 2.716 | 2.716 | 2.716 | 2.716 | 2.716 |
| | Occupancy | Measured | 2.34 | 2.57 | 2.53 | 2.42 | 2.37 | 2.31 |
| | | Unmeasured | 2.93 | 3.21 | 3.17 | 3.03 | 2.96 | 2.89 |
| | | Overall | 2.61 | 2.59 | 2.56 | 2.44 | 2.39 | 2.33 |
| Henley | Population (000s) | Measured | 29.364 | 46.091 | 47.480 | 53.484 | 56.070 | 59.342 |
| | | Unmeasured | 19.790 | 5.074 | 4.681 | 4.461 | 4.375 | 4.281 |
| | | Non-Household | 0.271 | 0.360 | 0.453 | 0.877 | 1.203 | 1.455 |
| | Properties (000s) | Measured | 14.014 | 19.927 | 20.743 | 24.157 | 25.828 | 27.935 |
| | | Unmeasured | 6.528 | 1.516 | 1.413 | 1.393 | 1.393 | 1.393 |
| | Occupancy | Measured | 2.10 | 2.31 | 2.29 | 2.21 | 2.17 | 2.12 |
| | | Unmeasured | 3.03 | 3.35 | 3.31 | 3.20 | 3.14 | 3.07 |
| | | Overall | 2.39 | 2.39 | 2.35 | 2.27 | 2.22 | 2.17 |

Table 3 - 15 ONS Growth Statistics

| WRZ | Parameter | | 2019-20 | 2024-25 | 2029-30 | 2049-50 | 2074-75 | 2099-2100 |
|---|---|---|---|---|---|---|---|---|
| London | Population (000s) | Measured | 3,085.022 | 4,496.115 | 4,839.007 | 5,948.805 | 7,195.622 | 8,091.775 |
| | | Unmeasured | 4,738.050 | 3,504.439 | 3,285.950 | 2,648.179 | 1,988.374 | 1,468.683 |
| | | Non-Household | 51.443 | 53.856 | 56.898 | 78.850 | 100.070 | 113.724 |
| | Properties (000s) | Measured | 1,221.332 | 1,799.653 | 1,988.784 | 2,564.455 | 3,186.312 | 3,642.560 |

| WRZ | Parameter | | 2019-20 | 2024-25 | 2029-30 | 2049-50 | 2074-75 | 2099-2100 |
|---|---|---|---|---|---|---|---|---|
| | | Unmeasured | 1,614.129 | 1,207.072 | 1,162.132 | 982.372 | 757.672 | 568.924 |
| | Occupancy | Measured | 2.53 | 2.50 | 2.43 | 2.32 | 2.26 | 2.22 |
| | | Unmeasured | 2.94 | 2.90 | 2.83 | 2.70 | 2.62 | 2.58 |
| | | Overall | 2.76 | 2.66 | 2.58 | 2.42 | 2.33 | 2.27 |
| SWOX | Population (000s) | Measured | 604.884 | 971.242 | 995.180 | 1,064.022 | 1,112.034 | 1,171.196 |
| | | Unmeasured | 431.470 | 93.507 | 91.834 | 88.210 | 86.252 | 84.119 |
| | | Non-Household | 32.589 | 33.577 | 34.837 | 40.677 | 44.299 | 47.563 |
| | Properties (000s) | Measured | 269.613 | 403.941 | 421.437 | 469.102 | 501.403 | 541.466 |
| | | Unmeasured | 144.418 | 29.204 | 29.204 | 29.204 | 29.204 | 29.204 |
| | Occupancy | Measured | 2.24 | 2.40 | 2.36 | 2.27 | 2.22 | 2.16 |
| | | Unmeasured | 2.99 | 3.20 | 3.14 | 3.02 | 2.95 | 2.88 |
| | | Overall | 2.50 | 2.46 | 2.41 | 2.31 | 2.26 | 2.20 |
| SWA | Population (000s) | Measured | 256.622 | 399.044 | 408.105 | 442.335 | 492.966 | 537.005 |
| | | Unmeasured | 280.491 | 146.657 | 140.980 | 124.562 | 107.256 | 92.013 |
| | | Non-Household | 5.281 | 5.642 | 6.091 | 8.239 | 10.159 | 11.556 |
| | Properties (000s) | Measured | 109.277 | 164.048 | 170.790 | 191.172 | 217.753 | 241.832 |
| | | Unmeasured | 95.079 | 47.994 | 46.966 | 42.854 | 37.714 | 32.985 |
| | Occupancy | Measured | 2.35 | 2.43 | 2.39 | 2.31 | 2.26 | 2.22 |
| | | Unmeasured | 2.95 | 3.06 | 3.00 | 2.91 | 2.84 | 2.79 |
| | | Overall | 2.63 | 2.57 | 2.52 | 2.42 | 2.35 | 2.29 |
| Kennet Valley | Population (000s) | Measured | 202.699 | 352.164 | 357.477 | 370.689 | 392.588 | 413.414 |
| | | Unmeasured | 203.171 | 57.047 | 53.347 | 48.439 | 47.345 | 46.245 |
| | | Non-Household | 6.791 | 7.013 | 7.309 | 8.782 | 9.900 | 10.768 |
| | Properties (000s) | Measured | 87.559 | 141.462 | 145.629 | 155.449 | 168.438 | 181.593 |
| | | Unmeasured | 67.962 | 17.745 | 16.829 | 15.730 | 15.730 | 15.730 |
| | Occupancy | Measured | 2.31 | 2.49 | 2.45 | 2.38 | 2.33 | 2.28 |
| | | Unmeasured | 2.99 | 3.21 | 3.17 | 3.08 | 3.01 | 2.94 |
| | | Overall | 2.61 | 2.57 | 2.53 | 2.45 | 2.39 | 2.33 |
| Guildford | Population (000s) | Measured | 75.297 | 148.908 | 149.301 | 150.492 | 157.384 | 164.959 |

| WRZ | Parameter | | 2019-20 | 2024-25 | 2029-30 | 2049-50 | 2074-75 | 2099-2100 |
|---|---|---|---|---|---|---|---|---|
| | | Unmeasured | 81.631 | 8.666 | 8.563 | 8.293 | 8.130 | 7.934 |
| | | Non-Household | 7.468 | 7.611 | 7.769 | 8.552 | 9.091 | 9.551 |
| | Properties (000s) | Measured | 32.204 | 58.390 | 59.243 | 61.665 | 65.779 | 70.649 |
| | | Unmeasured | 27.904 | 2.716 | 2.716 | 2.716 | 2.716 | 2.716 |
| | Occupancy | Measured | 2.34 | 2.55 | 2.52 | 2.44 | 2.39 | 2.33 |
| | | Unmeasured | 2.93 | 3.19 | 3.15 | 3.05 | 2.99 | 2.92 |
| | | Overall | 2.61 | 2.58 | 2.55 | 2.47 | 2.42 | 2.36 |
| Henley | Population (000s) | Measured | 29.364 | 46.230 | 47.816 | 51.583 | 54.061 | 57.211 |
| | | Unmeasured | 19.790 | 5.010 | 4.588 | 4.331 | 4.235 | 4.138 |
| | | Non-Household | 0.271 | 0.360 | 0.453 | 0.877 | 1.203 | 1.455 |
| | Properties (000s) | Measured | 14.014 | 20.243 | 21.313 | 23.998 | 25.725 | 27.860 |
| | | Unmeasured | 6.528 | 1.516 | 1.413 | 1.393 | 1.393 | 1.393 |
| | Occupancy | Measured | 2.10 | 2.28 | 2.24 | 2.15 | 2.10 | 2.05 |
| | | Unmeasured | 3.03 | 3.30 | 3.25 | 3.11 | 3.04 | 2.97 |
| | | Overall | 2.39 | 2.35 | 2.31 | 2.20 | 2.15 | 2.10 |

## Household water use

### Introduction

3.123 We forecast future household consumption in line with the methods set out by "WRMP19 Methods – Household Consumption Forecasting.

3.124 We use the same linear regression approach we used for the WRMP19. Details of the approach can be found in Appendix F Household Water Demand Forecasting.

### Household Consumption Model

3.125 The model takes the form:

$$\boldsymbol{Consumption = \alpha + \beta x_1 + \gamma x_2 + \delta x_3 + \eta x_4 + \upsilon x_5 + \varepsilon} \qquad \textbf{Equation } 1$$

where:

$x_1$ Number of adults
$x_2$ Number of children
$x_3$ South Asian Ethnic Group flagged property type flag; either Semi-detached, terraced, flats, flat block or detached
$x_4$ Non-IBP flagged property type flag; either Semi-detached, terraced, flats or flat block
$x_5$ Rateable value (RV)

and the coefficients:

$\alpha$ Intercept
$\beta$ Number of adults
$\gamma$ Number of children
$\boldsymbol{\delta}$ Vector of coefficients for South Asian Ethnic Group property types; Semi-detached, terraced, flats, flat block and detached. The appropriate coefficient is used dependent on the value of $x_3$
$\boldsymbol{\eta}$ Vector of coefficients for South Asian Ethnic Group property types; Semi-detached, terraced, flats, flat block and detached. The appropriate coefficient is used dependent on the value of $x_4$
$\upsilon$ Rateable value (RV)
$\varepsilon$ Error term

3.126 These parameters are the same for both the London and Thames Valley data sets.

3.127 The household consumption model residuals from previous years produce a significant trend in time series, indicating that some of the projected change in consumption is not accounted for by dynamic time series parameters within the model such as occupancy rates and meter penetration.

3.128 This observed un-modelled trend is thought to be driven by both technological efficiency of water using devices and behavioural changes.

3.129 Separate trends were derived for both London and Thames Valley data sets. The trend was observed over a ten-year period and is derived from model residuals. The trend was generally downward and stronger for winter; the year-round trend was applied to the initial forecast period to 2045 and also for a ten year initial period.

3.130 It is possible that the strong Thames Valley and weak London trends could switch because evidence[20] showed more efficient appliances are installed in Thames Valley, thus leaving a greater potential for consumption reduction in the London area.

3.131 Therefore, we have used a weighted average of the two observed trends for use in the demand forecasts. The trend is presented as a percentage which is used to factor the household demand. This trend has then been linearly extrapolated to 2100. The resultant trend across the whole forecast period is shown in Figure . In our opinion the extrapolation of this trend-based method into the future represents some of anticipated savings that would be anticipated from Government led water savings initiatives such as water labelling and as such we have been careful not to double count these savings. More details on Government led initiatives and associated benefits are contained within Section 8.

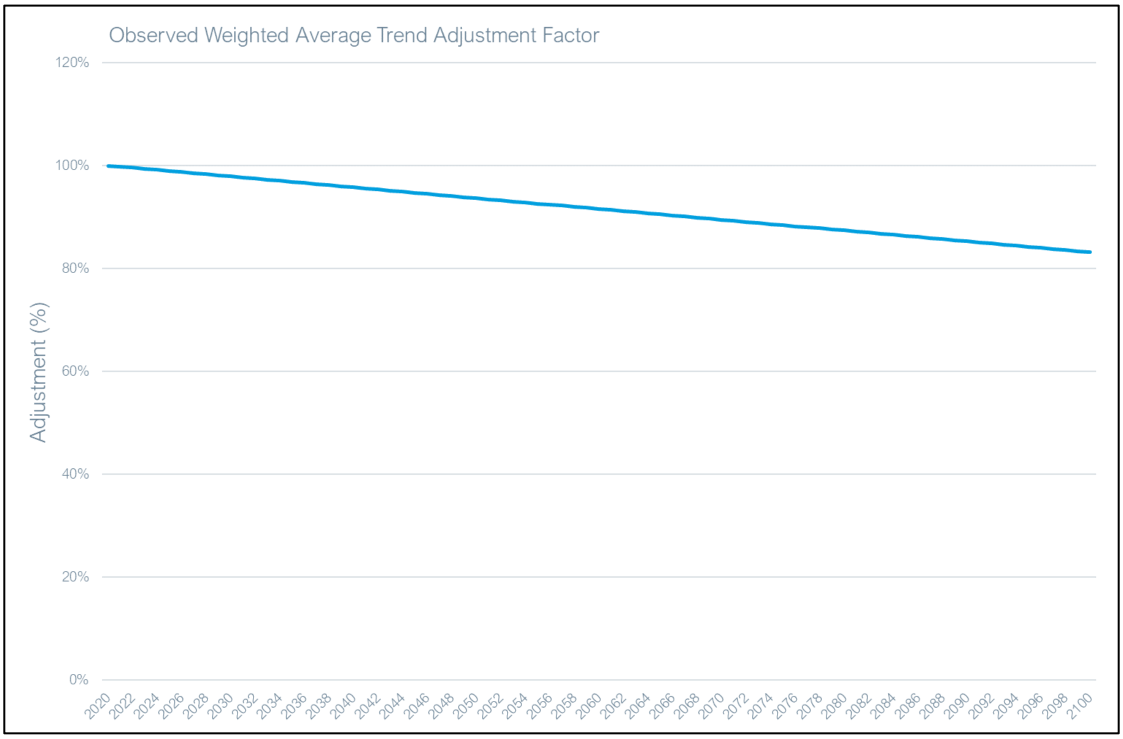


Figure 3 - 9 Household demand trend adjustment factor

3.1

[20] WRMP19 Household Consumption Forecast Final Report – Artesia Consulting 2017

## Climate change

3.132 We commissioned the consultants HR Wallingford to carry out a study[21] to estimate the likely impacts of climate change upon household demand. No climate change effects are assumed for other components of demand based on the findings of the UKWIR report on the impacts of climate change on demand[22].

3.133 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.

3.134 We provided the following data sets:

- DWUS Unmeasured PCC by property type (2000-2010)
- PCC by property type for testDWUS23 panel (2002-2004)
- Demand data (distribution input – minimum night line, 1998 onwards)
- Climate data (temperature, rainfall and sunshine hours, 1998 onwards)

3.135 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. 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.

3.136 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.

3.137 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 revised draft WRMP is 2016/17 a scaling factor was calculated:

$$ScalingFactor = \frac{2035 - BaseYear}{2035 - 1975} \qquad \text{Equation 2}$$

3.138 As the base year is 2019-20 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.

3.139 These factors were then used 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

3.1

[21] HR Wallingford (2012) EX6828 Thames Water Climate Change Impacts and Water Resource Planning. Thames Water Climate Change Impacts on Demand for the 2030s
[22] UKWIR 2013 Impact of Climate Change on Water Demand 13/CL/04/12
[23] testDWUS – A temporary panel of unmeasured customers used to validate DWUS

estimates have been used in headroom modelling (see Section 5: Allowing for risk and uncertainty).

3.140 The climate change profiles for lower, mid and upper estimates are shown for the DYAA and DYCP scenarios in Figure  and Figure .

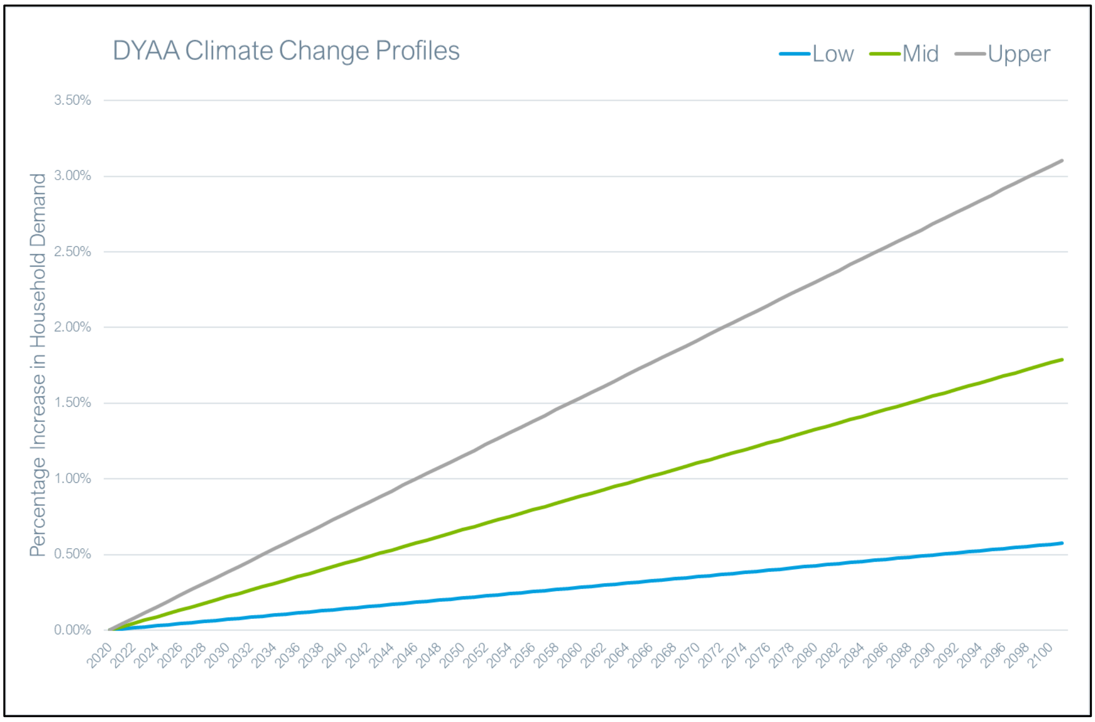


Figure 3 - 10 The impacts of climate change for the DYAA scenario

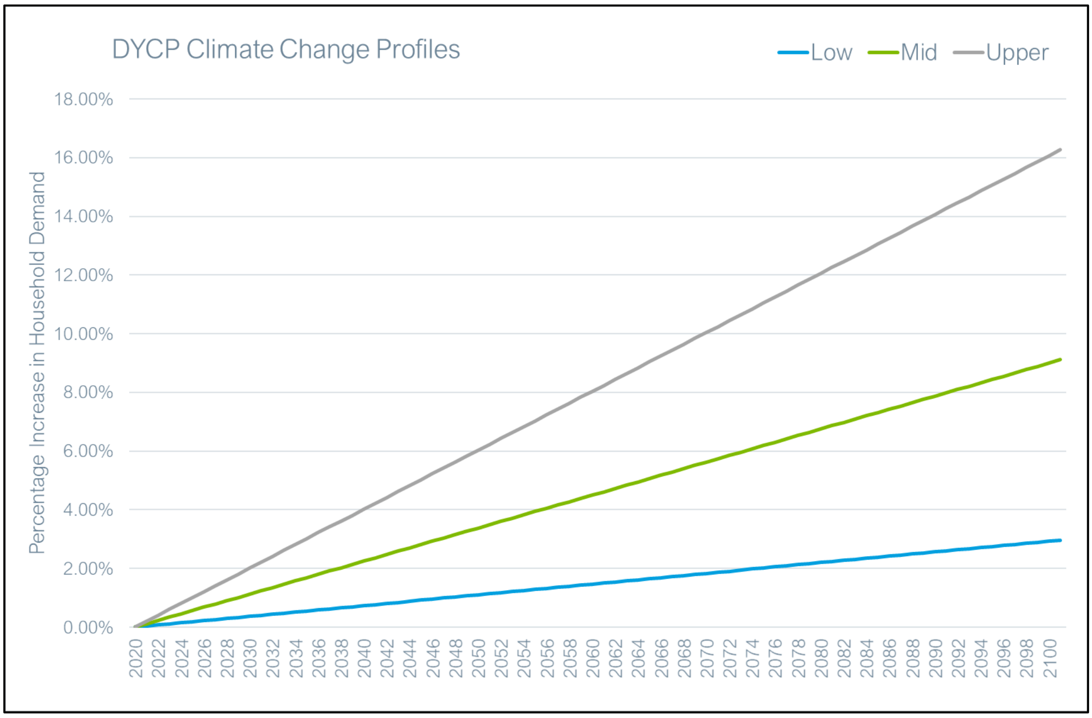


Figure 3 - 11 The impacts of climate change for the DYCP scenario

3.141 The volume impact of the central climate change profiles for DYAA is shown in Table  and Table  and for DYCP in Table 3 - 18 and Table .

Table 3 - 16 Plan-based DYAA additional demand due to climate change

| Units Ml/d | 2020 | 2025 | 2030 | 2050 | 2075 | 2100 |
|---|---|---|---|---|---|---|
| Guildford | 0.00 | 0.01 | 0.02 | 0.05 | 0.10 | 0.15 |
| Henley | 0.00 | 0.03 | 0.05 | 0.16 | 0.29 | 0.43 |
| Kennet Valley | 0.00 | 0.06 | 0.13 | 0.40 | 0.73 | 1.08 |
| London | 0.00 | 1.24 | 2.56 | 8.46 | 15.90 | 23.40 |
| SWA | 0.00 | 0.09 | 0.18 | 0.58 | 1.08 | 1.62 |
| SWOX | 0.00 | 0.17 | 0.35 | 1.13 | 2.05 | 3.03 |

Table 3 - 17 ONS DYAA additional demand due to climate change

| Units Ml/d | 2020 | 2025 | 2030 | 2050 | 2075 | 2100 |
|---|---|---|---|---|---|---|
| Guildford | 0.00 | 0.01 | 0.02 | 0.05 | 0.10 | 0.14 |
| Henley | 0.00 | 0.02 | 0.04 | 0.13 | 0.24 | 0.35 |
| Kennet Valley | 0.00 | 0.06 | 0.12 | 0.35 | 0.64 | 0.95 |
| London | 0.00 | 1.22 | 2.47 | 7.67 | 14.43 | 21.26 |
| SWA | 0.00 | 0.08 | 0.16 | 0.50 | 0.93 | 1.38 |
| SWOX | 0.00 | 0.16 | 0.32 | 0.99 | 1.80 | 2.67 |

Table 3 - 18 Plan-based DYCP additional demand due to climate change

| Units Ml/d | 2020 | 2025 | 2030 | 2050 | 2075 | 2100 |
|---|---|---|---|---|---|---|
| Guildford | 0.00 | 0.06 | 0.12 | 0.38 | 0.70 | 1.03 |
| Henley | 0.00 | 0.19 | 0.37 | 1.17 | 2.11 | 3.10 |
| Kennet Valley | 0.00 | 0.45 | 0.90 | 2.80 | 5.11 | 7.54 |
| SWA | 0.00 | 0.61 | 1.25 | 3.98 | 7.36 | 10.91 |
| SWOX | 0.00 | 1.20 | 2.47 | 7.76 | 14.06 | 20.70 |

Table 3 - 19 ONS DYCP additional demand due to climate change

| Units Ml/d | 2020 | 2025 | 2030 | 2050 | 2075 | 2100 |
|---|---|---|---|---|---|---|
| Guildford | 0.00 | 0.06 | 0.12 | 0.38 | 0.69 | 1.02 |
| Henley | 0.00 | 0.18 | 0.35 | 1.01 | 1.83 | 2.69 |
| Kennet Valley | 0.00 | 0.44 | 0.86 | 2.55 | 4.66 | 6.87 |
| SWA | 0.00 | 0.59 | 1.18 | 3.55 | 6.56 | 9.71 |
| SWOX | 0.00 | 1.16 | 2.32 | 7.06 | 12.78 | 18.80 |

## Baseline Demand Management

3.142 Planned activity for AMP7 is shown in the Table below. This sets out our planned activity from the 2019 Price Review and also incorporates additional activity as part of the Green Economic Recovery Programme and the conditional allowance. Additional metering numbers are shown in Table 3 - 21 and additional leakage reduction from conditional allowance in Table . Values for Green Economic Recovery and conditional allowance are included within the table of AMP7 planned activity. The total demand reduction volumes are incorporated into our demand forecasts.

3.143 We continue to support our customers and encourage efficient use of water, through a range of water efficiency initiatives on households and businesses. Average household water use continues to be higher than forecast at WRMP19 with planned reductions lower than originally set out.

3.144 Our ability to expand our delivery field-based programmes and GreenRedeem household water efficiency incentive in line with WRMP projections, was impacted significantly by Government's Covid-19 restriction – resulting in a suspension of all in-home water efficiency and wastage fix activities.

3.145 Our ability to digitally / electronically engage with customers to promote water efficiency incentives was also impacted by updated Privacy and Electronic Communication Regulations ruling under data protection laws, requiring greater levels of customer consent.

3.146 We are now changing our in-home and in-business water efficiency visits to utilise smart meter data for improved targeting of delivery and engagement activities with customers however we do not expect to be able to achieve PCC targets as set out in WRMP19.

Table 3 - 20 Baseline Demand Management Activity (Ml/d)

| WRZ | Activity | 2020-21 | 2021-22 | 2022-23 | 2023-24 | 2024-25 | 2025-26 |
|---|---|---|---|---|---|---|---|
| London | PMP Installs | 44120 | 103129 | 109705 | 85940 | 11843 | 0 |
| | Dumb Meter Replacement | 14182 | 41560 | 26633 | 28599 | 17333 | 0 |
| | Small Bulk Meter | 955 | 2786 | 1500 | 0 | 0 | 0 |
| | Bulk Meter | 414 | 710 | 366 | 0 | 0 | 0 |
| | Total Leakage Reduction (Ml/d) | 33.65 | -2.62 | 45.83 | 30.59 | 11.51 | 11.70 |
| | Total HH Usage Reduction (Ml/d) | 1.64 | 6.77 | 11.19 | 11.41 | 7.49 | 0.98 |
| | Total NHH Usage Reduction (Ml/d) | 6.08 | 2.81 | 1.10 | 0.00 | 0.00 | 0.00 |
| | Total Demand Reduction (Ml/d) | 41.36 | 6.96 | 58.12 | 42.00 | 18.99 | 0.00 |
| SWOX | PMP Installs | 0 | 0 | 14957 | 28905 | 56036 | 0 |
| | Bulk Installs | 3 | 0 | 0 | 0 | 0 | 0 |
| | Total Leakage Reduction (Ml/d) | 2.24 | -2.65 | 4.09 | 1.57 | 0.24 | 0.00 |
| | Total HH Usage Reduction (Ml/d) | 0.05 | 0.09 | 0.16 | 1.55 | 2.88 | 3.24 |
| | Total NHH Usage Reduction (Ml/d) | 1.07 | 0.63 | 0.50 | 0.00 | 0.00 | 0.00 |

| WRZ | Activity | 2020-21 | 2021-22 | 2022-23 | 2023-24 | 2024-25 | 2025-26 |
|---|---|---|---|---|---|---|---|
| | Total Demand Reduction (Ml/d) | 3.37 | -1.94 | 4.75 | 3.12 | 3.12 | 0.00 |
| Guildford | PMP Installs | 17 | 0 | 9043 | 5034 | 9759 | 0 |
| | Bulk Installs | 1 | 0 | 0 | 0 | 0 | 0 |
| | Total Leakage Reduction (Ml/d) | 1.11 | -1.43 | 1.64 | 0.18 | -0.68 | 0.00 |
| | Total HH Usage Reduction (Ml/d) | 0.03 | 0.05 | 0.10 | 0.75 | 0.56 | 0.66 |
| | Total NHH Usage Reduction (Ml/d) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Total Demand Reduction (Ml/d) | 1.14 | -1.38 | 1.74 | 0.93 | -0.11 | 0.00 |
| SWA | PMP Installs | 0 | 0 | 0 | 15673 | 30384 | 0 |
| | Total Leakage Reduction (Ml/d) | 0.00 | 0.00 | 0.00 | 0.26 | 0.49 | 0.00 |
| | Total HH Usage Reduction (Ml/d) | 0.00 | 0.00 | 0.00 | 0.34 | 1.56 | 1.76 |
| | Total NHH Usage Reduction (Ml/d) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Total Demand Reduction (Ml/d) | 0.00 | 0.00 | 0.00 | 0.59 | 2.05 | 0.00 |
| Henley | PMP Installs | 0 | 0 | 0 | 1670 | 3238 | 0 |
| | Total Leakage Reduction (Ml/d) | 0.00 | 0.00 | 0.00 | 0.03 | 0.05 | 0.00 |
| | Total HH Usage Reduction (Ml/d) | 0.00 | 0.00 | 0.00 | 0.04 | 0.19 | 0.22 |
| | Total NHH Usage Reduction (Ml/d) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Total Demand Reduction (Ml/d) | 0.00 | 0.00 | 0.00 | 0.06 | 0.24 | 0.00 |
| Kennet Valley | PMP Installs | 0 | 0 | 0 | 16777 | 32524 | 0 |
| | Total Leakage Reduction (Ml/d) | 0.00 | 0.00 | 0.00 | 0.27 | 0.53 | 0.00 |
| | Total HH Usage Reduction (Ml/d) | 0.00 | 0.00 | 0.00 | 0.36 | 1.67 | 1.88 |
| | Total NHH Usage Reduction (Ml/d) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Total Demand Reduction (Ml/d) | 0.00 | 0.00 | 0.00 | 0.63 | 2.20 | 0.00 |

Table 3 - 21 Green Economic Recovery Additional Household Meter Installs

| Region | Green Economic Recovery Meter Installs |
|---|---|
| Guildford | 14,793 |
| Henley | 4,909 |
| Kennet Valley | 49,301 |
| Slough-Wycombe-Aylesbury (SWA) | 46,057 |
| Swindon-Oxford (SWOX) | 84,941 |
| Total | 200,000 |

Table 3 - 22 Conditional Allowance Leakage Reduction

| | 2020-21 | 2021-22 | 2022-23 | 2023-24 | 2024-25 | 2025-26 |
|---|---|---|---|---|---|---|
| London Leakage Reduction | 0.0 | 0.0 | 0.0 | 9.4 | 10.0 | 11.7 |

## Household Demand forecasts

3.147 Household forecasts can now be produced for all WRZs. The charts in the sections below show total household demand in each WRZ for DYAA and ADPW where applicable. All zones show the same trend in that measured household demand increases both in absolute terms but also relative to the proportion of unmeasured household demand. This is due to two factors. The first is that all new properties are built with a meter installed and therefore drive an increase in measured demand. The second is the effect of metering (based on the AMP7 projections for the progressive metering programme, and thereafter the baseline optant and new households' forecasts to 2100).

3.148 This can be clearly seen in Figure  which shows total household demand for our whole water supply area for both ONS and plan-based forecasts of demand.

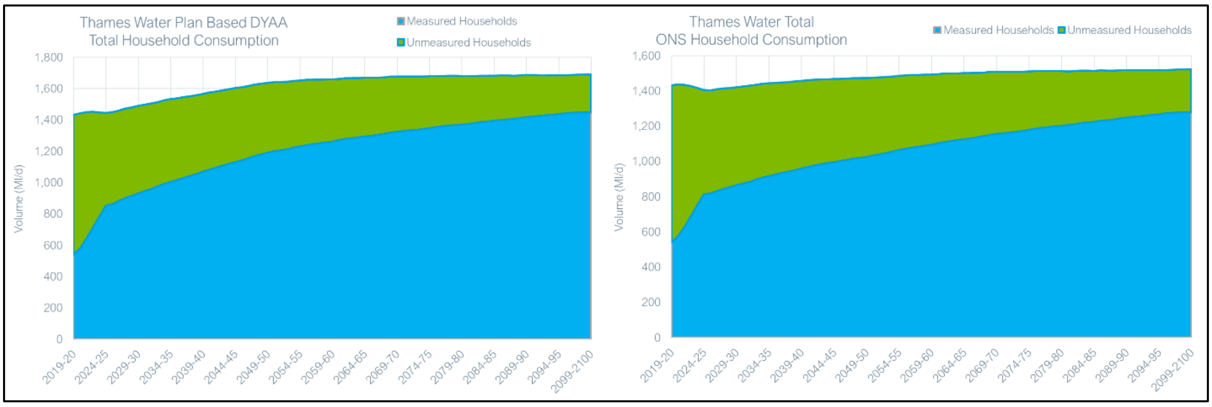


Figure 3 - 12 Thames Water Baseline Total Household Demand

3.149 The impact of both the London and Thames Valley progressive metering results in a sharp decline in unmeasured demand and a corresponding increase in measured household usage. The savings from metering and water efficiency activity within AMP7 offset the impacts of growth in both ONS and plan-based scenarios. Beyond AMP7 the effect of growth can be seen with household demand increasing in both scenarios but growing faster within the plan-based scenario due to higher growth. The plan-based scenario predicts an increase of 205 Ml/d to 2050, an additional 58 Ml/d increase to 2075 and an increase of 16 Ml/d from 2075 to 2100. The ONS scenario predicts an increase of 86 Ml/d from the start of AMP8 to 2050, an additional 55 Ml/d increase to 2075 and an increase of 16 Ml/d from 2075 to 2100.

3.150 The PCCs associated with these demands is shown in Figure  below.

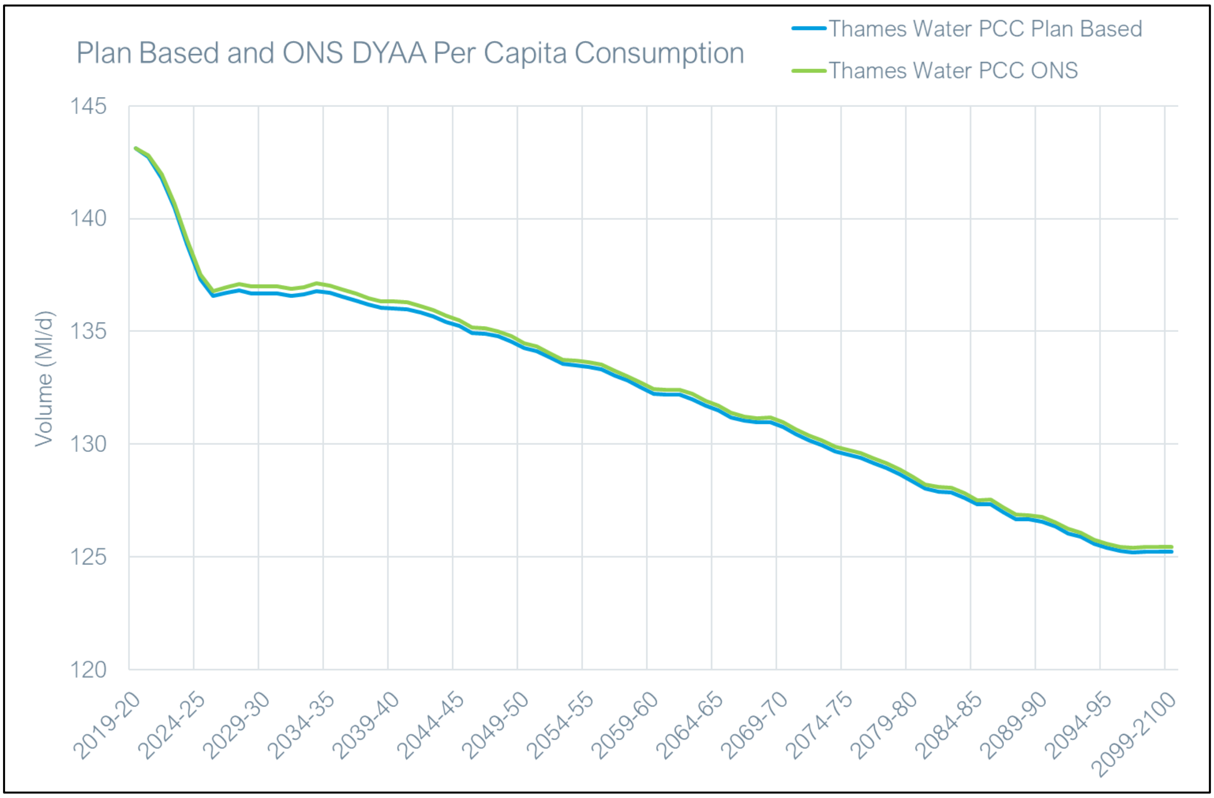


Figure 3 - 13 Thames Water Baseline Supply Area Per Capita Consumption

3.151 Minor variation in PCC is seen between the forecasts, as expected, as the volumetric differences are due to the amount of growth. Other factors within the model such as child/adult split, property types etc. remain consistent within the model so any differences are primarily due to changes in occupancy. This will affect the metered household segment more as this segment is growing and all new properties are metered.

3.152 The sharp decline in PCC in AMP7 is driven by the demand management programme incorporating metering and water efficiency, there is also a leakage reduction within the demand management programme for AMP7.

3.153 The ongoing slower reduction in PCC over the forecast period is due to ongoing changes in water using efficiency and behavioural changes, as outlined in the previous section.

### London

3.154 For the DYAA plan-based growth scenario London is forecast to begin AMP8 with a total household demand of 1,136 Ml/d, 52% of which is from customers on a measured tariff. This is forecast to increase to 1,285 Ml/d by 2050 and to 1,332 Ml/d by 2100.

3.155 The ONS 18 scenario gives a London demand of 1,106 Ml/d at the start of AMP8. This is then forecast to increase to 1,166 Ml/d by 2050 and to 1,210 Ml/d by 2100.

3.156 PCC is generally flat for all scenarios in the medium term (2025-2035) while a downward trend is seen in the longer term which is mainly due to a household demand trend adjustment factor. A summary of PCC movements for measured and unmeasured customers for both plan based and ONS scenarios can be seen in Table .

Table 3 - 23 London Baseline PCC Summary

| Component | Scenario | 2025-26 | 2049-50 | 2074-75 |
|---|---|---|---|---|
| Measured Household - PCC | ONS 18 | 118.5 | 110.9 | 111.4 |
| Unmeasured Household - PCC | ONS 18 | 156.2 | 154.4 | 149.9 |
| Measured Household - PCC | Plan Based | 124.5 | 128.5 | 126.5 |
| Unmeasured Household - PCC | Plan Based | 156.3 | 154.1 | 149.5 |

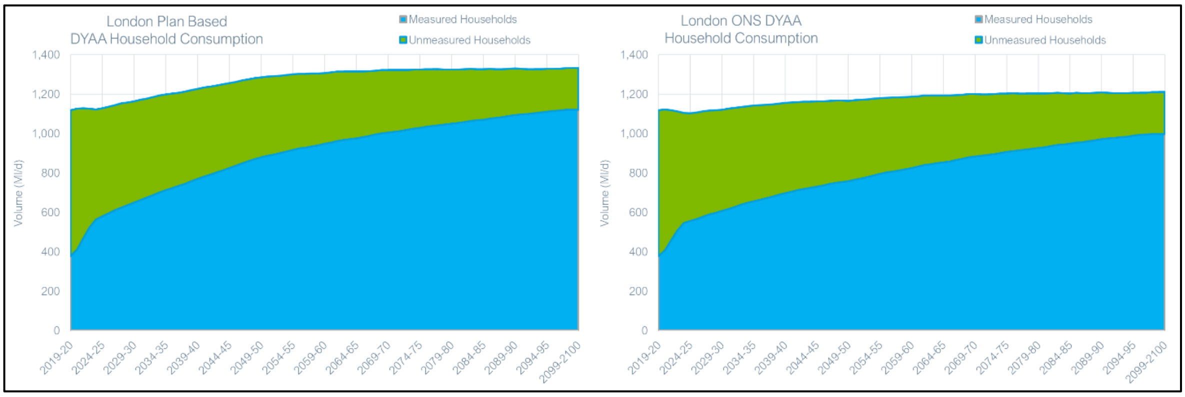


Figure 3 - 14 London Baseline DYAA Household Consumption

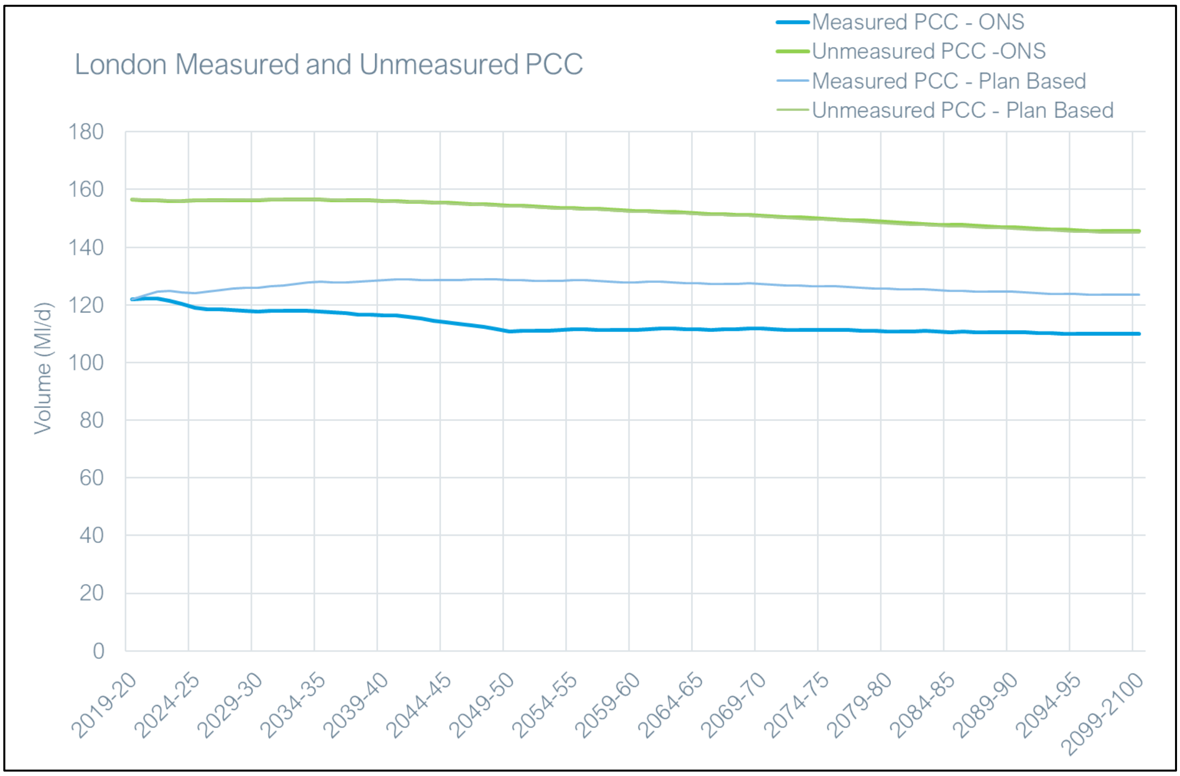


Figure 3 - 15 London Baseline Per Capita Consumption

## SWOX

3.157 For the DYAA plan-based growth scenario SWOX is forecast to begin AMP8 with a total household demand of 151.2 Ml/d. This is forecast to increase to 171.2 Ml/d by 2050 and to 172.7 Ml/d by 2100.

3.158 The DYAA ONS 18 scenario gives a SWOX household demand of 142.9 Ml/d at the start of AMP8. This is then forecast to increase to 150.4 Ml/d by 2050 and to 151.7 Ml/d by 2100.

3.159 The DYCP plan-based growth scenario SWOX is forecast to begin AMP8 with a total household demand of 213.9 Ml/d. This is forecast to increase to 237.7 Ml/d by 2050 and to 247.8 Ml/d by 2100.

3.160 The DYCP ONS 18 scenario gives a SWOX household demand of 205.6 Ml/d at the start of AMP8. This is then forecast to increase to 216.3 Ml/d by 2050 and to 225.1 Ml/d by 2100.

3.161 PCC declines sharply at the beginning of AMP8 due to the progressive metering planned as part of the Green Economic Recovery activity. The plan-based forecast shows a flat PCC for the remainder of the period while the ONS forecast exhibits a downward trend for the remainder of the forecast horizon.

3.162 A summary of PCC movements for measured and unmeasured customers for both plan based and ONS scenarios can be seen in Table .

Table 3 - 24 Baseline SWOX PCC Summary

| Component | Scenario | 2025-26 | 2049-50 | 2074-75 |
|---|---|---|---|---|
| Measured Household - PCC | ONS 18 | 123.4 | 111.0 | 106.4 |
| Unmeasured Household - PCC | ONS 18 | 145.8 | 144.3 | 139.7 |
| Measured Household - PCC | Plan Based | 131.2 | 127.8 | 122.4 |
| Unmeasured Household - PCC | Plan Based | 146.4 | 144.1 | 139.5 |

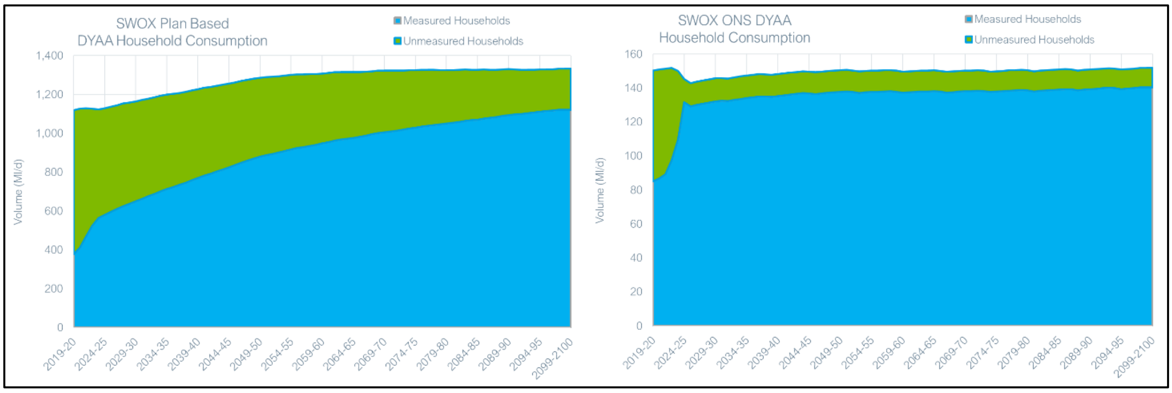


Figure 3 - 16 SWOX Baseline DYAA Household Consumption

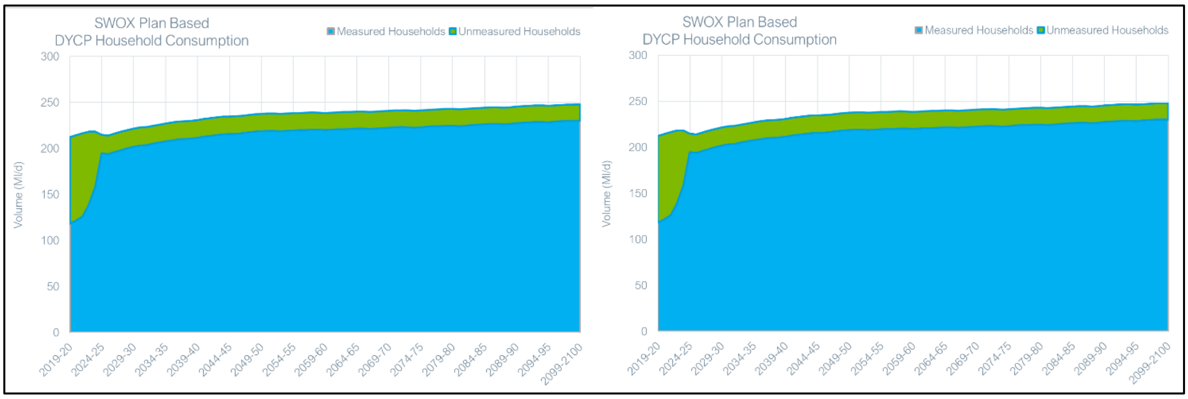


Figure 3 - 17 SWOX Baseline DYCP Household Consumption

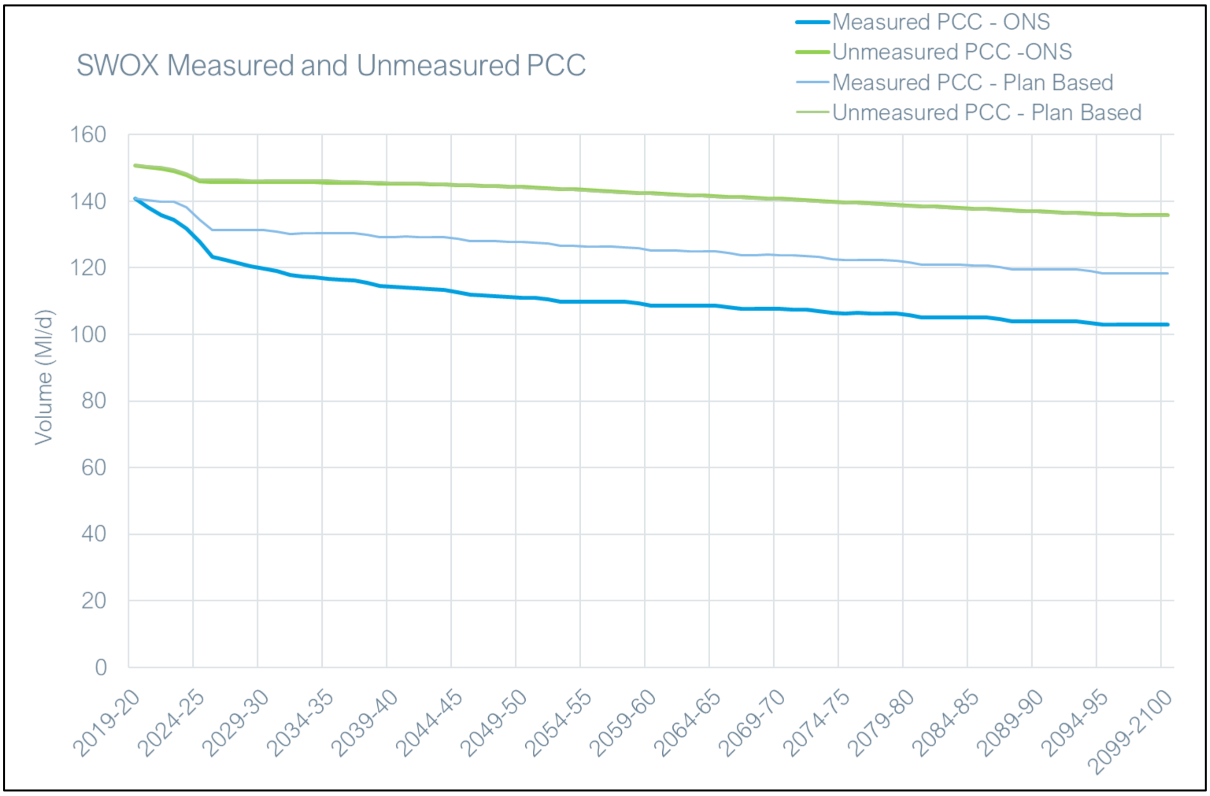


Figure 3 - 18 SWOX Baseline Per Capita Consumption

## SWA

3.163 For the DYAA plan-based growth scenario SWA is forecast to begin AMP8 with a total household demand of 77.4 Ml/d. This is forecast to increase to 88.2 Ml/d by 2050 and to 92.0 Ml/d by 2100.

3.164 The DYAA ONS 18 scenario gives a SWA demand of 73.4 Ml/d at the start of AMP8. This is then forecast to increase to 75.5 Ml/d by 2050 and to 78.7 Ml/d by 2100.

3.165 For the DYCP plan-based growth scenario SWA is forecast to begin AMP8 with a total household demand of 108.9 Ml/d. This is forecast to increase to 121.8 Ml/d by 2050 and to 130.6 Ml/d by 2100.

3.166 The DYCP ONS 18 scenario gives a SWA demand of 105.0 Ml/d at the start of AMP8. This is then forecast to increase to 108.7 Ml/d by 2050 and to 116.3 Ml/d by 2100.

3.167 PCC declines sharply at the beginning of AMP8 due to the progressive metering planned as part of the Green Economic Recovery activity. The plan-based forecast shows a flat PCC for the remainder of the period while the ONS forecast exhibits a downward trend for the remainder of the forecast horizon. A summary of PCC movements for measured and unmeasured customers for both plan based and ONS scenarios can be seen in Table .

Table 3 - 25 SWA PCC Summary

| Component | Scenario | 2025-26 | 2049-50 | 2074-75 |
|---|---|---|---|---|
| Measured Household - PCC | ONS 18 | 122.2 | 107.5 | 104.9 |
| Unmeasured Household - PCC | ONS 18 | 141.0 | 139.8 | 135.8 |
| Measured Household - PCC | Plan Based | 131.1 | 131.0 | 126.8 |
| Unmeasured Household - PCC | Plan Based | 141.7 | 140.0 | 135.9 |

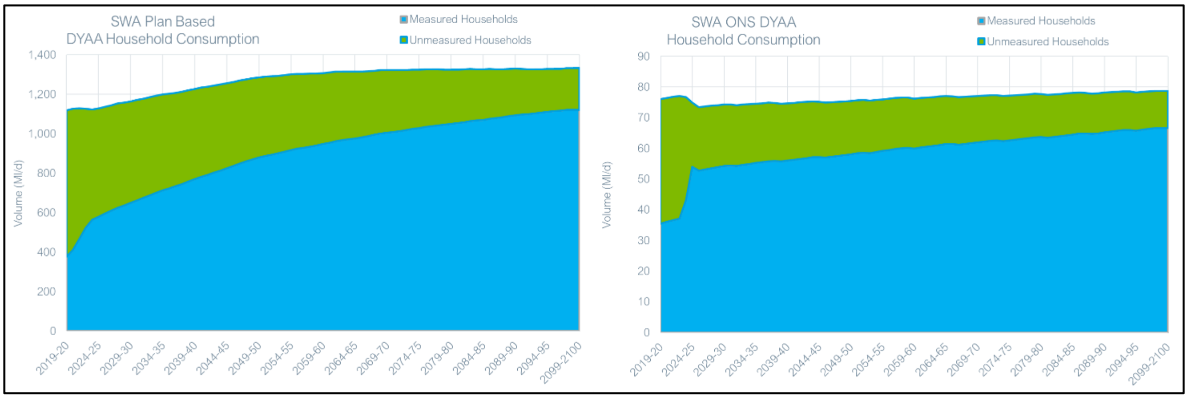


Figure 3 - 19 SWA Baseline DYAA Household Consumption

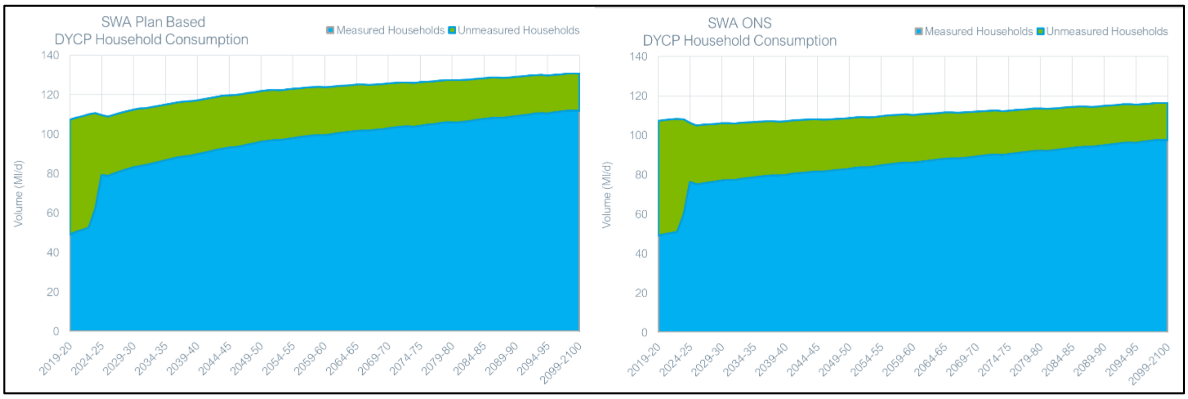


Figure 3 - 20 SWA Baseline DYCP Household Consumption

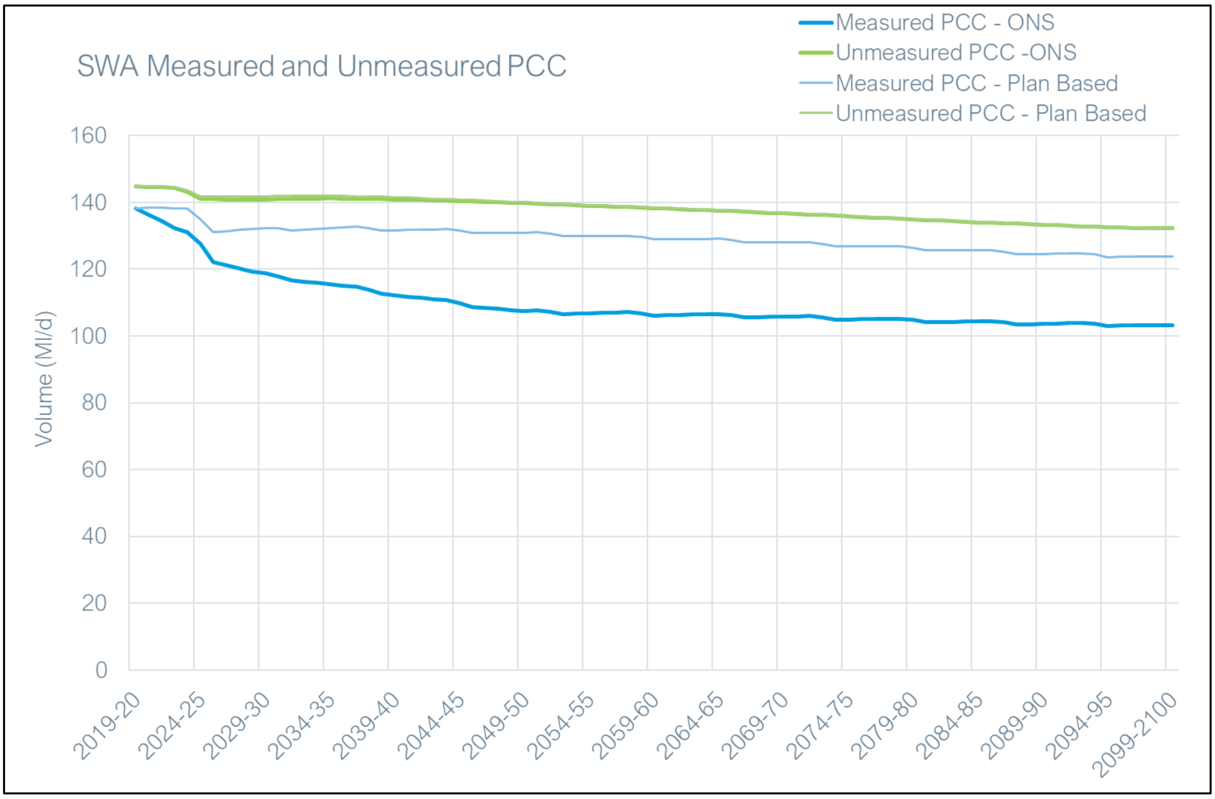


Figure 3 - 21 SWA Baseline Per Capita Consumption

## Kennet Valley

3.168 For the DYAA plan-based growth scenario Kennet Valley is forecast to begin AMP8 with a total household demand of 55.3 Ml/d. This is forecast to increase to 60.3 Ml/d by 2050 and to 61.7 Ml/d by 2100.

3.169 The DYAA ONS 18 scenario gives a Kennet Valley demand of 52.7 Ml/d at the start of AMP8. This is then forecast to increase to 53.1 Ml/d by 2050 and to 54.3 Ml/d by 2100.

3.170 For the DYCP plan-based growth scenario Kennet Valley is forecast to begin AMP8 with a total household demand of 79.3 Ml/d. This is forecast to increase to 85.6 Ml/d by 2050 and to 90.3 Ml/d by 2100.

3.171 The DYCP ONS 18 scenario gives a Kennet Valley demand of 76.7 Ml/d at the start of AMP8. This is then forecast to increase to 78.2 Ml/d by 2050 and to 82.3 Ml/d by 2100.

3.172 PCC declines sharply at the beginning of AMP8 due to the progressive metering planned as part of the Green Economic Recovery activity. The plan-based forecast shows a flat PCC for the remainder of the period while the ONS forecast exhibits a downward trend for the remainder of the forecast horizon. A summary of PCC movements for measured and unmeasured customers for both plan based and ONS scenarios can be seen in Table .

Table 3 - 26 Kennet Valley Baseline PCC Summary

| Component | Scenario | 2025-26 | 2049-50 | 2074-75 |
|---|---|---|---|---|
| Measured Household - PCC | ONS 18 | 119.7 | 108.1 | 103.7 |
| Unmeasured Household - PCC | ONS 18 | 141.9 | 140.3 | 136.0 |

| Component | Scenario | 2025-26 | 2049-50 | 2074-75 |
|---|---|---|---|---|
| Measured Household - PCC | Plan Based | 126.5 | 124.9 | 119.9 |
| Unmeasured Household - PCC | Plan Based | 142.1 | 139.6 | 135.3 |

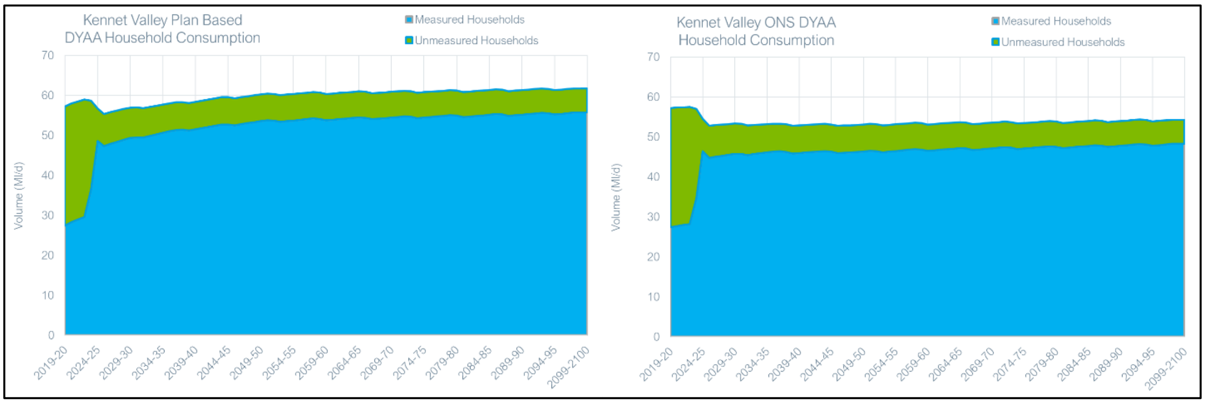


Figure 3 - 22 Kennet Valley Baseline DYAA Household Consumption

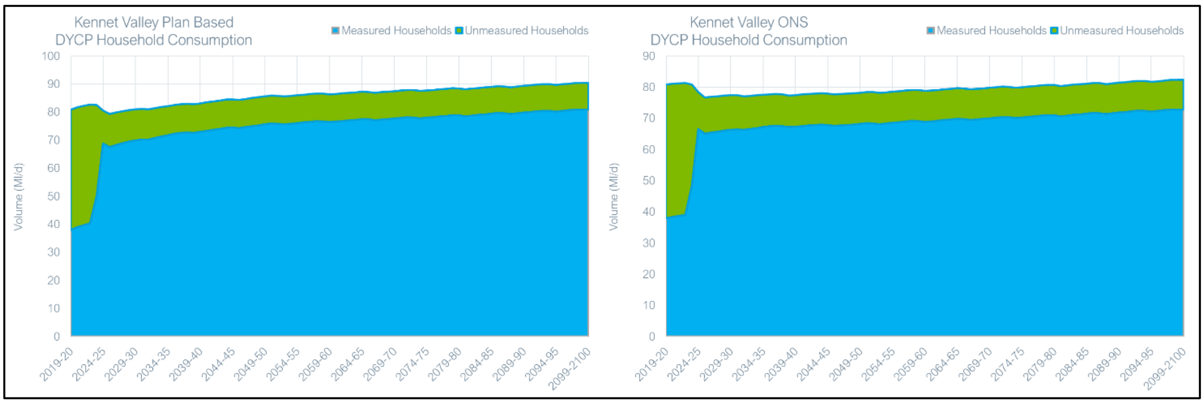


Figure 3 - 23 Kennet Valley Baseline DYCP Household Consumption

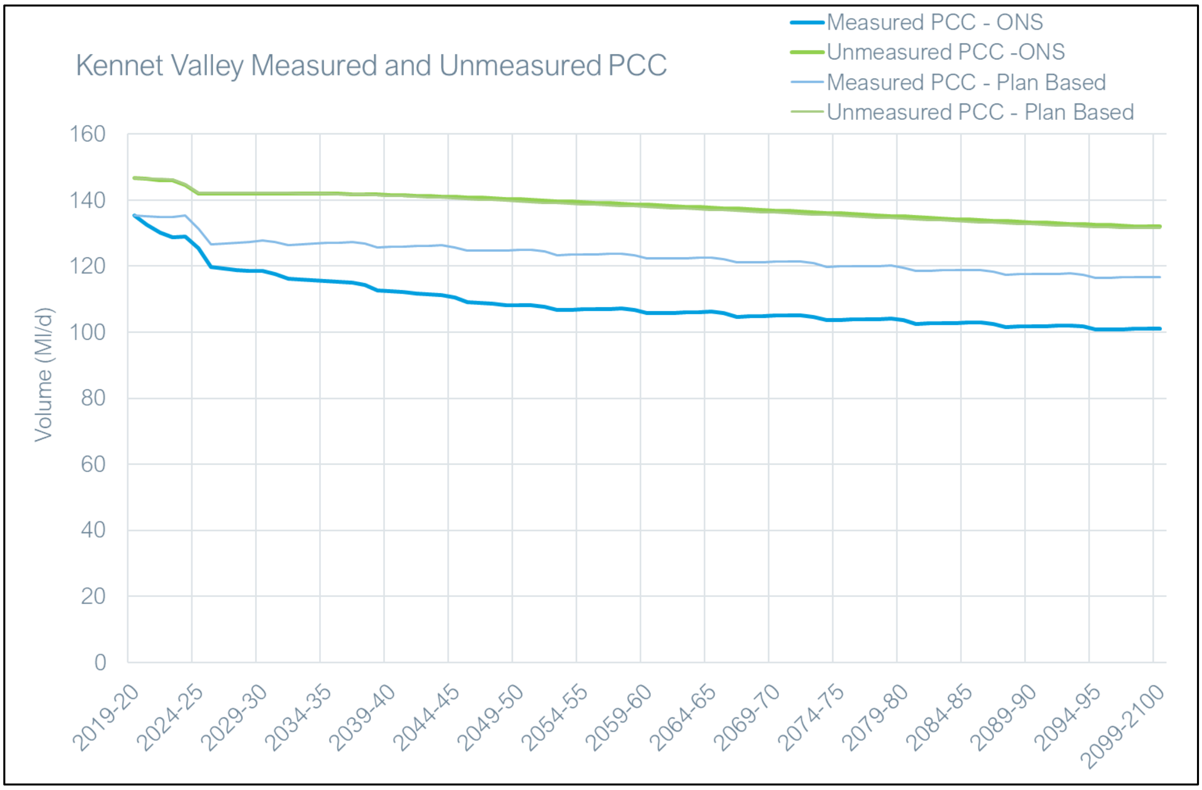


Figure 3 - 24 Kennet Valley Baseline Per Capita Consumption

## Guildford

3.173 For the DYAA plan-based growth scenario Guildford is forecast to begin AMP8 with a total household demand of 22.1 Ml/d. This is forecast to increase to 24.5 Ml/d by 2050 and to 24.7 Ml/d by 2100.

3.174 The DYAA ONS 18 scenario gives a Guildford demand of 20.3 Ml/d at the start of AMP8. This is then forecast to increase to 19.9 Ml/d by 2050 and to 20.0 Ml/d by 2100.

3.175 For the DYCP plan-based growth scenario Guildford is forecast to begin AMP8 with a total household demand of 32.7 Ml/d. This is forecast to increase to 35.7 Ml/d by 2050 and to 37.2 Ml/d by 2100.

3.176 The DYCP ONS 18 scenario gives a Guildford demand of 30.9 Ml/d at the start of AMP8. This is then forecast to increase to 31.0 Ml/d by 2050 and to 32.2 Ml/d by 2100.

3.177 PCC declines sharply at the beginning of AMP8 due to the progressive metering planned as part of the Green Economic Recovery activity. The plan-based forecast shows a flat PCC for the remainder of the period while the ONS forecast exhibits a downward trend for the remainder of the forecast horizon. A summary of PCC movements for measured and unmeasured customers for both plan based and ONS scenarios can be seen in Table .

Table 3 - 27 Guildford Baseline PCC Summary

| Component | Scenario | 2025-26 | 2049-50 | 2074-75 |
|---|---|---|---|---|
| Measured Household - PCC | ONS 18 | 116.2 | 99.9 | 95.5 |
| Unmeasured Household - PCC | ONS 18 | 147.7 | 146.2 | 141.3 |

| Component | Scenario | 2025-26 | 2049-50 | 2074-75 |
|---|---|---|---|---|
| Measured Household - PCC | Plan Based | 127.1 | 124.4 | 119.0 |
| Unmeasured Household - PCC | Plan Based | 148.3 | 145.4 | 140.4 |

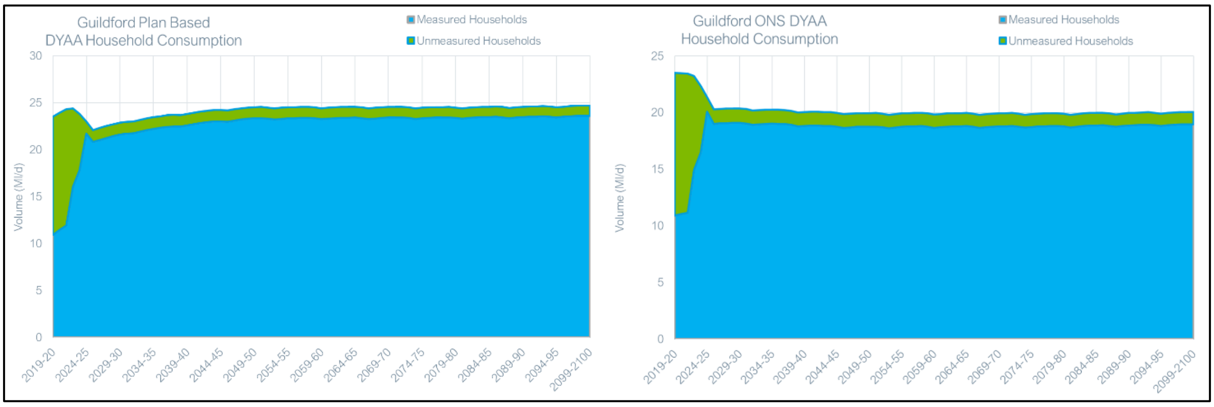


Figure 3 - 25 Guildford Baseline DYAA Household Consumption

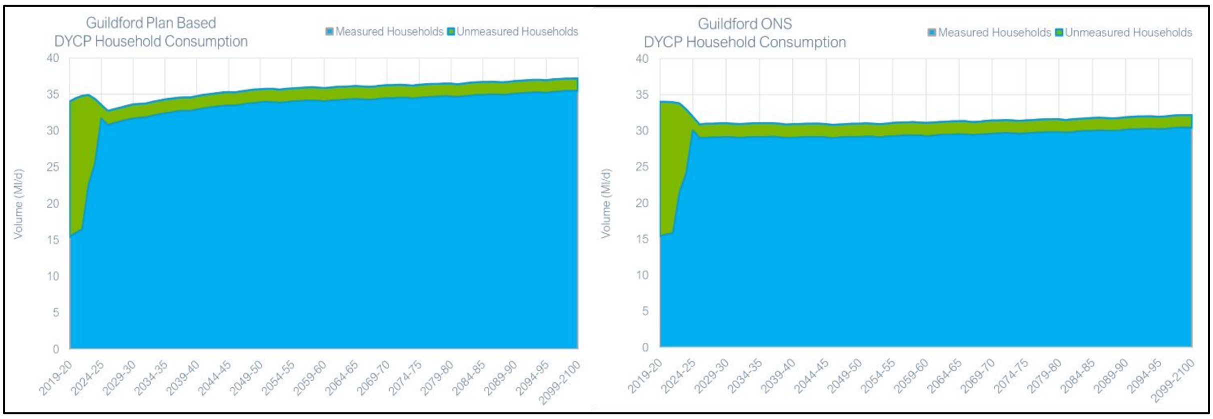


Figure 3 - 26 Guildford Baseline DYCP Household Consumption

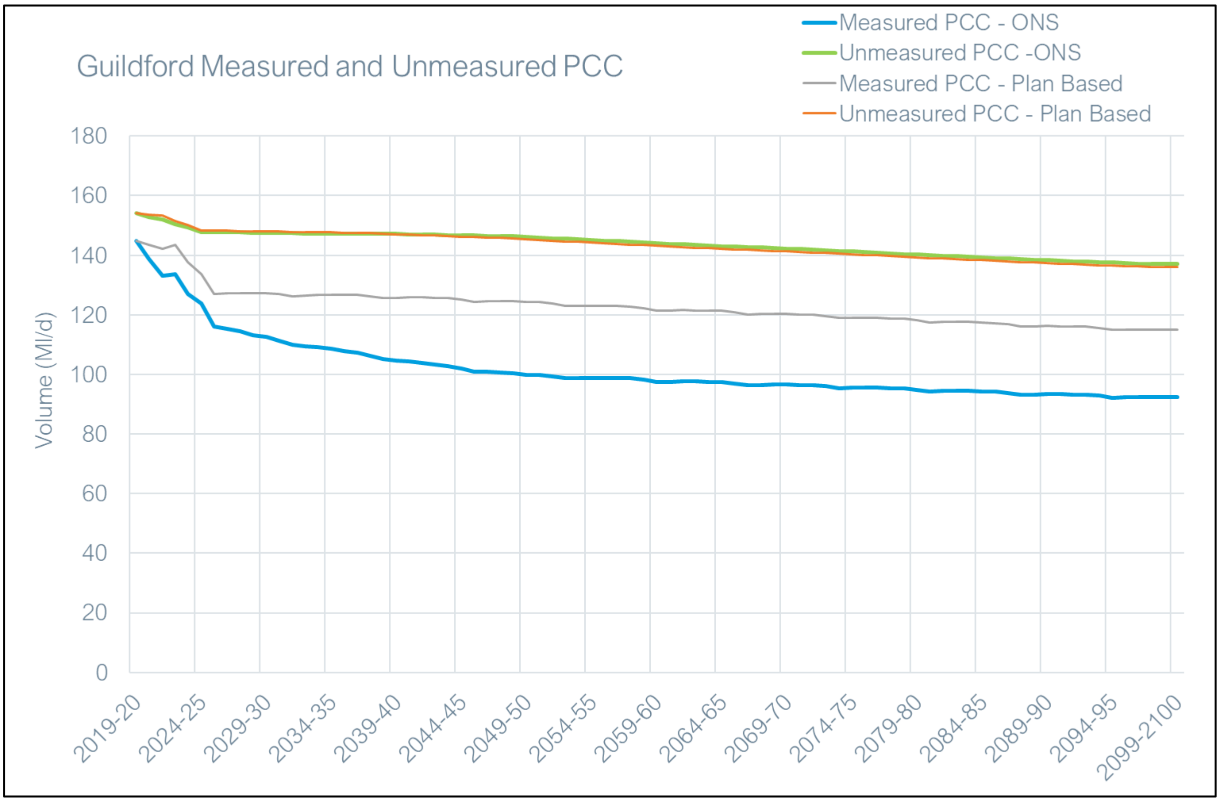


Figure 3 - 27 Guildford Baseline Per Capita Consumption

## Henley

3.178 For the DYAA plan-based growth scenario Henley is forecast to begin AMP8 with a total household demand of 7.4 Ml/d. This is forecast to increase to 8.1 Ml/d by 2050 and to 8.3 Ml/d by 2100.

3.179 The DYAA ONS 18 scenario gives a Henley demand of 7.4 Ml/d at the start of AMP8. This is then forecast to increase to 8.0 Ml/d by 2050 and to 8.2 Ml/d by 2100.

3.180 For the DYCP plan-based growth scenario Henley is forecast to begin AMP8 with a total household demand of 10.8 Ml/d. This is forecast to increase to 11.8 Ml/d by 2050 and to 12.4 Ml/d by 2100.

3.181 The DYCP ONS 18 scenario gives a Henley demand of 10.9 Ml/d at the start of AMP8. This is then forecast to increase to 11.6 Ml/d by 2050 and to 12.2 Ml/d by 2100.

3.182 PCC declines sharply at the beginning of AMP8 due to the progressive metering planned as part of the Green Economic Recovery activity. Both ONS and plan-based forecasts show very similar PCCs for both measured and unmeasured segments with a gradual decline over the forecast period. A summary of PCC movements for measured and unmeasured customers for both plan based and ONS scenarios can be seen in Table .

Table 3 - 28 Henley Baseline PCC Summary

| Component | Scenario | 2025-26 | 2049-50 | 2074-75 |
|---|---|---|---|---|
| Measured Household - PCC | ONS 18 | 144.4 | 137.5 | 132.3 |
| Unmeasured Household - PCC | ONS 18 | 139.3 | 135.0 | 130.2 |

| Component | Scenario | 2025-26 | 2049-50 | 2074-75 |
|---|---|---|---|---|
| Measured Household - PCC | Plan Based | 143.3 | 140.5 | 135.0 |
| Unmeasured Household - PCC | Plan Based | 140.4 | 137.5 | 132.8 |

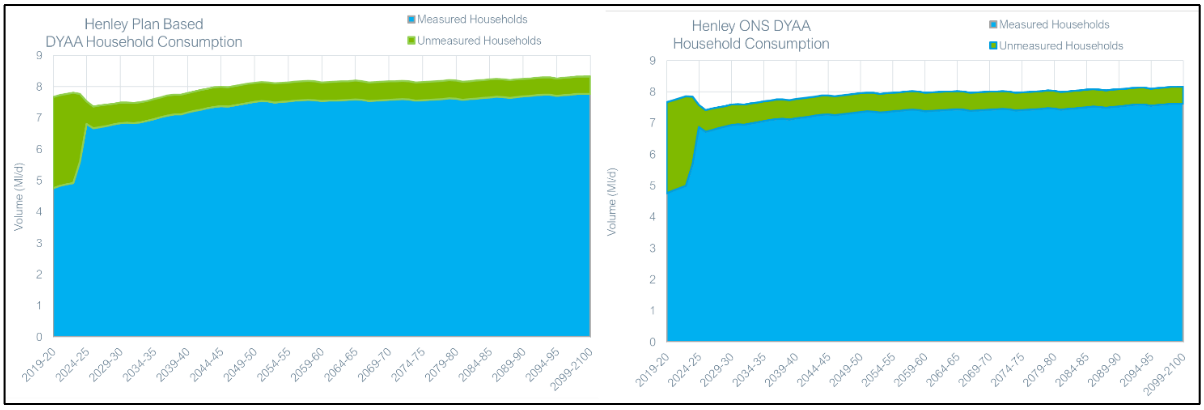


Figure 3 - 28 Henley Baseline DYAA Household Consumption

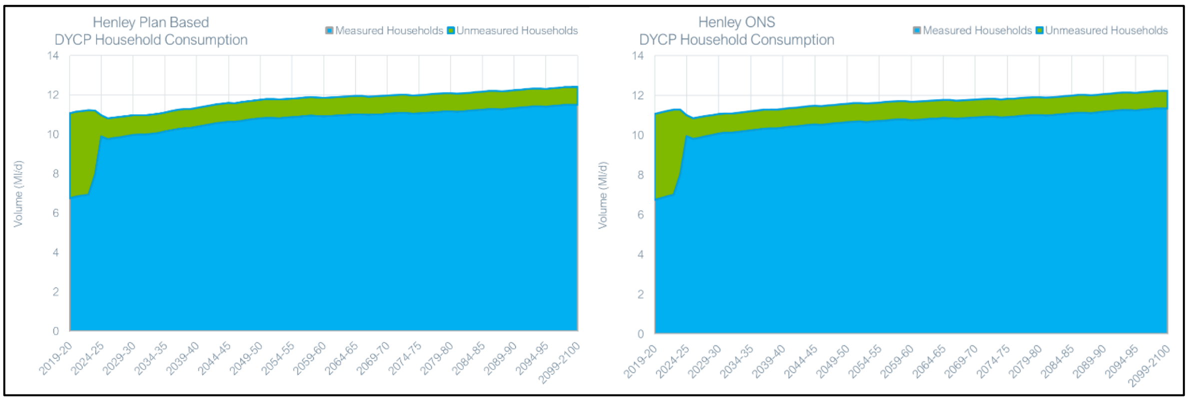


Figure 3 - 29 Henley Baseline DYCP Household Consumption

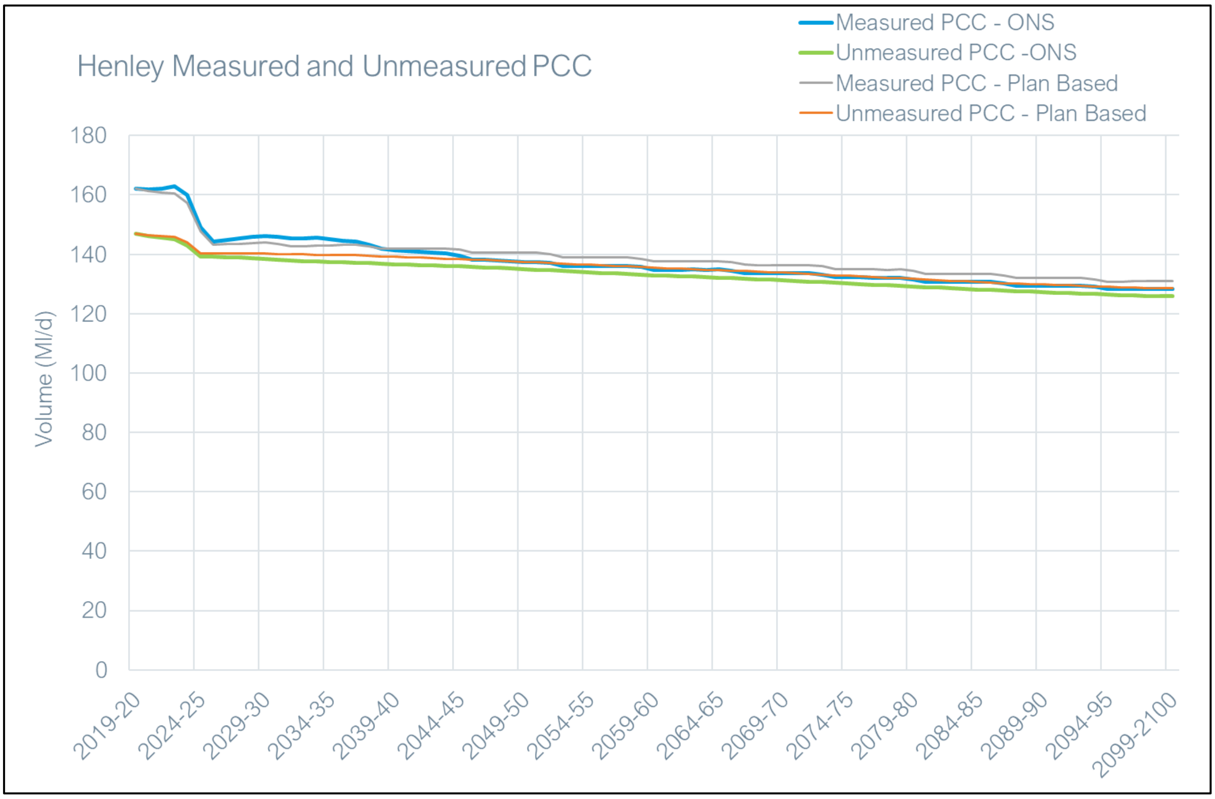


Figure 3 - 30 Henley Baseline Per Capita Consumption

# Non-Household water use

## Introduction

### Regulatory requirements

3.183 Expectations and guidance for non-household demand forecasts are set out in Section 6.5 of the WRPG. Water companies are required to forecast the demand for water being used by non-household premises (such as businesses and industrial processes) and for the population living in communal establishments (for instance hospitals, prisons and educational establishments). Since the last non-household demand forecasts were developed, the non-household market has been opened for competition. The definition of non-households is in line with Ofwat's guidance.

3.184 For non-household (NHH) demand forecasts we are required to:

- Produce plan that contains an estimated demand forecast for non-households
- Provide a description of how figures and assumptions in the forecast have been derived
- Ensure that the plan makes use of the Market Operator Services Ltd (MOSL)system that stores retail company data as needed
- Describe the makeup of non-household demand in different sectors either by using the service and non-service split (identifying the main sectors), or by using Standard Industrial Classification (SIC) categories published by the Office for National Statistics
- Derive a baseline forecast which reflects non-household demand without any further intervention

3.185 As part of WRSE we participated in a group project to develop a new non-household demand forecasting model, development of the model was undertaken by Artesia Consulting.

3.186 Artesia used data from the Central Market Operating System (CMOS) operated by MOSL for the period 2017 to 2020 and Additional data from the pre-MOSL period was also used to develop longer term trends in historic non-household consumption data.

3.187 SIC codes were used to assign non household customers into the identified segments with AddressBase Classification datasets provided by WRSE companies used to augment and crosscheck the SIC classifications.

### Voids and large users

3.188 Our consumption data was provided at property level which allowed Artesia to identify and exclude large users, which may have a significant impact on consumption at WRZ level and adversely affect the robustness of the model. Artesia used this to determine a consumption threshold value above which they could classify users as a large user. This threshold was set at 2%, i.e. if a single user consumes greater than 2% of the WRZ non-household consumption then this property would be flagged as a large user.

### Population data

3.189 Population data from forecasts and Annual Returns, by year and WRZ, are imported and combined to create a joint population dataset. Populations for overlapping years (2019-20) for both historical and forecast data are compared to check data accuracy. For the baseline population local authority plan-based forecasts are used.

3.190 SIC groups or AddressBase classifications are mapped to industry grouping using various mapping files, we developed mapping files for SIC_1980, SIC_1992, SIC_2003, SIC_2007 and AddressBase. These were then used to group the properties' consumption into the industrial sectors shown in Table .

Table 3 - 29 - Industry Groupings

| Industry grouping | SIC_2007 sections | Reference |
|---|---|---|
| Agriculture (and other weather dependent industries) | A | 1 |
| Non-service industries (excluding Agriculture) | B, C, D, E, F | 2 |
| Service industries – population driven | O, P, Q, R, S, T | 3 |
| Service industries – economy driven | G, H, I, J, K, L, M, N | 4 |
| Unclassified | | 5 |

3.191 Table shows the proportion of properties and the proportion of consumption for each company that falls into each of the industry groupings identified in Table .

Table 3 - 30 Proportions of consumption and properties by Industry grouping

| Company | Industry grouping | Proportion of properties in group | Proportion of consumption in group |
|---|---|---|---|
| Thames Water | Agriculture | 2% | 3% |
| | Non-service | 5% | 7% |
| | Service – population | 18% | 27% |
| | Service – economy | 29% | 31% |
| | Unclassified[24] | 46% | 34% |

3.192 Econometric data was provided by Oxford Economics (OE). This data is formatted into employment and gross value added (GVA) by SIC group and region. All WRSE companies currently use the "South East" region, with the only exception being Thames Water where the London WRZ uses the "London" OE region. Historic data was provided from 1991, and forecast data was provided to 2040.

3.193 A maximal theoretical dataset was created by creating all combinations of year (from OE, weather, consumption, and population datasets), WRZ (weather, consumption, and population) and SIC/industry groups (consumption), with all variables joined to these where available.

3.194 This is then aggregated to industry grouping level, with group-specific numerical variables summed (consumption, employment, GVA) and other numerical variables re-joined at aggregated level (weather and population). Both the SIC and industry grouping aggregation datasets are output for use in subsequent modules.

## Model build, testing and refinement for baseline forecasts

3.195 The non-household forecast modelling is carried out in line with best practice[25].

3.1

[24] Unclassified is used when we are unable to identify a specific industry for a non-household property
[25] Forecasting water demand components - Best practice manual. UKWIR, 97/WR/07/01. 1997.

3.196 Choosing the right modelling process is a complex task that needs to take into consideration statistical model performances, but also many other variables that require the modeller's expert judgement (availability of variables, reliability of data, overfitting problems, and more).

3.197 The NHH forecast modelling process is divided in the following steps:

- Build the multi linear regression (MLR) model based on past aggregated consumption data, considering Oxford Economic variables and potentially other factors
- Calibrate the model for the base year, in this case 2019-20, first by industry sector using the property consumption data, then by WRZ using the AR consumption
- Apply the MLR model and the calibration to future explanatory variables to estimate future NHH consumption

3.198 The MLR modelling is done at company level but considering industry groups independently. Calibration is then performed at WRZ level.

3.199 MLR modelling aims at finding a linear relationship between the observed consumption and explanatory variables. At first, all available explanatory variables are considered. Subsequently, the model is refined choosing only the significant variables. The choice is based on:

- Model performances excluding the variables one by one
- Interaction between variables
- Logical inclusions/exclusions based on the relationship between the expected effect of each variable on consumption, and the estimated coefficients
- Exclusion of outliers

3.200 The MLR model is based on MOSL data in the base year, which may not represent the total annual reported NHH Measured consumption. For this reason, the results of the model need to be calibrated against the Annual Report data for the base year, in this case 2019-20. This also helps account for differences between WRZ, not accounted for building the model at company level.

3.201 To ensure the proportion between different sectors is maintained, the calibration has been further refined:

- First, modelled consumption is calibrated against property consumption for each industry group and WRZ, deriving an additive factor
- Then the total measured consumption is calibrated against AR data at WRZ, deriving a multiplicative factor

3.202 The Artesia Consulting report for Thames Water specific results for each MLR model for each industry sector are included in Appendix G Non-Household Water Demand.

3.203 Final NHH baseline forecasts are obtained separately for the measured and the unmeasured component.

3.204 Our results are shown in Figure  to Figure . At start of the planning period (2025), the Thames Water region total non-household demand is predicted to be 457 Ml/d within an overall range of 334 Ml/d to 546 Ml/d. Much of the early uncertainty is due to the impact of Covid-19 and uncertainty over the quality of non-household consumption data from MOSL.

3.205 By the end of the planning period the non-household demand is predicted to be 495 Ml/d (an increase of 38 Ml/d) within a range of 351 Ml/d to 771 Ml/d.

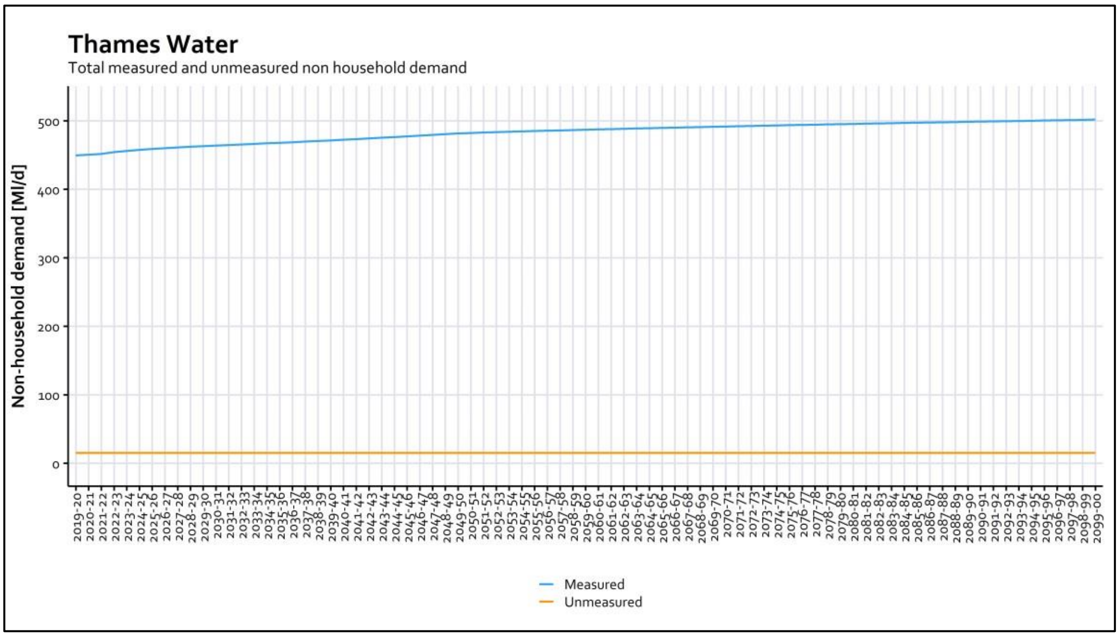


Figure 3 - 31 Thames Water measured and unmeasured non-household consumption

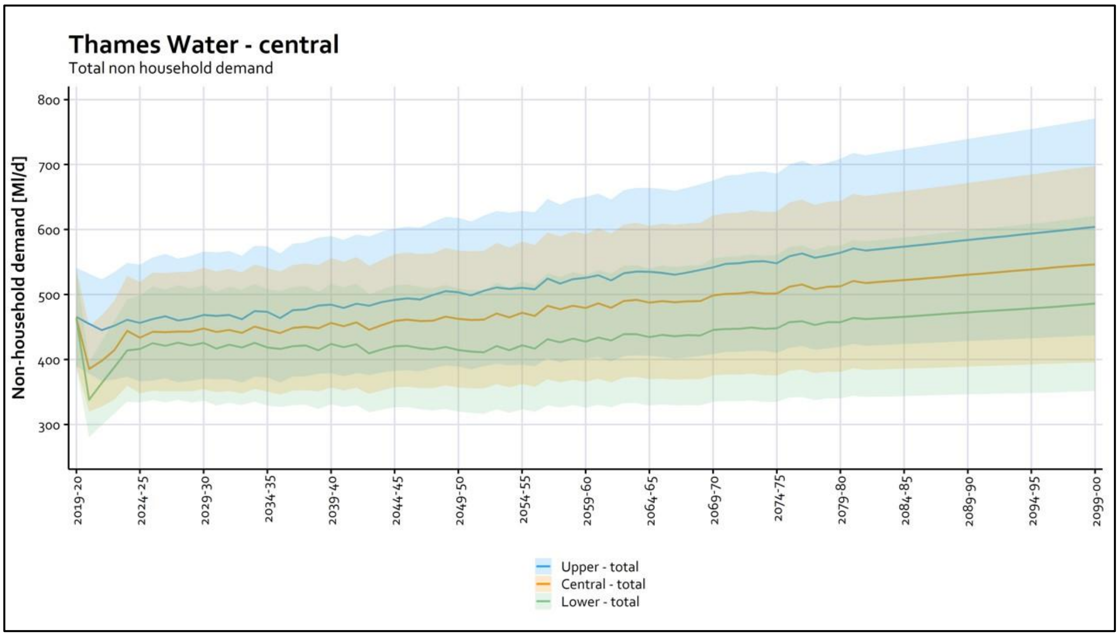


Figure 3 - 32 Thames Water region non-household consumption central, lower and upper scenarios

3.206 There is growth in the Thames Water region from the service sectors, with a small increase in agriculture, the non-service sector remains flat across the planning period.

3.207 About 27% of the demand in the Thames Water region falls into the unclassified group and this is held flat across the planning period. These are properties that could not be allocated into an industry sector because either the property has no industry code assigned to it or the industry code is incorrectly recorded and cannot be matched to a sector. Artesia attempted to model this unclassified sector, but because of the inconsistency in the data it was not possible to derive meaningful relationships or models, therefore the forecast for the unclassified sector is flat across the planning period.

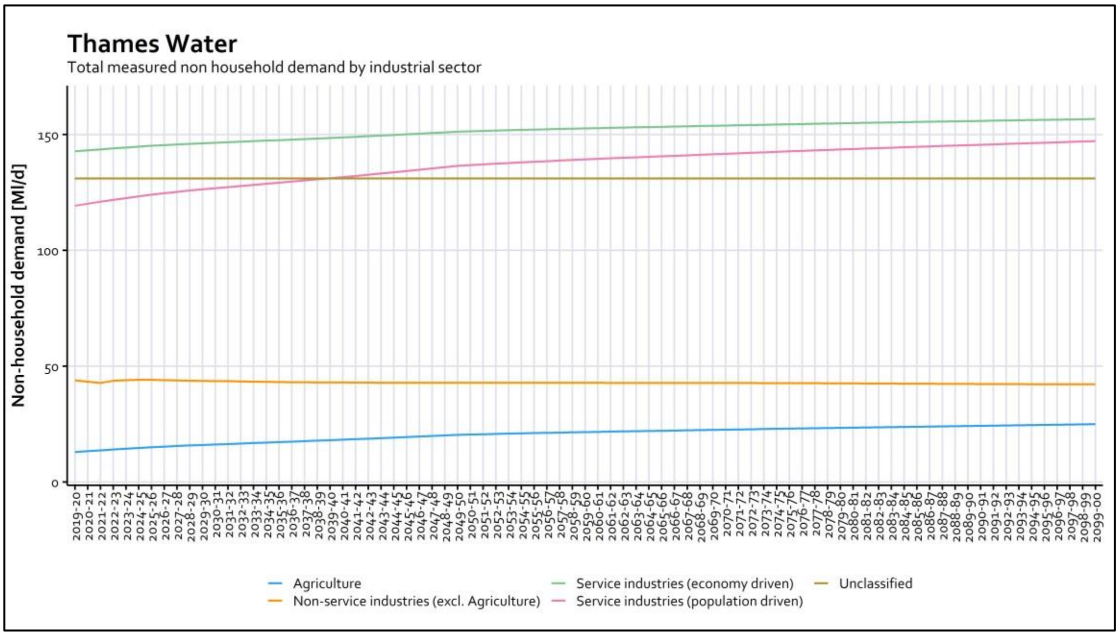


Figure 3 - 33 Modelled non-household by industrial Sector

3.208 Overall NHH demand shows modest increases across the forecast period with little change, except in Henley where the change looks dramatic, but is a decrease of less than 0.4 Ml/d between the start of AMP8 and 2100. The decreases in Henley are due to forecast reduction in the service sector. Figure  shows the forecast NHH consumption across all our WRZs for both measured and unmeasured categories.

Figure 3 - 34 WRZ NHH Demand Totals

## Baseline leakage and minor components

3.209 Typically, we forecast leakage in the baseline demand forecast as flat across the forecast period however there is additional leakage within year 1 of AMP8 for London which reflects the conditional allowance for this activity, this was an allowance within the 2019 Price Review.

3.210 We forecast minor components as unchanged over the planning period as there is no satisfactory method by which to forecast them.

3.211 The values for leakage, from year 2 of AMP8, and minor components across the planning period can be seen in Table .

Table 3 - 31 Leakage, operational usage and water taken unbilled

| WRZ | Leakage | DSOU | Water Taken Unbilled |
|---|---|---|---|
| Guildford | 15.71 | 0.57 | 1.10 |
| Henley | 3.99 | 0.12 | 0.28 |
| Kennet Valley | 25.42 | 0.75 | 2.24 |
| London | 360.77 | 15.94 | 56.36 |
| SWA | 37.23 | 0.96 | 2.04 |
| SWOX | 70.00 | 2.71 | 6.94 |
| Thames Water | 513.10 | 21.04 | 68.96 |

## Summary of our baseline demand forecasts

3.212 The baseline plan based and ONS DYAA demand forecast for each WRZ and the DYCP forecast for Thames Valley zone are shown in Figure  and Figure  with summaries presented in Tables 3 – 32, 3 – 33, 3 – 35 and 3 – 35.

3.213 In the Plan-Based scenario a consistent picture can be seen across our WRZs where once new demand management activity ceases at the end of AMP7 demand for water quickly shows significant increases in the housing plan scenario. Most of this increase in demand is prior to 2050 which is the period for which local plans are in place. Once we move beyond the period of the local plans and revert to longer term ONS statistics the increase in water demand slows for the remainder of the forecast period.

3.214 The ONS scenario shows a more mixed picture across our WRZs. Once AMP7 demand management activity is complete London, SWOX and SWA all return to an increasing demand across the forecast period.

3.215 Kennet Valley and Henley exhibit a much flatter water demand across the forecast period, the change in Henley demand is exaggerated due to the scale of the chart. Guildford is also generally flat but is notable in that is exhibits a slight downward trend for much of the forecast period.

Table 3 - 32 Summary of Total DYAA Demand (Plan Based Scenario)

| | 2025-26 | 2049-50 | 2074-75 | 2099-2100 |
|---|---|---|---|---|
| London | 1936.0 | 2102.4 | 2157.6 | 2168.3 |
| SWOX | 274.9 | 296.4 | 297.3 | 299.7 |
| SWA | 142.6 | 153.7 | 155.9 | 157.8 |
| Kennet Valley | 97.9 | 102.4 | 102.7 | 103.5 |
| Guildford | 45.5 | 47.4 | 47.2 | 47.3 |
| Henley | 12.8 | 13.1 | 13.1 | 13.4 |

Table 3 - 33 Summary of Total DYAA Demand (ONS Scenario)

| | 2025-26 | 2049-50 | 2074-75 | 2099-2100 |
|---|---|---|---|---|
| London | 1936.0 | 2102.4 | 2157.6 | 2168.3 |
| SWOX | 274.9 | 296.4 | 297.3 | 299.7 |
| SWA | 142.6 | 153.7 | 155.9 | 157.8 |
| Kennet Valley | 97.9 | 102.4 | 102.7 | 103.5 |
| Guildford | 45.5 | 47.4 | 47.2 | 47.3 |
| Henley | 12.8 | 13.1 | 13.1 | 13.4 |

Table 3 - 34 Summary of Total DYCP Demand (Plan Based Scenario)

| | 2025-26 | 2049-50 | 2074-75 | 2099-2100 |
|---|---|---|---|---|
| SWOX | 327.2 | 352.4 | 357.4 | 364.3 |
| SWA | 167.8 | 181.1 | 185.6 | 190.1 |
| Kennet Valley | 114.0 | 120.0 | 121.9 | 124.3 |
| Guildford | 58.3 | 60.8 | 61.2 | 61.9 |
| Henley | 17.6 | 18.1 | 18.3 | 18.8 |

Table 3 - 35 Summary of Total DYCP Demand (ONS Scenario)

| | 2025-26 | 2049-50 | 2074-75 | 2099-2100 |
|---|---|---|---|---|
| SWOX | 327.2 | 352.4 | 357.4 | 364.3 |
| SWA | 167.8 | 181.1 | 185.6 | 190.1 |
| Kennet Valley | 114.0 | 120.0 | 121.9 | 124.3 |
| Guildford | 58.3 | 60.8 | 61.2 | 61.9 |
| Henley | 17.6 | 18.1 | 18.3 | 18.8 |

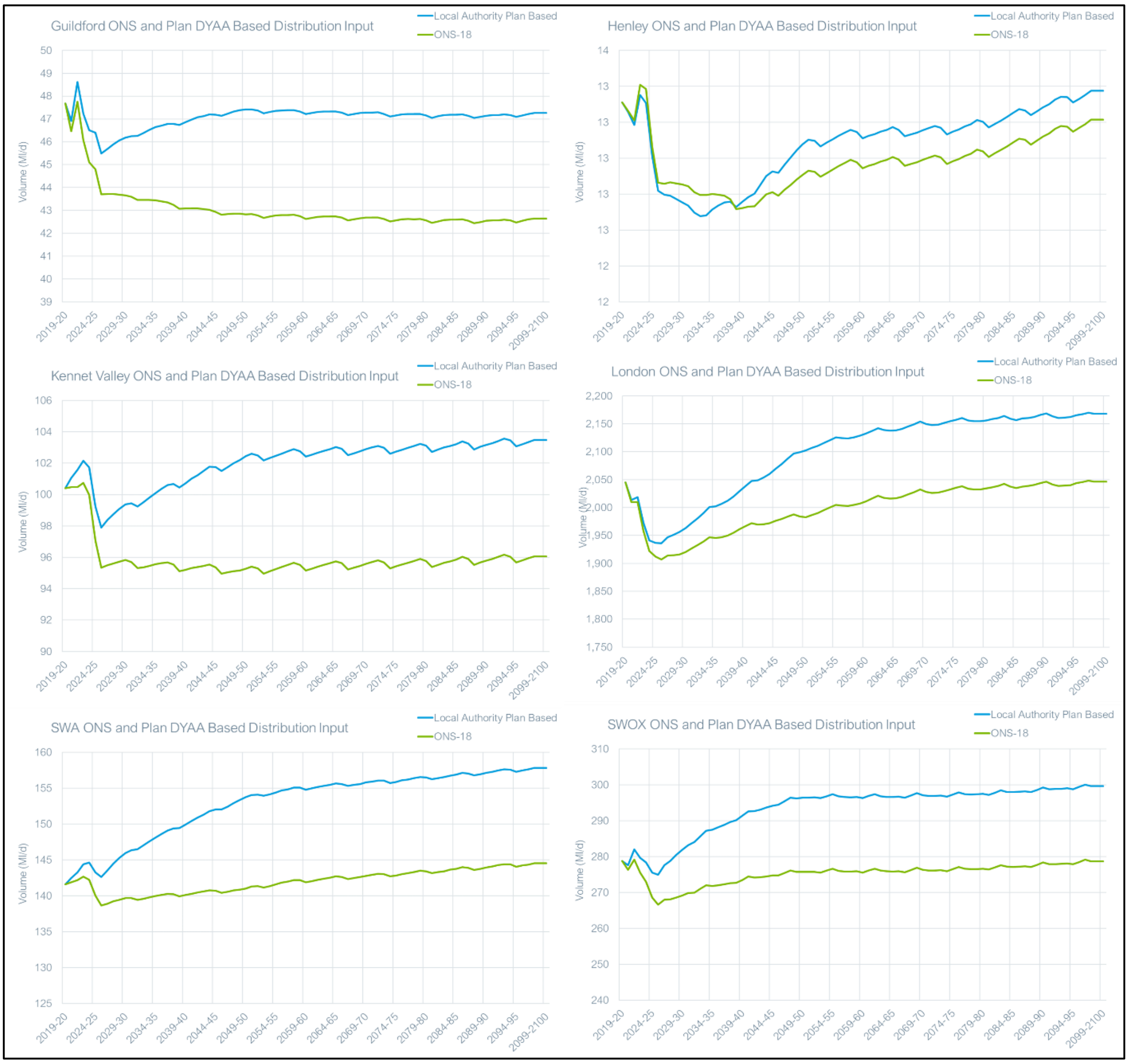


Figure 3 - 35 DYAA Distribution Input


Figure 3 - 36 DYCP Distribution Input