WRE

WATER RESOURCES EAST

# Demand Forecast

**Draft Regional Water Resources Plan for Eastern England**

November 2022

# Contents

## 1.1 Introduction

Water resources in our region are expected to suffer very significant pressures from both demand and supply issues, including; increasing demand due to population growth, climate change, sustainability reductions (in order to achieve our environmental ambitions) and the need to increase our resilience to severe drought. Additionally, our region has been classified by the Environment Agency as an area of serious water stress.

In particular, population in the WRE region is forecast to increase by 1.45M over the period 2025 to 2050, implying a potential increase in water demand of 85Ml/d (NYAA forecast) for public water companies.

This overall growth in base-line demand is driven by the growth in population. However, it is important to note that the demand forecast also factors in forecast reductions in per capita consumption due to current demand management programmes (in 2019 Water Resource Management Plans) and government led interventions already in place.

The assessment of key growth scenarios in the region have been driven by our understanding of local authority planning information. We have been keen to ensure that the regional strategy supports regional growth and is carried forward in consultation with local stakeholders.

The challenges are acute and they drive the need for investment in demand management as well as supply-side options, particularly in the short to medium-term.

To ensure that customers in the WRE region are provided with clean, safe drinking water we have considered the widest range of options to secure our water supplies, using a ‘twin track’ approach; exploring options to increase our capacity to supply water, as well as options to reduce demand.

By exploring both supply and demand options we can ensure a cost effective, secure supply-demand balance, whilst ensuring the environment is protected.

In particular, whilst developing our draft Regional Plan and WRMP24 plans, we have noted the importance placed upon demand management including leakage control as the preferred strategy amongst many stakeholders, including Defra, to address anticipated growth and mitigate environmental impacts. Along with the demand management options that are being developed by Water Companies, demand reductions will require significant government intervention along with non-household stakeholder participation.

## 1.2 Overview

Forecasting the future demand for water is framed by significant uncertainties, with regard to all major influent factors.

Long term water demand forecasting has, therefore, been designed to account for many factors and elements of demand, including:

- New housing growth, based upon local authority Local Plans, including regional growth strategies (the potential strategic growth arc and new 'garden' towns).
- Demographic change: migration patterns, ageing population profiles and reducing average household sizes and occupancies.
- Technological, behavioural and attitudinal changes to water usage (demand management strategies including leakage reduction and smart metering).
- Potentially continuing Covid19 impacts upon behaviour and consumption (working from home).
- Future economic uncertainties, including changing industrial, energy sector and agricultural patterns of usage (emergent industries such as hydrogen).
- Climate change impacts on weather patterns (climate) and the potential for increasing frequency and severity of heatwaves, dry weather spells and drought events.

In order to understand these uncertainties, a suite of projections has been generated to reveal how these influences will affect water demand and consumption across the region, over at least the next 25 years.

Coherent demand forecast scenarios have been developed by participating water companies using in-house modelling processes with aligned datasets and agreed assumptions. These forecasts have been complemented by forecasts for water usage by key non-household sectors, whose demand is met outside of the public water company domain. These forecasts have been derived for the WRE Water Resource Zones as shown below. Additional weather factors have been modelled such that impacts upon water supply systems (drought) and demand are aligned.

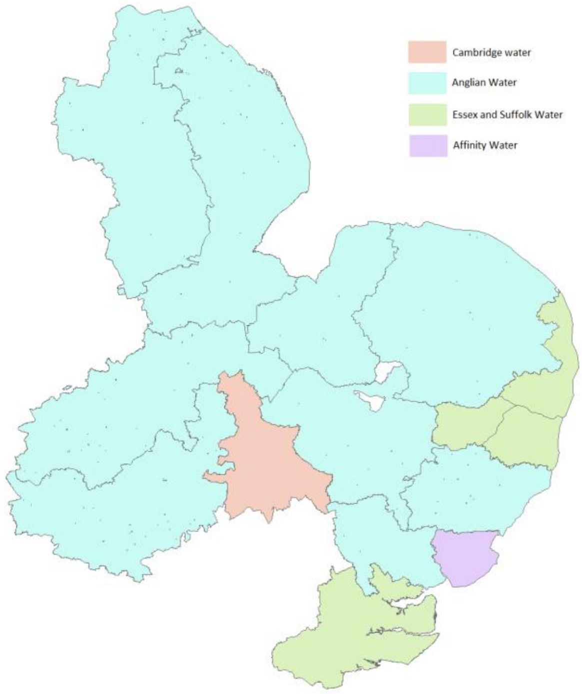


Figure 1: WRE's Water Resource Zones

WRE scenario testing has been aligned with the preferred forecast projections developed by the water companies for their Water Resource Management Plans 2024 (WRMP24). This alignment has ensured that the WRE regional planning and option appraisal process can viewed as being 'back to back' with the development of the company WRMPs.

Additionally, as the WRMP24 forecasts have been included as the core scenario, alignment has also been sought between the neighbouring regional groups with regard to the core assumptions driving each WRMP (i.e. the inclusion of strategic growth etc.) and the wider theoretical scenarios being modelled.

## 1.3 Proposed forecast approach

To understand the uncertainties associated with long term water demand forecasting, a suite of projections has been generated to reveal how influencing factors (housing growth, demographic change, technology, industrial and agricultural development) will affect demand for water across the region, over time.

How these factors interplay has informed the derivation of the highest and lowest outcomes over the plan period (2025 – 2050). Scenario development and analysis has allowed us to sensitivity test variant factors and has produced the parameters for uncertainty over the long term.

- Demand forecasts have been developed, identifying each demand segment and their respective influences
- household (HH) consumption; measured (billed on volume used) and unmeasured
- non-household (NHH – public sector, industrial etc) consumption
- Leakage, distribution losses, Customer Supply Pipe Leakage (cspl), Distribution System Operational Use (DSOU), Water Taken Unbilled (WTU); and

- Non-PWS Non-Household sectors (agriculture, energy, leisure etc with their own abstraction licences).

Based upon the forecasts for these segments, aggregated demand scenarios have been developed with variants based upon:

- **Housing projections**:
  - based upon current trend, Local Authority Plan and historical completion rates
  - including strategic growth plans (OxCam Arc and 'garden city' developments)
  - projections taking account of potential economic impacts from Covid19; recession and growth and internal migration post lock down along with governmental strategies to stimulate the economy.
- **Population projections**
  - based upon ONS variant scenarios for births, deaths and migration
  - with population variants aligned with the variant housing projections.
- **Changes in household consumption due to**:
  - meter penetration (visual read; switching unmeasured to measured customers)
  - rollout of smart metering
  - impacts on behaviour (PCC) through communications strategies ('nudging')
  - Impacts on cspl (leakage) and internal plumbing losses ('leaky loos' and PCC)
  - technological change in appliances and utilities (including as a result of water efficiency labelling for white goods)
  - behavioural and attitudinal changes to water usage (positive and negative)
  - other government and regulatory changes (labelling, mandatory standards)
  - new build water efficiency standards (the installation of water efficient utilities, grey/green/blackwater re-use).
- **Leakage reduction scenarios**
  - agreed variant percentage reductions, with consideration to national Leakage targets.
- **Changes in non-household/industrial consumption due to:**
  - population growth
  - econometric/GVA forecasting.
- **Changes in Non-PWS - non-household/industrial consumption due to**:
  - changes in the energy sector
  - changes in agriculture
  - scenarios accounting for future industrial hubs (South Humber Bank and Hydrogen generation).
- **Environmental demand (this has been modelled as part of the WRE simulator process)**

Scenarios have been constructed to reflect combinations of these variant influences to create a full suite of potential future demand outcomes. This has shown how the various influences interact and allowed sensitivity analysis for each of the impacts, over time.

## 2.1 Population and properties

The latest forecasts of demographic change in the UK suggest that population and household growth will be a common characteristic of local communities over the next 25 years. A sustained period of new housing growth, ageing population profiles and reducing average household occupancies are key considerations for planners and policy makers. Great uncertainty surrounds future property and demographic change, and we have, therefore, endeavoured to derive a variety of potential forecasts in order to inform our final plan, noting that regional growth should not be constrained by the availability of water.

Robust housing and demographic forecasts are a key consideration in the planning guidelines established for both the Water Resource Management Plan (WRMP24) and the regional WRE plan. Understanding how housing growth and demographic change over the short, medium and long term will affect the future requirements for water and wastewater services across the WRE region is a critical element of the collective business planning process, both informing the WRE's option appraisal, the WRE Statement of Regional Resource Position (SRRP) and the WRMP24 forecasts for each member of the regional group.

A suite of variant housing and population projections has, therefore, been developed for the WRE region, covering the period 2020 to 2100. These have been generated utilising aligned datasets for all participating water companies, at a sub-regional level.

The core WRE projections have been aligned with WRMP24 property and population forecasts for both the preferred plan and scenarios utilised in WRMP24 sensitivity testing (EBSD). This has been agreed between the participating water companies, in alignment with Water Resources Planning Guidance. This guidance indicates that core WRMP demand forecasts should be developed reflecting Local Authority Plan projections, such that water availability will be guaranteed to meet regional growth, and that core scenarios should also account for potential strategic development.

For the purposes of WRE scenario testing a much broader view has been developed for potential future outcomes to 2100, in order to scenario test variant population/housing distributions and worse case scenarios (very high population growth).

## 2.2 Developing the property and population projections

In order to facilitate the collation of Local Authority Planning information, we have utilized a specialized demographic analysis company, Edge Analytics, who have collated and produced household build trajectories for all Local Authorities in the WRE Region.

Edge Analytics contacted all 67 local authorities that are either wholly or partially included within the WRE boundary, to collect Local Plan housing growth evidence. Each of the 67 local authorities are at a different stage of Local Plan development, with each collating a variety of demographic and economic evidence to inform its plan-making process.

Additionally, Edge has developed a full suite of projections based upon different demographic scenarios, based upon trend and local authority planning data.

This process has involved:

- Collecting, organising and delivering Local Plan evidence from all Local Councils, providing both macro and micro (site-level) to inform more detailed planning (WRC) for housing growth including its distribution and phasing.

- Developing population and property forecasts (with an outlook horizon to 2100) for all water (WRZ, PZ) and wastewater geographies, combining plan-based and demographic-led data inputs and assumptions, as appropriate (long term forecasting).
- Producing a core property and population projection to be used in compiling WRMP24s by each water company, in alignment with EA guidance.
- Produce variant property projections based upon LAUA Plan, ONS trends, LAUA completion rates, strategic growth (OxCam Arc) scenarios, with population forecasts allowing for variations in fertility, mortality and migration.
- Provide hidden and transient (H&T) population estimates for the WRE region (to inform both population forecasts and potential peaking factors).
- Select the key variants which will be used to generate consumption forecasts.
- These inform the key selected scenarios for inclusion in the WRE simulator.
- Aligning scenario selection with other regional groups (WRSE and OxCam) where possible.

Population and property projection over the long term is subject to very significant uncertainty, being influenced by many factors including; economic activity, government strategies, migration, fertility and mortality rates.

To ascertain the level of uncertainty, Edge Analytics have produced a suite of projections for both population and properties for the WRE region (aligned with WRSE). This has generated a suite of 25 near term property/population forecasts and 75 long term variants, as described in detail below (Figure 2).


Figure 2: Variants based upon property and population projections to 2100 (source Edge Analytics)

The 25 key variants have been extrapolated to 2100 using ONS based long term factors to produce a suite of 75 potential household and population variants, for use in generating demand (described further below).

A sub-selection of these (highest, median, plan-based, lowest) have then been chosen for analysis in the WRE simulation process, with the remaining variants providing evidence for further detailed sensitivity testing. The graph below (Figure 3) shows the full spread of projections that have been available for scenario development

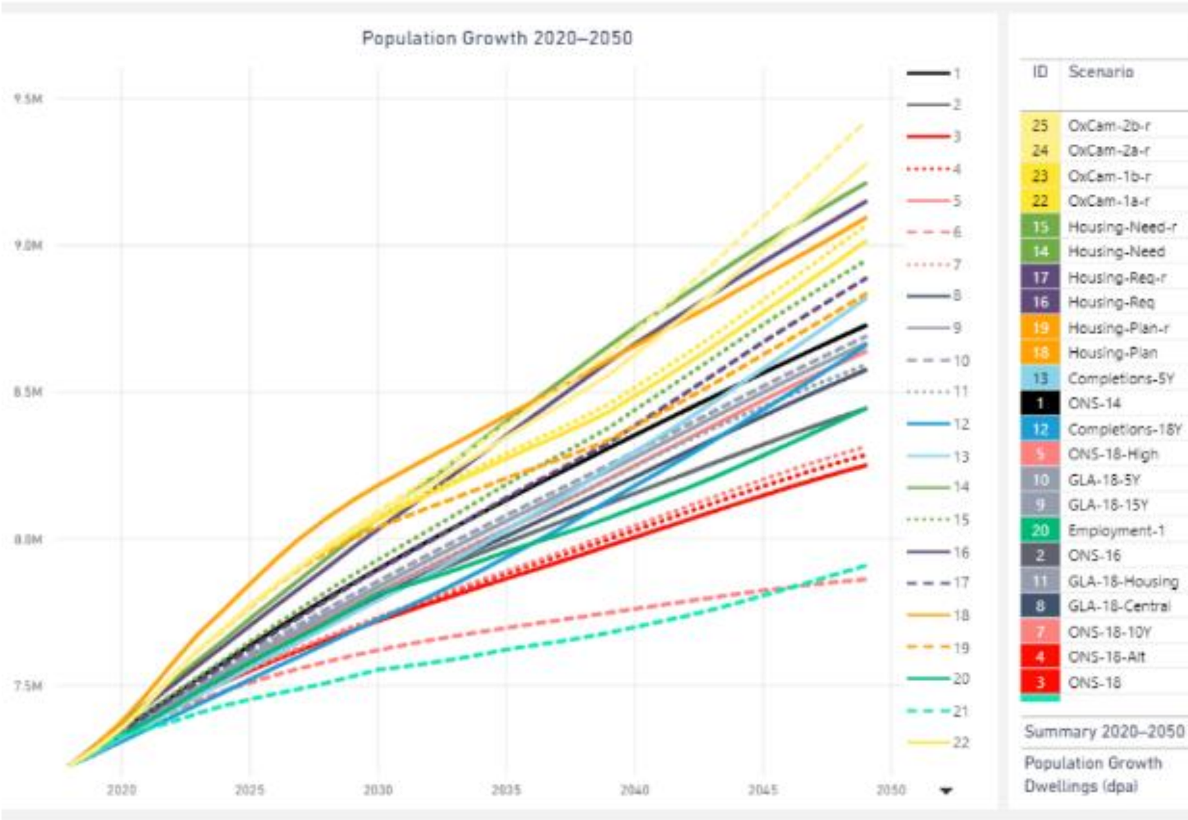


**Figure 3: Example of projections at WRZ level (source Edge Analytics)**

As described in the figure and in the Edge Report, ‘WRE Population & Property Forecasts – methodology and Outcomes – July 2020’, growth scenarios have been developed to reflect both planned housing, GLA forecasts, recent completion, econometric and trend population variants in the nearer term (see Table 1 below).

| No. | Scenario | Description | No. | Scenario | Description |
|---|---|---|---|---|---|
| **1** | ONS-14 | ONS trend 2014 snpp base | **14** | Housing-Need | LAUA Housing need led |
| **2** | ONS-16 | ONS trend 2016 snpp base | **15** | Housing-Need-r | LAUA Housing need led - representative rates for young adults returning |
| **3** | ONS-18 | ONS trend 2018 snpp base | **16** | Housing-Required | LAUA Housing Required |
| **4** | ONS-18-Alt | ONS trend 2018 Alternate international migration | **17** | Housing-Required-r | LAUA Housing Required - representative rates for young adults returning |
| **5** | ONS-18-High | ONS trend 2018 High international migration | **18** | Housing-Plan | LAUA Housing Plan led |
| **6** | ONS-18-Low | ONS trend 2018 Low international migration | **19** | Housing-Plan-r | LAUA Housing Plan - representative rates for young adults returning |
| **7** | ONS-18-10Y | ONS trend 2018 10 year international migration | **20** | Employment-1 | Employment led 1% growth London to 2030 - 0.8% outside growth |
| **8** | GLA-18-Central | Greater London Authority Central | **21** | Employment-2 | Employment led 0.5% growth London to 2030 - 0.4% outside growth |
| **9** | GLA-18-15Y | GLA - 15 year history | **22** | Oxcam-1a-r | New settlement 23K dpa scenario |
| **10** | GLA-18-5Y | GLA - 5 year history | **23** | Oxcam-1b-r | Expansion 23K dpa scenario |
| **11** | GLA-18-Housing | GLA - Housing led | **24** | Oxcam-2a-r | New settlement 30K scenario |
| **12** | Completions-18Y | Completion rates - Housing led - 18 year history | **25** | Oxcam-2b-r | Expansion 30K dpa scenario |
| **13** | Completions-5Y | Completion rates - Housing led - 5 year history | | | |

**Table 1: Scenario variants 2020-2050 (Edge Analytics)**

In the long term (2050-2100) where there is significantly less certainty, growth variants have been developed for each of the 25 scenarios, extending the scenario horizon to 2100. Growth scenarios for the 2050–2100 period have been aligned to the ONS 2018-based national population projection (NPP), configuring a principal, low and high growth outcome. Three variants for each scenario have therefore been produced, for the period 2050 to 2100, based upon the criteria described below (Table 2).

| Scenario | Description |
|---|---|
| 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. |
| 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. |

**Table 2: Scenario definitions 2050-2100 (source Edge Analytics)**

## 2.3 Strategic growth inclusion

As part of our WRE/WRMP24 planning process, we have considered the potential for strategic economic growth across the region. Edge Analytics have been commissioned to produce a number of variants, for consideration, based around the potential Oxford/Cambridge growth corridor. Although immediate planning for this strategic option has waned, it is noted that the areas envisaged by Edge to be most impacted are still those where very high growth is to be expected (due to economic drivers).

Where relevant, and in accordance with WRMP Guidance, strategic growth has been included in the principal WRMP24 projection. With respect to Anglian Water, this has meant the inclusion of the OxCam1b-r-P projection (a relatively conservative estimate, uplifting local authority growth). In the case of Cambridge Water, the Local Authority planning projection has been used, but this currently reflects very high levels of growth in the medium/long term.

The scenarios have been chosen from the following sub-set of the variants, pending more detailed plans. These have been generated by Edge Analytics, using the best current intelligence regarding potential 'build-out' rates and spatial distributions (Table 3).

| Scenario | Description |
|---|---|
| Housing-Plan-P | Housing-Plan-Preferred |
| OxCam-1a-r-P | 23k dpa (dwellings per annum), New Settlements – 56%% of growth in AWS |
| OxCam-1b-r-P | 23k dpa (dwellings per annum), Expansion – 75%% of growth in AWS |
| OxCam-2a-r-P | 30k dpa (dwellings per annum), New Settlements – 56%% of growth in AWS |
| OxCam-2b-r-P | Dpa (dwellings per annum), Expansion – 75% of growth in AWS |
| ***Note Expansion based upon cities – Milton Keynes , Luton, Bedford, Cambridge, Northampton Peterborough*** ***New Settlement – includes areas in Cherwell / Aylebury Vale, Central beds, South Cambs*** | |

**Table 3: Local Authority and Strategic growth Scenarios**

The variants for the potential Oxcam growth have been developed based upon different spatial distributions (expansion and new settlement) and growth rates (23K and 30K new dwellings per annum). We have been mindful when selecting key variants for OxCam scenarios not to under-represent nor double count growth between WRE/WRSE and participating WRE public water companies (Figure 4).

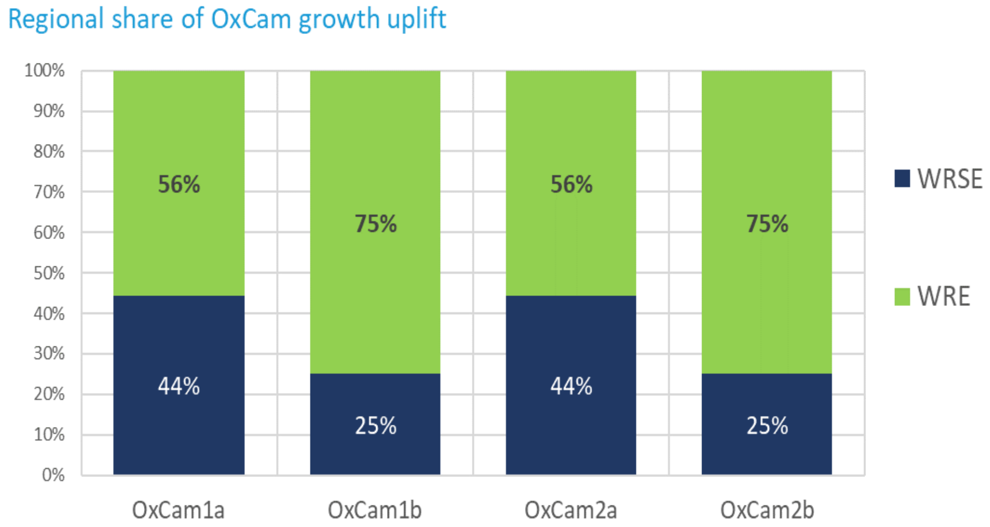


**Figure 4: Potential distributions between WRE and WRSE from the growth due to the OxCam Arc (source: Edge Analytics)**

Potential strategic development will have a significant impact on water demand, wastewater treatment requirements, flood risk management and environmental protection. Although demand management may potentially alleviate some of the increased water requirements, population-driven wastewater treatment will have no equivalent mitigation (considering biological load and population equivalent).

Strategic growth variants have been used to inform the WRE planning process. As discussed, all participating water companies in the WRE region have used local authority plan projections and where relevant OxCam1b (low strategic plan uplift), in order to account for any potential growth in the WRE region.

## 2.4 Key scenarios and sensitivity testing

For WRE sensitivity testing, key scenarios have been chosen from this long list of 75 population and property projections (25 variants x 3: high, principal and low). Where feasible, we have aligned this selection with WRSE modelling, noting that they have also utilised Edge Analytics data.

Additionally, core WRMP24 variants have been chosen to ensure compliance with the EA regulatory framework (basing this key projection upon LAUA plans, locally assessed housing need and including strategic growth areas such as the potential Oxford-Cambridge growth corridor (OxCam)).

Note that for the participating water companies, all have chosen to include Local Authority planned growth in their WRMP24 preferred plan, with Anglian Water also including an uplift to account for the potential for strategic growth in the area (the Oxcam1b variant).

The key chosen growth scenarios are listed below (Table 4). The highlighted variants have been used as appropriate to each company, as the key growth projections for the purpose of generating the WRMP24 forecasts.

| Scenario | Description |
|---|---|
| Housing-Plan-P | **Housing-Plan-Preferred variant WRMP24 (E&S, Cambs, Affinity)** |
| OxCam-2b-r-H | Maximum growth projection |
| ONS-18-High-P | Median growth projection |
| ONS-18-Low-L | Minimum growth projection |
| Completions-5Y-P | Completions-5Y-P projection |
| Housing-Need-H | Housing-Need-H projection |
| OxCam-1a-r-P | Lower strategic growth variant |
| OxCam-2b-r-P | Alternate high strategic growth variant |
| OxCam-1b-r-P | **Strategic growth projection – preferred variant WRMP24 (AWS)** |

**Table 4: WRE Sub-selection of growth scenarios (this is a selection from the full scenario suite provided by Edge)**

Referencing these growth variants, a number of demand scenarios were generated for the simulator, including both demand growth and demand management options. These are described below (Table 9 & 10).

## 3.1 Demand, household consumption and demand management options

Demand has been derived in accordance with in-house WRMP24 modelling methodologies, using consistent key datasets and assumptions, where feasible.

Each participating water company contributing to the WRE Regional Plan has established internal methodologies for forecasting future household consumption (and additional demand components such as non-household, leakage, etc.).

Additionally, it is understood that participating companies are at different points on their metering, water efficiency and leakage reduction journeys and need to design their WRMP24 demand management option portfolios accordingly. This has informed the preferred projections that have been used in WRMP24s and aligned with the WRE preferred projection.

However, in addition to this, as part of the WRE scenario generation process an aligned set of influent factors has been applied to the growth projections (described above) in order to generate a set of consistent theoretical demand forecast projections, accounting for demand management option packages, leakage reduction and government led interventions (these are described in detail below).

Methodologies used to prepare demand forecast have followed published best practice as defined in WRM19 Methods:

- UKWIR (2016) ‘Population, household property and occupancy forecasting’ – Guidance manual, supplementary report and worked example.
- UKWIR (2016) ‘WRMP19 methods – Risk based planning’.
- UKWIR (2016) ‘Integration of behavioural change into demand forecasting and water efficiency practices’.
- UKWIR (2012) ‘Customer behaviour and water use – A good practice manual and roadmap for household consumption forecasting’.

Developing the demand forecasts has consequently involved:

- Agreeing on the approach to developing household consumption forecasts for all potential scenarios (in alignment with population/household variants) including the potential for strategic growth areas (OxCam Arc).
- Aligning water company modelling assumptions, where feasible (noting that water companies will continue to model 'in-house' or collaborate as appropriate).
- Agreeing and aligning, where possible, baseline and final plan WRMP24 scenario assumptions.
- Developing scenarios to reflect theoretical demand management options, including smart metering and behavioural change interventions (also including non-PWC options).
  - Note the core WRMP demand management scenario for each PWC will be developed separately according to assessment of each company. These demand management option packages will be included in the key WRMP24 scenarios developed by each PWC. These will be subject to full Cost Benefit Appraisal (CBA) within each company.
- Developing additional demand management option variants to include:
  - scenarios that reflect the Defra 'Per Capita Consumption Consultation' and the results of the water industry club project on 'Water Demand Insights from 2018 (Artesia 2020). ('Water UK: Pathways to long-term PCC reduction: Report number: AR1286: 2019-08-15).
  - scenarios that reflect alternate PCC outcomes in line with different 'states of the world' i.e. socio-economic scenarios.
- Considering peaking factors (weather etc.), the impact of longer-term factors (climate change) and Target Headroom in order to understand how they will be applied in both the WRMP/WRE modelling processes and how they will align.
  - Noting that forecasts provided for the WRE simulator are Normal Year Annual Average (NYAA) with weather impacts being modelled within the simulator itself.
- Coordinating the production of the required WRE simulator inputs.

For the purposes of the WRE simulator, scenarios have been derived for Normal Year Annual Average (NYAA) projections, excluding dry year uplift (DYAA), critical period (CP) and climate change factors. These weather-based influences have been accounted for in the simulator, based upon Met. Office stochastic modelling.

## 3.2 The key WRMP24 demand forecast

With regard to Per Capita (Household) Consumption (PCC) and the WRMP24 preferred demand projections, the participating water companies have derived forecasts using the methodologies, as described in Table 5.

| Option | Household demand forecast modelling approaches |
|---|---|
| Anglian Water | Consumption/PCC values derived at Planning Zone level (PZ) for segmented customers (measured, unmeasured, optant, newbuild).<br>Consumption savings are determined due to meter switching unmeasured to measured using industry accepted assumptions. Occupancies are derived from ONS data.<br>Changes in PCC are determined using detailed demand management option analysis. This determines PCC savings per year per option (water efficiency, 'plumbing loss', cspl) by cohort (including full CBA, saving, decay rates etc.) applied at sub-regional level to consumption/PCC.<br>Micro-component analysis is used to calibrate forecast savings.<br>Further account is taken of potential influences from technological/attitudinal/climatic change. |

| | |
|---|---|
| Affinity Water | AFW produce a baseline household consumption forecast using multiple linear regression (MLR) modelling and forecasting. It combines occupancy, property type, socio-demographics and weather in a dynamic model which can be used to forecast household consumption.<br>Micro-component (MC) modelling for PCC is utilised and adopts a bottom-up approach by estimating household use at component level i.e. per equipment type such as a shower or toilet use, then calculates per capita use based on the population and property forecast by unmetered and metered bill type to build a water demand model.<br>By forecasting changes in each of the variables (O, V, F or daily water use for each micro-component) over time, a water demand forecast can be created. Hence, the micro-component forecast model requires estimates of changes in these variables to reflect future changes in technology, policy, regulation, and behaviour.<br>Household consumption forecasts derived from the multiple linear regression model (MLR) and are fed into the micro-component model as per household consumption figures (PHC) for measured and unmeasured households in each water resource zone.<br>The micro-component (MC) model takes the PHC values as inputs and then splits the household consumption into micro-components each year, based on the micro-component split for household consumption in each year calculated from the MC model. |
| Essex and Suffolk Water | a. Household demand is forecasted by using a micro-component data set for measured and unmeasured properties by region (Essex/Suffolk). The PCCs are rebased to the base year of the forecast, this is then increased to allow for meter under-registration and an estimate of supply pipe leakage for internally metered households. Metered properties are segmented into existing, new, selective, the micro-component forecasted PCC is used for the existing measured/unmeasured properties. New PCCs are based on a company new home study. Each measured segment has a separate occupancy forecast, based on a customer demand questionnaire/billing data and for WRMP24 CACI occupancy. Optant PCCs are forecasted based on an assumed saving from the unmeasured PCC forecast.<br>b. In line with the WRPG (Environment Agency, 2017a) requirement, ESW used local authority Plan housing growth evidence from all local authorities and ~~has~~ selected the Plan-based scenario for WRMP19.<br>c. The following demand management options will impact average PCC and should be considered as external factors to the household forecasting process: metering, water efficiency savings estimations, void property strategy, and meter under registration. |
| Cambridge Water | The baseline household consumption forecast has been produced using micro---component modelling and forecasting, which is suitable for a zone with a moderate level of water resource planning concern. A new micro-component forecast model was developed for us for WRMP by consultancy firm Artesia. This model will be updated and populated to inform the WRMP24 and Regional Plans for both regions.<br>The model quantifies the water used for specific activities (for example, showering, bathing, toilet flushing, dishwashing and garden watering by combining values for ownership (O), volume per use (V) and frequency of use (F). The micro-component model is combined with property, population and occupancy forecasts in a unique way in that the micro-components vary with occupancy.<br>Micro-components are then forecast using a combination of longitudinal micro-component data and future market transformation programme derived micro- component values. These trends are applied to the normal year micro-component values. An additional occupancy specific trend is also added, to ensure that the varying occupancy within each of the household segments is captured.<br>Data from national studies was used to update previous micro-component estimates - From surveys, the Market Transformation (MTP) scenarios and other, older sources - and to consider upper and lower consumption forecasts.<br>Relevant data, existing survey results, and consumption data from metered customer billing records were all analysed and investigated, along with data collected in the 2016 UKWIR behaviour integration study, to estimate base year micro-component estimates. Household customers were segmented based on meter status (measured/unmeasured), with sub-divisions for meter type (existing metered, free meter optants, new property). Data was used to determine how to account for differences in consumption between segments and also the effect of meter switching. Normal |

| | |
|---|---|
| | year and dry year adjustments were made to the base year consumption and the consumption forecast. |

Table 5: Household Consumption (PCC) modelling approaches

Where alignments in either supporting data or assumptions have been feasible, they have been agreed by the participating water companies. We have been keen to collaborate and share understanding between our regional Public Water Company (PWC) colleagues.

Whilst understanding that water companies are all at different points with respect to their water efficiency and demand management strategies, we have sought to share knowledge and where possible align methodologies and assumptions (being mindful of the competition framework). We have also sought to align the inclusion of influent factors (i.e. Covid19 impacts on demand) in our preferred plan scenarios. The current state of alignment can be seen in Table 6.

| Parameter | Anglian Water | Essex and Suffolk | Cambridge | Affinity |
|---|---|---|---|---|
| **WRMP24 Preferred Growth** | Edge - Local Plan (OxCam1b) | Edge - Local Plan | Edge - Local Plan | Edge – local Plan |
| **Low Growth Scenario** | ONS18 | ONS18 | ONS18 | ONS18 |
| **Ofwat Scenarios** | Aligned | Aligned | Aligned | Aligned |
| **DY/CP method** | Aligned | Aligned | Aligned | Aligned |
| **Critical period** | 7 day | 7 day | 7 day | 7 day |
| **Gov led Intervention inclusion** | Artesia Low Scenario 11l/h/d by 2050 inc. in Baseline/Final Plan | Artesia Low Scenario 11l/h/d by 2050 inc. in BL/FP | Artesia Low Scenario inc. in FP only | Artesia low scenario in FP only |
| **Covid19 factor** | Artesia analysis - 2.5% near term reducing to 1% | Artesia analysis - 2% uplift | 2% end of AMP7 to 1% by end of AMP 8 | |
| **Leakage Target** | 24% by 2050 | 40% by 2050 | 50% by 2050 | 50% by 2050 (as average across all WRZs) |
| **PCC Target** | 110 l/h/d by 2050 | 110 l/h/d by 2050 | 110 l/h/d by 2050 | 113 l/h/d by 2050 (as average across al WRZs) |
| **Smart Meter Rollout** | Full rollout by 2030 | Full rollout by 2035 | Full rollout by 2035 | Full rollout by 2040 |
| **Smart meter savings assumptions** | AMI - 2% Behaviour change - 4% plumbing loss - 2.5% cspl reduction (in addition to dumb meter savings approx. 15%) | AMI - 3% behaviour change<br>(in addition to dumb meter savings approx. 15%) | AMI | 2.75% behaviour change, 12 l/prop/d wastage reduction, allows continuation of HWECs (in addition to dumb meter savings approx. 15%) |
| **Non-HH Forecast** | Ovarro methodology | Ovarro methodology | Artesia NHH forecast | Artesia NHH forecast |
| **Non-HH DMO inclusion** | No Non-HH DMO savings in draft plan - will be included in final plan | No Non-HH DMO savings in draft plan - will be included in final plan | 9% reduction | 12% by 2050 |
| **Climate Change** | UKCP09 climate projections<br>UKWIR methodology (WRMP24 model)* | UKCP09 climate projections<br>UKWIR methodology (WRMP24 model)* | Climate change factor- circa 1% | None |
| **Water taken unbilled (WTU)– Distribution system operational use (DSOU) as % of DI** | WTU - 2% DSOU - 1% | 2% | DSOU >1%- | <2% |
| **New Non-HH major users** | manual adjustment to include identified new NONHH users | BL NHH all new NHH requests included. | No specific allowance for major users | No specific allowance for major users |

**Table 6: Alignment between demand forecast influences (Water Company overall targets)**

As we progress toward the Final WRMP24 submission we will continue to work with our WRE partners as we gain further understanding regarding the plans.

As WRMP24 preferred plan projections have been generated by the participating water companies, these have been combined for submission into the WRE simulator for final analysis. As can be seen in the figure below the combined WRMP24 projections sit within the envelope of previously tested demand projections (Figure 5).

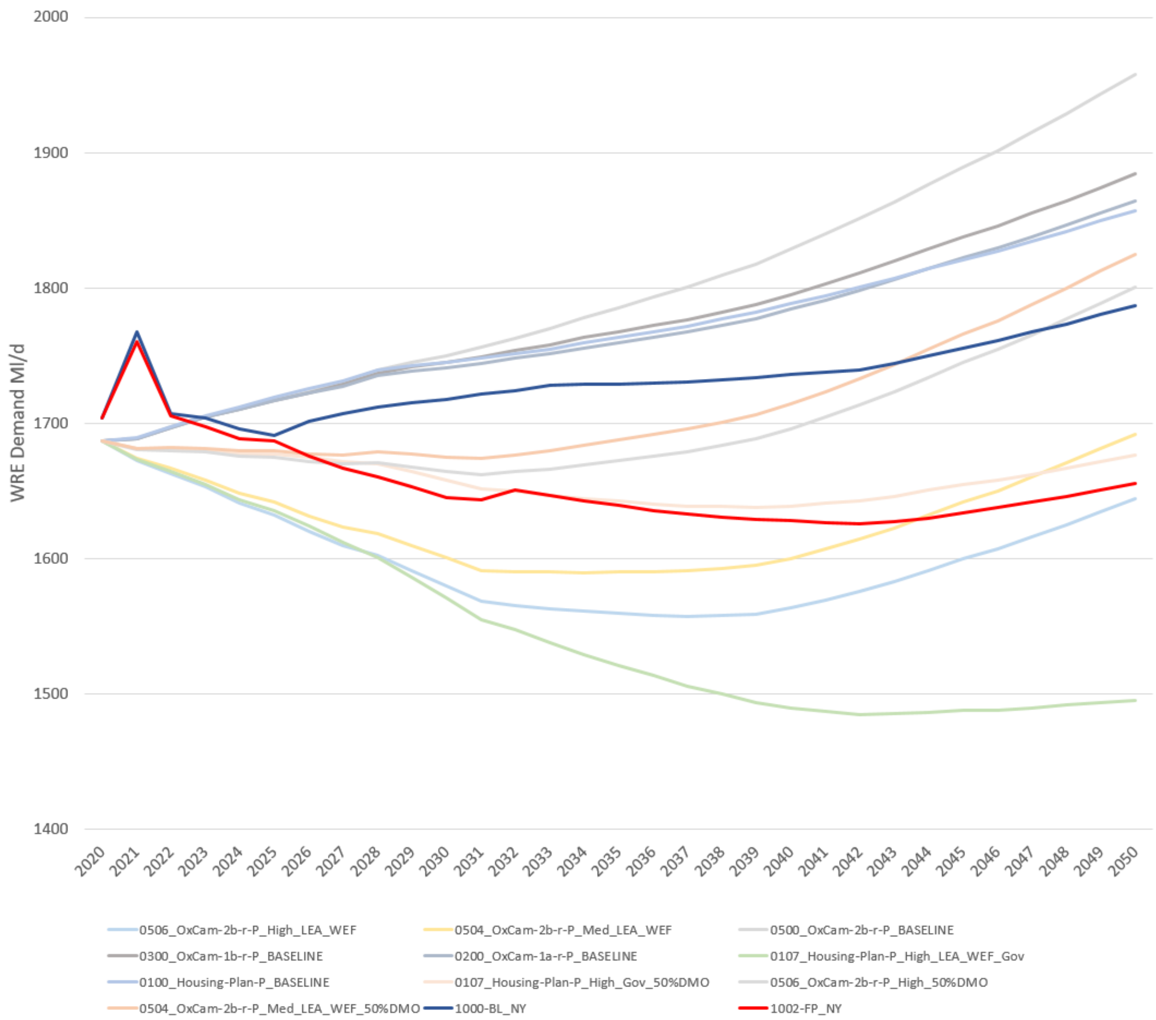


**Figure 5: Demand forecast scenarios, including the WRMP24 baseline and final plan projections (1000 and 1002),**

WRMP24 scenarios have been derived and have been included in the WRE modelling process, reflecting both baseline (BP) and final plan (FP) outcomes (these are the 1000 and 1002 scenarios). These reflect the different approaches finally decided upon by each water company, with regard to their implementation of demand management options in their respective WRMPs (as described above). However, key regional datasets and assumptions have underpinned the WRMP forecasts, allowing for regional comparison of the final WRMP outcomes.

## 3.3 Key WRMP24 demand forecast considerations and outcomes

Overall baseline water company demand is forecast to increase from 1744Ml/d in 2025 to 1829Ml/d in 2050 for the Dry Year Annual Average scenario, without additional demand management beyond plans included within WRMP19s. This reflects the impact of growth over the 25-year period.

For the final plan water company demand is forecast to decrease to 1669Ml/d by 2050, a difference of approximately 160Ml/d. This reflects the impact of demand management options including behavioural change, smart meter rollout and leakage reduction.

Note that the base-year for the modelling processes has been set at 2019/20.

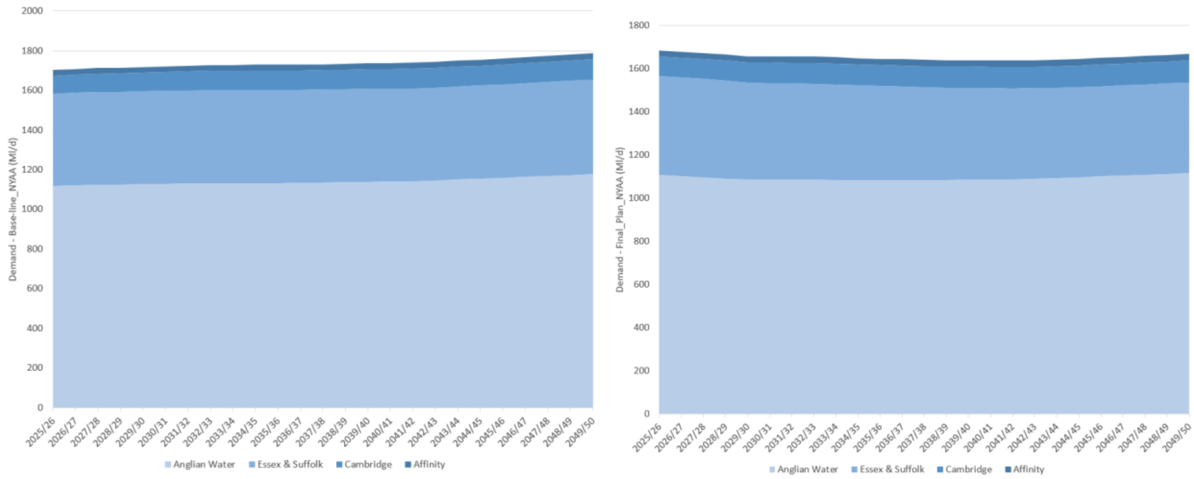


**Figure 6: Demand for the participating water companies, before and after WRMP24 demand management options**

The main forecast outcomes for the participating water companies are shown as below in Table 7.

Note this data is Dry Year Annual Average data from the WRE table submission.

| Parameter | Year | Anglian Water | Essex and Suffolk | Cambridge | Affinity | Regional |
|---|---|---|---|---|---|---|
| **% of WRE Households** | 2025 | 68% | 26% | 4% | 2% | |
| **Housing Growth expected** | 2050 | 24% | 22% | 24% | 18% | 23% |
| **Meter penetration (ex voids)** | 2025 | 87.6% | 76.2% | 81.8% | 79.0% | 84% |
| | 2050 | 96.3% | 98.3% | 100.0% | 82.6% | 97% |
| | % increase | 9.9% | 29.0% | 22.2% | 4.6% | 15% |
| **Smart meter Rollout** | | Full Rollout by 2030 | Full Rollout by 2035 | Full Rollout by 2035 | Full Rollout by 2040 | |
| **Leakage (Ml/d)** | 2025 | 154 | 53 | 12 | 3 | 222 |
| | 2050 | 141 | 39 | 5 | 2 | 188 |
| | % decrease | -8.4% | -26.4% | -58.3% | -33.3% | -16% |
| | Vs 2017/18 | -24% | -40% | -50% | -50% | |
| **Per Capita Consumption (l/p/d)** | 2025 | 130 | 150 | 132 | 115 | 135.0 |
| | 2050 | 110 | 113 | 105 | 92 | 110.2 |
| | % decrease | -15.4% | -24.7% | -20.5% | -20.0% | -18% |
| **Non-HH Consumption (Ml/d)** | 2025 | 290 | 81 | 29 | 6.1 | 406.1 |
| | 2050 | 309 | 92 | 29 | 6 | 436 |
| | % change | 6.6% | 13.6% | 0.0% | -1.6% | 8% |
| **DI - DYAA** | 2025 | 1131 | 493 | 90 | 28 | 1744 |
| | 2050 without DMOs | 1192 | 507 | 97 | 32 | 1829 |
| | 2050 with DMOs | 1128 | 438 | 76.5 | 26 | 1669 |
| | % change | 0.1% | -8.0% | -13.1% | -7.1% | -3% |

Table 7 Key forecast outcomes for the WRE region (These are DYAA values taken from the tables)

Regionally:

- Household numbers are expected to increase by 25% over the WRMP24/WRE plan period.
- Meter penetration is expected to reach 97% by 2050 across the WRE region; an increase of 15% from 2025.
- Smart meter rollout will be fully completed by 2040.
- Leakage is expected to reduce by 16% from 2025 to 2050, on top of around a 15% reduction during AMP7.
- Per capita consumption will be approximately 110l/h/d by 2050 achieving the National Framework target.
- Demand will be reduced from 1744Ml/d in 2025 to 1669Ml/d by 2050; a reduction of 4% over the 25 year period. Alternatively, demand may be viewed as being reduced from the projected 2050 out-turn of 1829 Ml/d in 2050 to 1669Ml/d with demand management options (a potential reduction of 9%).

## 3.4 Additional theoretical demand forecasts for WRE

Additional theoretical demand scenarios have been developed to reflect an agreed set of variant options (metering, behaviour management, demand management targets).

These options have been developed in accordance with the National Framework for Water Resources. As stated, the water industry must be committed to ambitious demand reduction programmes, which support the emerging national target of reducing per capita consumption to 110 l/h/d and reducing leakage by 50% by 2050.

It is noted that the baseline for these assessments in the National Framework is 2017/18, and so for alignment purposes (and in alignment with WRSE), this has been chosen as the base-year for the WRE scenarios.

For WRE scenario testing, household consumption variants have been derived to reflect multiple behavioural change scenarios and demand management interventions over the longer-term. Future water demand has been determined, whilst including influences and factors, such as:

- changes in water usage behaviour (in households)
- metering effects on demand (both as consumers switch from being unmeasured to measured and smart metering)
- increasing water efficiency and sustainability practises
- changing design standards of products and devices that utilise water
- tariffs on water usage
- the potential application of grey/green/blackwater re-use
- improved design standards in new build property
- long term impacts due to the Covid19 pandemic (changing societal behaviours)
- changes in technology and practises for leakage detection and repair; and
- climate change and weather patterns (dealt with within the WRE simulator).

Households and populations have been segmented for both the base and forecast period at Water Resource Zone level. For the WRE process, scenarios have been agreed and developed to reflect variant targets for PCC reduction including the 110l/h/d target.

The PCC values have been modelled to include:

- potential interventions which might lie outside of the remit of water company operation (i.e. government lead mandatory standards), reflecting; the WUK/Defra Consultation (AR1286_WUK-PCC-pathways_technical-report_FINAL_20190911); and
- the results of the water industry club project on 'Water Demand Insights from 2018 (Artesia 2020),

Whilst considering these factors, a set of high, medium, low demand management scenarios has been designed to achieve a range of 'top down' targets, for both water efficiency and leakage, as described below. These have specifically been designed to achieve the 110l/h/d PCC target and 50% reduction in leakage, in alignment with WRSE and the National Framework.

Note that although these scenarios describe percentage reductions in demand, these are not absolute, and will be relative to the growth projections to which they are attributed. Consequently, demand will most likely still remain flat or increase in most of the modelled scenarios, due to population growth 'out-pacing' the impact of demand management.

The water efficiency scenarios will include a baseline (No DMO), Low, Medium and High variant (with targets to 2050 and 2100), with additional consideration for Government lead options, resulting in a further set of variants; Low+Gov, Med+Gov and High+Gov (Table 8).

| **WRE Consumption Scenarios - Household and Non-Household** | | | |
|---|---|---|---|
| | **End AMP 7** | **2050 Target** | **2100 Target** |
| ***Extreme Low DMO - (Baseline) No impact from DMOs (Potential for increased PCC - includes meter installation only)*** | *AMP7: achieve WRMP reduction* | *By 2050:.No further DMO driven reductions in consumption (Potential for PCC to increase)* | *2050 - 2100: No further DMO driven reductions in consumption (Potential for PCC to increase)* |
| *Includes No Non-HH DMO savings* | | | |
| **Low - reduce consumption by up to 5% by 2050 from Household + Non-Household options** | AMP7: achieve WRMP reduction | By 2050: reduction in projected demand by an equivalent of up to 5% of 2017/18 baseline. | 2050 - 2100: 0-0.5% reduction each AMP from 2049/50 level - (0 to 5% further reduction) |
| Includes Low Non-HH DMO savings - approx. 2% by 2050 – flat-lined to 2100 | | | |
| **Medium - reduce consumption by up to 10% by 2050 from Household + Non-Household options** | AMP7: achieve WRMP reduction | By 2050: reduction in projected demand by an equivalent of 5-10% of 2017/18 baseline. | 2050 - 2100: 0.5-1% reduction each AMP from 2049/50 level - (5 to 10% further reduction) |
| Includes Medium Non-HH DMO savings - approx. 7.5% by 2050 – flat-lined to 2100 | | | |
| **High 1 (water company led) - reduce consumption by up to 15% by 2050 from Household + Non-Household options** | AMP7: achieve WRMP reduction | By 2050: reduction in projected demand by an equivalent of 10-15% of 2017/18 baseline. | 2050 - 2100: >1% reduction each AMP from 2049/50 level - (>10% further reduction) |
| Includes High Non-HH DMO savings - approx. 15% by 2050 – flat-lined to 2100 | | | |
| **High 2 (with Gov-led interventions in addition to water company led)** | | Higher than High 1 Strategy - based upon Artesia assumptions | |

**Table 8: Design criteria for low/medium/high water efficiency scenarios**

Leakage scenarios have been designed to achieve, 30% and 50% reductions by 2050 for Low, Medium and High variants (with further less significant reductions to 2100), with the addition of a worst-case base-line variant (no leakage reduction beyond 2025). See Table 9.

| **WRE Leakage Scenarios** | | | |
|---|---|---|---|
| | **End AMP 7** | **2050 Target** | **2100 Target** |
| ***Base-line Low (Baseline) - No leakage change from 2024/25*** | *AMP7: achieve WRMP reduction* | *No further reductions in leakage from 2024/25* | *No further reductions in leakage from 2024/25* |
| **Low - less than WRMP** | AMP7: achieve WRMP reduction | By 2050: 30% reduction (from 2017/18) | 2050 - 2100: 0-1% reduction each AMP from 2049/50 level - (1 to 10% further reduction) |
| *Reference: NF 2019/20 High demand scenario (30% reduction)* - Low Percentage Reduction from 2017/18 | | | |
| **Medium - equal/above WRMP** | AMP7: achieve WRMP reduction | By 2050: 50% reduction (from 2017/18) | 2050 - 2100: 1-2% reduction each AMP from 2049/50 level - (10-20% further reduction) |
| *Reference: NF 2019/20 Central/Low demand scenario (50% reduction)* - Medium Percentage Reduction from 2017/18 | | | |
| **High - greater than WRMP** | AMP7: achieve WRMP reduction or greater | By 2050: 50% reduction (from 2017/18) | 2050 - 2100: >2% reduction each AMP from 2049/50 level (20-40% further reduction) |
| *Reference: NF 2019/20 Central/Low demand scenario (50% reduction)* | | | |

**Table 9: Design criteria for low/medium/high leakage scenarios**

These demand management options were then combined with the selected growth scenarios in order to generate a long list of 70 potential demand forecast scenarios (Table 10).

| Scenario Name | HH/Population -Growth Scenario | Non-HH Growth - DMO Scenario | HH DMO Scenario Description |
|---|---|---|---|
| 0101_Housing-Plan-P_BASE_no_LEA_WEF | Housing-Plan-P | Non-HH growth aligned/NoDMO | HH-LEA No Investment, HH-No WEF - Baseline |
| 0102_Housing-Plan-P_Low_LEA_WEF | Housing-Plan-P | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF |
| 0103_Housing-Plan-P_Low_LEA_WEF_Gov | Housing-Plan-P | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF including Government Standards |
| 0104_Housing-Plan-P_Med_LEA_WEF | Housing-Plan-P | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF |
| 0105_Housing-Plan-P_Med_LEA_WEF_Gov | Housing-Plan-P | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF including Government Standards |
| 0106_Housing-Plan-P_High_LEA_WEF | Housing-Plan-P | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF |
| 0107_Housing-Plan-P_High_LEA_WEF_Gov | Housing-Plan-P | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF, including Government Standards |
| 0201_OxCam-1a-r-P_BASE_no_LEA_WEF | OxCam-1a-r-P | Non-HH growth aligned/NoDMO | HH-LEA No Investment, HH-No WEF - Baseline |
| 0202_OxCam-1a-r-P_Low_LEA_WEF | OxCam-1a-r-P | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF |
| 0203_OxCam-1a-r-P_Low_LEA_WEF_Gov | OxCam-1a-r-P | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF including Government Standards |
| 0204_OxCam-1a-r-P_Med_LEA_WEF | OxCam-1a-r-P | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF |
| 0205_OxCam-1a-r-P_Med_LEA_WEF_Gov | OxCam-1a-r-P | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF including Government Standards |
| 0206_OxCam-1a-r-P_High_LEA_WEF | OxCam-1a-r-P | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF |
| 0207_OxCam-1a-r-P_High_LEA_WEF_Gov | OxCam-1a-r-P | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF, including Government Standards |
| 0301_OxCam-1b-r-P_BASE_no_LEA_WEF | OxCam-1b-r-P | Non-HH growth aligned/NoDMO | HH-LEA No Investment, HH-No WEF - Baseline |
| 0302_OxCam-1b-r-P_Low_LEA_WEF | OxCam-1b-r-P | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF |
| 0303_OxCam-1b-r-P_Low_LEA_WEF_Gov | OxCam-1b-r-P | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF including Government Standards |

| | | | |
|---|---|---|---|
| 0304_OxCam-1b-r-P_Med_LEA_WEF | OxCam-1b-r-P | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF |
| 0305_OxCam-1b-r-P_Med_LEA_WEF_Gov | OxCam-1b-r-P | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF including Government Standards |
| 0306_OxCam-1b-r-P_High_LEA_WEF | OxCam-1b-r-P | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF |
| 0307_OxCam-1b-r-P_High_LEA_WEF_Gov | OxCam-1b-r-P | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF, including Government Standards |
| 0401_OxCam-2a-r-P_BASE_no_LEA_WEF | OxCam-2a-r-P | Non-HH growth aligned/NoDMO | HH-LEA No Investment, HH-No WEF - Baseline |
| 0402_OxCam-2a-r-P_Low_LEA_WEF | OxCam-2a-r-P | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF |
| 0403_OxCam-2a-r-P_Low_LEA_WEF_Gov | OxCam-2a-r-P | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF including Government Standards |
| 0404_OxCam-2a-r-P_Med_LEA_WEF | OxCam-2a-r-P | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF |
| 0405_OxCam-2a-r-P_Med_LEA_WEF_Gov | OxCam-2a-r-P | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF including Government Standards |
| 0406_OxCam-2a-r-P_High_LEA_WEF | OxCam-2a-r-P | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF |
| 0407_OxCam-2a-r-P_High_LEA_WEF_Gov | OxCam-2a-r-P | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF, including Government Standards |
| 0501_OxCam-2b-r-P_BASE_no_LEA_WEF | OxCam-2b-r-P | Non-HH growth aligned/NoDMO | HH-LEA No Investment, HH-No WEF - Baseline |
| 0502_OxCam-2b-r-P_Low_LEA_WEF | OxCam-2b-r-P | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF |
| 0503_OxCam-2b-r-P_Low_LEA_WEF_Gov | OxCam-2b-r-P | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF including Government Standards |
| 0504_OxCam-2b-r-P_Med_LEA_WEF | OxCam-2b-r-P | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF |
| 0505_OxCam-2b-r-P_Med_LEA_WEF_Gov | OxCam-2b-r-P | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF including Government Standards |
| 0506_OxCam-2b-r-P_High_LEA_WEF | OxCam-2b-r-P | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF |
| 0507_OxCam-2b-r-P_High_LEA_WEF_Gov | OxCam-2b-r-P | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF, including Government Standards |
| 0601_OxCam-2b-r-H_BASE_no_LEA_WEF | OxCam-2b-r-H | Non-HH growth aligned/NoDMO | HH-LEA No Investment, HH-No WEF - Baseline |
| 0602_OxCam-2b-r-H_Low_LEA_WEF | OxCam-2b-r-H | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF |

| | | | |
|---|---|---|---|
| 0603_OxCam-2b-r-H_Low_LEA_WEF_Gov | OxCam-2b-r-H | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF including Government Standards |
| 0604_OxCam-2b-r-H_Med_LEA_WEF | OxCam-2b-r-H | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF |
| 0605_OxCam-2b-r-H_Med_LEA_WEF_Gov | OxCam-2b-r-H | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF including Government Standards |
| 0606_OxCam-2b-r-H_High_LEA_WEF | OxCam-2b-r-H | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF |
| 0607_OxCam-2b-r-H_High_LEA_WEF_Gov | OxCam-2b-r-H | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF, including Government Standards |
| 0701_ONS-18-High-P_BASE_no_LEA_WEF | ONS-18-High-P | Non-HH growth aligned/NoDMO | HH-LEA No Investment, HH-No WEF - Baseline |
| 0702_ONS-18-High-P_Low_LEA_WEF | ONS-18-High-P | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF |
| 0703_ONS-18-High-P_Low_LEA_WEF_Gov | ONS-18-High-P | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF including Government Standards |
| 0704_ONS-18-High-P_Med_LEA_WEF | ONS-18-High-P | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF |
| 0705_ONS-18-High-P_Med_LEA_WEF_Gov | ONS-18-High-P | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF including Government Standards |
| 0706_ONS-18-High-P_High_LEA_WEF | ONS-18-High-P | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF |
| 0707_ONS-18-High-P_High_LEA_WEF_Gov | ONS-18-High-P | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF, including Government Standards |
| 0801_ONS-18-Low-L_BASE_no_LEA_WEF | ONS-18-Low-L | Non-HH growth aligned/NoDMO | HH-LEA No Investment, HH-No WEF - Baseline |
| 0802_ONS-18-Low-L_Low_LEA_WEF | ONS-18-Low-L | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF |
| 0803_ONS-18-Low-L_Low_LEA_WEF_Gov | ONS-18-Low-L | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF including Government Standards |
| 0804_ONS-18-Low-L_Med_LEA_WEF | ONS-18-Low-L | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF |
| 0805_ONS-18-Low-L_Med_LEA_WEF_Gov | ONS-18-Low-L | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF including Government Standards |
| 0806_ONS-18-Low-L_High_LEA_WEF | ONS-18-Low-L | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF |
| 0807_ONS-18-Low-L_High_LEA_WEF_Gov | ONS-18-Low-L | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF, including Government Standards |

| | | | |
|---|---|---|---|
| 0901_Housing-Need-H_BASE_no_LEA_WEF | Housing-Need-H | Non-HH growth aligned/NoDMO | HH-LEA No Investment, HH-No WEF - Baseline |
| 0902_Housing-Need-H_Low_LEA_WEF | Housing-Need-H | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF |
| 0903_Housing-Need-H_Low_LEA_WEF_Gov | Housing-Need-H | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF including Government Standards |
| 0904_Housing-Need-H_Med_LEA_WEF | Housing-Need-H | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF |
| 0905_Housing-Need-H_Med_LEA_WEF_Gov | Housing-Need-H | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF including Government Standards |
| 0906_Housing-Need-H_High_LEA_WEF | Housing-Need-H | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF |
| 0907_Housing-Need-H_High_LEA_WEF_Gov | Housing-Need-H | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF, including Government Standards |
| 1001_Completions-5Y-P_BASE_no_LEA_WEF | Completions-5Y-P | Non-HH growth aligned/NoDMO | HH-LEA No Investment, HH-No WEF - Baseline |
| 1002_Completions-5Y-P_Low_LEA_WEF | Completions-5Y-P | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF |
| 1003_Completions-5Y-P_Low_LEA_WEF_Gov | Completions-5Y-P | Non-HH growth aligned/LowDMO | HH-LEA Low, HH-Low WEF including Government Standards |
| 1004_Completions-5Y-P_Med_LEA_WEF | Completions-5Y-P | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF |
| 1005_Completions-5Y-P_Med_LEA_WEF_Gov | Completions-5Y-P | Non-HH growth aligned/MedDMO | HH-LEA Middle, HH-Med WEF including Government Standards |
| 1006_Completions-5Y-PH_High_LEA_WEF | Completions-5Y-P | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF |
| 1007_Completions-5Y-P_High_LEA_WEF_Gov | Completions-5Y-P | Non-HH growth aligned/HighDMO | HH-LEA Higher, HH-Higher WEF, including Government Standards |

**Table 10: Long list scenario description**

The suite of projections was then analysed in order to identify a representative sub-set of high and low demand outcomes, as well as other key scenarios (Table 11).

- It is noted that the selected demand forecast variants used in the WRE simulator include chosen demand management packages implicitly within forecast consumption values (as demand options are not being individually assessed in the WRE simulator).

Once the weather-based variation has been applied in the simulator, these variants create a realistic future demand ‘envelope’, indicating both potential high and low demand possibilities (and encompassing the WRMP24 final projection (including NY, DYAA uplift; CP and target headroom)).

| No. | Scenario | Description | No. | Scenario | Description |
|---|---|---|---|---|---|
| **1** | 0100_Housing-Plan-P_BASELINE | LAUA Housing Plan led – Base-line | **11** | 0500_OxCam-2b-r-P_BASELINE | OxCam2b scenario – Base-line |
| **2** | 0102_Housing-Plan-P_Low_LEA_WEF | LAUA Housing Plan led – Low Water Efficiency | **12** | 0502_OxCam-2b-r-P_Low_LEA_WEF | OxCam2b Housing Plan led – Low Water Efficiency |
| **3** | 0104_Housing-Plan-P_Med_LEA_WEF | LAUA Housing Plan led – Med Water Efficiency | **13** | 0504_OxCam-2b-r-P_Med_LEA_WEF | OxCam2b Housing Plan led – Med Water Efficiency |
| **4** | 0106_Housing-Plan-P_High_LEA_WEF | LAUA Housing Plan led – High Water Efficiency | **14** | 0506_OxCam-2b-r-P_High_LEA_WEF | OxCam2b Housing Plan led – High Water Efficiency |
| **5** | 0107_Housing-Plan-P_High_LEA_WEF_Gov | LAUA Housing Plan led – High Water Eff. with Gov. interventions | **15** | 0507_OxCam-2b-r-P_High_LEA_WEF_Gov | OxCam2b Housing Plan led – High Water Eff. with Gov. interventions |
| **6** | 0200_OxCam-1a-r-P_BASELINE | OxCam1a scenario – Base-line | **16** | 0700_ONS-18-High-P_BASELINE | ONS-Trend led – Base-line |
| **7** | 0300_OxCam-1b-r-P_BASELINE | OxCam1b scenario – Base-line | **17** | 0702_ONS-18-High-P_Low_LEA_WEF | ONS-Trend led – Low Water Efficiency |
| **8** | 0302_OxCam-1b-r-P_Low_LEA_WEF | OxCam1b Housing Plan led – Low Water Efficiency | **18** | 0704_ONS-18-High-P_Med_LEA_WEF | ONS-Trend led – Med Water Efficiency |
| **9** | 0304_OxCam-1b-r-P_Med_LEA_WEF | OxCam1b Housing Plan led – Med Water Efficiency | **19** | 0706_ONS-18-High-P_High_LEA_WEF | ONS-Trend led – High Water Efficiency |
| **10** | 0306_OxCam-1b-r-P_High_LEA_WEF | OxCam1b Housing Plan led – High Water Efficiency | **20** | **1002-dWRMP_BL_FP_WRE** | Combined WRMP24 base-line & final plan (inc. DMOs) |

**Table 11: WRE demand scenarios (based upon differing growth and demand management projections)**

These key variants formed the basis of the demand projections that were developed, based upon household consumption, aligned water company non-household demand and demand management option influences, providing high and low envelope for the WRE planning process, along with potentially expected out-comes (and the WRMP24 preferred projection).

## 3.5 Non-household forecast

Non-household consumption accounts for a substantial proportion of overall demand in the WRE region. Consequently, non-household consumption forecasts have been developed in accordance with in-house WRMP modelling methodologies, using consistent key datasets and assumptions where feasible.

Additionally, non-water company demand is a key component in the WRE regional planning process. Sectors including agriculture and the energy sector have been modelled in alignment with water company non-household scenarios. Additionally, scenarios have been developed to reflect emergent technologies, such as the hydrogen economy.

Non-Household consumption has been modelled by characterising non-household customers by geographical area and industrial sector. Historical regression modelling has consequently been applied to each of the sectors consumption. Historic analysis has then been calibrated, based upon the appropriate selection of explanatory variables, such as numbers in employment or the level of economic activity (GVA), which most appropriately account for historical trends and variations in demand.

Non-Household consumption forecast scenarios forecasts have been developed, reflecting the mixture of industries at WRZ level in alignment with the variant projections for population and housing (Edge variants). Econometric modelling will factor the following influences on a sector by sector basis.

These scenarios reflect:

- Property and population variants (from Edge).
- Variant economic growth - employment and GVA growth rates.
- Non-Household water efficiency measures (WRMP24 demand management options).

The participating companies have indicated that the following methodologies have been applied in deriving their non-household forecasts (Table 12). Where alignments in either supporting data or assumptions have been feasible they have been agreed by the participating water companies.

| Option | PWC Non-Household demand forecast modelling approaches |
|---|---|
| Anglian Water | AWS will use historic consumption data and regression based analysis to derive forecasts for future non-household demand based upon groups relating to Standard Industrial Classifications.<br>The following data will be used to derive the non-household forecasts:<br>• Historic consumption data for non-household properties (PWC)<br>• Non-Household property SIC code classification<br>• The East of England Forecasting Model (Oxford Economics) which includes forecasts of Gross Value Added (GVA), Employment and Population<br>• Public domain evidence for prospective new major customers<br><br>Industry sectors will be characterised and aggregated into Night Use groups (aligned with the Standard Industrial Classification (SIC) codes), include;<br>• Public sector - “Education” and “Health” (relating to household population)<br>• Recreational: private sector focused - “Hotel”, “Holiday Camp”, “Restaurant” etc. (relating to household population)<br>• Office or domestic: “Office”, “Media”, “Washing and Dry Cleaning”, and “Transport”<br>• Retail both public and private<br>• Agriculture / Industrial: “Arable”, “Aquaculture”, “Pastural”, “Construction”, “Materials Manufacturing”, “Textile Manufacture” and “Mining”<br>• Remaining non-service sectors: “Food Processing”, “Beverages”, “Facilities”, “Utilities”, “Repair and Maintenance” and “Waste”<br>• Unknown: Consumption without a known sector.<br><br>This will allow Water Resource Zones (WRZs) to be characterised by non-household sector, as shown below, and projections to be made accordingly (based upon relevant influent factors). |

| | |
|---|---|
| Affinity Water | The non-household customers are divided by geographical area (WRZ) and industry sector and then separate models developed to forecast consumption based on one or more explanatory factors such as numbers in employment or the level of economic activity.<br><br>Other major uses and major developments proposed in the area are modelled individually as the have a sizeable impact on future demand. |
| Essex and Suffolk Water | ESW have developed a proprietary forecast methodology for non-household demand. This methodology uses trend data based on past actual customer use to predict a profile of future demand. The demand forecast applied an individual trend line for each identified customer. For all the remaining non-identified customers an average demand per property has been derived and the same trend approach had been applied using the average demand per property. The forecast average per property is then multiplied by the forecast number of non-identified properties to generate a total forecast demand for the non-identified customers.<br><br>For AMP 8 a percentage of non-households will receive a water demand questionnaire regarding future use of water to enable planning scenarios.<br><br>ESW have used trend analysis for the previous two WRMP's and these have proved sufficiently accurate. Taking into account these key assumptions a formula was developed that uses a logarithmic trend as a base to forecast demand. This forecast is based on three sections:<br>• Trend data<br>• Step change adjustment<br>• Economic adjustment |
| Cambridge Water | A trend-based model has been used to forecast non-household demand.<br>Non-household consumption is analysed using a 'trend-based' approach at a high level, and subsequently, at individual industry level and consumption bands. Large users are also considered separately. Consumption figures are tested against a set of economic factors including, but not limited to: unemployment; Gross Domestic Product (GDP); and population.<br><br>The update of this model for the WRMP24 and Regional plans will consider an Econometric forecasting methodology to ensure a robust forecast has been achieved particularly with the uncertainty around the 'OxCam arch' scenarios. |

**Table 12: Non-Household Consumption modelling approaches for participating water companies**

It is noted that regression modelling does not capture potential step changes in non-household use, which might arise from emergent industries (i.e. hydrogen technology, carbon capture and storage, specialist agricultural developments (e.g. glasshouse horticulture)). These industries might involve the use of non-potable/non-PWC water resources (or water re-use systems) and have been accounted for in the total demand forecasts.

Impacts of climate change and retail separation have also been considered, however, no strong evidence of correlation between annual demand and climate change has been found.

## 4.1 Demand management

The importance of managing demand has been emphasized in the 'National Framework for Water Resources', as stated: 'Water companies should plan to meet ambitious reductions in demand and leakage'.

In addition, demand management forms an essential strategy in mitigating short-term environmental risks. Increasing our current abstractions to meet growth related requirements would represent a serious deterioration risk. There is envisaged to be a significant reduction in licensable water available to meet future demand, as we strive for environmental improvement over the next 25 years.

Demand management also has wider environmental benefits. It directly benefits our local environment, as we are saving water that would otherwise have to be abstracted and increasing the well-being and resilience of natural aquatic habitats. Avoiding the need for additional abstraction is particularly important in our region, which is home to many internationally important wetland ecosystems and is classified as an area of 'serious water stress' by the Environment Agency. In addition, water saved does not need to be treated and distributed which reduces our operational energy consumption, making us more efficient and saving carbon, as we build towards our Net zero strategy.

**WRE's member water companies therefore plan to use demand management strategies to off-set any growth in demand over the next 25 years, mitigating these risks.**

Water companies are all at different positions with regard to meter penetration, leakage levels and current water efficiency programmes and per capita consumption. As described, theoretical demand reduction has been modelled, based upon the National framework target, but for the WRMP24 and core WRE plan, water companies have developed their own demand management programmes.

Public Water Companies intend to make the best use of available water resources, before developing new ones. Consequently, demand management programmes have been developed to comprise three strongly interlinked strategies, understanding that metering (and smart metering), leakage reduction and water efficiency measures must form a holistic whole to be effectively implemented.

These programmes have been developed, whilst being mindful of cost and affordability, ensuring the preferred plans represents 'best value' over the long-term, through rigorous cost benefit analysis and sensitivity testing.

## 4.2 Customer engagement

Given the scale of the challenges that we anticipate, WRE and participating water companies have actively collaborated and engaged extensively during the development of draft WRMP24s. Additionally, we have actively participated with Water Resources East (WRE) to derive the regional plan, in collaboration with major regional stakeholders. Customer engagement is central to our long-term decision making processes.

Our enhanced strategy places greater emphasis on ensuring our engagement is meaningful to customers and stakeholders and explores differences of opinion, experience and behaviours. We have also undertaken extensive work to understand the value that customers/stakeholders place on certain standards of service and different outcomes. We have used the outputs of these studies in our cost benefit analysis.

Key customer conclusions have included:

- Customers are fully supportive of the public water company 'core' responsibility in ensuring that supply meets demand in the region. Customers support investment to increase resilience and believe we should be planning for the long-term and taking preventative action to deal with foreseeable future challenges.

- Generally, customers prefer options that are perceived to make best use of existing resources, however, many customers also recognize industry expertise to make complex investment decisions.
- Leakage continues to be a priority and an emblematic issue, with customers supporting the continued drive to reduce wastage.
- Although customers are prepared to accept bill increases for service improvements that they value, many customers are feeling under financial pressure and are concerned about future bill increases.

## 4.3 Smart metering and enhancing behavioural change

Customers being metered and receiving bills based upon their usage is known to encourage water efficiency and reductions in per capita consumption.

Building upon this, the smart meter technological revolution is now progressing across the UK.

Smart metering is fundamental in supporting our water efficiency behavioural change activities, through the provision of real time consumption data for both customers and water companies. Using these systems, data can be provided on a daily basis to customers through dedicated website and 'customer portals'.

The central imperative, which drives the 'smart meter' roll-out, is the provision of reliable information for water customers, so that they, and we, can understand their consumption and help encourage behavioural change. This will reinforce current water savings as customers become metered and measured and unlock the potential for additional water efficiency measures, in a mutually reinforcing way.

Smart metering will also enable significant benefits for leakage reduction through the more efficient and timely identification of both 'plumbing loss' and customer supply side leaks. This identification of leakage will inform home visits, adding significant value to water efficiency activities. Consequently, the systems that will be invested in must be robust and, critically, must be able to supply accurate and reliable data over the long term.

Within the WRE region participating water companies are currently at different stages with regard to the introduction of smart meters and their intended rollout. However, it is expected that meter penetration will be 95% (or above) by 2050.

Water companies have all agreed to work to towards the National Framework target of 110l/h/d by 2050, with metering policies and smart metering in particular being a key element in achieving this.

### Anglian Water

Anglian Water intend to complete the rollout of smart meters by 2030. This rollout will be for the AMI technology (readings read through a network, hourly). Savings are estimated to be - 2% from Behaviour change - 4% from plumbing loss - 2.5% from cspl reduction (these reductions are in addition to savings from visual read meters (approximately 15%).

Overall meter penetration will reach 96.3% by 2050 (excluding voids).

### Essex & Suffolk

Essex & Suffolk Water intend to complete the rollout of smart meters by 2035. This rollout will be for the AMI technology (readings provided through a network, hourly). Savings are estimated to be - 3% from Behaviour change.

Overall meter penetration will reach 98.3% by 2050 (excluding voids).

### Cambridge Water

Cambridge Water intend to complete the rollout of smart meters by 2035. This rollout will be for the AMI technology (readings provided through a network, hourly).

Overall meter penetration will reach 100% by 2050 (excluding voids).

### Affinity Water

Affinity Water intend to complete the rollout of smart meters by 2040. This rollout will be for the AMI technology (readings provided through a network, hourly).

Overall meter penetration will reach 82.6% by 2050 (excluding void - Brett WRZ only).

Further detail regarding the smart meter programmes being implemented can be found in the water company WRMP24 reports.

## 4.4 Leakage

Leakage is a particular concern for our customers, who see it as wasteful and a sign that we are not 'doing our bit' to conserve water and invest in infrastructure. This can be a strong disincentive to customers adopting more water efficient behaviours and customers often associate leaks with service interruptions. Minimizing the amount of water we lose from public water system through leakage is the right thing to do for the regions customers and the environment.

Whilst developing the water company plans all the water companies have reviewed the PIC (Public interest commitment) and NIC (National Infrastructure Commission) targets, current leakage positions and future potential outcomes. Costs and benefits have been generated for a number of scenarios achieving alternate leakage reductions and the preferred plan has been selected to generate an ambitious, but achievable goal, without burdening our customers with significant additional costs.

Whilst balancing the desire to continue to reduce leakage, water companies have considered the following:

- achieving the NIC and PIC targets.
- the current leakage position of each water company.
- feasible options for leakage reduction.
- potential rising costs to maintain these lower levels of leakage and whether it is equitable to expect certain customers to pay very high costs for relatively low additional leakage reductions, while other customers face much lower costs.
- potential minimum leakage levels with current and future technologies.
- smart meter rollout and embedding the new process for cspl (customer supply pipe leakage) reduction in our systems.

### Anglian Water

Anglian Water intend to reduce leakage from 154Ml/d (14.2% of DI) in 2025 to 142Ml/d by 2050 (12.5% of DI). This represents a 24% reduction from 2017/18.

### Essex & Suffolk

Essex and Suffolk intend to reduce leakage from 54Ml/d (11.3% of DI) in 2025 to 43Ml/d by 2050 (9.8% of DI). This represents a 40% reduction from 2017/18.

### Cambridge Water

Cambridge Water intend to reduce leakage from 12Ml/d (13.6% of DI) in 2025 to 5Ml/d by 2050 (6.6% of DI). This represents a 50% reduction from 2017/18.

### Affinity Water

Affinity Water intend to reduce leakage from 3Ml/d (10.7% of DI) to 2Ml/d by 2050 (7.6% of DI) in the Brett WRZ. This represents a 50% reduction from 2017/18 (across all WRZs).

Further detail regarding the smart meter programmes being implemented can be found in the water company WRMP24 reports.

## 4.4.1 Proposed leakage performance against national targets

In their 2018 'Preparing for a Drier Future' report, the National Infrastructure Commission recommended water companies work to halve leakage by 2050 as part of a twin-track approach to increasing resilience of the public water supply. In April 2019, Water UK endorsed this target within their Public Interest Commitment and set a goal on behalf of companies in England to triple the rate of leakage reduction by 2030. The National Framework for Water Resources in 2020 then formalised the 50% leakage reduction target for the whole of England and Wales by 2050, using 2017/18 performance as the baseline. Ofwat's methodology for the PR19 price review meant there was early progress, by setting a stretching target for companies to reduce leakage by 15% by 2025.

In accordance with these ambitions, companies committed to achieve a 15% reduction in leakage for AMP7, and further reductions for WRMP24.

As part of the evaluation of potential leakage reduction programmes, water companies have reviewed their current positions with respect to the Public Interest Commitment and the National Infrastructure Commission and National Framework target of a 50% reduction.

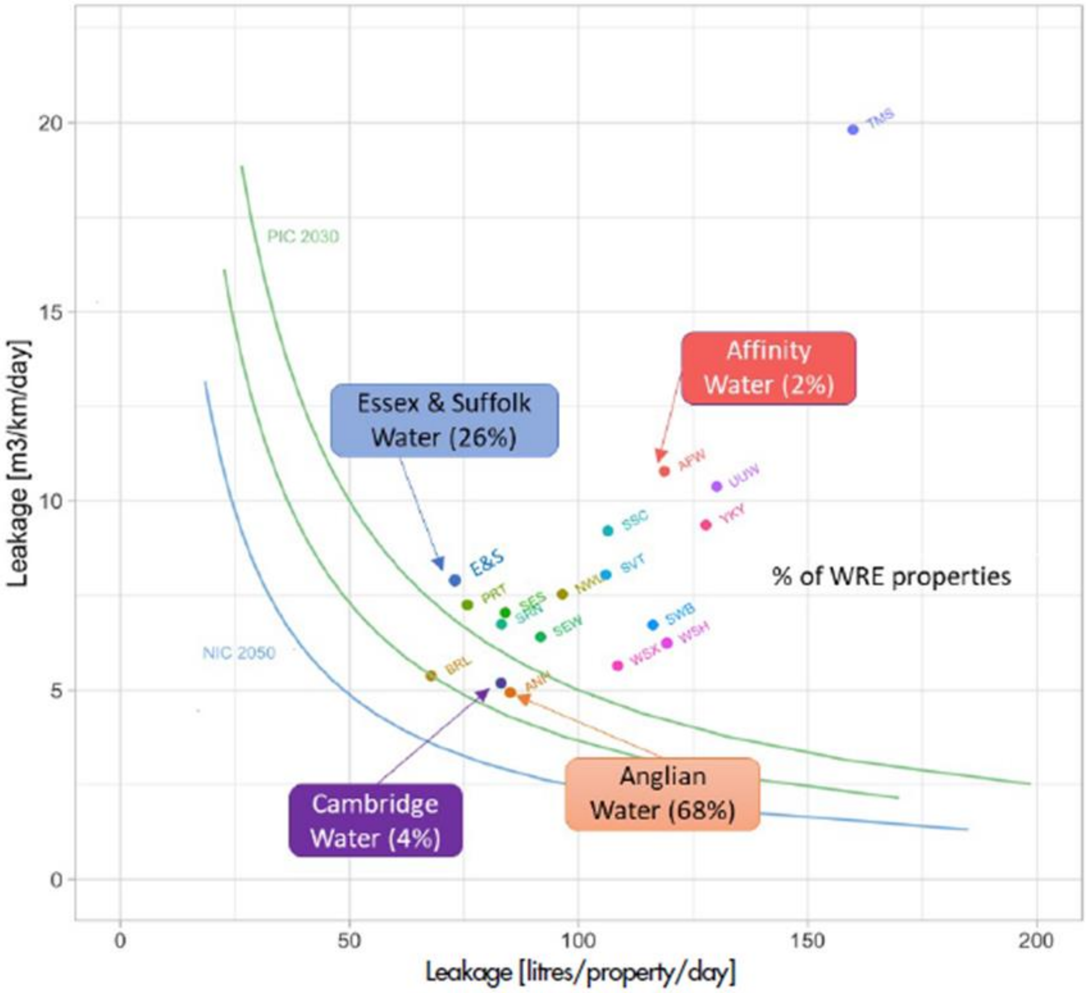


**Figure 7: Water company leakage performance in comparison with frontiers that represent achieving the Public Interest Commitment (PIC) and National Infrastructure Commission (NIC) targets**

This chart (Figure 7), based on one included in Water UK's 'Leakage Routemap to 2050' report (page 56) shows the wide range of current leakage positions, and indicates that for the national 50% reduction to be achieved some companies need to reduce their leakage values by a much larger amount than other forefront companies (such as Anglian Water, Cambridge Water and Essex & Suffolk Water). Additionally, it must be noted that as companies, such as Anglian Water, reach lower and lower leakage levels, the costs for finding and repairing greater numbers of smaller and smaller leaks will lead to diminishing returns for significantly higher costs.

*Note that the attainment curves for PIC and NIC targets have been created in the National Leakage Routemap by aggregating the water company leakage values to a national value (for 2017/18), halving this, and then creating a set of equivalent figures for the combined metrics of leakage per Km main and leakage per property.*

Considering this, Affinity Water and Cambridge Water have both committed to the 50% reduction by 2050, Essex and Suffolk Water have determined that they can achieve a 40% reduction and Anglian Water have determined that a 24% reduction is achievable (given their current frontier position).

### Anglian Water leakage analysis

As part of leakage option analysis Anglian Water have determined how different levels of leakage reduction will be reflected, against these attainment curves. The graph below (Figure 8) shows the leakage position for each AMP out-turn year (2030, 2035, 2040 etc.) up to the year 2050. As can be seen even with our current baseline and the impact of smart meters (on customer supply pipe leakage), Anglian Water expect leakage to be below the PIC target by 2025 and below the NIC target by 2040.

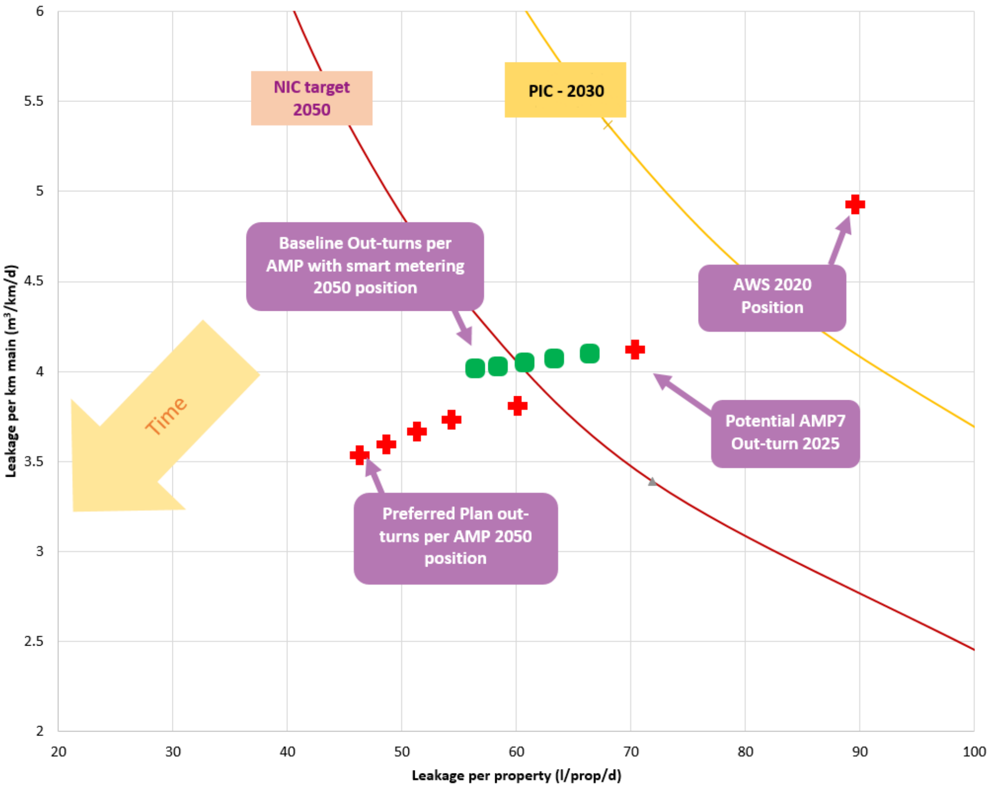


Figure 8: Anglian Water leakage out-turns compared with NIC/PIC targets

Anglian Water expect to be below the NIC target by 2030, reaching the levels of 3.5m$^3$ per km of main/day or 49l/prop/day respectively, by 2050.

Through analysis, Anglian Water found that achieving a reduction of 50% of leakage from their 2017/18 position (equivalent to a leakage level of 90Ml/d), is not a reasonable option, due to the uncertainty in being able to realise this reduction in practice (potentially being below our background leakage level) and the fact that it is currently estimated that it would inflict huge costs on Anglian Water’s customers (potentially a current estimation of £22 billion). It must also be noted that pressure management and network optimisation schemes may well be fully exhausted using current technology (in terms of further leakage reduction) by 2025.

However, Anglian Water is actively exploring how the use of state-of-the-art technology can help to achieve further reductions, which is why they made ‘zero leakage and bursts’ one of the seven goals of their ‘Innovation Shop Window’ initiative. Active trials of technologies such as thermal imagining drones to detect leaking pipes and the use of satellite imagery to identify leakage, are being undertaken. Additionally, smart metering is facilitating an opportunity for a significant advance in detecting leaks by improving our understanding of continuous flows into customer properties (usually indicating a leak). Customer supply pipe leakage currently accounts for approximately 23% of total leakage. As smart meters are introduced, we expect that cspl will be reduced by 70% from the current level.

The intention is to make a fair and equitable contribution to the overall national leakage target, such that the preferred plan provides us with an ambitious, but achievable goal, without burdening customers with significant additional costs.

## 4.5 Water efficiency: encouraging changes in behaviour

An important aspect of demand management is the empowerment of customers to understand and reduce their water usage.

Key to future water efficiency strategies is the introduction of the smart metering program and the ability to communicate the reasons why demand and water efficiency are so important in achieving our goals for the environment and for the provision of sustainable clean water supplies in the WRE region.

All water companies have committed to the introduction of smart meters during the 25 year plan period, with Anglian Water completing the rollout by 2030, Essex and Suffolk Water and Cambridge Water completing rollout by 2035 and Affinity (Brett WRZ) completing their rollout by 2040.

Water companies have all agreed to work to achieve the National Framework target of 110l/h/d by 2050.

Current water efficiency initiatives include:

- Water efficiency campaigns and advice.
- Home audits delivering water savings through retrofitting free water saving devices and, through the provision of advice, to encourage positive behaviour change.
- Campaigns to assist customers with leaky loos (noting that a leaking loo can lose on average 478l/prop/d).

Looking to the future, public water companies are keen to rollout smart meters across the region, while expanding digital offerings to take full advantage of the smart future.

This will potentially include:

- trialling of smart water devices and the internet of things.
- innovative water efficiency interventions utilizing tailored customer engagement.
- customer campaigns and reward schemes.

Companies understand that smart metering is a technological revolution and it needs to be accompanied by a behavioural revolution to unlock its full potential to help manage demand.

### Anglian Water

Anglian Water intend to complete the rollout of smart meters by 2030 and undertake an extensive package of water efficiency measures, leveraging the smart meter rollout.

Per capita consumption in 2050 is forecast to be 110 l/h/d (this includes influences from government led interventions, long term covid19 impacts, dry year uplift and climate change)

### Essex & Suffolk

Essex & Suffolk Water intend to complete the rollout of smart meters by 2035 and undertake an extensive package of water efficiency measures.

Per capita consumption in 2050 is forecast to be 113 l/h/d (this includes influences from government led interventions, long term covid19 impacts, dry year uplift and climate change)

### Cambridge Water

Cambridge Water intend to complete the rollout of smart meters by 2035 and undertake an extensive package of water efficiency measures.

Per capita consumption in 2050 is forecast to be 105 l/h/d (this includes influences from government led interventions, long term covid19 impacts, dry year uplift and climate change)

### Affinity Water

Affinity Water intend to complete the rollout of smart meters by 2040 and undertake an extensive package of water efficiency measures.

Per capita consumption in 2050 is forecast to be 92 l/h/d, for the Brett WRZ (this includes influences from government led interventions, long term covid19 impacts, dry year uplift and climate change).

Further detail regarding the smart meter programmes being implemented can be found in the water company WRMP24 reports.

## 4.7 The impact of government-led interventions

As part of the WUK/Defra project Artesia developed a number of demand management scenarios based around the potential impact of Government-led interventions on per capita consumption ('Water UK: Pathways to long-term PCC reduction: Report number: AR1286: 2019-08-15).

In particular they found that the introduction of water labelling and the slow change to more efficient white goods, along with a set of government led mandatory standards for new-build and retrofit properties might lead to very significant savings in the long-term (up to 27 l/h/d by 2050)

Given that the government has signalled their intent to introduce legislation to bring in labelling and promote more water efficient white goods, we have felt that it is prudent to include a reduction in the base-line demand profile and final plan forecast to reflect this.

We have, therefore, conservatively, included a reduction equivalent to the low 'white good' labelling scenario in our final plan forecasts (approximately 11l/p/d).

It is noted that by 2050, this has a very significant impact on demand (less so in AMP8 with a 1.35l/h/d saving by 2030). However, with smart metering and our other quantified water efficiency interventions this is instrumental in achieving the National Framework Target of 110l/h/d by 2050.

| Scenario | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|
| **G1. Mandatory water labelling \| With minimum standards \| Saving \| Lower - l/h/d** | - | 2.83 | 8.71 | 16.15 | 20.63 | 23.15 |
| **G2. Mandatory water labelling \| With minimum standards \| Saving \| Middle - l/h/d** | - | 3.33 | 10.25 | 19.00 | 24.27 | 27.23 |
| **G3. Mandatory water labelling \| With minimum standards \| Saving \| Upper - l/h/d** | - | 3.83 | 11.79 | 21.85 | 27.92 | 31.32 |
| G4. Mandatory water labelling \| No minimum standards \| Saving \| Lower - l/h/d | - | 1.35 | 4.16 | 7.71 | 9.85 | 11.05 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **G5. Mandatory water labelling \| No minimum standards \| Saving \| Middle - l/h/d** | - | 1.59 | 4.89 | 9.07 | 11.59 | 13.00 |
| **G6. Mandatory water labelling \| No minimum standards \| Saving \| Upper - l/h/d** | - | 1.83 | 5.63 | 10.43 | 13.33 | 14.95 |

Table 13: Government led intervention scenarios (preferred scenario highlighted in bold)

## 4.6 Non-household efficiency

Under the aegis of WRE, and as part of the WRMP24 pre-consultation process, we have engaged with non-household customers, retailers and water company partners, with regard to the development of non-household water efficiency measures.

Our relationship with our Retail partners has developed through AMP7 as we work with Retailers on operational matters, water demand and drought. The relationship between wholesalers, retailers and non-household customers is complex and, consequently, the development of water efficiency options that are actionable, requires sensitivity and collaboration.

We are actively working to overcome barriers to the development of these options, including:

- working within the retail/wholesale framework;
- the provision of meaningful data for retailers and non-household customers;
- characterizing the multiple sectors and business concerns involved (large, small, simple, complex);
- Understanding the different behaviours and water usage of the multiple sectors involved (household equivalent, process, irrigation etc.); and
- ensuring that business customers understand the overarching need for reductions in demand as part of our environmental destination.

Additionally, given the diversity of different types of organisation and their water consumption, we are working to develop methods of best characterising businesses, so that water saving measures might be more efficiently targeted to their needs.

Currently, our consultation suggests that there are two initial options that should be developed in more detail, between ourselves as water companies and our Retail partners.

- Reducing leakage (both internal plumbing loss and supply pipe leakage) for business customers, leveraging our smart meter introduction and the leakage notifications that the system enables.
- Enable businesses to reduce water usage, with self-auditing systems, virtual visits and in-person visits to assist with retrofitting water efficient devices (for example, toilet cistern replacement).

It should be possible to develop these options for most of the business customer base, but more complex interventions may well be necessary for the largest non-household consumers. This will potentially include:

- Encouraging and helping to enable businesses to adopt water recycling systems, providing advice on the installation of grey/green/blackwater re-use systems.
- Liaising with developers/local authorities to facilitate installation of water re-use systems as new-build projects are designed and constructed.

We intend to develop these options for trial and full implementation in the WRMP24s and collaborate where possible, so that offerings can be coordinated between regional water companies and retailers.

### Anglian Water and Essex & Suffolk Water

Currently Anglian Water and Essex and Suffolk Water have not included non-household demand management option savings in the draft WRMP24.

### Cambridge Water and Affinity Water

Cambridge and Affinity have both included a preliminary assessment of non-household savings in their respective dWRMP24 assessments (approximately 10% reduction over the WRMP plan period).

## 5.1 Conclusion

For WRMP24 and the WRE planning process the participating water companies have developed sophisticated demand forecasts, collaborating where possible in order to align assumptions and key datasets. Additionally, all the participating companies are planning to build upon current demand management programmes to pursue ambitious reductions in demand for the future (including smart metering and leakage reduction).

Additional detail regarding these plans can be found in the respective draft Water Resource Management Plan documents being published by companies.