Thames Water

Final Water Resources Management Plan 2019

Technical Appendices

Appendix E: Population and property projections

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Note: This document comprises three reports from external consultants (at sections B, C and D), each with a Thames Water foreword. Each report uses its own section and page numbering.

Appendix E.

Population and property projections

A. Introduction

E.1 For our 2019 Water Resources Management Plan (WRMP), Thames Water employed Edge Analytics to produce our population and property forecasts. Our water supply area contains 65 Local Authorities and the forecasts have been produced using Local Plan housing evidence from each authority.

E.2 Edge Analytics is a specialist consultancy providing expertise in demographic analytics, geographical modelling and research with a specialism in scenario forecasting. Edge Analytics is contracted by the Local Government Association (LGA) to support-develop the POPGROUP suite of forecasting models used by planners and researchers across the UK.

E.3 Section 3: *Current & future demand for water* contains an overview of the population and property forecasts which have been produced for each Water Resource Zone (WRZ) and how they have then been used to produce demand forecasts.

E.4 This appendix comprises three reports undertaken by Edge Analytics for Thames Water:

- Part B: Report setting out how the population and property forecasts for 2016-2045 were developed, including the inputs, method and outputs of the plan-based forecasts, the compliance with regulatory guidance and technical support published by Defra and UKWIR.
- Part C: Report detailing the inputs, methodology and outputs of the 'long-term' forecasting exercise, providing population and property forecasts for the extended 2045-2100 horizon.
- Part D: Report examining new demographic evidence from the Greater London Authority (GLA), the Office for National Statistics (ONS), plus updated Local Plan information; comparing this evidence with Thames Water's Baseline growth scenario presented in the main WRMP document.

B. 2016-2045 Population, household & property forecasts

Foreword

E.5 The Water Resources Planning Guideline (WRPG) incorporate guidance on the development of population, property and occupancy forecasts to support WRMP19. This guidance has been supplemented by supporting technical documentation from UKWIR.

E.6 The WRPG has stated that the formulation of WRMP19 forecasts for the 2016-2045 horizon must be underpinned by housing growth evidence from Local Plans.

E.7 This report presents a technical summary of the process by which 'plan-based' population and property forecasts have been developed for the Thames Water operational area to meet WRPG guidelines.

E.8 The report summarises the regulatory context; the extensive data collection exercise with local authorities; the demographic forecasting methodologies employed; and the population and property growth outcomes for the Thames Water geographies.

E.9 This document should be read in conjunction with the '*WRMP Demographics: further analysis in response to dWRMP representations*' report, presented in part C of this Appendix. This document provides a summary of new demographic evidence published since dWRMP19 submission and its impact upon Thames Water's core population and property forecasts.

E.10 Forecasts presented in this report are a critical input to the WRMP19 demand estimates, providing the core 2016-2045 outlook which underpins Thames Water's longer-term growth forecast to the end of the century.

Report

(Starts overleaf)

Thames Water Ltd

Population, Household & Property Forecasts

Demographic evidence for Water Resources Management Plans

edge analytics

Leeds Innovation Centre | 103 Clarendon Road | Leeds | LS2 9DF

0113 384 6087 | www.edgeanalytics.co.uk

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Note: *Throughout this document 'forecast' is used as a general term to refer to both population 'trend' projections and other types of 'plan-based' population forecasts.*

Introduction

Context

1.1 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 a reducing average household size are key considerations for planners and policy makers. More people will be living in more homes and will require more water and wastewater services; with the existing geographical disparities between the supply and demand for water projected to become significantly more acute.

1.2 All water companies require reliable population, household and property forecasts to support the 2019 Price Review and the development of new Water Resources Management Plans (WRMPs). Demographic information is key evidence in the planning process, ensuring a reliable water supply is available to meet future demand, whilst accommodating increases in flow and loads to the wastewater network and wastewater treatment works.

1.3 Demographic forecasts are reported as part of the strategic business plan submission to Ofwat and are used in the WRMP submission to the Secretary of State for the Environment and the Environment Agency. In addition, population, household and property forecasts are used by water companies for a range of other internal planning and regulatory activities.

Requirements & Approach

1.4 Thames Water (TW) is seeking to update the demographic evidence it uses in the development of plans for future water resource management. TW has requested the delivery of updated population, households and property forecasts that comply with regulatory guidelines.

1.5 These forecasts are required for TW's water supply area and the wider geography to which it provides wastewater services. The smallest geographical area for which the forecasts are required is the Output Area (OA).

1.6 To meet TW's requirements, a **'Plan-based'** scenario has been prepared that uses housing growth evidence from Local Plans.

1.7 Accompanying household forecasts have been derived using household assumptions from the Department for Communities and Local Government's (DCLG) 2014-based household projections. Property forecasts have been estimated from the household forecast through the application of a vacancy rate derived from the 2011 Census data.

1.8 Output from the forecasting process consists of an MS Excel workbook that includes the following components:

- Total population
- Households
- Household population
- Population not-in-households
- Household occupancy
- Properties
- Properties (rescaled to Address Based Premium (ABP) data provided by TW)

1.9 This data deliverable is accompanied by a 'Final Report' (this document) which provides details on data inputs and assumptions, methodological alignment to regulatory guidelines and a summary of scenario outcomes.

2 Forecasting Methodology

Regulatory Guidelines

2.1 The Environment Agency in conjunction with Defra, the Welsh Government, Natural Resources Wales and Ofwat are responsible for the industry's Water Resources Planning Guidelines (WRPG)[1]. These guidelines provide a framework for water companies to follow when developing and presenting their WRMPs. The guidelines summarise the key requirements for population, property and occupancy forecasts that feed into the 2019 WRMPs.

2.2 In developing population and property forecasts for the 2019 WRMPs, the WRPG emphasise the importance of using housing growth evidence from Local Plans:

> *"For companies supplying customers wholly or mainly in England you will need to base your forecast population and property figures on local plans published by the local council or unitary authority." (p. 22)*

2.3 The WRPG acknowledges that councils may be at different stages of Local Plan development but states if a local council has:

> *• "a published adopted plan that is not being revised, you must take account of the planned property forecast. You will need to ensure your planned property forecast and resulting supply does not constrain the planned growth by local councils. If you adjust the planned property forecast and select a higher number you will need to justify why you have selected a higher forecast and provide evidence.*
>
> *• published a draft plan but it has not yet been adopted you must take account and use this as the base of your forecast. You should discuss with your local council whether it expects to make changes to the forecast for the adopted plan*
>
> *• not started or published a draft plan you should use alternative methods such as household projections from Department of Communities, Local Government or/and Office of National Statistics or derive your own analysis using methodologies outlined in UKWIR (2016) Population, household property and occupancy forecasting" (p. 22)*

[1] https://naturalresources.wales/media/681612/interim-wrpg-update-final-april-2017.pdf

2.4 The WRPG highlights a number of additional requirements concerning the data inputs and assumptions used in the development of population, property and occupancy forecasts. It requests that water companies should:

- *"Clearly describe the assumptions and supporting information used to develop population, property and occupancy forecasts. You should demonstrate you have incorporated local council information (particularly in relation to their published adopted local plans) in England.*
- *explain the methods you have used to forecast property figures after the planning period used by local councils (for example from years 15 to 25 in the planning period).*
- *demonstrate how you have included other sources of information and amended your forecast accordingly" (p. 23)*

2.5 WRMP demographic evidence must include an indication of the size of the population not captured in published statistics, with the guidance requesting that water companies should:

- *"explain the assumptions about how you have derived unaccounted population" (p. 23)*

2.6 Finally, the WRPG requests that the methodology for allocation of population and property forecasts to Water Resource Zones (WRZs) is made explicit, requesting that water companies:

- *"describe how you have allocated populations to the geographically different WRZs (eg using neighbourhood plans or census data to further subdivide the populations)" (p. 23)*

2.7 To support the WRPG demographic guidance, UKWIR has produced a suite of documents which provide advice on the development of population, property and occupancy forecasting. The UKWIR documentation is in three forms: a **Guidance Manual**; a **Worked Example**; and a **Supplementary Report**. The latter includes a review of engagement with key industry stakeholders and a technical review of potential forecasting approaches that underpin the WRMP guidance methodology.

2.8 This Guidance Manual identifies six key stages in the development of demographic forecasts:

- *"**Task A. Assess needs and make choices** – involves considering the requirements of the population and household forecasts and the WRZ problem characterisation, to help choose how to calculate the forecasts. The choices will need to take account of regulatory guidance and policy.*
- ***Task B. Assess Local Development Plans** – involves collating and assessing the housing growth forecasts set out in Local Development Plans, and engaging with local authorities, as appropriate, to obtain further information and understanding about the housing plans.*

> • ***Task C. Calculate population and household forecasts*** *– involves applying the chosen forecasting method(s): trend-based and/or plan-based and/or econometric and/or "hybrid" approach. Application of these methods includes reconciliations to ensure the data fits WRMP requirements.*
>
> • ***Task D. Calculate occupancy forecasts*** *– involves checking the occupancy values implied by the population and household forecasts and making modifications if necessary.*
>
> • ***Task E. Analyse uncertainty*** *– involves quantifying potential uncertainty in the population, household or occupancy forecasts.*
>
> • ***Task F. Review and finalise population, household and occupancy forecasts*** *– involves carrying out appropriate checks and identification of preferred forecasts." (p. 1)*

2.9 Whilst identifying the six key stages of the forecasting process, the UKWIR Guidance Manual is not prescriptive in terms of methodological recommendations. It provides guidance on the issues that should be considered at each stage of development but provides scope for water companies to consider and apply methods they deem to be appropriate.

2.10 The remainder of this section details Edge Analytics' approach to the development of demographic forecasts and its conformity with both the WRPG and the process summarised in the UKWIR Guidance Manual.

Edge Analytics' Approach

2.11 Edge Analytics' approach to the delivery of demographic forecasts to support water resources management consists of eight distinct stages (Figure 1).

2.12 **Step 1** is project initiation, involving the agreement on key data inputs and assumptions. **Step 2** is the key data processing stage, requiring the collection of all datasets and the configuration of the appropriate forecasting model.

2.13 **Steps 3-5** are the key technical stages, during which the application of formal demographic forecasting methodologies is essential to ensure robustness of output. Edge Analytics uses a combination of its **POPGROUP** and **VICUS** technology to configure population and household forecasts for both local authority areas and for the smaller OAs from which water industry geographies are derived. Consistency with water company evidence is assured through the

integration of property statistics from the billing database (where available) in the base year of the forecast.

Step 6 focuses on sensitivity analysis to examine uncertainty associated with the derived forecasts. UKWIR guidance recommends that this includes consideration of variant scenarios, plus the quantification of uncertainty using methods recommended in its guidance documentation. The sensitivity analysis is not reported in this document but has been completed separately by Thames Water as part of its dWRMP19.

2.14 **Step 7** generates output in an appropriate format for the specified geographical areas and provides documentation which confirms all inputs, assumptions, methods and outputs associated with the forecasting process.

2.15 **Step 8** is a separate and independent stage of the process and involves the estimation of 'clandestine and hidden' populations that are not routinely captured in published 'usually resident' population statistics. **Step 8** is conducted as a separate exercise, does not form part of the core forecasting analysis and is not included within this Final Report.

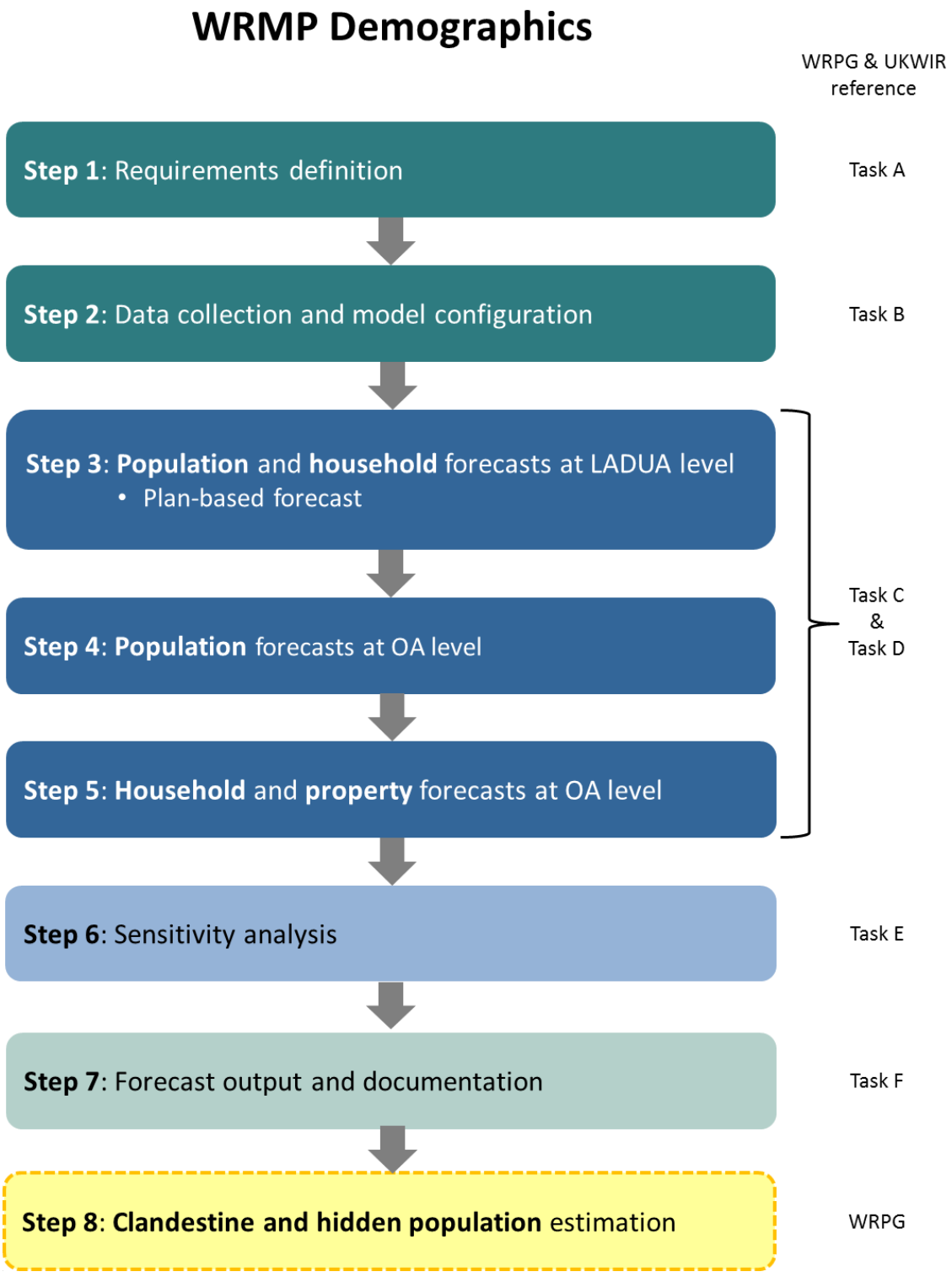


Figure 1: Development of WRMP demographic forecasts

Step 1: Requirements definition

2.16 At project initiation the geographical scope of the forecasts was determined, scenario definition was agreed and the forecast horizon was confirmed.

2.17 The TW operational area consists of 43,044 individual OAs (Figure 2).

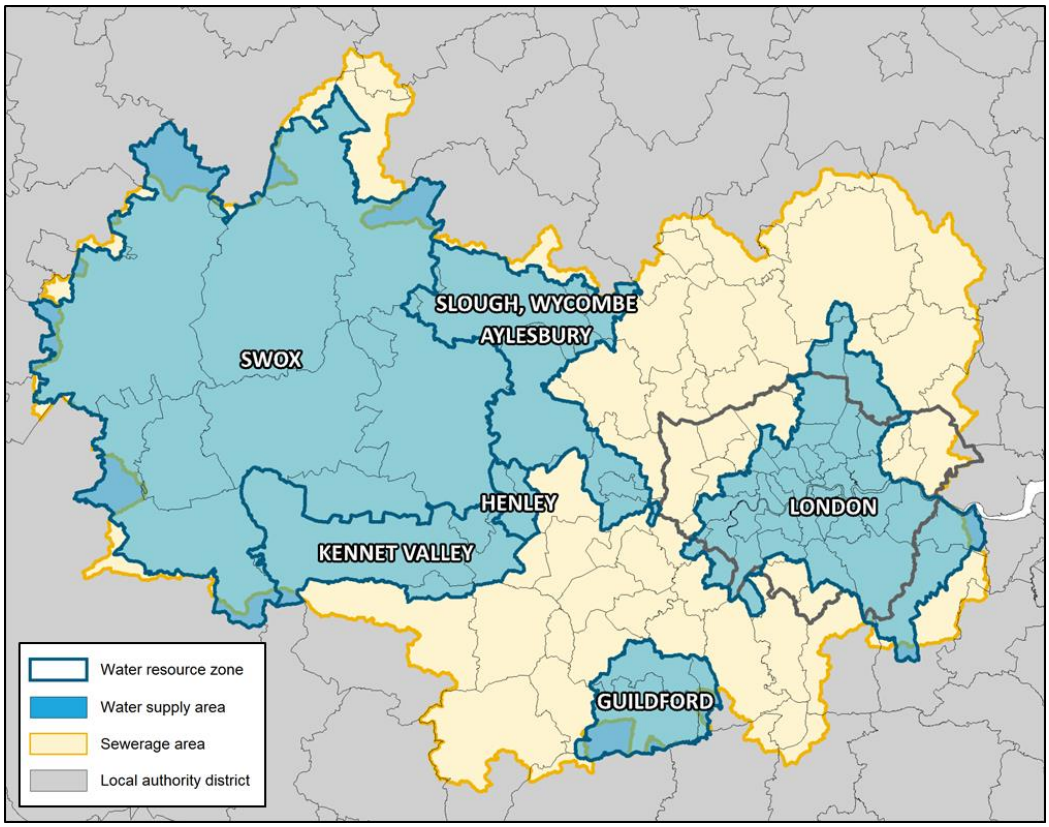


Figure 2: Thames Water – area definition

2.18 This area comprises 95 Local Authority Districts & Unitary Authorities (LADUA) as follows (values in brackets indicate approximately what share of each district's properties lie within TW's operational boundary):

Aylesbury Vale (70%)	Hammersmith & Fulham (100%)	South Oxfordshire (100%)
Barking & Dagenham (100%)	Haringey (100%)	Southwark (100%)
Barnet (100%)	Harlow (100%)	Spelthorne (100%)
Basingstoke & Deane (86%)	Harrow (100%)	St Albans (100%)
Bexley (100%)	Hart (100%)	Stevenage (97%)
Bracknell Forest (100%)	Havering (94%)	Stratford-on-Avon (2%)
Brent (100%)	Hertsmere (100%)	Surrey Heath (100%)

Brentwood (35%)	Hillingdon (100%)	Sutton (100%)
Bromley (100%)	Horsham (1%)	Swindon (100%)
Broxbourne (100%)	Hounslow (100%)	Tandridge (61%)
Camden (100%)	Islington (100%)	Tewkesbury (0%)
Central Bedfordshire (5%)	Kensington & Chelsea (100%)	Three Rivers (100%)
Cherwell (100%)	Kingston upon Thames (100%)	Thurrock (0%)
Chichester (2%)	Lambeth (100%)	Tonbridge & Malling (0%)
Chiltern (100%)	Lewisham (100%)	Tower Hamlets (100%)
City of London (100%)	Luton (99%)	Uttlesford (30%)
Cotswold (89%)	Merton (100%)	Vale of White Horse (100%)
Crawley (100%)	Mid Sussex (4%)	Waltham Forest (100%)
Croydon (100%)	Mole Valley (98%)	Wandsworth (100%)
Dacorum (100%)	Newham (100%)	Watford (100%)
Dartford (97%)	North Hertfordshire (16%)	Waverley (100%)
Daventry (7%)	Oxford (100%)	Welwyn Hatfield (100%)
Ealing (100%)	Reading (100%)	West Berkshire (100%)
East Hampshire (59%)	Redbridge (100%)	West Oxfordshire (100%)
East Hertfordshire (100%)	Reigate and Banstead (100%)	Westminster (100%)
Elmbridge (100%)	Richmond upon Thames (100%)	Wiltshire (11%)
Enfield (100%)	Runnymede (100%)	Winchester (0%)
Epping Forest (100%)	Rushmoor (100%)	Windsor & Maidenhead (100%)
Epsom & Ewell (100%)	Sevenoaks (84%)	Woking (100%)
Greenwich (100%)	Slough (100%)	Wokingham (100%)
Guildford (100%)	South Bucks (100%)	Wycombe (100%)
Hackney (100%)	South Northamptonshire (15%)	

2.19 One growth scenario has been developed (**Plan-based**). This scenario provides a set of population and property growth outcomes.

2.20 The scenario is presented with a 2016 base year and a 2045 forecast horizon, which includes the 25-year plan period for the updated 2019 WRMP. All forecasts have been derived at OA level, enabling subsequent aggregation to appropriate planning geographies.

Step 2: Data collection and model configuration

Thames Water Data

2.21 TW provided a definition of its key geographical boundary in a digital format. This data was used to determine the geographical scope of the forecasts and to provide the basis for apportioning forecasts to OA and WRZ geographies.

2.22 In addition, TW supplied an extract of its ABP database to enable scaling of base year property totals in each OA. The ABP data includes a residential property identifier plus a geocode, enabling a precise allocation of properties to OA geographies in the base year of the forecast.

Local Plan Data

2.23 In line with the WRPG requirement, Edge Analytics has collected Local Plan housing growth evidence from all local authorities that are either wholly or partially contained within the TW operational boundary.

2.24 Each of the 95 local authorities (plus 2 National Park Authorities and Old Oak Park Royal Development Corporation) is at a different stage of Local Plan development. All have collated a variety of demographic and economic evidence to inform the plan-making process. Some plans have been adopted; others remain under development or open for consultation.

2.25 The information in Table 1 provides a summary of the current status of each Local Plan with an indication of the likely housing growth target over a designated plan period. These data are subject to change but provide a point-in-time perspective on likely housing growth outcomes.

Table 1: Local Plan status, August 2017 (Source: Local Plans)

Area	Latest Local Plan Status	Plan Period	Housing Target
Aylesbury Vale	Consultation	2013-2033	21,300
Barking & Dagenham	Consultation	2015-2030	28,492
Barnet	Emerging	2016-2031	?
Basingstoke & Deane	Adopted	2011-2029	15,300
Bexley	Emerging	?	?
Bracknell Forest	Emerging	2013-2036	?
Brent	Adopted	2007-2026	20,970
Brentwood	Draft	2013-2033	7,240
Bromley	Consultation	2015-2030	9,615
Broxbourne	Draft	2014–2031	7,123
Camden	Examination	2016-2031	16,800
Central Bedfordshire	Emerging	2011-2031	29,500
Cherwell	Adopted	2011-2031	22,840
Chichester	Adopted	2014-2029	7,388
Chiltern	Preferred Options Consultation	2014-2036	7,300
City of London	Consultation	2016-2036	?
Cotswold	Draft	2011-2031	8,400
Crawley	Adopted	2015-2030	5,100
Croydon	Consultation	2016-2036	31,850
Dacorum	Emerging	2006-2031	10,750
Dartford	Emerging	?	15,000 (2011-2026)
Daventry	Adopted	2011-2029	6,985
Ealing	Adopted	2011-2026	14,000
East Hampshire	Adopted	2011-2028	8,366
East Hertfordshire	Pre-submission	2011–2033	16,390
Elmbridge	Emerging	2015-2035	3,375
Enfield	Consultation	2017-2032	16,061 (2015-2031)
Epping Forest	Draft Plan Consultation	2011-2033	11,400
Epsom & Ewell	Emerging	?	?
Greenwich	Adopted	2013-2028	38,925
Guildford	Proposed Submission Consultation	2013-2033	13,860
Hackney	Emerging	-2033	28,197
Hammersmith & Fulham	Consultation	2015-35	25,800
Haringey	Pre -Submission	2011-2026	19,802
Harlow	Emerging Strategy and Further Options	2011-2031	5,346 - 8,000

Area	Latest Local Plan Status	Plan Period	Housing Target
	Consultation		
Harrow	Adopted	2009-2026	6,050
Hart	In preparation	2011-2032	7,500
Havering	Consultation	2017-2032	17,550
Hertsmere	Emerging	2019-2034	9000
Hillingdon	Emerging	?	?
Horsham	Emerging	2011-2031	16,000
Hounslow	Consultation	2015-2030	12,330
Islington	Consultation	?	12,641 (2015-2025)
Kensington & Chelsea	Issues and Options (2015)	2015-2035	10,995
Kingston upon Thames	Emerging	?	9,645
Lambeth	Emerging	?	17,925 (2015-2030)
Lewisham	Emerging	2018-2033	25,000
Luton	Examination	2011–2031	6,700
Merton	Emerging	?	4,800 (2011-2026)
Mid Sussex	Submitted (Aug 2016)	2014-2031	13,600
Mole Valley	Emerging	2018-2033	3,760
Newham	Emerging	?	?
North Hertfordshire	Proposed Submission Draft	2011-2031	15,950
Oxford	Emerging	2016-2036	?
Reading	Emerging	2013-2036	16,077
Redbridge	Pre-submission Draft Consultation	2015-2030	16,845
Reigate & Banstead	Adopted	2012-2027	6,900
Richmond upon Thames	Pre-publication Draft	2018-2033	?
Runnymede	Emerging	2015-2035	9,320
Rushmoor	Emerging	2011-2032	8,190
Sevenoaks	Emerging	2015-2035	?
Slough	Consultation	2016-2036	18,540
South Bucks	Preferred Options Consultation	2014-2036	7,800
South Northamptonshire	Adopted	2011-2029	7,170
South Oxfordshire	Preferred Options Consultation	2011-2032	15,750
Southwark	Consultation	2017-2033	41,040
Spelthorne	Emerging	2013-33	3,320
St Albans	Submitted	2011-2031	8,720
Stevenage	Examination	2011-2031	7,600
Stratford-on-Avon	Adopted	2011-2031	14,600

Area	Latest Local Plan Status	Plan Period	Housing Target
Surrey Heath	Emerging	2014-2032	6,876
Sutton	Issues & Preferred Options Consultation	2016-2031	6,405
Swindon	Emerging	?	22,000
Tandridge	Emerging	2013-2033	9,400
Tewkesbury	Examination	2011-2031	9,899
Three Rivers	Emerging	?	2,008
Thurrock	Emerging	2014-2037	22,379
Tonbridge & Malling	Emerging	2011-2031	12,374
Tower Hamlets	Draft	2016-2031	3,931
Uttlesford	Draft to be published in Oct 2016	2011-2033	12,496
Vale of White Horse	Adopted	2011-2031	20,560
Waltham Forest	Adopted	2011-2026	10,320
Wandsworth	Emerging	?	?
Watford	Emerging	2016-2036	6,500
Waverley	Pre-Submission Draft Consultation	2013-2032	9,861
Welwyn Hatfield	Proposed Submission Consultation	2013-2032	12,000
West Berkshire	Emerging	until 2036	10,500
West Oxfordshire	Consultation	2011-2031	15,950
Westminster	Adopted	2015-2036	21,360
Wiltshire	Adopted	2006-2026	42,000
Winchester	Adopted	2011-2031	12,500
Windsor & Maidenhead	Draft	2013-2033	14,298
Woking	Adopted	2010-2027	4,964
Wokingham	Consultation	2016-2036	17,120
Wycombe	Draft	2013-2033	10,000
New Forest NP	Consultation	2016-2036	700
South Downs NP	Submission	2014-2032	4,596
OPDC	Draft	2018-2038	22,350

2.26 Where available, the annual allocation of the overall housing target was taken from the information provided by each Council. In cases where this information was not available, the overall housing target was distributed equally over the Local Plan period with adjustments made to take account of historical completions if available. These annual housing growth trajectories

form the key input to the **Plan-based** scenario. Details of this data have been made available to TW in an accompanying MS Excel workbook.

Demographic Data

2.27 The configuration of the **POPGROUP** and **VICUS** population and household forecasting models required the following key demographic datasets:

- Population estimates, 2001-2015 (ONS)
- Birth, death and migration data, 2001-2015 (ONS)
- Household data and assumptions (DCLG; 2011 Census)
- Fertility, mortality and migration growth assumptions from the Sub-National Population Projections (ONS)

Step 3: Population and household forecasts at LADUA level

2.28 Demographic forecasts at LADUA level were developed using the **POPGROUP** suite of products. **POPGROUP** is a family of demographic models that enables forecasts to be derived for population, households and the labour force, for areas and social groups. The main **POPGROUP** model is a cohort component model, which enables the development of population forecasts based on births, deaths and migration inputs and assumptions (Figure 3).

2.29 The **Derived Forecast** (DF) model sits alongside the population model, providing a household representative rate model for household projections (Figure 4). Household representative rates measure the *"probability of anyone in a particular demographic group being classified as being a household representative"*[2].

2.30 Household forecasts are derived from a population forecast, taking account of population 'not-in-households' and variations in household representative rates by age-group and sex. The population not-in-households includes those people that live in communal establishments, e.g. prisons, residential care homes and student halls of residence.

2.31 Households are converted to dwellings (properties) through the application of a vacancy rate.

[2] Household Projections 2014-based: Methodological Report. Department for Communities and Local Government (July 2016). https://www.gov.uk/government/statistics/2014-based-household-projections-methodology

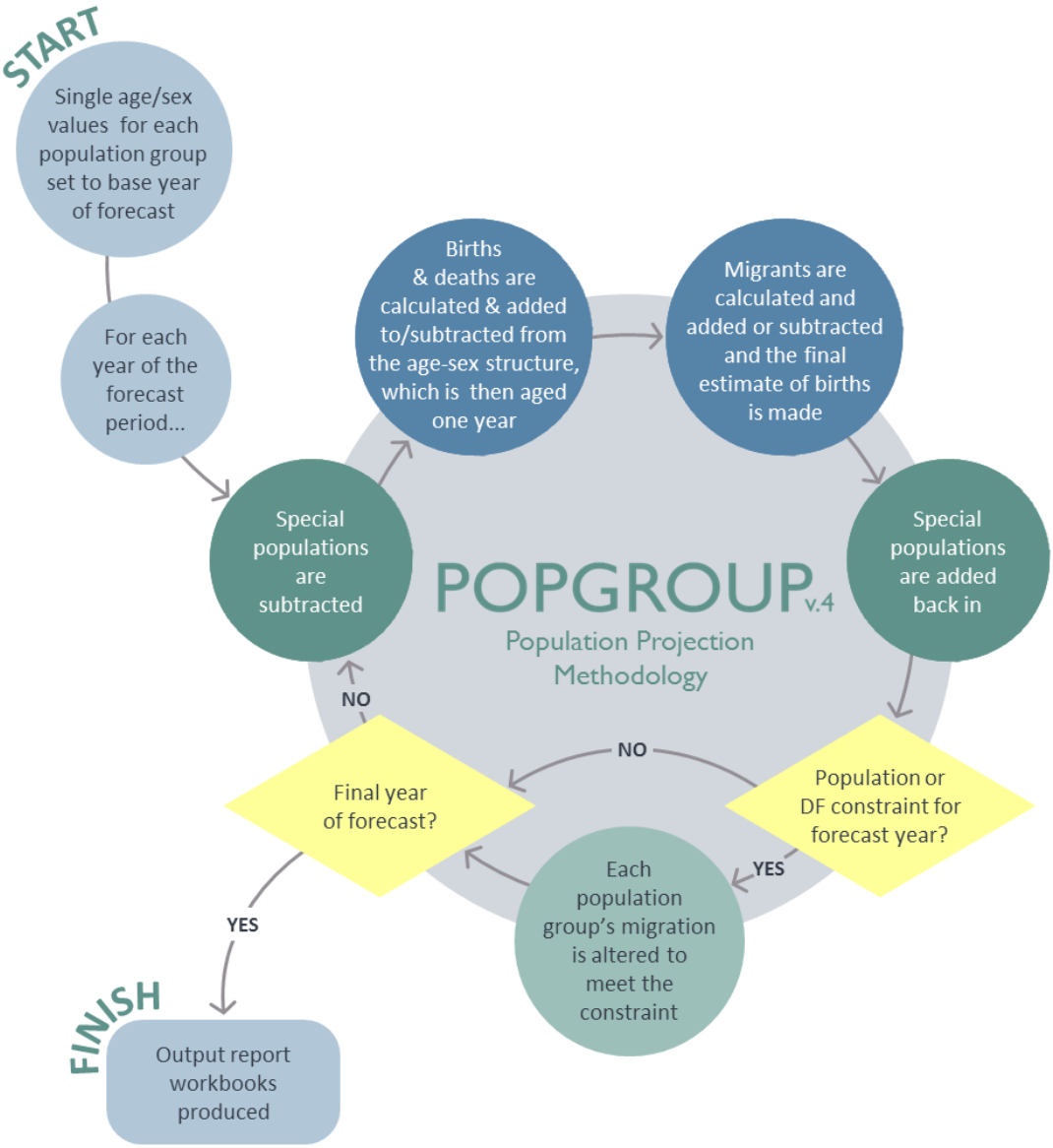
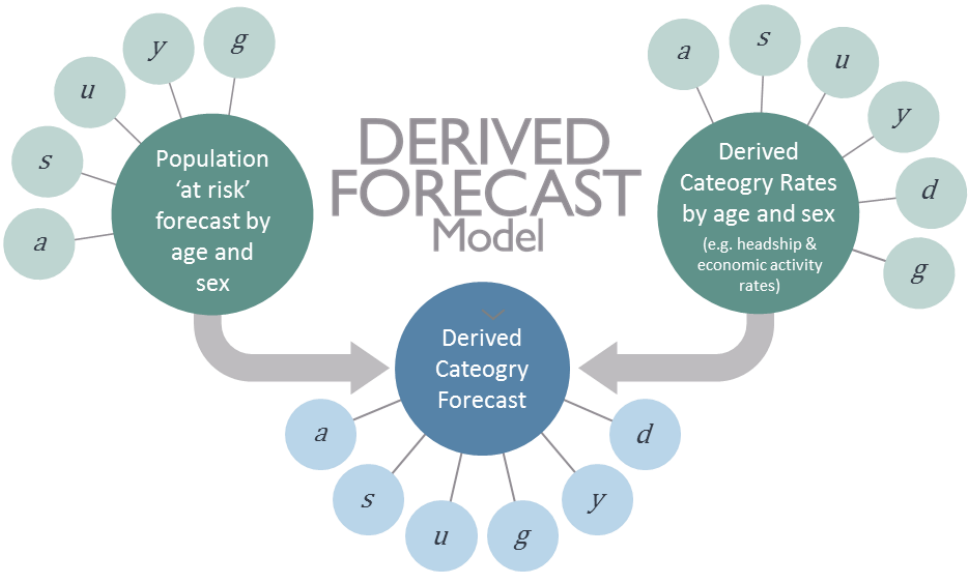


Figure 3: POPGROUP population projection methodology



$$D_{a,s,u,y,d,g} = \frac{P_{a,s,u,y,g} \; R_{a,s,u,y,d,g}}{100}$$

D	Derived Category Forecast	y	Year
P	Population 'at risk' Forecast	d	Derived category
R	Derived Category Rates	g	Group (usually an area, but can be an ethnic group or social group)
a	Age-group		
s	Sex		
u	Sub-population		

Figure 4: Derived Forecast (DF) methodology

2.32 One scenario has been run using **POPGROUP**:

- **Plan-based**: this scenario uses future housing growth evidence from Local Plans. For years beyond each local authority's plan period, the annual Local Plan housing growth reverts to the trend-based estimate of annual housing growth by 2045. A summary of the housing growth assumed in the **Plan-based** scenario is presented in Table 2.

Table 2: Housing growth – Plan-based scenario, 2015-2045

Area	Average Housing Growth	
	2015/16 to end of Local Plan	End of Local Plan to 2044/45
Aylesbury Vale	975	901
Barking & Dagenham	1,899	1,597
Barnet	1,895	2,027
Basingstoke & Deane	1,023	670
Bexley	538	920
Bracknell Forest	741	586
Brent	1,204	1,187
Brentwood	361	333
Bromley	710	1,344
Broxbourne	406	306
Camden	1,096	1,294
Central Bedfordshire	1,533	1,314
Cherwell	1,359	505
Chichester	515	435
Chiltern	342	289
City of London	176	70
Cotswold	442	295
Crawley	410	402
Croydon	1,207	2,064
Dacorum	519	505
Dartford	1,428	964
Daventry	733	285
Ealing	1773	1,709
East Hampshire	732	226
East Hertfordshire	802	817
Elmbridge	198	265
Enfield	1,001	1,371
Epping Forest	725	606
Epsom & Ewell	160	266
Greenwich	2,659	2,199
Guildford	889	789
Hackney	1,325	1,140
Hammersmith & Fulham	1,273	497

Area	Average Housing Growth	
	2015/16 to end of Local Plan	End of Local Plan to 2044/45
Haringey	1,465	1,625
Harlow	591	345
Harrow	931	841
Hart	375	183
Havering	1,183	1,344
Hertsmere	443	448
Hillingdon	583	1,143
Horsham	817	506
Hounslow	1,100	1,513
Islington	1,069	1,271
Kensington & Chelsea	752	454
Kingston upon Thames	572	641
Lambeth	1,753	1,387
Lewisham	1,117	1,281
Luton	495	674
Merton	538	792
Mid Sussex	811	710
Mole Valley	227	305
Newham	3,148	2,953
North Hertfordshire	987	807
Oxford	442	396
Reading	753	541
Redbridge	1,245	1,423
Reigate & Banstead	517	617
Richmond upon Thames	306	692
Runnymede	426	438
Rushmoor	514	217
Sevenoaks	295	344
Slough	920	812
South Bucks	217	234
South Northamptonshire	703	445
South Oxfordshire	803	587
Southwark	2,565	1,885
Spelthorne	386	399

Area	Average Housing Growth	
	2015/16 to end of Local Plan	End of Local Plan to 2044/45
St Albans	490	534
Stevenage	482	339
Stratford-on-Avon	874	438
Surrey Heath	393	315
Sutton	426	846
Swindon	1,375	1,109
Tandridge	270	376
Tewkesbury	502	438
Three Rivers	134	265
Thurrock	679	691
Tonbridge & Malling	653	608
Tower Hamlets	3,393	2,259
Uttlesford	597	487
Vale of White Horse	1,158	653
Waltham Forest	950	1,203
Wandsworth	1,650	1,158
Watford	578	509
Waverley	591	300
Welwyn Hatfield	669	533
West Berkshire	576	293
West Oxfordshire	909	508
Westminster	1,017	1,368
Wiltshire	2,096	1,533
Winchester	807	251
Windsor & Maidenhead	762	679
Woking	328	249
Wokingham	688	351
Wycombe	656	390
New Forest NP	55	45
South Downs NP	281	191
OPDC	1,343	N/A

2.33 The output from this scenario provided the basis from which the OA forecasts have been produced using the **VICUS** suite of models (Steps 4-5).

Step 4: Population forecasts at OA level

2.34 The LADUA level outcomes for population have been used to derive population forecasts at the OA level. For the years when the data is available, the LADUA level population is allocated to OAs according to the location of specific housing developments identified by the Councils. For the years when this information is not available, the OA distribution of population by 5 year age group and sex has been used instead.

2.35 The base estimates of the OA population 'not-in-households' by 5 year age group and sex have been derived from the 2011 Census evidence. LADUA-level estimates of population not-in-households from the DCLG household projection model have been used to rescale the OA level counts for each year of the forecast to ensure consistency with the LADUA-level estimates by age group and sex.

Step 5: Household and property forecasts at OA level

2.36 Household forecasts at OA level have been calculated by applying household representative rates from the DCLG household projection model at LADUA level to the OA level population, excluding population not-in-households.

2.37 For the forecast years, OA-level households have been reconciled to the trend in the LADUA level household totals derived at Step 3.

2.38 The DCLG provides data for a forecast period that is shorter than the TW forecast horizon. After the last year for which the DCLG data are available (2039), the household representative rates have been kept fixed for the remainder of the TW forecast period.

2.39 An OA-level vacancy rate has been calculated using statistics on households (occupied household spaces) and dwellings (shared and unshared) from the 2011 Census. This vacancy rate has been applied to the OA-level households for each of the forecast years to create OA-level property figures.

2.40 TW's ABP database has been used to derive property totals for the 2016 base year of the forecast. In a small number of OAs, no ABP rescaling has been applied, specifically where zero and very small ABP totals contrast to address and dwelling counts from alternative Census and postcode address file data evidence.

Step 6: Sensitivity analysis

UKWIR guidance recommends that this includes consideration of variant scenarios, plus the quantification of uncertainty using methods recommended in its guidance documentation. The sensitivity analysis is not reported in this document but has been completed separately by Thames Water as part of its dWRMP19.

Step 7: Forecast output and documentation

2.41 Output from the forecasts has been summarised in MS Excel workbooks that include the following key demographic data for each scenario and for each WRZ and individual OAs within wider operational area:

- Total population
- Households
- Household population
- Population not-in-households
- Household occupancy
- Properties
- Properties (rescaled to TW ABP data)

2.42 Two workbooks have been provided for the **Plan-based** scenario outcomes: one for WRZs, another one for OAs.

2.43 This data deliverable has been accompanied by a 'Final Report' (this document).

3 Scenario Forecasts

Scenario Summary

3.1 For the TW operational area, combining the water-supply and waste-water geographies, the **Plan-based** scenario estimates a population growth of 3.5 million (23.8%) for the 2016-2045 plan period.

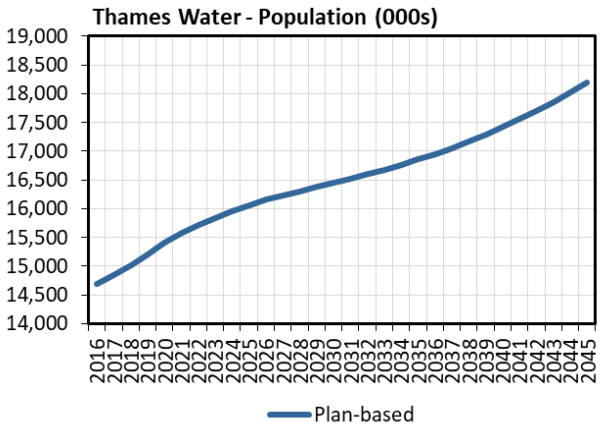


Figure 5: Thames Water – water supply area and waste-water area population growth, 2016-2045

3.2 In terms of properties, the **Plan-based** scenario estimates a growth of over 2.047 million (33.1%) over the 2016-2045 forecast period.

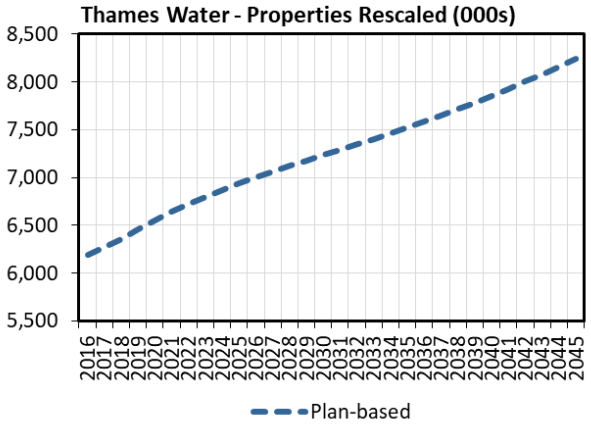


Figure 6: Thames Water – water supply area and waste-water area property growth, 2016-2045

3.3 The household occupancy reduces over time from 2.41 in 2016 to 2.25 at the end of the forecast period; a reduction of 6.9%.

Table 3: Thames Water – water supply area and waste-water area Plan-based scenario outcomes, 2016-2045

Thames Water ('000s)

Plan-based	2016	2021	2026	2031	2036	2041	2045	Change 2016-45	% Change
Core Forecast									
Population	14,693	15,575	16,156	16,522	16,953	17,556	18,186	3,494	23.8%
Population in households	14,477	15,352	15,924	16,277	16,692	17,280	17,898	3,421	23.6%
Population not in households	216	223	232	245	261	276	289	73	33.7%
Households	6,000	6,428	6,776	7,052	7,336	7,667	7,969	1,969	32.8%
Household occupancy	2.41	2.39	2.35	2.31	2.28	2.25	2.25	-0.17	-6.9%
Properties	6,191	6,642	7,004	7,292	7,585	7,926	8,238	2,047	33.1%
Properties Rescaled	6,191	6,642	7,004	7,292	7,585	7,926	8,238	2,047	33.1%

3.4 The distribution of growth between the WRZs of the water supply area is presented below.

Guildford WRZ

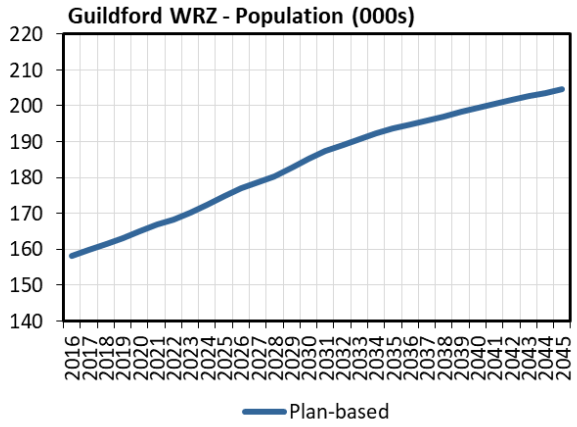


Figure 7: Guildford WRZ – population growth, 2016-2045

Table 4: Guildford WRZ – Plan-based scenario outcomes, 2016-2045

Guildford WRZ ('000s)

Plan-based	2016	2021	2026	2031	2036	2041	2045	Change 2016-45	% Change
Core Forecast									
Population	158	167	177	187	195	201	205	47	29.4%
Population in households	150	159	169	179	186	192	195	45	30.2%
Population not in households	8	8	8	9	9	9	9	1	14.4%
Households	63	67	71	76	79	83	85	22	34.3%
Household occupancy	2.38	2.37	2.37	2.36	2.34	2.32	2.30	-0.07	-3.0%
Properties	66	70	75	80	84	87	89	23	34.8%
Properties Rescaled	66	70	75	80	84	87	89	23	34.8%

Henley WRZ

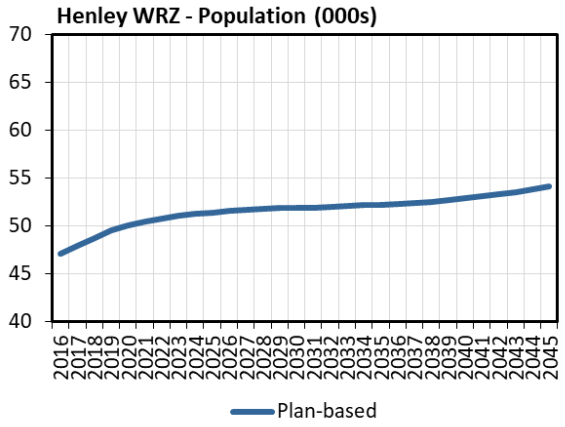


Figure 8: Henley WRZ – population growth, 2016-2045

Table 5: Henley WRZ – Plan-based scenario outcomes, 2016-2045

Henley WRZ ('000s)

Plan-based	2016	2021	2026	2031	2036	2041	2045	Change 2016-45	% Change
Core Forecast									
Population	47	50	52	52	52	53	54	7	15.1%
Population in households	46	50	51	51	51	52	53	6	13.9%
Population not in households	1	1	1	1	1	1	1	1	82.0%
Households	20	21	21	22	22	23	23	3	15.9%
Household occupancy	2.32	2.40	2.40	2.36	2.32	2.29	2.28	-0.04	-1.7%
Properties	21	22	22	23	23	24	24	3	16.1%
Properties Rescaled	21	22	22	23	23	24	24	3	16.1%

Kennet Valley WRZ

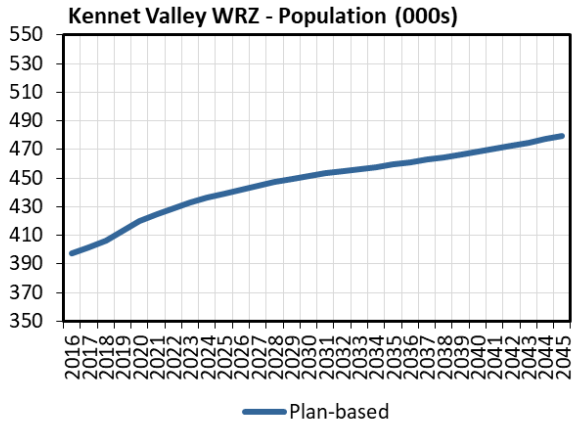


Figure 9: Kennet Valley WRZ – population growth, 2016-2045

Table 6: Kennet Valley WRZ – Plan-based scenario outcomes, 2016-2045

Kennet Valley WRZ ('000s)

Plan-based	2016	2021	2026	2031	2036	2041	2045	Change 2016-45	% Change
Core Forecast									
Population	397	425	442	453	461	471	479	82	20.6%
Population in households	389	416	432	444	451	460	468	80	20.5%
Population not in households	9	9	9	10	10	11	11	2	25.0%
Households	163	172	178	185	191	197	201	38	23.5%
Household occupancy	2.38	2.41	2.42	2.40	2.36	2.34	2.33	-0.06	-2.4%
Properties	169	179	186	193	199	206	210	41	24.3%
Properties Rescaled	169	179	186	193	199	206	210	41	24.3%

London WRZ

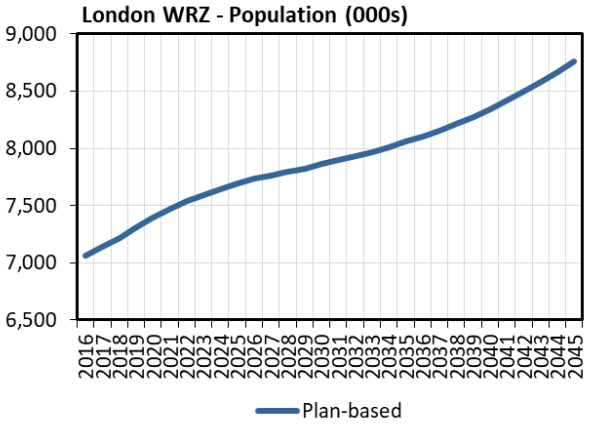


Figure 10: London WRZ – population growth, 2016-2045

Table 7: London WRZ – Plan-based scenario outcomes, 2016-2045

London WRZ ('000s)

Plan-based	2016	2021	2026	2031	2036	2041	2045	Change 2016-45	% Change
Core Forecast									
Population	7,064	7,472	7,734	7,896	8,106	8,419	8,759	1,695	24.0%
Population in households	6,980	7,387	7,645	7,804	8,008	8,316	8,651	1,671	23.9%
Population not in households	84	85	88	92	98	103	108	24	28.9%
Households	2,991	3,212	3,393	3,534	3,680	3,856	4,024	1,033	34.5%
Household occupancy	2.33	2.30	2.25	2.21	2.18	2.16	2.15	-0.18	-7.9%
Properties	3,080	3,312	3,500	3,645	3,795	3,975	4,147	1,066	34.6%
Properties Rescaled	3,080	3,312	3,500	3,645	3,795	3,975	4,147	1,066	34.6%

Slough Wycombe Aylesbury Vale WRZ

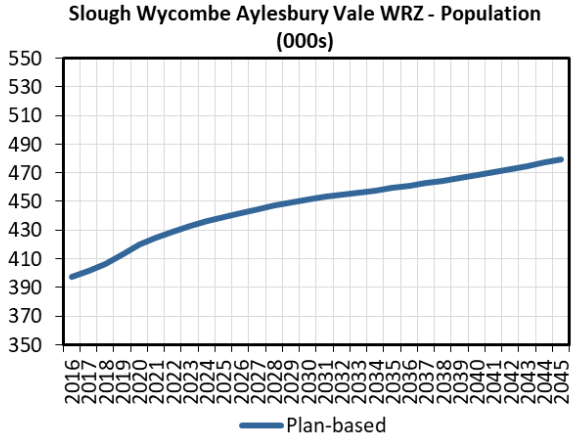


Figure 11: Slough Wycombe Aylesbury Vale WRZ – population growth, 2016-2045

Table 8: Slough Wycombe Aylesbury Vale WRZ – Plan-based scenario outcomes, 2016-2045

Slough Wycombe Aylesbury Vale WRZ ('000s)

Plan-based	2016	2021	2026	2031	2036	2041	2045	Change 2016-45	% Change
Core Forecast									
Population	527	561	579	594	612	633	650	124	23.5%
Population in households	519	553	571	585	603	623	639	120	23.2%
Population not in households	8	8	8	9	10	10	11	3	42.0%
Households	205	220	230	240	250	260	269	63	30.9%
Household occupancy	2.53	2.51	2.48	2.44	2.41	2.39	2.38	-0.15	-5.9%
Properties	212	228	238	248	259	270	279	67	31.5%
Properties Rescaled	212	228	238	248	259	270	279	67	31.5%

SWOX WRZ

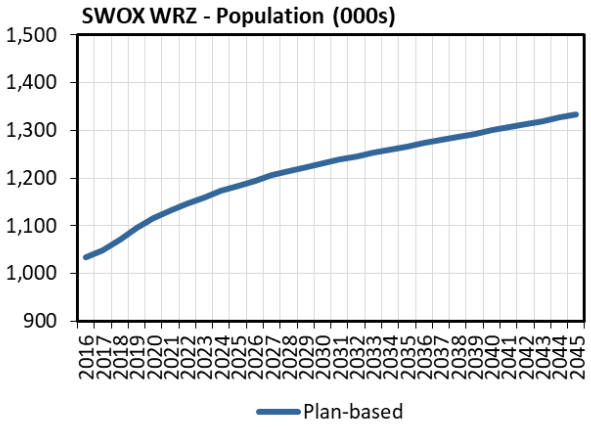


Figure 12: SWOX WRZ – population growth, 2016-2045

Table 9: SWOX WRZ – Plan-based scenario outcomes, 2016-2045

SWOX WRZ ('000s)

Plan-based	2016	2021	2026	2031	2036	2041	2045	Change 2016-45	% Change
Core Forecast									
Population	1,035	1,132	1,195	1,238	1,273	1,307	1,333	299	28.8%
Population in households	1,001	1,097	1,159	1,201	1,233	1,265	1,291	290	29.0%
Population not in households	34	35	36	38	40	41	42	8	24.6%
Households	430	471	501	524	546	566	581	150	34.9%
Household occupancy	2.33	2.33	2.31	2.29	2.26	2.24	2.22	-0.10	-4.4%
Properties	449	492	523	547	570	590	606	156	34.8%
Properties Rescaled	449	492	523	547	570	590	606	156	34.8%

4 Summary

4.1 Thames Water (TW) requires reliable population, household and property forecasts to support the 2019 Price Review and the development of its new WRMP. Demographic information is key evidence in the planning process, ensuring a reliable water supply is available to meet future demand, whilst accommodating changes to the wastewater network and wastewater treatment works.

4.2 The Environment Agency, in conjunction with Defra, the Welsh Government, Natural Resources Wales and Ofwat, provide *Water Resources Planning Guidelines* (WRPG), a framework for WRMP development, which includes a summary of the key requirements for demographic evidence to support the 2019 WRMP[3].

4.3 To supplement the WRPG demographic guidance, UKWIR's *Population, Household Property and Occupancy Forecasting Guidance Manual*[4] provides further practical advice to water companies on the development of population and property forecasts.

4.4 Edge Analytics has delivered demographic forecasts to meet TW's WRMP requirements. These forecasts have been derived using a combination of POPGROUP forecasting software and Edge Analytics' VICUS micro-forecasting models. Wherever possible, the forecasting process has sought to align itself with the guidelines provided by the Environment Agency and UKWIR publications.

4.5 This report has detailed the development of a **Plan-based** scenario which is driven by Local Plan housing growth statistics. TW's ABP data has provided the basis for alignment of property numbers in the base year of the forecast period, where feasible.

4.6 Output has been provided to TW in the form of MS Excel workbooks, containing population, household and property data for WRZs in aggregate as well as individual OAs; the latter to enable aggregation to higher planning geographies. This report is the other main deliverable, providing a basis for ensuring methodological consistency with regulatory requirements.

[3] https://naturalresources.wales/media/681612/interim-wrpg-update-final-april-2017.pdf
[4] http://www.ukwir.org/eng/site/web/content/reports/reports

Appendix A

Key References & Glossary

Water Resources Planning Guideline: Interim update, April 2017
https://naturalresources.wales/media/681612/interim-wrpg-update-final-april-2017.pdf

WRMP19 Methods – Population, Household Property and Occupancy Forecasting
http://www.ukwir.org/eng/site/web/content/reports/reports

DCLG	Department for Communities and Local Government
LADUA	Local Authority District & Unitary Authority
OA	Census Output Area
ONS	Office for National Statistics
POPGROUP	Demographic Forecasting software
SNPP	Sub-National Population Projection
UKWIR	UK Water Industry Research
VICUS	Edge Analytics' micro-geography forecasting software
WRPG	Water Resources Planning Guidelines
WRMP	Water Resource Management Plan
WRZ	Water Resource Zone
TW	Thames Water

C. Long-term (2045-2100) Population and Property Forecasts

Foreword

E.1 The plan-based forecasts meet regulatory requirements for a population and property growth outlook to 2045 that is linked directly to local authority housing plans. A second key component of Thames Water's demand forecasting process is the consideration of longer-term forecasts, with a horizon that stretches to 2100.

E.2 In the dWRMP19, population and property output from the University of Leeds' demographic forecasting model was used as the basis for the long-term growth outlook. Since completion of the dWRMP19, ONS has published a new 2016-based, long-term projection, the first release of future population growth estimates since the Brexit referendum in June 2016.

E.3 To ensure alignment with the latest ONS evidence on the likely trajectory of growth during the second half of the 21st century, Thames Water commissioned Edge Analytics to produce updated population and property forecasts for its WRZs for the extended, 2045-2100 horizon.

E.4 Whilst the core and long-term forecasts have used consistent methodologies, the long-term forecasts have been formulated using trend-based inputs and assumptions that are consistent with ONS' 2016-based national population projection; this contrasts to the housing-led approach used in the development of the core, 2016-2045 forecasts.

E.5 This report presents a detailed description of the methods, inputs and assumptions used in the development of the long-term forecast and a summary of the forecast outcomes,

Report

(Starts overleaf)

Thames Water

WRMP Demographics

Extended Forecast Horizon, 2045-2100

February 2018

For the attention of:

Ross Henderson

Strategic Water Planning

Asset Investment

Thames Water

edge analytics

Leeds Innovation Centre | 103 Clarendon Road | Leeds | LS2 9DF

0113 384 6087 | www.edgeanalytics.co.uk

Acknowledgements

Demographic statistics used in this report have been derived from data from the Office for National Statistics licensed under the Open Government Licence v.3.0.

Table of Contents

Context & Requirements

Context

1.1 Thames Water provides water and waste services across the London and Thames Valley area to approximately 14 million people in a total of 95 local authority areas. Approximately 9.2 million people reside within Thames Water's six Water Resource Zones (WRZ), which overlap 67 of these 95 local authorities (Figure 2).

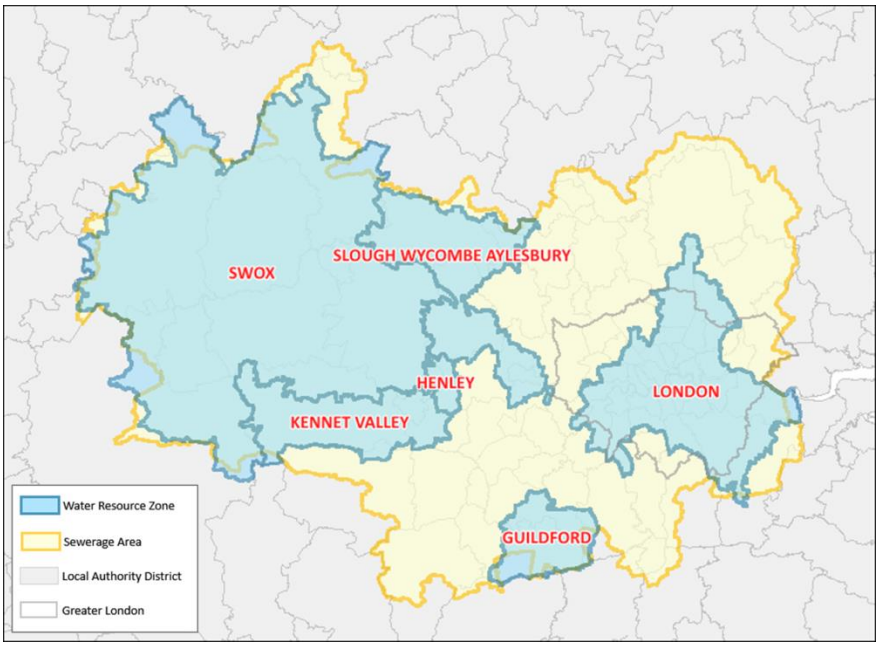


Figure 13: Thames Water – area definition

1.2 Thames Water requires reliable population, household and property forecasts to support the development of its Water Resources Management Plan (WRMP). Robust demographic information is key to the planning process, ensuring a reliable water supply is available to meet future demand, whilst accommodating increases in flow and loads to the wastewater network and wastewater treatment works.

1.3 Thames Water submitted its draft Water Resources Management Plan (dWRMP) in December 2017. The document included demographic forecasts for the core dWRMP plan period (2016-2045) and

outcomes for the longer-term outlook (2045-2100). The core dWRMP forecasts were Plan-Based, driven by available evidence on future housing growth plans published by individual local authority areas. The long-term forecasts were derived from the University of Leeds NewETHPOP model, providing a broad ethnic-group dimension to the forecasts.

1.4 With a period of review and public consultation on the dWRMP, Thames Water is now seeking to derive additional evidence to support the consultation process and to inform its final submission of the WRMP.

Requirements

1.5 The outlook for demographic change remains highly uncertain, with Brexit negotiations working towards a solution that will require the UK to have greater control over the movement of population across its borders. Changes to the scale and profile of international migration to the UK will have an important impact upon growth forecasts for the UK's population.

1.6 Much of the Thames Water demographic evidence produced for the dWRMP has been underpinned by 2014-based evidence. The Office for National Statistics (ONS) has now released its latest 'national' population projections. These are '2016-based' projections and will inform sub-national projections that are due for release in spring 2018.

1.7 Thames Water has requested that a new suite of trend-based, long-term forecast is produced for all local authorities within its WRZs. These forecasts are required for the 2016-2100 forecast horizon; must incorporate the very latest evidence from the ONS on the long-term outlook for population change; and must be capable of alignment with the Plan-Based scenario for 2016-2045.

2 Methodology

UK Context

2.1 At the end of 2017, ONS published a 2016-based 'national' population projection for the UK and its constituent countries[5]. The *Principal* projection for the UK, estimates substantially *lower* population growth than each of its 2010-based, 2012-based and 2014-based predecessors (Figure 14).

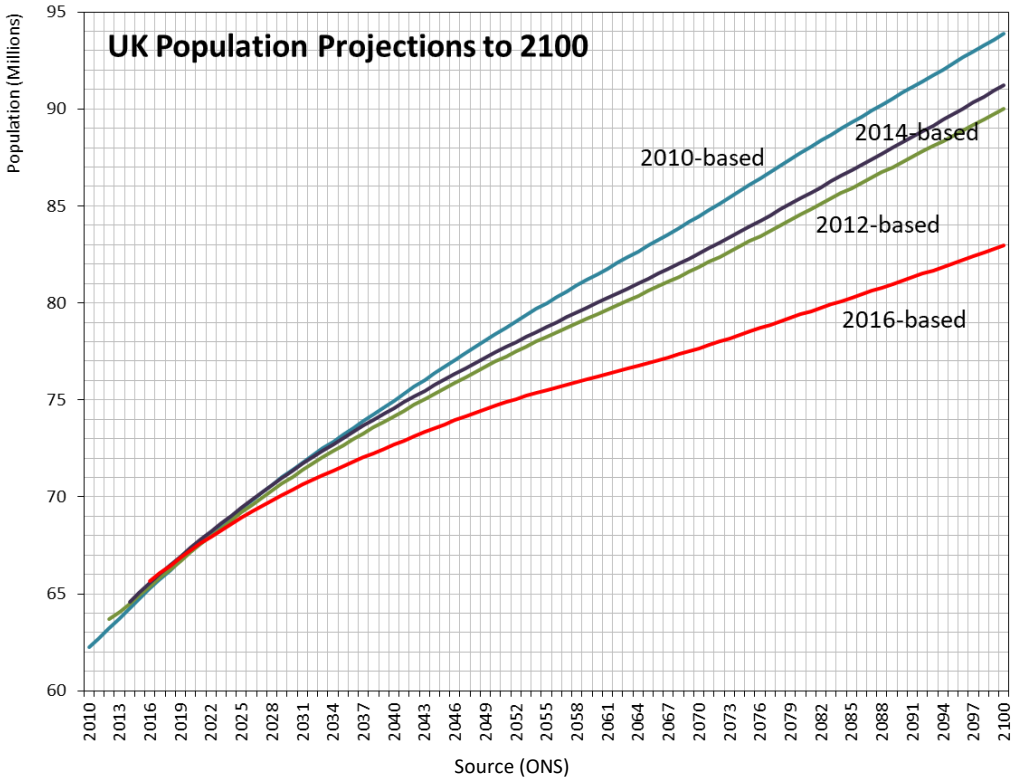


Figure 14: UK Population projections – 2010, 2012, 2014 and 2016-based

2.2 The UK's population is projected to increase to 83 million by 2100 under the 2016-based growth trajectory, compared to 91 million under the previous, 2014-based scenario. The lower rate of growth in the 2016-based scenario is driven by a combination of: lower international migration

[5]https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2016basedstatisticalbulletin

assumptions; lower fertility (births) assumptions; and a slower rate of increase in life expectancy (Table 10).

Table 10: UK National Projection Assumptions

Component	2014-based	2016-based
Net annual long-term international migration (after mid-2022)	185,000	165,000
Long-term average number of children per woman	1.89	1.84
Life expectancy at birth, males, mid-2041 (years)	84.3	83.4
Life expectancy at birth, females, mid-2041 (years)	87.1	86.2

2.3 In addition to its 2016-based Principal projection, ONS has also published a number of variant UK national projections which consider alternative assumptions for future fertility, mortality and migration. ONS has presented its variant national projections, for both a 25-year outlook (to 2041) and an extended 100-year horizon.

2.4 A selection of the UK growth variants illustrate important potential variations in the level of international migration, evaluating higher or lower immigration and emigration impacts than that assumed for the Principal projection (Figure 15). Fertility and mortality assumptions remain consistent with the Principal projection under each variant.

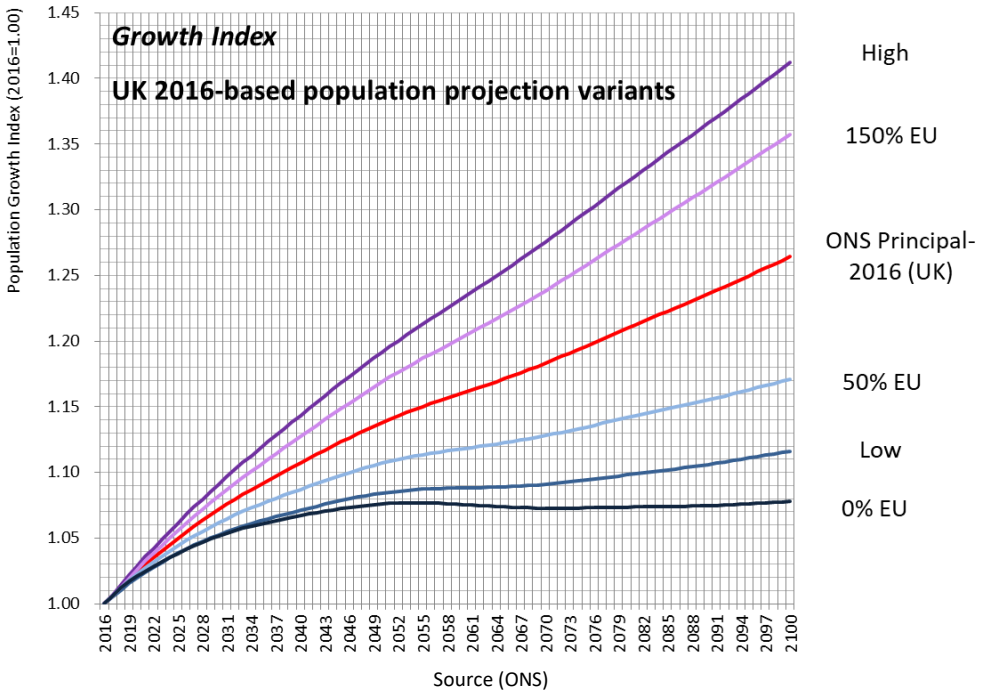


Figure 15: UK 2016-based population projections variants

2.5 ONS has produced two international migration variants on its Principal scenario: a **High** variant and a **Low** variant. In all three scenarios, current levels of net international migration reduce to a fixed long-term assumption. The ONS Principal trend projection for the UK in total is underpinned by international migration assumptions that reduce to an annual net figure of +165,000 per year by mid-year 2023, a significant reduction from its high point approaching +350,000 in 2015/16. Growth of 26% is projected under the Principal scenario to 2100.

2.6 The Low variant considers a lower value of +85,000 net international migration per year by 2020/21; the High variant considers a higher value of +245,000 by 2020/21, remaining constant to 2100. UK population growth of 41% is achieved under the High scenario, 12% under the Low scenario.

2.7 To meet stakeholder demand for additional scenario variants in the face of the UK's exit from the European Union (EU), ONS has provided projections for three additional international migration outcomes. These complement the High and Low variants presented above and examine the likely impact of higher or lower EU migration, specifically:

0% future EU migration:
No future migration to and from the UK by EU citizens from the year ending mid-2019 onwards.

50% future EU migration:
50% future migration to and from the UK by EU citizens from the year ending mid-2019 onwards.

150% future EU migration:
150% future migration to and from the UK by EU citizens from the year ending mid-2019 onwards.

2.8 Under the 150% EU migration scenario, UK population growth to 2100 is estimated at 36%; compared to 17% under the 50% EU migration scenario and just 8% under the 0% EU migration variant.

dWRMP Growth Scenarios

2.9 Thames Water's dWRMP included population growth scenarios for its core 2016-2045 plan period and for the extended 2045-2100 horizon. Regulatory guidance mandated that the core scenarios were underpinned by local authority housing plans, with Edge Analytics providing a Plan-Based, population growth scenario to 2045 for each of the six WRZs. Longer-term population growth outcomes were derived separately, from the University of Leeds NewETHPOP model.

2.10 The (indexed) growth trajectories for the core, 2016-2045 Plan-Based scenario and for the longer-term, 2045-2100 outcome for Thames Water's WRZs, are presented alongside the 2016-based Principal projection for the UK, in total. These indicate how the speed and scale of growth estimated across Thames Water's six WRZs compares to that projected under the latest UK population growth trajectory (Figure 16).

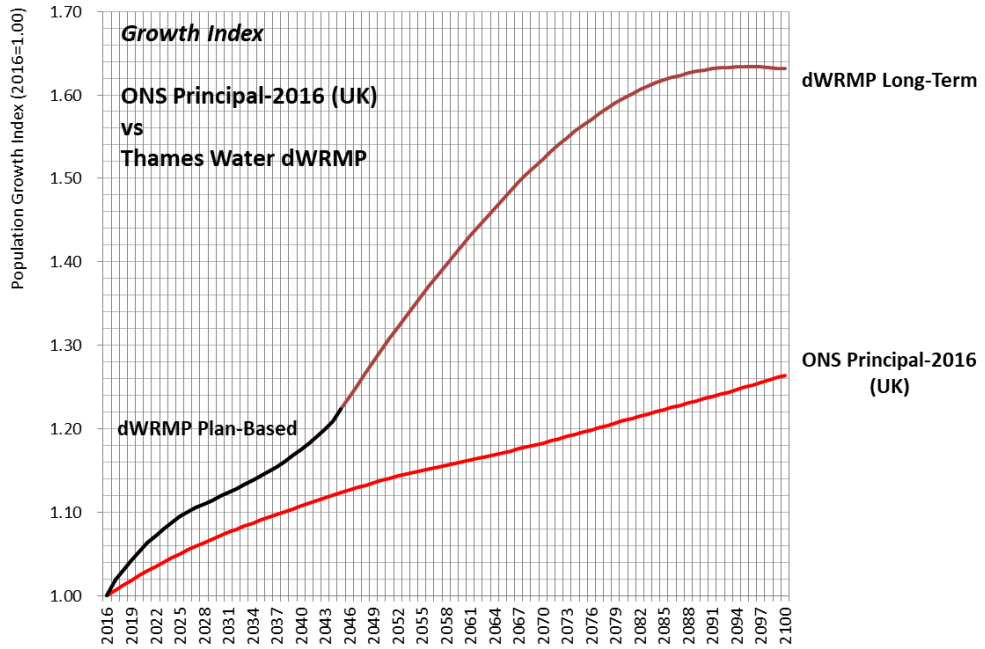


Figure 16: UK and Thames Water dWRMP population growth rates

2.11 The dWRMP trajectories would be expected to have growth rates that exceed the UK projection's rate of growth, as Thames Water's WRZs encompass the relatively high growth areas of London and the South East (78% of Thames Water's WRZ population resides within the London WRZ). However, there are some important variations in the 2016-2100 growth curves that provide key context for the new scenario analysis that follows.

2.12 The dWRMP Plan-Based scenario has relatively high, short-term growth, driven by the planned uplift in new housing development. This rate of growth flattens around 2030, with little plan-based evidence thereafter. The uplift to the remainder of the dWRMP's Plan-Based growth curve is driven by a 'return' to the trends evident in the 2014-based population projections, published by ONS for each of Thames Water's local authority areas. By 2045, the Plan-Based growth across Thames Water's six WRZs is estimated at 22%; contrasting to the 12% across the UK under the latest, 2016-based Principal projection.

2.13 Beyond 2045, the dWRMP's Long-Term trajectory suggests a rate of growth that continues to deviate from the 2016-based, flattening only after 2090. By 2100, the dWRMP's Long-Term growth for the six Thames Water WRZs is estimated at 63% of its 2016 total; compared to 26% for the UK in total under the 2016-based Principal projection.

2.14 The implication of the deviation between the UK and dWRMP Long-Term growth curve is that the UK's population is estimated to become increasingly concentrated within the Thames Water WRZs over the course of the 2045-2100 plan period.

Forecasting Model

2.15 The objective of this new forecasting analysis is to develop a suite of Long-Term growth forecasts for the Thames Water WRZs, which take more account of the population growth assumptions (and variants) implied by ONS' latest, 2016-based UK population projection.

2.16 The local authority projection models developed for Thames Water's Plan-Based scenario have been reconfigured to enable forecasts to be generated for the extended 2016-2100 horizon. These models incorporate ONS assumptions on fertility, mortality and migration, extrapolated to the end of the forecast period and configured to enable variant assumptions on each demographic component to be tested.

2.17 Seven alternative trend scenarios have been formulated: the Principal-2014, plus six scenarios that incorporate the variant international migration assumptions that have been used by ONS in its suite of 2016-based UK national projections:

- Principal-2014
- Principal-2016
- High
- Low
- 0%-EU
- 50%-EU
- 150%-EU

2.18 For the Principal-2014 scenario, assumptions on international migration have been drawn directly from the current 2014-based sub-national population projection for each local authority area within the Thames Water supply area. For the Principal-2016 scenario, assumptions on international

migration have also been drawn directly from the 2014-based evidence, but scaled for consistency with the 2016-based totals.

2.19 In addition, for each local authority area, international migration assumptions have been estimated that conform to the UK totals implied by the High, Low, 0%-EU, 50%-EU and 150%-EU 2016-based variants. Assumptions have been extended for the full forecast period, to 2100.

2.20 Each of the scenarios produces population growth outcomes that have been scaled for consistency with Thames Water's WRZ geography. Each scenario has then provided a potential trajectory of growth for 2045-2100 that has been combined with the Plan-Based scenario for 2016-2045.

2.21 For each WRZ, the Plan-Based population growth forecast has been extended to 2100, in line with the growth curves suggested by each of the variant scenarios.

2.22 Population statistics resulting from this analysis are provided in an accompanying Microsoft Excel workbook.

3 Variant Scenarios

Principal-2016 Scenario

3.1 The Thames Water WRZ forecasting models incorporate assumptions on fertility, mortality and international migration drawn from the 2016-based UK Principal projection. Fertility and mortality assumptions have important effects at *sub-national* level but it is the continuing effect of international migration plus the balancing effect of domestic migration upon London that are the key determinants of growth outcomes for the Thames Water WRZs.

3.2 The potential effect of the Principal-2016 scenario upon Thames Water's WRZs is presented under **three different variants**. These variants have identical levels of international migration but allow variant impacts of *domestic* migration upon WRZ growth, the overwhelming impact of which is concentrated in the London WRZ (Figure 17).

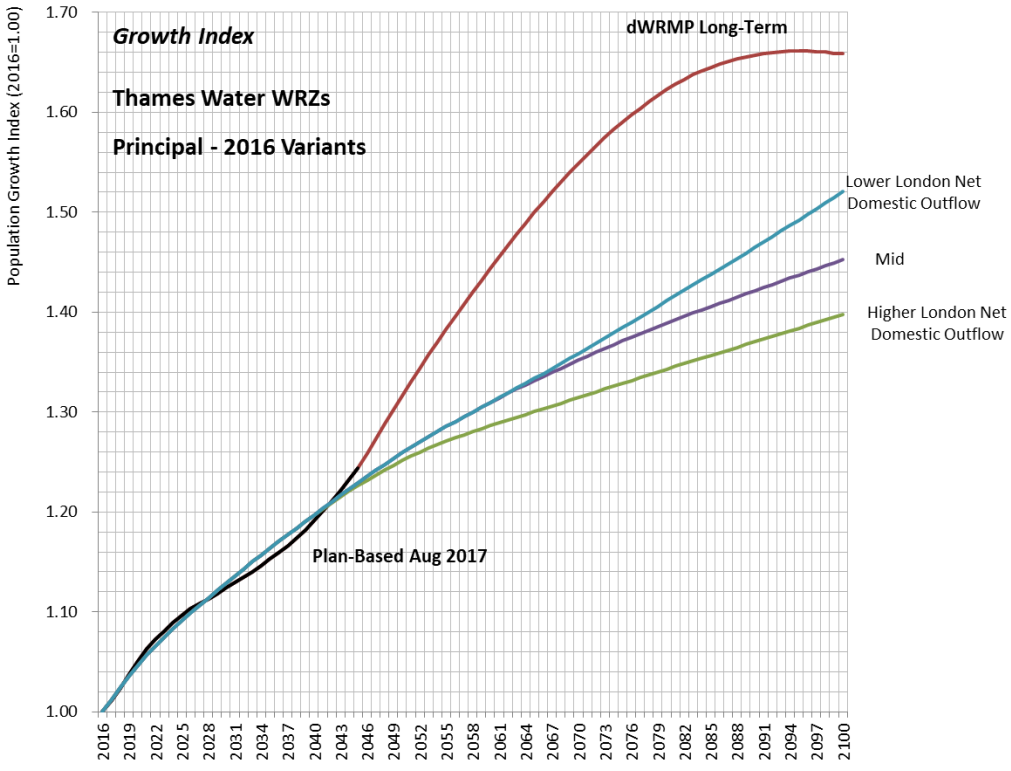


Figure 17: Population growth under Principal-2016 scenario – Thames Water WRZs

3.3 The Plan-Based and Long-Term growth trajectories have again been included for context but in this illustration the Plan-Based scenario has been updated to a later and more up-to-date version than that used in the dWRMP. **This revised Plan-Based scenario has a different base-period population and an altered trajectory of growth to that used in the dWRMP**. This 'Plan-Based-August 2017' scenario and its accompanying Long-Term growth curve, are used throughout all subsequent illustrations in this report.

3.4 Allowing domestic migration to continue to redistribute population to and from the London WRZ post-2045, in similar proportions to that experienced prior to 2045, results in a 51% growth in total WRZ population 2016-2100. Under this scenario, despite London's population growth year-on-year, the balance of domestic in- and out-migration remains relatively constant.

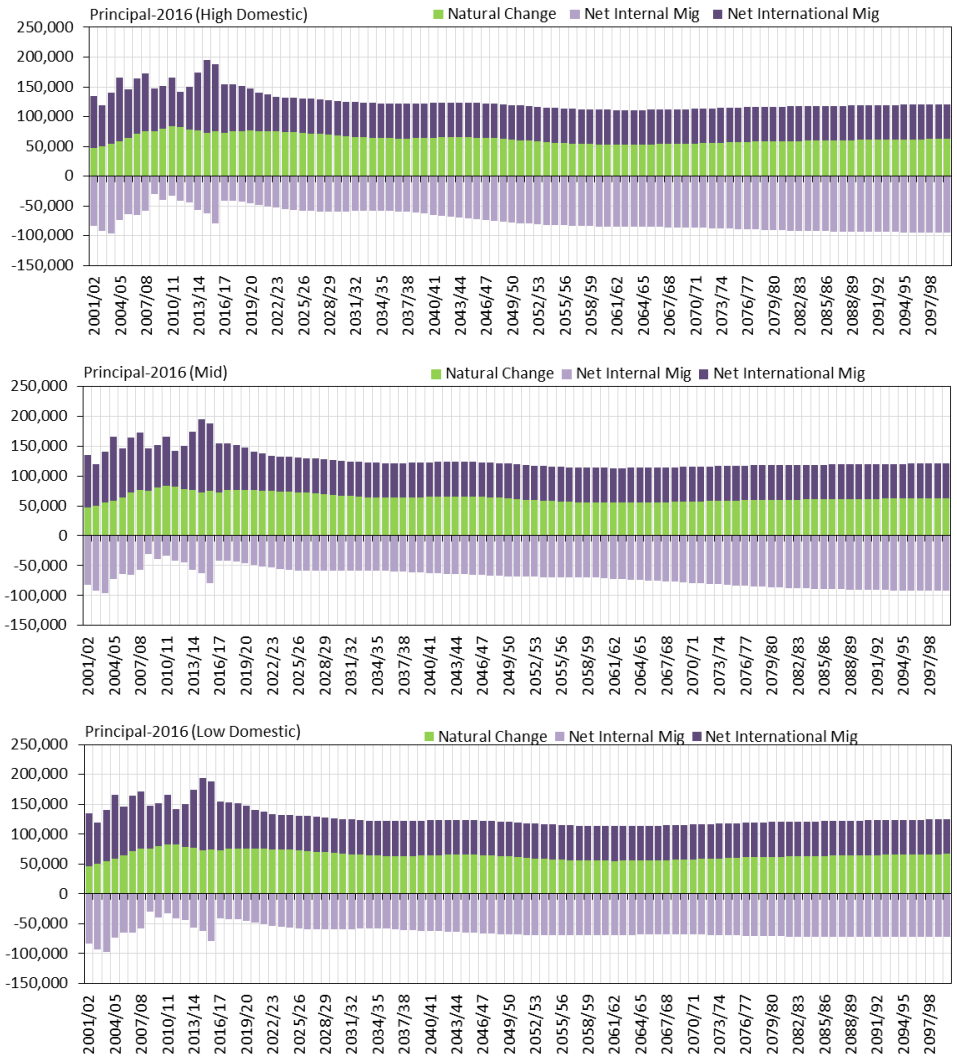
3.5 Conversely, enabling a more significant net outflow of population from London, results in a lower overall growth, 40% over the 2016-2100 horizon. Under this scenario, the continued growth of London's population results in a higher rate of growth in domestic out-migration compared to in-migration, with lower overall population growth as a result.

3.6 It is challenging to determine what the future balance of domestic migration to and from London will be but the lower levels of net outflow from London that have been experienced most recently are not comparable with longer-term historical trends. Balancing the effects of the 'higher' and 'lower' net domestic migration effects from the London WRZ, enables a net domestic migration impact that returns to the higher net outflow experienced in London prior to the financial crash in 2007. Growth under this 'Mid' option is estimated at 44.5% over the 2016-2100 time period.

3.7 The variant effects of these three alternative growth outcomes for the Thames Water WRZs are best illustrated using 'components-of-change' charts, which present the changing importance of natural change, domestic migration and international migration upon population change to 2100 (Figure 18).

3.8 The higher net domestic migration outflow from London results in a lower growth outcome for the Thames Water WRZs in total. The lower net domestic migration outflow implies greater retention of population in London, with higher population growth for the WRZs to 2100.

3.9 The 'Mid' variant of the Principal-2016 scenario is presented here as the **preferred** growth alternative. This scenario enables net flow of domestic migration to and from London to gradually return to levels experienced prior to 2007.



Higher London Net Domestic

Mid

Lower London Net Domestic Outflow

Figure 18: Population growth under Principal-2016 scenario – Thames Water WRZs

Variant International Migration Scenarios

3.10 The Principal-2016 scenario presents a growth outcome that is linked to a specific level of international migration, with accompanying assumptions on fertility and mortality. The Principal-2014 scenario is presented alongside this scenario to indicate the effect of the later, 2016-based national assumptions on growth within Thames Water's WRZs.

3.11 Five additional variants on the Principal-2016 scenario are presented which examine the Thames Water WRZ growth outcomes resulting from higher or lower international migration (Figure 19). The

Plan-Based-August 2017 and associated dWRMP Long-Term growth trajectories are again included for context.

3.12 In line with the previous examination of the effects of domestic migration upon growth in the London WRZ, the net outflow from London is allowed to increase in the latter half of the forecast period. Each of the seven scenarios has a growth trajectory that runs from 2016 to 2100. At this stage there is no attempt to 'append' these curves to the Plan-Based-August 2017 outcome for the core, 2016-2045 plan period.

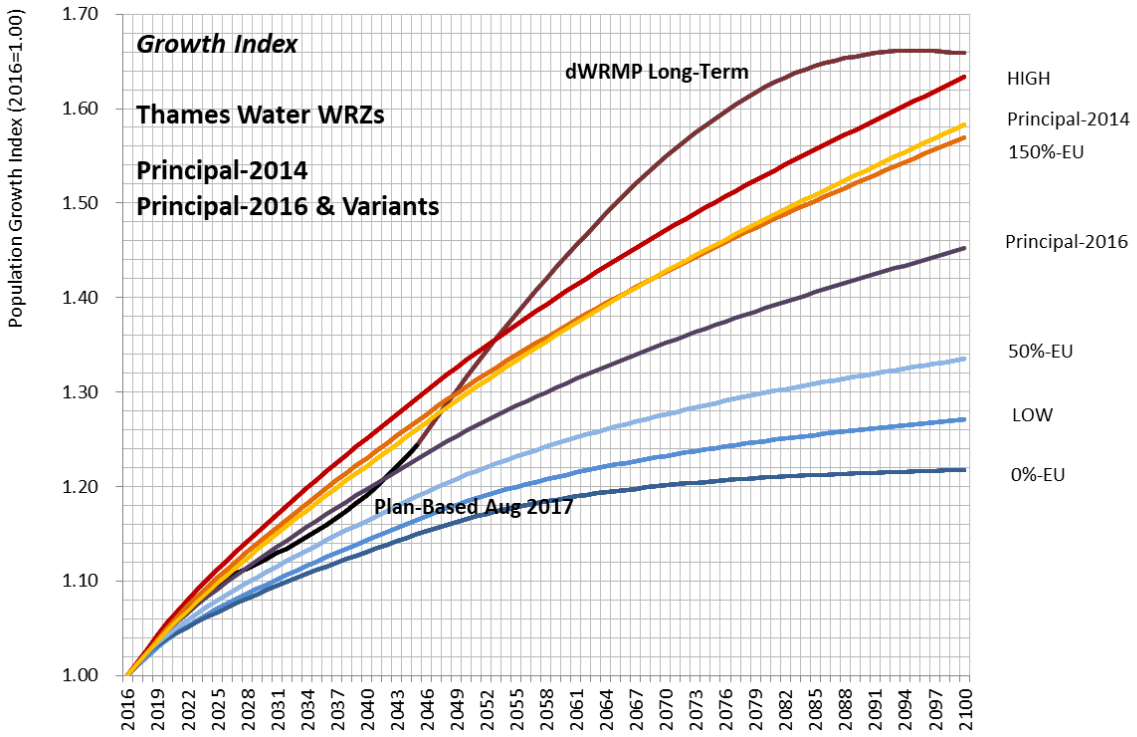


Figure 19: Population growth under Principal-2016 Variants – Thames Water WRZs

3.13 The Principal-2016 scenario is underpinned by levels of international migration that are lower than those implied by previous ONS growth scenarios (2010-based, 2012-based and 2014-based). The 2016-based outcomes reflect the reality of lower international migration effects that is likely to result from the UK's exit from the EU. However, two scenarios are presented here which imply significantly higher international migration over the extended 2016-2100 forecast period. Under the High and 150%-EU scenarios the population of the Thames Water WRZs increases by 63% and 57% respectively by 2100. The High scenario outcome is higher than that implied by the Principal-2014 scenario but similar to that suggested by the dWRMP Long-Term trajectory. However, rates of growth in the High and Principal-2014 scenarios are significantly higher in the core 2016-2045 period of the WRMP trajectory.

3.14 It is very likely that the level of international migration that underpins the UK's future population growth will be reduced as a result of exit from the EU and greater control over cross-border population movement. The Principal-2016 scenario presented here does imply lower international migration, whilst the 50%-EU, Low and 0%-EU scenarios consider further reductions in the net impact of immigration and emigration upon population growth in Thames Water's WRZs.

3.15 Whilst the Principal-2016 scenario records growth of 44.5% across the Thames Water WRZs by 2100, a 50% reduction in the net effect of migration from the EU results in lower population growth; 34% by 2100. The Low and 0%-EU scenarios reduce this growth outcome further, to 27% and 22% respectively.

4 Growth Scenarios by WRZ

4.1 Principal-2014 and Principal-2016 scenarios, together with five variants of higher/lower international migration are presented here, for the six Thames Water WRZs in total and for each WRZ individually.

4.2 Each of the scenarios has two components: the 2016-2045 plan period; and the 2045-2100 plan period. In all cases, the core, 2016-2045 growth curves are determined by the Plan-Based scenario from August 2017, with forecasts underpinned by the Local Plan housing evidence. Growth for the 2045-2100 horizons is then determined by the rate of population growth evident under each of the seven variant scenarios.

4.3 Under the Principal-2016 scenario, a 46.9% increase in population is estimated across all WRZs to 2100. Total population is estimated at approximately **13.55** million, a **4.32** million increase from 2016 (Figure 20, Table 11).

4.4 This compares to a population total approaching 14.40 million under the Principal-2014 scenario and 15.3 million in the Long-Term outlook estimated from the dWRMP, when appended to the revised Plan-Based outcome. Under the Principal-2016 assumptions, higher migration variants have been estimated to achieve population growth of up to 56.9% by 2100, with the population reaching 14.48 million by the end of the plan period. The UK's exit from the EU points towards lower rather than higher international migration, so these high-migration variants are presented as a less likely outcome for the Thames Water WRZs over the long-term horizon.

4.5 Whilst lower international migration is a likely consequence of changed economic and political association with the EU, the continued growth of the UK's economy is predicated upon the ready supply of labour both from the UK and overseas. A 50% reduction in the level of international migration from EU countries would appear to be a threshold from which to consider the lowest potential growth outcome for the Thames Water WRZs.

4.6 Population growth summaries are presented for each scenario (Table 12); and then separately for each WRZ, with an associated chart of growth curves and table of estimated population change (Figures 9-14 and Tables 4-9).

All WRZs

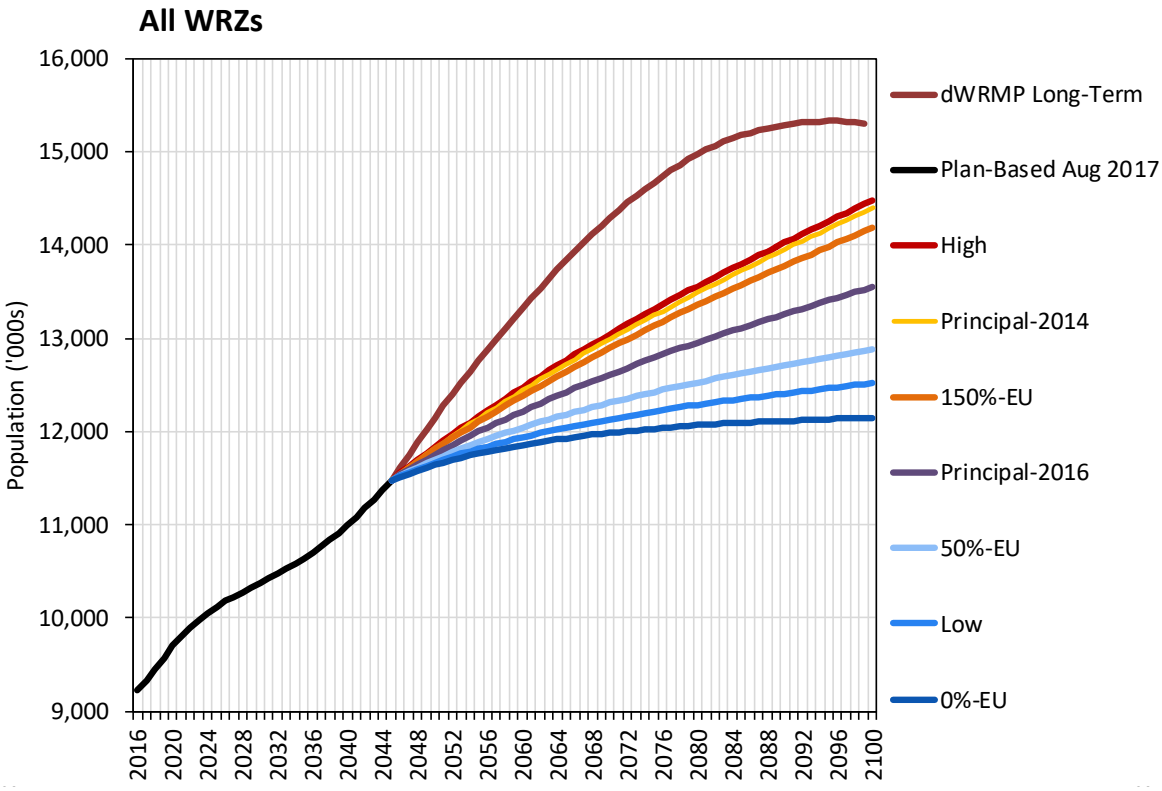


Figure 20: Population growth (2016-2100), All WRZs

Table 11: Population growth (2016-2100), All WRZs

Scenario	Population ('000s)			Growth ('000s)			% Growth		
	2016	2045	2100	2016-2045	2045-2100	2016-2100	2016-2045	2045-2100	2016-2100
dWRMP	9,228	11,481	15,311	2,253	3,831	6,084	24.4%	33.4%	65.9%
High	9,228	11,481	14,483	2,253	3,002	5,255	24.4%	26.1%	56.9%
Principal-2014	9,228	11,481	14,404	2,253	2,923	5,176	24.4%	25.5%	56.1%
150%-EU	9,228	11,481	14,187	2,253	2,706	4,959	24.4%	23.6%	53.7%
Principal-2016	9,228	11,481	13,551	2,253	2,071	4,324	24.4%	18.0%	46.9%
50%-EU	9,228	11,481	12,875	2,253	1,394	3,647	24.4%	12.1%	39.5%
Low	9,228	11,481	12,519	2,253	1,038	3,291	24.4%	9.0%	35.7%
0%-EU	9,228	11,481	12,151	2,253	670	2,923	24.4%	5.8%	31.7%

Table 12: Population growth (2016-2100), by scenario

Principal-2016

WRZ	Population			Growth			% Growth		
	2016	2045	2100	2016-2045	2045-2100	2016-2100	2016-2045	2045-2100	2016-2100
LONDON	7,063,662	8,758,922	10,431,704	1,695,261	1,672,782	3,368,042	24.0%	19.1%	47.7%
SWA	526,627	650,144	760,168	123,517	110,025	233,541	23.5%	16.9%	44.3%
SWOX	1,034,905	1,333,472	1,524,039	298,567	190,567	489,135	28.8%	14.3%	47.3%
GUILDFORD	158,104	204,626	235,349	46,523	30,723	77,246	29.4%	15.0%	48.9%
KENNET VALLEY	397,349	479,362	538,533	82,013	59,170	141,184	20.6%	12.3%	35.5%
HENLEY	47,080	54,181	61,703	7,101	7,522	14,623	15.1%	13.9%	31.1%
All WRZs	9,227,725	11,480,707	13,551,496	2,252,981	2,070,790	4,323,771	24.4%	18.0%	46.9%

Principal-2014

WRZ	Population			Growth			% Growth		
	2016	2045	2100	2016-2045	2045-2100	2016-2100	2016-2045	2045-2100	2016-2100
LONDON	7,063,662	8,758,922	11,078,907	1,695,261	2,319,985	4,015,245	24.0%	26.5%	56.8%
SWA	526,627	650,144	811,009	123,517	160,865	284,382	23.5%	24.7%	54.0%
SWOX	1,034,905	1,333,472	1,622,484	298,567	289,012	587,579	28.8%	21.7%	56.8%
GUILDFORD	158,104	204,626	250,594	46,523	45,967	92,490	29.4%	22.5%	58.5%
KENNET VALLEY	397,349	479,362	574,672	82,013	95,309	177,323	20.6%	19.9%	44.6%
HENLEY	47,080	54,181	65,857	7,101	11,676	18,777	15.1%	21.6%	39.9%
All WRZs	9,227,725	11,480,707	14,403,521	2,252,981	2,922,815	5,175,796	24.4%	25.5%	56.1%

High

WRZ	Population			Growth			% Growth		
	2016	2045	2100	2016-2045	2045-2100	2016-2100	2016-2045	2045-2100	2016-2100
LONDON	7,063,662	8,758,922	11,133,463	1,695,261	2,374,541	4,069,802	24.0%	27.1%	57.6%
SWA	526,627	650,144	815,782	123,517	165,638	289,155	23.5%	25.5%	54.9%
SWOX	1,034,905	1,333,472	1,635,642	298,567	302,170	600,738	28.8%	22.7%	58.0%
GUILDFORD	158,104	204,626	252,306	46,523	47,680	94,203	29.4%	23.3%	59.6%
KENNET VALLEY	397,349	479,362	579,246	82,013	99,884	181,897	20.6%	20.8%	45.8%
HENLEY	47,080	54,181	66,277	7,101	12,096	19,197	15.1%	22.3%	40.8%
All WRZs	9,227,725	11,480,707	14,482,716	2,252,981	3,002,009	5,254,991	24.4%	26.1%	56.9%

Low

WRZ	Population			Growth			% Growth		
	2016	2045	2100	2016-2045	2045-2100	2016-2100	2016-2045	2045-2100	2016-2100
LONDON	7,063,662	8,758,922	9,648,468	1,695,261	889,546	2,584,806	24.0%	10.2%	36.6%
SWA	526,627	650,144	699,661	123,517	49,518	173,034	23.5%	7.6%	32.9%
SWOX	1,034,905	1,333,472	1,403,122	298,567	69,650	368,218	28.8%	5.2%	35.6%
GUILDFORD	158,104	204,626	216,749	46,523	12,123	58,646	29.4%	5.9%	37.1%
KENNET VALLEY	397,349	479,362	493,762	82,013	14,399	96,413	20.6%	3.0%	24.3%
HENLEY	47,080	54,181	56,760	7,101	2,580	9,681	15.1%	4.8%	20.6%
All WRZs	9,227,725	11,480,707	12,518,522	2,252,981	1,037,816	3,290,797	24.4%	9.0%	35.7%

0%-EU

WRZ	Population			Growth			% Growth		
	2016	2045	2100	2016-2045	2045-2100	2016-2100	2016-2045	2045-2100	2016-2100
LONDON	7,063,662	8,758,922	9,357,834	1,695,261	598,911	2,294,172	24.0%	6.8%	32.5%
SWA	526,627	650,144	680,060	123,517	29,916	153,433	23.5%	4.6%	29.1%
SWOX	1,034,905	1,333,472	1,366,062	298,567	32,590	331,158	28.8%	2.4%	32.0%
GUILDFORD	158,104	204,626	210,725	46,523	6,098	52,621	29.4%	3.0%	33.3%
KENNET VALLEY	397,349	479,362	480,968	82,013	1,606	83,619	20.6%	0.3%	21.0%
HENLEY	47,080	54,181	55,220	7,101	1,039	8,140	15.1%	1.9%	17.3%
All WRZs	9,227,725	11,480,707	12,150,869	2,252,981	670,162	2,923,143	24.4%	5.8%	31.7%

50%-EU

WRZ	Population			Growth			% Growth		
	2016	2045	2100	2016-2045	2045-2100	2016-2100	2016-2045	2045-2100	2016-2100
LONDON	7,063,662	8,758,922	9,914,583	1,695,261	1,155,661	2,850,921	24.0%	13.2%	40.4%
SWA	526,627	650,144	721,025	123,517	70,882	194,398	23.5%	10.9%	36.9%
SWOX	1,034,905	1,333,472	1,446,808	298,567	113,336	411,904	28.8%	8.5%	39.8%
GUILDFORD	158,104	204,626	223,365	46,523	18,739	65,262	29.4%	9.2%	41.3%
KENNET VALLEY	397,349	479,362	510,369	82,013	31,006	113,019	20.6%	6.5%	28.4%
HENLEY	47,080	54,181	58,526	7,101	4,345	11,446	15.1%	8.0%	24.3%
All WRZs	9,227,725	11,480,707	12,874,676	2,252,981	1,393,970	3,646,951	24.4%	12.1%	39.5%

150%-EU

WRZ	Population			Growth			% Growth		
	2016	2045	2100	2016-2045	2045-2100	2016-2100	2016-2045	2045-2100	2016-2100
LONDON	7,063,662	8,758,922	10,913,906	1,695,261	2,154,984	3,850,244	24.0%	24.6%	54.5%
SWA	526,627	650,144	797,659	123,517	147,515	271,032	23.5%	22.7%	51.5%
SWOX	1,034,905	1,333,472	1,598,081	298,567	264,609	563,176	28.8%	19.8%	54.4%
GUILDFORD	158,104	204,626	246,742	46,523	42,116	88,638	29.4%	20.6%	56.1%
KENNET VALLEY	397,349	479,362	565,575	82,013	86,213	168,226	20.6%	18.0%	42.3%
HENLEY	47,080	54,181	64,761	7,101	10,581	17,682	15.1%	19.5%	37.6%
All WRZs	9,227,725	11,480,707	14,186,724	2,252,981	2,706,017	4,958,998	24.4%	23.6%	53.7%

LONDON WRZ

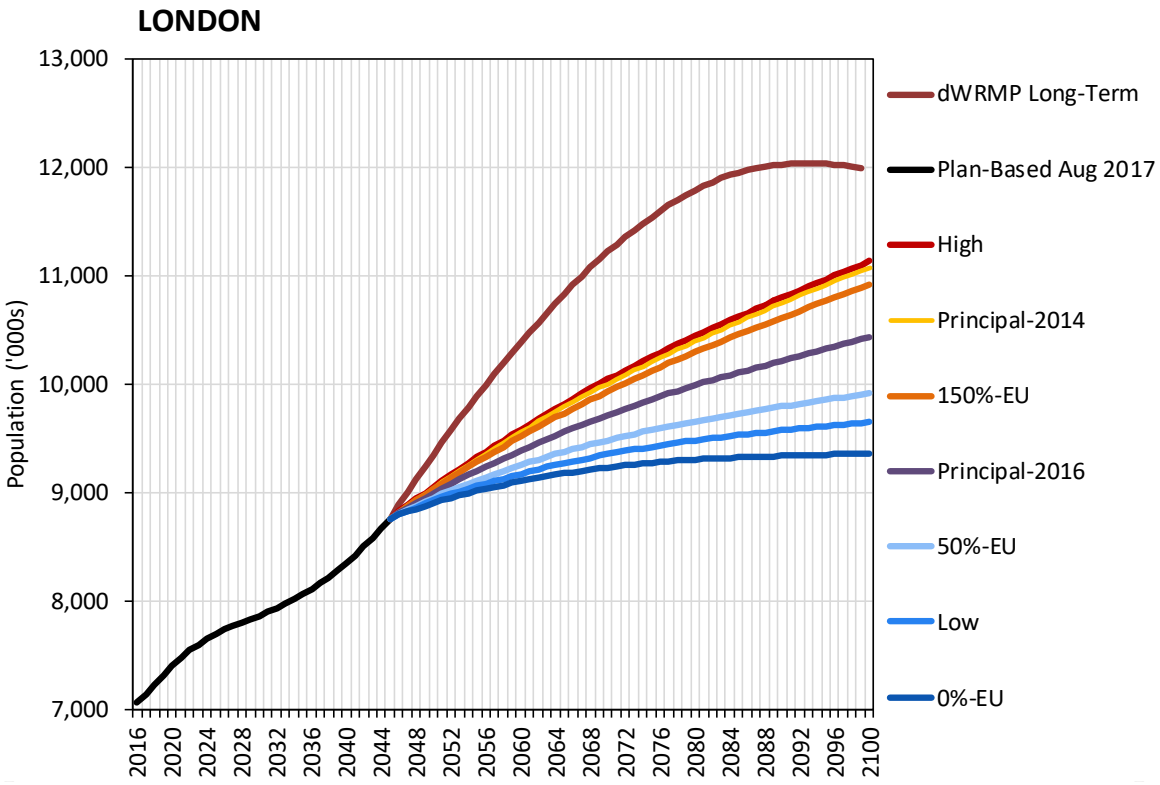


Figure 21: Population growth (2016-2100), London WRZ

Table 13: Population growth (2016-2100), London WRZ

Scenario	Population ('000s)			Growth ('000s)			% Growth		
	2016	2045	2100	2016-2045	2045-2100	2016-2100	2016-2045	2045-2100	2016-2100
dWRMP	7,064	8,759	11,989	1,695	3,230	4,926	24.0%	36.9%	69.7%
High	7,064	8,759	11,133	1,695	2,375	4,070	24.0%	27.1%	57.6%
Principal-2014	7,064	8,759	11,079	1,695	2,320	4,015	24.0%	26.5%	56.8%
150%-EU	7,064	8,759	10,914	1,695	2,155	3,850	24.0%	24.6%	54.5%
Principal-2016	7,064	8,759	10,432	1,695	1,673	3,368	24.0%	19.1%	47.7%
50%-EU	7,064	8,759	9,915	1,695	1,156	2,851	24.0%	13.2%	40.4%
Low	7,064	8,759	9,648	1,695	890	2,585	24.0%	10.2%	36.6%
0%-EU	7,064	8,759	9,358	1,695	599	2,294	24.0%	6.8%	32.5%

SWA WRZ

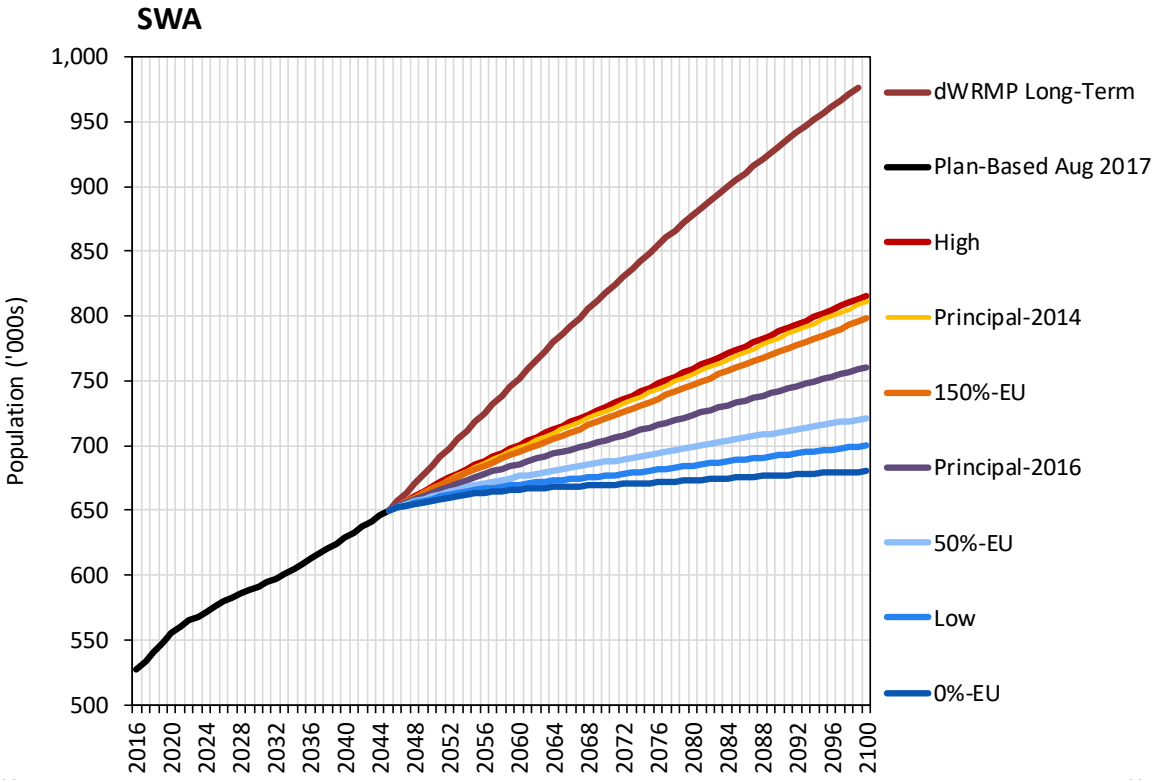


Figure 22: Population growth (2016-2100), SWA WRZ

Table 14: Population growth (2016-2100), SWA WRZ

Scenario	Population ('000s)			Growth ('000s)			% Growth		
	2016	2045	2100	2016-2045	2045-2100	2016-2100	2016-2045	2045-2100	2016-2100
dWRMP	527	650	976	124	326	449	23.5%	50.1%	85.3%
High	527	650	816	124	166	289	23.5%	25.5%	54.9%
Principal-2014	527	650	811	124	161	284	23.5%	24.7%	54.0%
150%-EU	527	650	798	124	148	271	23.5%	22.7%	51.5%
Principal-2016	527	650	760	124	110	234	23.5%	16.9%	44.3%
50%-EU	527	650	721	124	71	194	23.5%	10.9%	36.9%
Low	527	650	700	124	50	173	23.5%	7.6%	32.9%
0%-EU	527	650	680	124	30	153	23.5%	4.6%	29.1%

SWOX WRZ

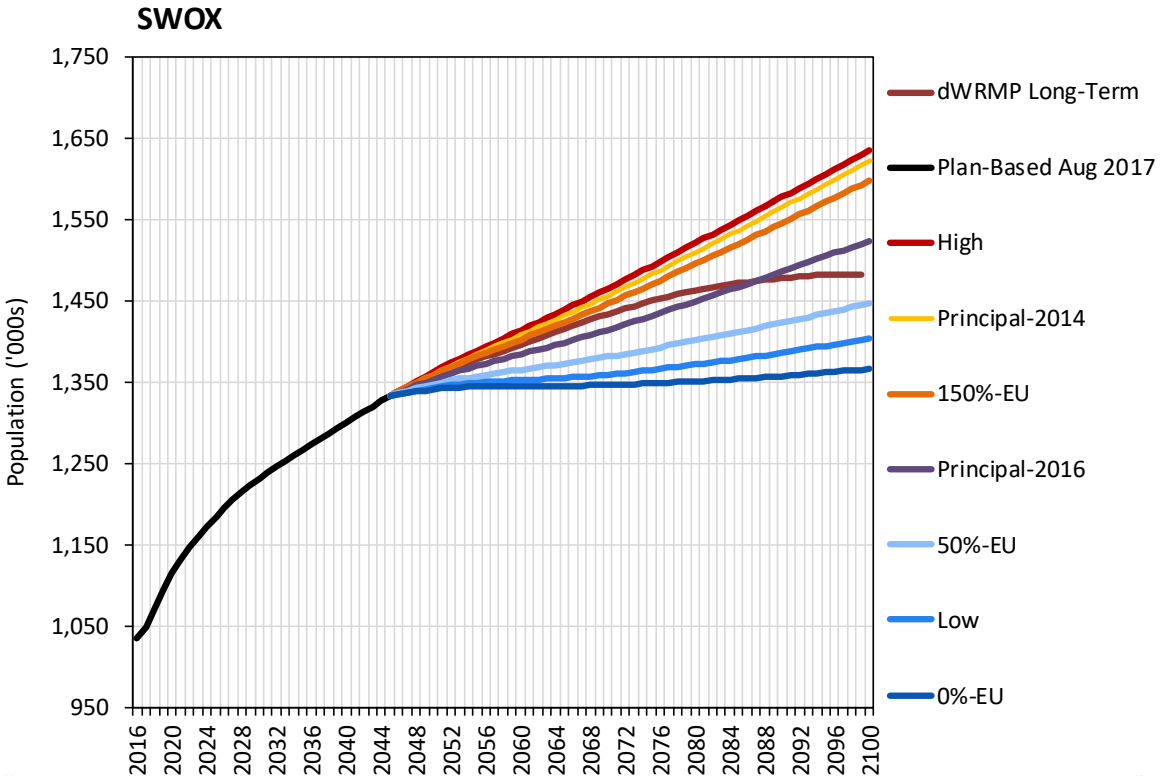


Figure 23: Population growth (2016-2100), SWOX WRZ

Table 15: Population growth (2016-2100), SWOX WRZ

Scenario	Population ('000s)			Growth ('000s)			% Growth		
	2016	2045	2100	2016-2045	2045-2100	2016-2100	2016-2045	2045-2100	2016-2100
High	1,035	1,333	1,636	299	302	601	28.8%	22.7%	58.0%
Principal-2014	1,035	1,333	1,622	299	289	588	28.8%	21.7%	56.8%
150%-EU	1,035	1,333	1,598	299	265	563	28.8%	19.8%	54.4%
Principal-2016	1,035	1,333	1,524	299	191	489	28.8%	14.3%	47.3%
dWRMP	1,035	1,333	1,482	299	149	448	28.8%	11.2%	43.2%
50%-EU	1,035	1,333	1,447	299	113	412	28.8%	8.5%	39.8%
Low	1,035	1,333	1,403	299	70	368	28.8%	5.2%	35.6%
0%-EU	1,035	1,333	1,366	299	33	331	28.8%	2.4%	32.0%

GUILDFORD WRZ

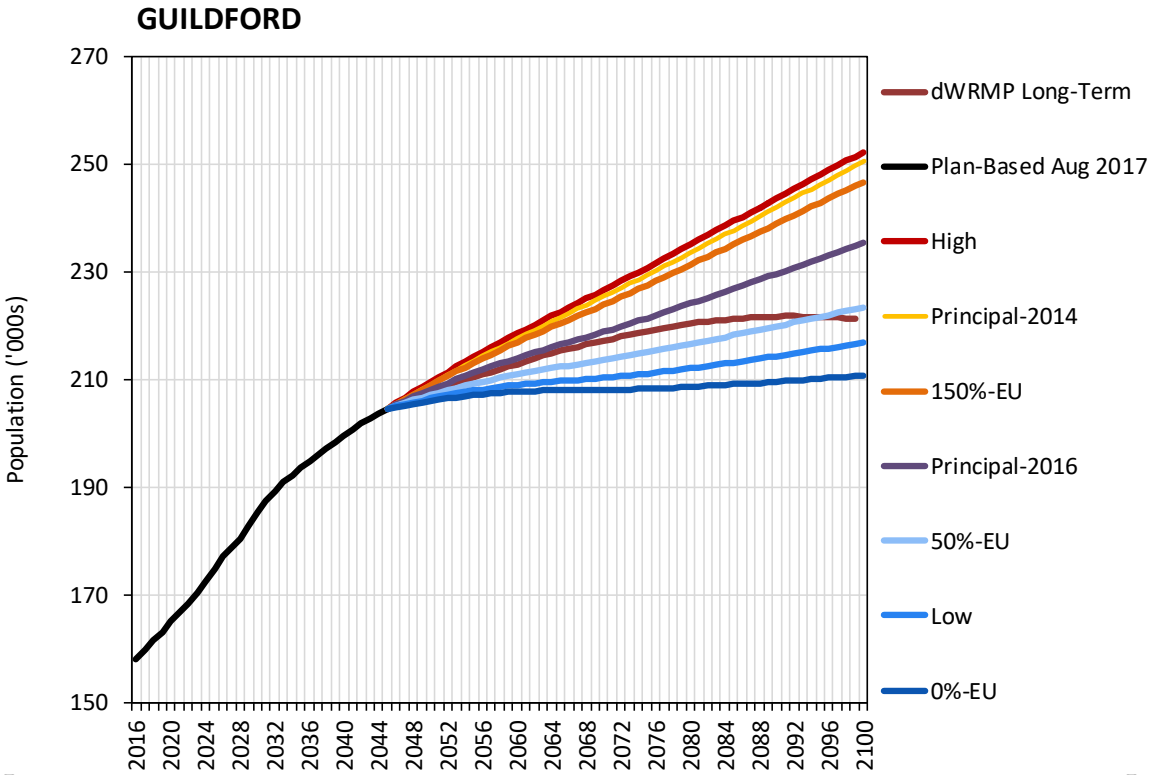


Figure 24: Population growth (2016-2100), Guildford WRZ

Table 16: Population growth (2016-2100), Guildford WRZ

Scenario	Population ('000s)			Growth ('000s)			% Growth		
	2016	2045	2100	2016-2045	2045-2100	2016-2100	2016-2045	2045-2100	2016-2100
High	158	205	252	47	48	94	29.4%	23.3%	59.6%
Principal-2014	158	205	251	47	46	92	29.4%	22.5%	58.5%
150%-EU	158	205	247	47	42	89	29.4%	20.6%	56.1%
Principal-2016	158	205	235	47	31	77	29.4%	15.0%	48.9%
50%-EU	158	205	223	47	19	65	29.4%	9.2%	41.3%
dWRMP	158	205	221	47	17	63	29.4%	8.1%	40.0%
Low	158	205	217	47	12	59	29.4%	5.9%	37.1%
0%-EU	158	205	211	47	6	53	29.4%	3.0%	33.3%

KENNET VALLEY WRZ

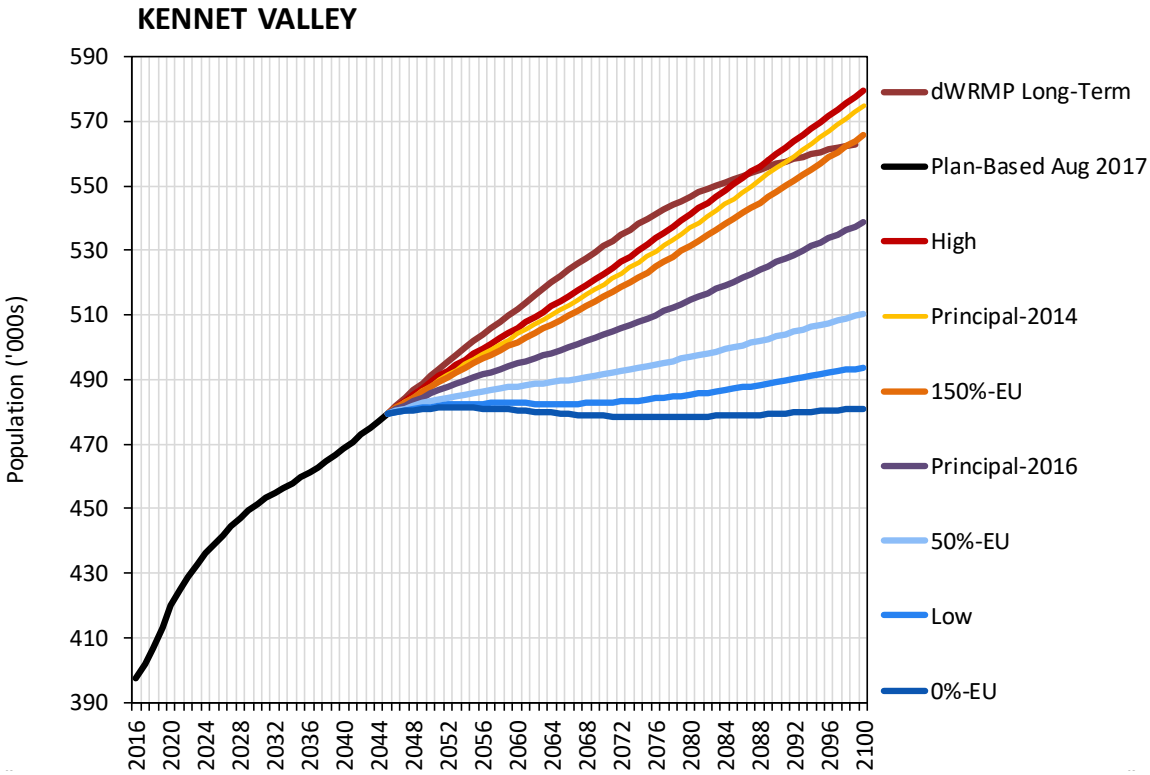


Figure 25: Population growth (2016-2100), Kennet Valley WRZ

Table 17: Population growth (2016-2100), Kennet Valley WRZ

Scenario	Population ('000s)			Growth ('000s)			% Growth		
	2016	2045	2100	2016-2045	2045-2100	2016-2100	2016-2045	2045-2100	2016-2100
High	397	479	579	82	100	182	20.6%	20.8%	45.8%
Principal-2014	397	479	575	82	95	177	20.6%	19.9%	44.6%
150%-EU	397	479	566	82	86	168	20.6%	18.0%	42.3%
dWRMP	397	479	563	82	84	166	20.6%	17.4%	41.7%
Principal-2016	397	479	539	82	59	141	20.6%	12.3%	35.5%
50%-EU	397	479	510	82	31	113	20.6%	6.5%	28.4%
Low	397	479	494	82	14	96	20.6%	3.0%	24.3%
0%-EU	397	479	481	82	2	84	20.6%	0.3%	21.0%

HENLEY WRZ

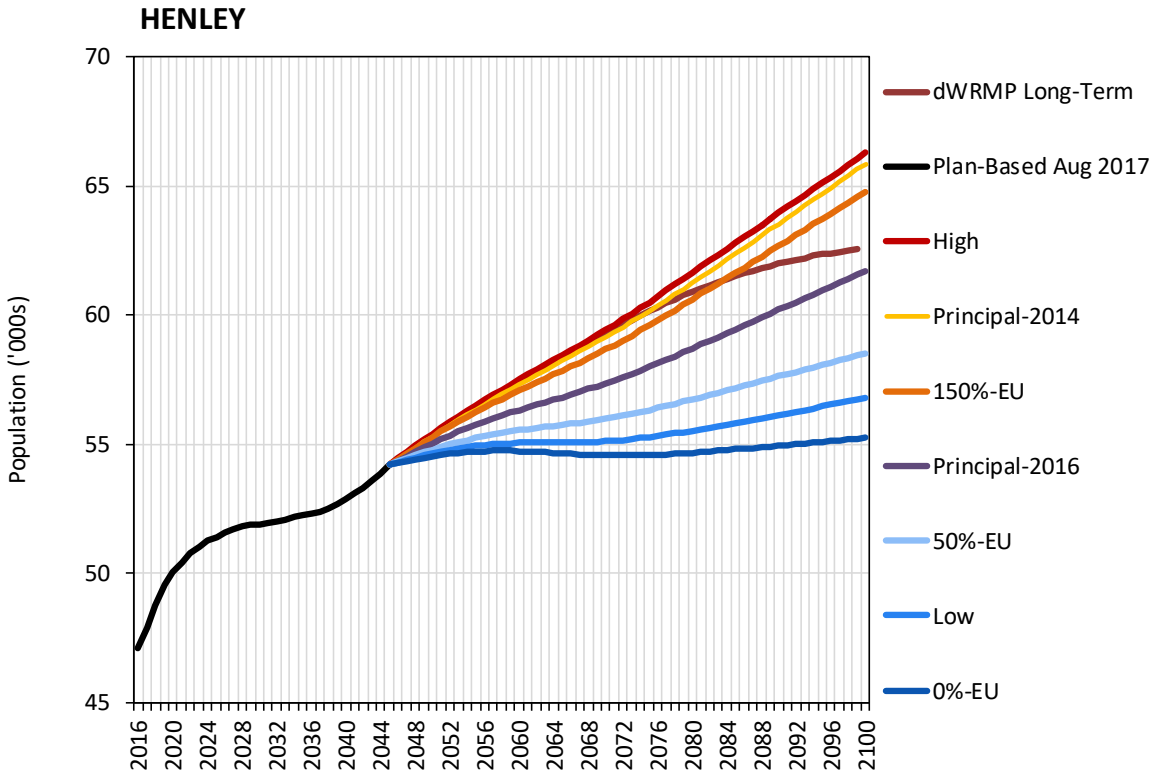


Figure 26: Population growth (2016-2100), Henley WRZ

Table 18: Population growth (2016-2100), Henley WRZ

Scenario	Population ('000s)			Growth ('000s)			% Growth		
	2016	2045	2100	2016-2045	2045-2100	2016-2100	2016-2045	2045-2100	2016-2100
High	47	54	66	7	12	19	15.1%	22.3%	40.8%
Principal-2014	47	54	66	7	12	19	15.1%	21.6%	39.9%
150%-EU	47	54	65	7	11	18	15.1%	19.5%	37.6%
dWRMP	47	54	63	7	8	15	15.1%	15.4%	32.8%
Principal-2016	47	54	62	7	8	15	15.1%	13.9%	31.1%
50%-EU	47	54	59	7	4	11	15.1%	8.0%	24.3%
Low	47	54	57	7	3	10	15.1%	4.8%	20.6%
0%-EU	47	54	55	7	1	8	15.1%	1.9%	17.3%

5 Summary & Recommendations

Summary

5.1 Thames Water submitted its dWRMP in December 2017, including demographic forecasts for the core dWRMP plan period (2016-2045) and for the longer-term outlook (2045-2100). The core dWRMP forecasts were Plan-Based, driven by available evidence on future housing growth plans published by individual local authority areas. The long-term forecasts were derived from the University of Leeds NewETHPOP model, providing a broad ethnic-group dimension to the forecasts.

5.2 At the end of 2017, ONS published a 2016-based 'national' population projection for the UK and its constituent countries. The *Principal* projection for the UK, estimates substantially *lower* population growth than each of its 2010-based, 2012-based and 2014-based predecessors. The UK's population is projected to increase to 83 million by 2100 under the 2016-based growth trajectory, compared to 91 million under the previous, 2014-based scenario. The lower rate of growth in the 2016-based scenario is driven by a combination of: lower international migration; lower fertility rates; and a slower rate of increase in life expectancy.

5.3 In addition to its 2016-based Principal projection, ONS also published a number of variant UK national projections which consider alternative assumptions for future fertility, mortality and migration. A selection of the UK growth variants illustrates the impact of higher or lower levels of international migration. These international migration variants have provided the basis for the Thames Water WRZ analysis presented in this report. These scenarios have included the 2016-based fertility and mortality differentials applied to all local authority areas and assumptions on the long-term effect of domestic migration to and from London.

5.4 Including the benchmark Principal-2014 and Principal-2016 scenarios, a total of seven variants of higher/lower international migration have been presented. In all scenarios, the core, 2016-2045 growth curves have been determined by the Plan-Based scenario from August 2017. **This revised Plan-Based scenario has a different base-period population and an altered trajectory of growth to that used in the dWRMP**. Growth for the 2045-2100 time period has been determined by the rate of population change evident under each of the seven variant scenarios.

Recommendations

5.5 The Principal-2016 scenario is presented here as the preferred trajectory of growth to 2100. Post-2045 this is driven by a UK net international migration total of approximately +165,000 per year, plus a domestic net migration outflow from London that reverts to pre-2007 levels over the course of the forecast period. A 46.9% increase in population is forecast across all WRZs to 2100 under the Principal-2016 scenario, with total population estimated at approximately 13.55 million in 2100, a 4.32 million increase from 2016 (Figure 27).

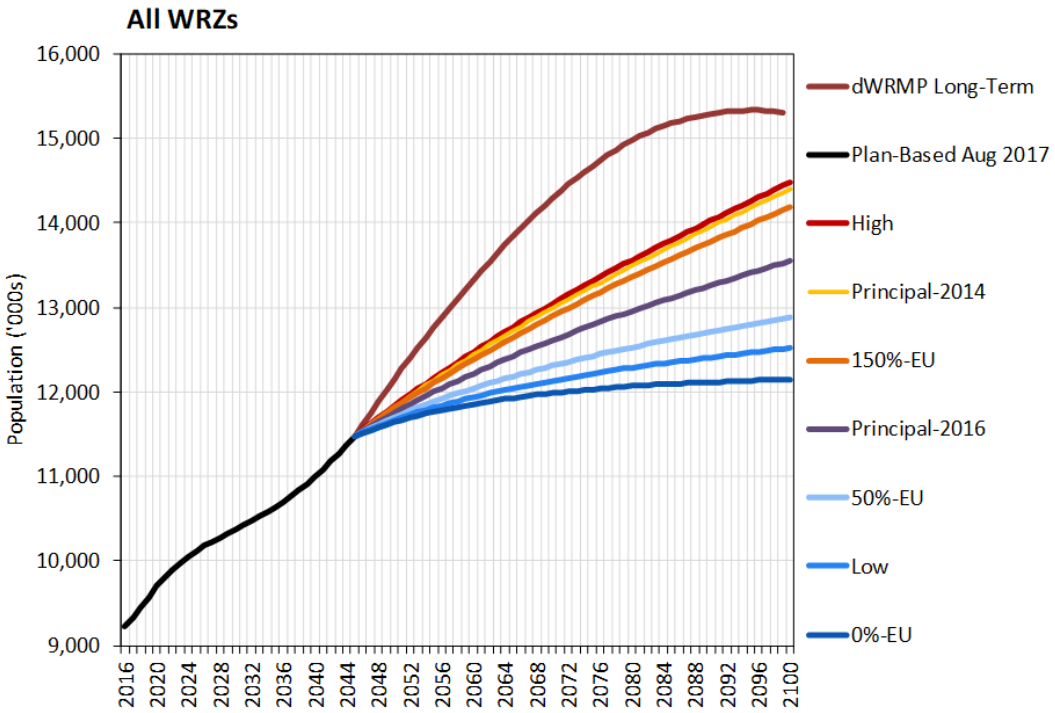


Figure 27: Population growth (2016-2100), All WRZs

5.6 The UK's exit from the EU points towards lower rather than higher international migration, so the high-migration variants are presented as a less likely outcome for the Thames Water WRZs over the long-term horizon. However, whilst lower international migration is a likely consequence of exit from the EU, the UK's economy will require a constant and ready supply of labour both from the UK and overseas. A 50% reduction in the level of international migration from EU countries would appear to be a threshold from which to consider the lowest potential growth outcome for the Thames Water WRZs; a 39.5% growth in population that achieves a total population of 12.88 million (+3.65 million) by 2100.

5.7 All population statistics resulting from this analysis are provided in an accompanying Microsoft Excel workbook. Included within the workbook is a broad indication of the likely ethnic composition associated with the Principal-2016 growth outcome. Also included are accompanying statistics on households, household population, population not-in-households, household occupancy and properties associated with each of the scenarios.

D. dWRMP19 representations and new evidence

Foreword

E.1 Following the submission of the dWRMP19 in December 2017, we received formal feedback, both from regulatory bodies and other stakeholder organisations. A number of points were raised with regard to the demographic evidence supporting the dWRMP19, identifying the availability of new housing and demographic evidence and the need to compare our dWRMP19 growth forecasts with this new evidence.

E.2 Since the dWRMP19 was first submitted, a range of new demographic evidence has been published, including:

- ONS 2016-based population projections, the first release of future sub-national population growth estimates since the Brexit referendum in June 2016;
- The latest Draft London Plan, with demographic evidence to inform these new housing numbers provided by the Greater London Authority (GLA);
- New Local Plan evidence from local authorities outside London, detailing revisions to the housing growth trajectories that informed the dWRMP demographic forecasts.

E.3 In response to these specific points of representation, we requested that Edge Analytics considered the new housing and demographic evidence. This report draws together the latest ONS, GLA and Local Plan evidence and formulates forecasts for the 'core' 2016-2045 plan-period, for direct contrast and comparison with our Baseline scenario presented in the main body of the WRMP document.

Report

(Starts overleaf)

Thames Water

WRMP Demographics

Further analysis in response to dWRMP representations

August 2018

edge analytics

Leeds Innovation Centre | 103 Clarendon Road | Leeds | LS2 9DF

0113 384 6087 | www.edgeanalytics.co.uk

Table of Contents

Context & Requirements

dWRMP Demographics

1.1 Thames Water submitted its draft Water Resources Management Plan (dWRMP) in December 2017. This included a 'Plan-based' demographic forecast for the core dWRMP plan period (2016–2045), driven by housing-plan evidence collected from all local authorities across Thames Water's supply area.

1.2 The use of Plan-based evidence was mandated in the WRMP guidelines, established by Ofwat and the Environment Agency and designed to ensure consistency between local authority housing plan intentions, and the requirements for water resource planning to meet property and population growth.

1.3 The collection of local authority housing plans and the derivation of Plan-based demographic evidence has been particularly challenging due to the fluid nature of the planning process, the gradual recovery of the UK housing market, and the uncertain impact that Brexit is likely to have upon the outlook for local population and property growth.

1.4 In addition, local authority housing plans do not have a consistent outlook horizon, with most Plan-based evidence expiring in 2030, or very soon thereafter. It has therefore been necessary to forecast likely growth in property and population totals to the end of the core dWRMP plan period (2045) using additional evidence from the Office for National Statistics (ONS) trend projections.

1.5 To complement the Plan-based forecasts to 2045, Thames Water also presented longer-term, trend-based growth outcomes for its Water Resource Zones (WRZs). With a 2100 horizon, these projections have considered how population and property growth might materialise, taking account of the long-term effects of fertility, mortality and migration trends upon Thames Water's resident population.

dWRMP Representations

1.6 In response to its submitted dWRMP, Thames Water has received formal feedback, both from the regulatory bodies and other stakeholder organisations. This feedback covers the full range of dWRMP components but there have been a number of points raised with regard to the supporting demographic evidence that Thames Water has presented. These points relate specifically to the availability of new housing and demographic evidence and the need for Thames Water to compare its growth forecasts with this new information.

1.7 Since the dWRMP was submitted, a range of new demographic evidence has been published. This evidence includes:

- The latest Draft London Plan, advocating higher housing growth across the thirty-three London Boroughs to 2029, with demographic evidence to inform these new housing numbers provided by the Greater London Authority (GLA);
- New Local Plan evidence from local authorities outside London, detailing revisions to the housing growth trajectories that were used in Thames Water's dWRMP Plan-based demographic forecasts;
- ONS 2016-based population projections, the first release of future sub-national population growth estimates since the Brexit referendum in June 2016.

1.8 In relation to the London Plan and new demographic evidence from the GLA and other local authorities, the Environment Agency and Ofwat have made the following observations in their respective feedback:

> *"The London Plan has revised property forecasts which Thames Water has not been able to include in its dWRMP. There is therefore a risk to security of supply as the company could be underestimating property numbers".*
> (Recommendation 3, Evidence Report, Environment Agency, April 2018)[6]

> *"We recommend the company updates the plan with the latest Local Authority plan figures and considers the implications for the company's population and demand forecasts."*
> (Recommendation 3, Main Report, Environment Agency, April 2018)[7]

[6] Environment Agency, April 2018. *Representation on Thames Water's draft water resources management plan* (Evidence Reports: evidence, details and reasons to support the recommendations it has made in Sections 3 & 4 of its Main Report)

[7] Environment Agency, April 2018. *Representation on Thames Water's draft water resources management plan* (Main Report)

> *"In the long term, population growth is one of the key drivers of Thames Water's draft plan. Further assurance regarding both short and long term forecasts is required for the final plan, for example how the estimates compare with the latest Greater London Authority forecasts and other independent forecasts."*
> (Ofwat Letter, page 6, April 2018)[8]

1.9 In relation to the publication of new projections from ONS, Ofwat's request for a comparison of Thames Water's evidence with other 'independent forecasts', is replicated in representations from the Campaign to Protect Rural England (CPRE) and the Group Against Reservoir Development (GARD):

> *"We urge that a single methodology is used throughout the period based on the Government's own figures, i.e. the ONS population projections. At the very minimum TW should consider a range of projections and work though the impact of the uncertainty in this range, on their investment options."*
> (CPRE, page 2, April 2018)[9]

> *"We would expect to see more evidence that the latter part of the period up to 2045 is aligned with ONS forecasts and that some attempt has been made to realistically smooth the transition from local area plans to ONS data."*
> (GARD, page 26, April 2018)[10]

1.10 In response to these specific points of representation, Thames Water has requested that the new housing and demographic evidence is considered, to establish its comparability with dWRMP statistics.

This Report

1.11 In responding to the dWRMP representations, the latest ONS trend projections have been compared and contrasted with previous projections and with Plan-based scenarios; the latest available evidence from the London Plan and accompanying GLA demographics has been considered; plus, new Local Plan publications have been collected to quantify changes to housing growth trajectories in the local authorities within Thames Water's supply area. Updated forecasts have been provided for Thames Water to consider in formulating its final WRMP submission.

[8] Ofwat, April 2018. *Letter from PR19 Senior Director David Black to the Secretary of State for Environment, Food & Rural Affairs*

[9] CPRE, April 2018. *CPRE Response to Thames Water Draft Water Resources Management Plan 2019* (Helen Marshall, Director, CPRE Oxfordshire)

[10] GARD, April 2018. *GARD response to Thames Water's Consultation on Draft Water Resources Management Plan 2019*

1.12 Section 2 briefly reviews the latest ONS scenario evidence and the assumptions that underpin its projections and variants. The new ONS data provides the basis for revised *trend* projections for each WRZ, for direct comparison with the previous **Plan-based (dWRMP)** forecast and the new Plan-based outcomes formulated here.

1.13 Section 3 provides an overview of the demographic evidence for London Boroughs from London Plans and GLA projections, summarising methodology and presenting key growth projections. This evidence provides the basis for a revised population and housing growth outcome for the London WRZ.

1.14 Section 4 summarises the results of the latest review of Local Plan evidence from all local authorities (outside London) that form part of Thames Water's supply area. The new housing growth trajectories are compared and contrasted to those underpinning the **Plan-based (dWRMP)** scenario. The new data forms the basis of a revised population and housing growth scenario for the non-London WRZs.

1.15 Section 5 presents a suite of new trend-based and Plan-based growth scenarios for each of Thames Water's WRZs. Combining the latest GLA, Local Plan and ONS evidence, a **Plan-based (August 2018)** scenario is formulated. Population and housing growth are presented for a 2016/17 – 2044/45 plan-period, enabling direct comparison with the **Plan-based (dWRMP)** forecast.

1.16 Section 6 provides concluding comments, summarising the new evidence that has been presented and providing recommendations for Thames Water to consider in the formulation of its final WRMP.

1.17 Demographic statistics produced to accompany the analysis presented in this report are provided in a separate XLS workbook.

2 Latest ONS Evidence

National Projection

2.1 Every two years, ONS publishes its national and sub-national population projections. The 2016-based national population projection (NPP) was released in October 2017[11], with the associated 2016-based sub-national population projection (SNPP) released in May 2018 (superseding the previous 2014-based NPP and SNPP). Both projections use the ONS 2016 mid-year population estimates (MYE) as their starting point, projecting forward using national and/or local assumptions relating to fertility, mortality and migration.

2.2 The ONS national projection provides the basis for generating *sub-national* projections. It sets key assumptions on the long-term effects of fertility, mortality and international migration, which are appropriate to all areas. The 2016-based NPP suggests a *lower* rate of population growth than under the earlier NPPs, driven by assumptions on lower natural change (i.e. increased deaths and fewer births) and lower net international migration (Figure 1).

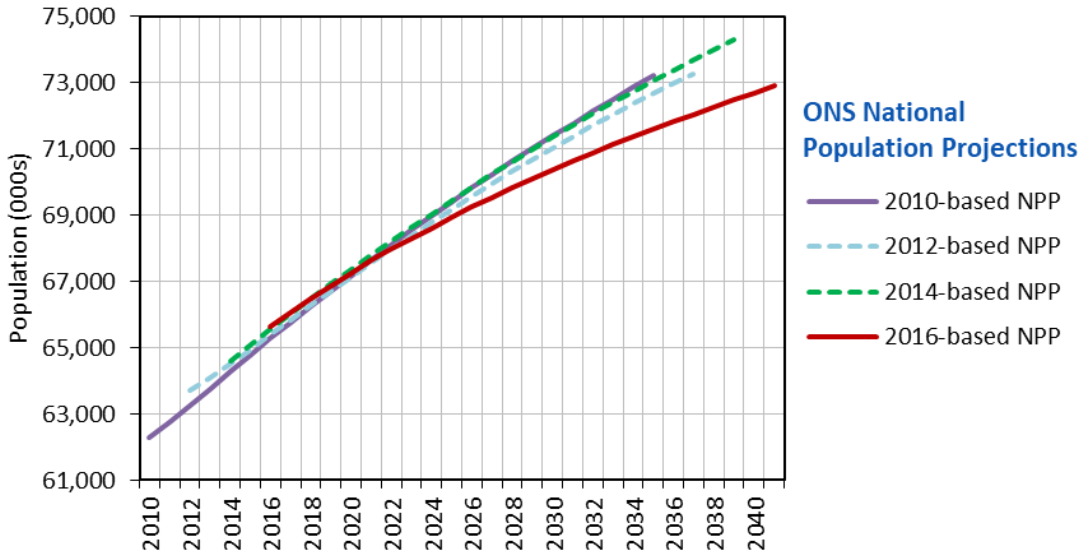


Figure 28: Population change under the official NPPs for the UK

[11] https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2016basedstatisticalbulletin#quality-and-methodology

2.3 Under the 2016-based NPP *Principal* projection, the population of the UK is projected to increase to 72.9 million by 2041, an 11.1% increase from the current (2016) population estimate of 65.6 million. Under the previous 2014-based NPP, the population was expected to increase by 15.0% for an equivalent, 2014–2039 25-year period.

2.4 The Principal scenario of the 2016-based projection has a long-term net international migration assumption set at +165,000 per year for the UK (Figure 2). This is lower than under the earlier 2014-based NPP (+185,000) but more closely aligned to the 2012-based NPP (+165,000). Under the 2016-based *High* variant population projection, net international migration to the UK is set at approximately +245,000 per year (from mid-2023 onwards), while the *Low* variant projection assumes net international migration flows of approximately +85,000 per year.

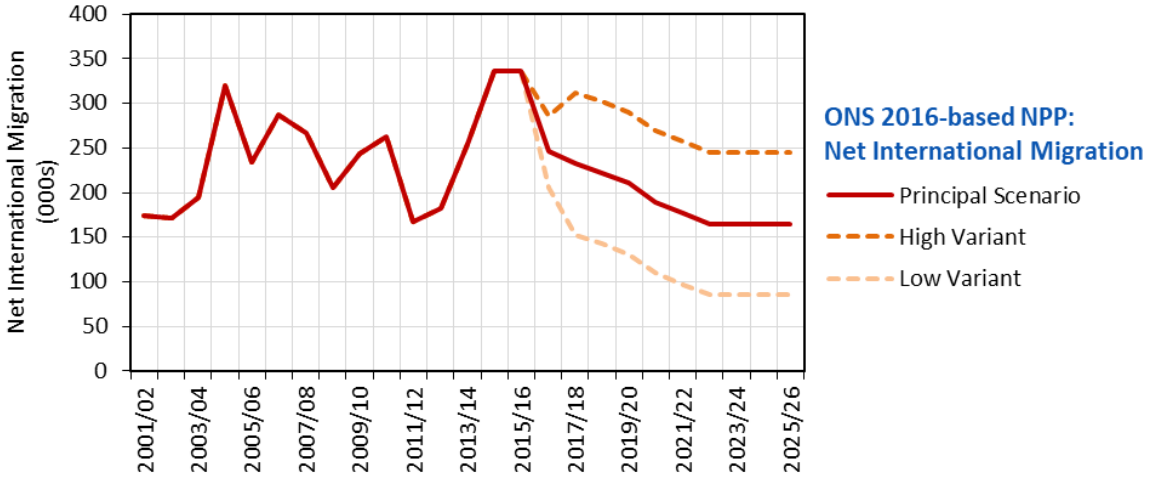


Figure 29: ONS net international migration under the variant projections for the UK

Sub-National Projections

2.5 In May 2018, the ONS released its 2016-based SNPPs[12], providing a new suite of 'official' statistics for all local authority areas in England. These are trend-based projections and do not take account of any planned trajectories of housing growth for individual local authorities. However, the 2016-based SNPPs provide an important benchmark against which to compare the derived Plan-based scenario used in the dWRMP and in the final WRMP.

[12] https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/subnationalpopulationprojectionsforengland/2016based

2.6 In section 5, the latest 2016-based scenario evidence from ONS (**ONS-2016**) is considered alongside the **Plan-based (dWRMP)** scenario and the **Plan-based (August 2018)** equivalent. An additional comparison is made to the earlier ONS 2014-based projections (**ONS-2014**).

2.7 Using the new ONS evidence, **ONS-2016 High** and **ONS-2016 Low** scenarios have been formulated, which consider the potential for higher or lower international migration growth over the 25-year projection horizon. As ONS does not produce its own variant projections at a sub-national level, the High and Low scenarios presented here are based on the national variants published by ONS as part of its 2016-based projections.

2.8 The scenario analysis also considers how the latest ONS assumptions on population growth influence the 'return-to-trend' assumptions, which are a key component of the Plan-based scenarios for non-London local authorities over the second half of the WRMP plan period, 2030–2045. With the 2016-based projections generally resulting in lower growth than their 2014-based equivalents, the revised 'return-to-trend' assumptions will invariably result in a dampening of estimated housing growth for most local authorities beyond the end of each Local Plan period.

3 The London Plan & GLA Projections

Introduction

3.1 Since the production of the **Plan-based (dWRMP)** forecast, the GLA has published new demographic evidence for all London Boroughs, supporting its responsibility for strategic planning policy across Greater London. The new evidence includes revised housing targets, as presented in the December 2017 Draft London Plan[13], and an updated, 2016-based round of population and household projections[14].

3.2 Underpinned by the GLA's 2016-based projections and an updated Strategic Housing Land Availability Assessment[15] (SHLAA), the Draft London Plan housing targets record higher housing growth compared to the existing housing targets for London, set out in the 2016 London Plan[16]. The new annual housing target of 64,935 represents a 53% increase on the previous target of 42,389. As highlighted in the Draft London Plan, to achieve the revised targets, the overall rate of housing delivery would need to approximately double, compared to current average completion rates.

3.3 In their representations to Thames Water in April 2018, both the Environment Agency and Ofwat highlight the need for the dWRMP to consider the implications of these revised GLA housing targets and projections. In this section, therefore, an overview of the latest GLA evidence is provided, as context for the revised **Plan-based (August 2018)** scenario that is presented in section 5.

[13] Mayor of London, December 2017. *The London Plan: The spatial development strategy for Greater London (Draft for Public Consultation)* https://www.london.gov.uk/what-we-do/planning/london-plan/new-london-plan

[14] https://data.london.gov.uk/dataset/projections/

[15] Mayor of London, November 2017. *The London Strategic Housing Land Availability Assessment 2017* https://www.london.gov.uk/sites/default/files/2017_london_strategic_housing_land_availability_assessment.pdf

[16] Mayor of London, March 2016. *The London Plan (consolidated with alterations since 2011)* https://www.london.gov.uk/what-we-do/planning/london-plan/current-london-plan

The London Plan

3.4 The London Plan is the Spatial Development Strategy for London, setting out the economic, environmental, transport and social policy context for the capital. The individual Boroughs' local development plans have to be 'in general conformity' with the London Plan, which must be taken into account when planning decisions are made.

3.5 A key policy of the London Plan is concerned with increasing the supply of housing across the capital[17]. London's housing requirements are determined by the GLA in the London-wide Strategic Housing Market Assessment (SHMA). Underpinning the objective assessment of housing need are the trend-based population and household projections from the GLA, which are produced on an annual basis.

3.6 The SHLAA identifies the land capacity of each Borough to meet the objectively assessed housing need set out in the SHMA, determining the housing targets specified in the London Plans. A summary of the key information from the two latest London Plans is provided in Table 1.

Table 19: London Plan comparison

	London Plan 2016	**Draft London Plan 2017**
Publication date	March 2016	December 2017
Housing target source	2013 SHMA 2013 SHLAA	2017 SHMA 2017 SHLAA
SHMA housing requirement (per year)	48,841 (to 62,000)	65,878
Demographic projection underpinning SHMA	2013 Round Central Trend Scenario	2016-Based Central Trend Scenario
Population growth (per year)	76,700 *(2011–2035)*	79,000 *(2016–2041)*
Household growth (per year)	39,850 *(2011–2035)*	48,200 *(2016–2041)*
10-year London Plan housing target (per year) i.e. SHLAA housing capacity	**42,000** *(2015/16–2024/25)*	**64,935** *(2019/20–2028/29)*

Source: March 2016 London Plan; December 2017 London Plan (Mayor of London), GLA population & household projections, 2013 Round and 2016-based

[17] Policy 3.3 of the London Plan (March 2016) and Policy H1 of the Draft London Plan (December 2017)

London Plan (March 2016)

3.7 In the March 2016 London Plan (referred to as the 'current' London Plan) minimum annual housing growth targets have been identified for each London Borough, totalling just over 42,000 net additional homes per year across London (2015/16–2024/25). These targets were informed by the 2013 SHMA[18] and SHLAA[19], both published in January 2014.

3.8 The 2013 SHMA identified a minimum housing requirement for London of 48,841 homes per year (2015–2035). This requirement was underpinned by the 'Central' trend scenario from the 2013 Round of GLA population and household projections. Under this trend-based scenario, the population of London was projected to increase by 76,700 people per year (2011–2035), with household growth at 39,850 per year. Using a 'net stock model' approach to assessing housing needs, housing requirements were calculated with adjustments made to account for the 'backlog' of housing need, affordability, undersupply and vacant/second homes. The 2013 SHMA determined that if the backlog of housing need was to be cleared at a faster rate than projected, the housing need would increase to around 62,000 per year.

3.9 Whilst the 2013 SHMA identified London's housing requirements, the 2013 SHLAA identified the potential quantity and suitability of land available for housing development. A capacity for a minimum of approximately 42,000 homes per year was identified (2015–2025), split between large sites (29,024 per year), small sites (10,647 per year), the return to use of long-term vacant properties (755 per year) and student rooms (1,962 per year).

Draft London Plan (December 2017)

3.10 In December 2017, the GLA published a draft update to the London Plan, setting out revised **10-year** targets for net housing completions by Borough. Totalling approximately 64,935 homes per year over the 2019/20–2028/29 period, the new housing target is informed by an updated range of evidence, including 2016-based population and household projections, the 2017 SHMA[20] and 2017 SHLAA[21].

[18] Mayor of London, January 2014. *The 2013 London Strategic Housing Market Assessment*

[19] Mayor of London, January 2014. *The London Strategic Housing Land Availability Assessment 2013*

[20] Mayor of London, November 2017. *The 2017 London Strategic Housing Market Assessment* https://www.london.gov.uk/sites/default/files/london_shma_2017.pdf

[21] Mayor of London, November 2017. *The London Strategic Housing Land Availability Assessment 2017* https://www.london.gov.uk/sites/default/files/2017_london_strategic_housing_land_availability_assessment.pdf

3.11 The 2017 SHMA housing requirement is underpinned by the 'Central' trend scenario from the latest 2016-based round of GLA population and household projections. Under this trend-based scenario, the population of London is projected to increase by 79,000 people per year (2016–2041), with household growth at 48,200 per year. As in the 2013 SHMA, adjustments were made to the household figures to account for affordability, backlog, vacancy and second homes.

3.12 The 2017 SHLAA identified that London has the capacity for a total of 649,350 additional homes during the 2019–2029 period covered by the Draft London Plan. Of this, approximately 40,000 per year are on large sites, an 11,000 a year increase on the previous large site capacity of the 2013 SHLAA. Policy changes in the Draft London Plan "in favour of small housing developments" (Policy H2) have informed an increased small site capacity compared to recent trends, averaging nearly 25,000 per year.

GLA Population & Household Projections

Scenario Definition

3.13 The 'Central' trend population and household projections from the 2013 Round and 2016-based GLA projections have underpinned the assessment of housing need in the 2013 and 2017 SHMAs respectively. The SHMA requirements have then informed the SHLAAs, determining the annual housing growth targets for the London Boroughs as defined in the London Plans.

3.14 The GLA produces population and household projections on an annual basis; these include variant trend-based scenarios and 'Housing-led' scenarios linked to housing development data. Between the 2013 Round and 2016-based projections, three other rounds were produced, the 2014 Round, 2015 Round, and the 2015-based (interim). For comparability, the 2015-based (interim) projections are included here[22]. The variant projections produced by the GLA for these three rounds are summarised in Table 2.

3.15 Alongside the Central scenarios in each round are variant trend-based projections, based on

[22] Due to changes in the housing-led projection methodologies between the 2013 Round and 2016-based projections and the differing projection forecast horizons, the 2015-based (interim) projections have been included here for comparison. The 2015-based (interim) Housing-led projection uses the same housing development data as the 2013 Round (i.e. the 2013 SHLAA), but uses a methodology comparable to that used in the 2016-based projections. There is also no housing trajectory data provided for the 2013 Round Housing-led scenario, whereas the 2015-based and 2016-based have 'assumed development' trajectories included within the projection data files.

alternative migration assumptions. In the 2013 Round, 'High' and 'Low' variants were included. In the 2015-based (interim) and the 2016-based rounds, 'Long-Term' and 'Short-Term' variants were produced.

3.16 Accompanying the trend-based scenarios are 'Housing-led' scenarios, which incorporate a forecast housing development trajectory. In the 2013 Round and 2015-based (interim) projections, housing data were drawn from the 2013 SHLAA (i.e. linked to the housing targets in the 2016 London Plan). In the 2016-based Housing-led projection, the housing trajectory has been drawn from the 2017 SHLAA (i.e. linked to targets in the 2017 Draft London Plan).

Table 20: GLA projections, 2013 Round, 2015-based (interim) and 2016-based

2013 Round Projections	Trend-based High	Domestic migration trends derived from 2008–2012 period, held constant for projection period
	Trend-based Low	Domestic migration as per the 'High' projection to mid-2012, with increasing outflow (+10%) and reducing inflow (-10%) beyond this point
	Trend-based Central	The mid-point of the assumptions in the High and Low projections is taken (after 2017, migration outflows increase by 5% and inflows fall by 3%)
	SHLAA DCLG	Housing-led projection, linked to 2013 SHLAA housing data
2015-Based (interim) Projections	Trend-based Long-Term	Migration patterns based on estimates over a 14-year period
	Trend-based Short-Term	Migration patterns based on estimates over a 5-year period
	Trend-based Central	Migration patterns based on estimates over a 10-year period
	Housing-led	Housing-led projection, linked to 2013 SHLAA housing data
2016-Based Projections	Trend-based Long-Term	Migration patterns based on estimates over a 12-year period (mid-2007 to mid-2016)
	Trend-based Short-Term	Migration patterns based on estimates over a 5-year period (mid-2012 to mid-2016)
	Trend-based Central	Migration patterns based on estimates over a 10-year period (mid-2007 to mid-2016)
	Housing-led	Housing-led projection, linked to 2017 SHLAA housing data

Source: GLA

Housing-led Projections

3.17 The GLA recommends that, "for most uses"[23], the Housing-led projection is the most appropriate. In this section, the 2016-based growth outcomes for London in total are considered and compared to the 2015-based (interim) Housing-led projection (i.e. the most recent round of projections to use the previous GLA housing targets).

3.18 In the latest two rounds of Housing-led projections, the GLA has adopted a two-stage methodology. During Stage 1, a trend projection is generated, producing a set of rates and constraints consistent with the GLA Central trend-based projection. During Stage 2, the projected population in each year is 'reconciled' with a target population based on available housing supply, drawn from the SHLAA, with actual completions data used to 2016. The population growth outcomes are then constrained to be in line with the outputs from Stage 1 of the process at the Housing Market Area (HMA) level (i.e. the whole of London). The result of this approach is that the Housing-led scenarios produce a level of population growth that is consistent with the Central scenarios for London in total, but with different implied average household sizes.

3.19 The property growth trajectories associated with the 2015-based and 2016-based Housing-led scenarios are illustrated in Figure 3, with detail provided for each London Borough in Appendix B. Note that in both projection rounds the housing growth trajectory extends only to 2041. In the 2015-based projection, no housing growth data is provided beyond 2041; in the 2016-based projection, the GLA has assumed that the housing stock figure is fixed beyond 2041.

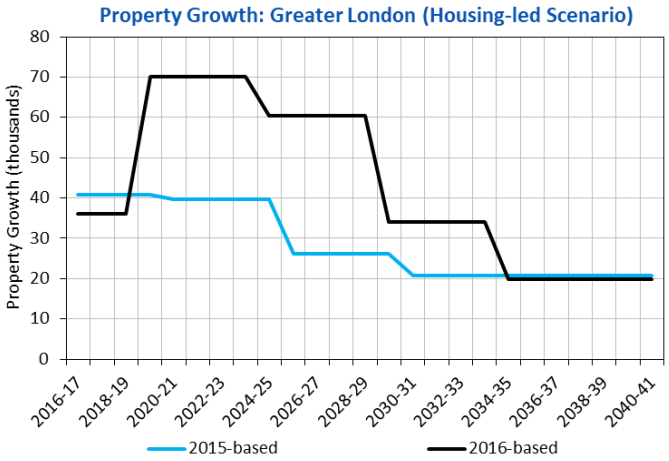


Figure 30: Housing growth under the GLA Housing-led scenarios (source: GLA)

[23] https://data.london.gov.uk/dataset/projections/

3.20 Under the 2015-based scenario, the assumed level of development averages 28,762 per year between 2016 and 2041. Under the 2016-based scenario, growth is higher, averaging 42,814 per year (2016–2041). These differences are a reflection of the different capacity levels identified in the 2013 and 2017 SHLAAs[24]. In both scenarios, growth is higher towards the start of the projection period, reducing to similar levels by the mid-2030s (approximately 20,000 per year).

3.21 Despite displaying different trajectories of housing growth, the two Housing-led scenarios project similar levels of population growth, consistent with the accompanying Central trend-based scenario (Figure 4). Under the latest, 2016-based scenario, the population of London is projected to increase by 1.98 million (22%) between 2016 and 2041, compared to 1.88 million (21%) under the previous 2015-based scenario.

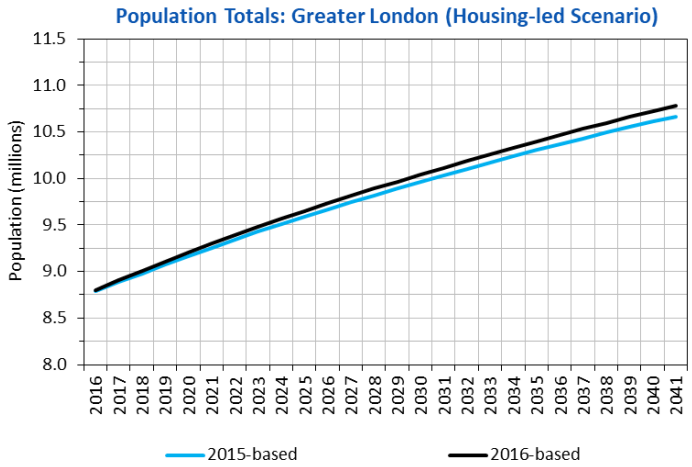


Figure 31: Population growth under the GLA Housing-led scenarios (source: GLA)

An Updated London-WRZ Forecast

3.22 This latest GLA 2016-based Housing-led projection (in conjunction with the updated Local Plan and ONS evidence presented in sections 2 and 4) provides the basis for a revised Plan-based population and housing growth outcome for the London WRZ, the results of which are presented in section 5 as the **Plan-based (August-2018)** scenario.

[24] Note that the levels of assumed development presented in the GLA Housing-led scenarios do not exactly match the SHLAA-based 10-year targets that are presented in the London Plans. Over the 10-year period to which the 2013 SHLAA (and 2016 London Plan) refers (2015/16–2024/25), the 2015-based Housing-led scenario shows an average level of property growth of approximately 39,200 per year, compared to the annual SHLAA/London Plan target of 42,000. Under the 2016-based Housing-led scenario there is better alignment, with the level of assumed development averaging 65,300 per year (2019/20–2028/29), compared to the SHLAA/Draft London Plan target of 64,935.

3.23 The London WRZ covers 38 authorities (wholly or partly), 29 of which are London Boroughs (Figure 5 & Appendix C). For each of these 29 Boroughs, the data items listed in Table 3 have been collated/derived for each year of the WRMP plan-period, 2016–2045. For consistency with the **Plan-based (dWRMP)** forecast outcomes, it has been necessary to derive certain data items.

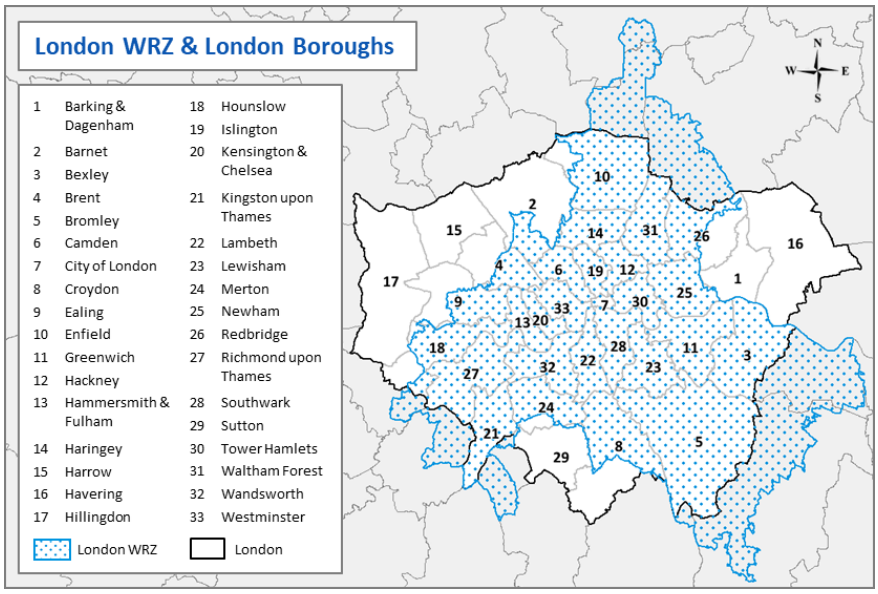


Figure 32: Extent of the London WRZ and the London Boroughs

Table 21: GLA 2016-based scenario data used within the Plan-based (August-2018) forecast

Data Item	Source of data
Population	Taken directly from the GLA 2016-based Housing-led scenario. Note that the London total population in this scenario is the same as the Central trend-based scenario (due to the GLA rescaling at HMA-level). The individual London Borough populations are, however, different in the Housing-led and Central scenarios.
Institutional population	I.e. the population 'not-in-households'. This has been taken directly from the household projection of the GLA 2016-based Central trend-based scenario, as this data item is not provided for the Housing-led scenario[25].
Household Population	Calculated as the total population minus the institutional population.
Properties	Drawn directly from the GLA 2016-based Housing-led projection. The GLA provides housing stock and 'assumed development' data up to 2050, however, from 2041, the housing stock figure is fixed (i.e. there is no growth in the number of properties for the London Boroughs beyond 2041).
Households	Derived by multiplying housing stock from the 2016-based Housing-led scenario by the household to housing stock ratio from the 2015-based Housing-led scenario.

[25] The GLA has confirmed that there is no household projection associated with the 2016-based Housing-led scenario.

3.24 There is no household projection associated with the GLA's 2016-based Housing-led population projection[20]. Therefore, the institutional population, household population and household figures required for the updated **Plan-based (August 2018)** forecast have been derived by Edge Analytics, using data from the GLA 2016-based Central trend-based scenario, in combination with the GLA 2015-based Housing-led scenario.

3.25 In the formulation of the earlier **Plan-based (dWRMP)** scenario, a 'return-to-trend' assumption was applied to all London Boroughs, to account for estimated housing growth beyond the end-point of each Borough's planned housing growth trajectory. This 'return-to-trend' assumption has not been applied in the new **Plan-based (August 2018)** scenario as GLA population and housing growth numbers for 2016-2045 have been drawn directly from its 2016-based Housing-led scenario.

3.26 In the GLA's Housing-led scenario, housing stock figures are fixed beyond 2041. This is replicated in the development of the **Plan-based (August 2018)** scenario for the London WRZ.

4 New Local Plans

Introduction

4.1 In line with the regulatory guidance, Thames Water's **Plan-based (dWRMP)** forecast was underpinned by housing growth evidence drawn from Local Plans (including the London Plan). The **Plan-based (dWRMP)** population and housing forecast was formulated in August 2017, encapsulating Local Plan housing growth statistics that were published during (or before) 2017.

4.2 A separate technical report accompanies the August 2017, **Plan-based (dWRMP)** evidence. It details the Local Plan evidence that was collected and used in the dWRMP population and housing forecast. It includes a summary of evidence collected for local authorities both within Thames Water's supply area and within its wider waste-water geography.

4.3 In response to the dWRMP representations, this section reports on the collection and review of all Local Plan housing evidence published since the **Plan-based (dWRMP)** forecast was formulated. This process has focused only on those local authorities within Thames Water's supply area (not the extended waste-water geography). Excluding the London Boroughs, this represents a total of 31 local authorities.

Local Plan Updates

4.4 Appendix D provides an updated summary of the Local Plan status of the 31 non-London local authorities within the Thames Water supply area. The summary table provides an indication of the published sources that have been used to derive a revised housing trajectory for each local authority, plus accompanying notes to provide further guidance on how this has been achieved.

4.5 For each local authority, a comparison of previous and revised housing growth totals is presented (Table 4), with totals for the full 2016-2045 WRMP plan period and annual growth for 2016-2030 and 2030-2045. The resulting difference between the previous and revised totals is provided in a final column.

Table 22: Local Plan data: non-London districts

Aylesbury Vale	27,022	975	892	27,599	1,263	661	577
Basingstoke & Deane	24,565	1,035	672	23,467	1,044	590	-1,097
Broxbourne	10,609	440	297	11,865	510	315	1,256
Cherwell	27,381	1,420	501	31,040	1,550	622	3,659
Chiltern	9,448	342	310	8,693	326	276	-754
Cotswold	10,594	443	293	12,309	512	343	1,715
Dacorum	14,713	530	486	14,395	588	411	-318
Dartford	33,058	1,412	886	27,936	1,159	781	-5,122
East Hertfordshire	23,570	797	827	23,257	1,054	567	-313
Elmbridge	6,646	207	250	7,450	225	287	804
Epping Forest	20,053	780	609	16,571	761	394	-3,481
Epsom & Ewell	6,456	142	298	5,187	189	170	-1,269
Guildford	24,990	837	885	20,773	716	717	-4,216
Mole Valley	8,516	273	313	7,195	255	242	-1,321
Oxford	12,228	464	382	10,927	510	252	-1,301
Reading UA	19,934	823	561	18,087	762	494	-1,847
Sevenoaks	9,356	263	378	8,721	285	315	-635
Slough UA	25,845	904	879	24,060	1,006	665	-1,785
South Bucks	6,712	193	267	5,635	192	197	-1,077
South Oxfordshire	20,745	826	612	20,227	893	515	-518
Spelthorne	11,584	378	419	8,997	324	298	-2,587
Swindon UA	33,413	1,296	1,018	40,927	1,748	1,097	7,514
Tandridge	10,339	298	412	9,194	311	323	-1,145
Vale of White Horse	26,913	1,210	665	28,929	1,341	677	2,016
Waverley	13,602	656	294	14,356	692	312	755
West Berkshire UA	11,559	496	308	13,312	562	363	1,753
West Oxfordshire	21,408	977	516	19,905	980	412	-1,502
Wiltshire UA	50,465	1,943	1,551	56,361	2,297	1,613	5,896
Windsor & Maidenhead UA	21,256	764	704	20,286	757	645	-970
Wokingham UA	16,965	945	249	24,469	1,018	681	7,504
Wycombe	15,577	707	378	13,610	655	296	-1,967
Total non-London Districts	**575,517**	22,776	17,110	575,742	24,485	15,530	**225**

4.6 It is important to note that housing totals include a 'return-to-trend' assumption to estimate housing growth beyond each local authority's Local Plan horizon (typically from approximately 2030 onwards, although sometimes earlier). Housing totals for August 2017 include a 'return-to-trend' assumption based on ONS 2014-based population projections. Housing totals presented for August 2018 include a 'return-to-trend' assumption based on ONS 2016-based population projections.

4.7 There are changes in the housing growth trajectories associated with individual local authorities but in total (taking account of both Local Plan and 'return-to-trend' evidence), the overall difference is just +225 in favour of the August 2018 evidence.

4.8 Generally the pattern is for higher housing growth in the 2016-2030 time-period, reducing in 2030-2045 beyond the Local Plan horizons. With the ONS 2016-based projections generally resulting in lower growth than their 2014-based equivalents, the revised 'return-to-trend' assumptions will invariably result in a dampening of estimated housing growth for most local authorities beyond the end of each Local Plan period.

4.9 These new Local Plan housing trajectories have been used in the formulation of a **Plan-based (August 2018)** scenario, presented in section 5 alongside the **Plan-based (dWRMP)** scenario and alternative trend-based scenarios based on published ONS projections.

5 WRZ Growth Scenarios

Methodology

5.1 In response to the dWRMP representations, a range of new evidence has been collected, reviewed and combined, to produce an updated *August 2018* Plan-based forecast for Thames Water's supply area and its WRZs. For comparison, a range of trend-based projections have been derived using the most recent ONS statistics. In summary, the new evidence (reported in previous sections) includes:

- ONS 2016-based population projections, the first release of future sub-national population growth estimates since the Brexit referendum in June 2016;
- The latest Draft London Plan, with demographic evidence to inform these new housing numbers provided by the GLA;
- New Local Plan evidence from local authorities outside London, detailing revisions to the housing growth trajectories that informed the **Plan-based (dWRMP)** demographic forecasts.

5.2 The six growth scenarios presented here are as follows:

- **Plan-based (dWRMP)**: Original Plan-based scenario used in the dWRMP
- **Plan-based (August 2018)**: Latest Plan-based scenario
- **ONS-2016**: 2016-based trend projection
- **ONS-2016 High**: 2016-based trend projection, assuming higher international migration
- **ONS-2016 Low**: 2016-based trend projection, assuming lower international migration
- **ONS-2014**: 2014-based trend projection

5.3 In deriving the **Plan-based (August 2018)** scenario, population and housing growth for London Boroughs within Thames Water's supply area has been drawn directly from the GLA's 2016-based Housing-led scenario.

5.4 For non-London local authorities within Thames Water's supply area, population growth in the **Plan-based (August 2018)** scenario has been linked to the annual housing growth trajectories

drawn from Local Plans, using key assumptions relating to dwelling vacancy, population 'not-in-households' (i.e. the institutional population), and variations in household representative rates by age-group and sex.

5.5 For years beyond each *non-London* local authority's plan horizon, the annual Local Plan housing growth has reverted to the ONS trend-based estimate of average annual housing growth to 2045. In the **Plan-based (August 2018)** scenario, the 'return-to-trend' has been configured using the ONS 2016-based SNPP. The **Plan-based (dWRMP)** scenario used the 2014-based SNPP as the basis for its 'return-to-trend'.

5.6 To provide a trend-based contrast to the Plan-based evidence, a series of trend projections have been formulated, underpinned by published ONS evidence. A 2016-based projection is accompanied by High and Low variants which consider alternative levels of international migration that are recorded in ONS national projections. A 2014-based projection is included as an indication of how trend projections have altered in the latest round of ONS output.

5.7 All population and property forecasts have been apportioned to Thames Water's WRZ geography with population and property totals, re-based to ensure consistency and comparability with the (October 2016) base-year totals of Thames Water's **Plan-based (WRMP)**. Results are summarised for the Thames Water supply area in total and for each of the six WRZs.

Property Growth Profiles

5.8 An illustration of the trajectories of property growth underpinning the **Plan-based (dWRMP)** scenario and the **Plan-based (August 2018)** scenario reveals the key differences between the previous and new evidence for Thames Water's supply area (Figure 6).

5.9 The **Plan-based (August 2018)** scenario records higher property growth in the first half of the 2016/17–2044/45 WRMP plan-period, but lower growth thereafter. This trend is a reflection of two key factors:

- Higher property growth totals in the new draft London Plan and in the latest Local Plan statistics for non-London local authorities, both of which relate to the period prior to 2030.

- Lower property growth totals associated with the GLA's Housing-led scenario for London Boroughs post-2030, plus lower property growth totals in non-London local authorities resulting from the dampened 'return-to-trend' assumptions to 2045.

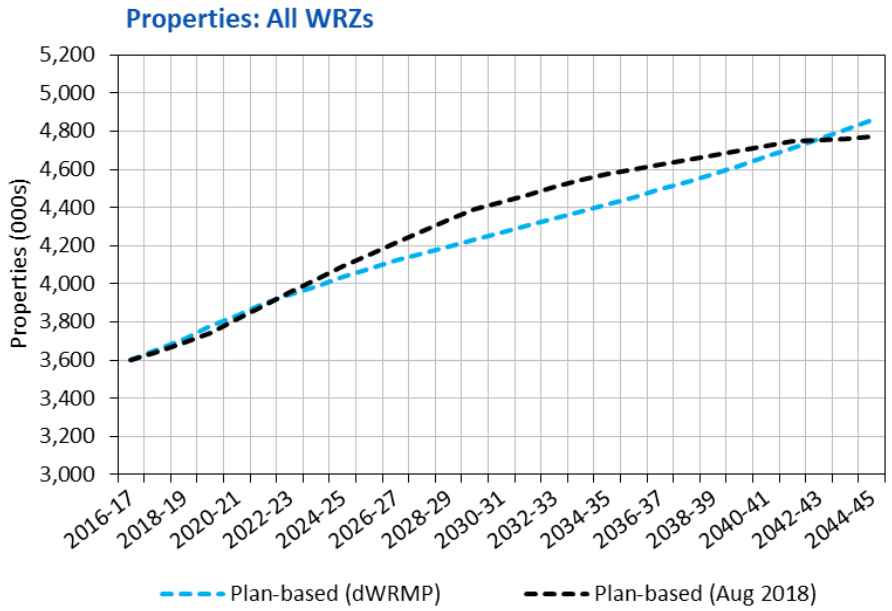


Figure 33: Property growth: Plan-based (dWRMP) vs. Plan-based (Aug 2018): All WRZs

5.10 Property growth under the **Plan-based (August 2018)** scenario averages approximately +59,100 per year in 2016/17-2029/30, compared to +47,600 per year under the **Plan-based (dWRMP)** scenario. However, in the second half of the WRMP plan-period, 2030/31-2044/45, the **Plan-based (August 2018)** scenario averages +24,400 per year, compared to +42,300 per year under the **Plan-based (dWRMP)** scenario.

5.11 This supply area property growth profile is most influenced by the London WRZ, where the draft London Plan and the accompanying 2016-based Housing-led scenario from the GLA, results in +46,000 per year housing growth in 2016/17-2029/30 under the **Plan-based (August 2018)** scenario, compared to approximately +36,500 under the **Plan-based (dWRMP)** (Figure 7).

5.12 In contrast, the **Plan-based (August 2018)** scenario records a London WRZ property growth of approximately +16,600 per year in 2030/31-2040/45, compared to over +34,200 per year under the **Plan-based (dWRMP)** scenario. The GLA's 2016-based Housing-led scenario, which forms the basis of the London population and housing growth totals in the August 2018 evidence, records substantially lower housing growth post-2030, compared to the draft London Plan totals for earlier years.

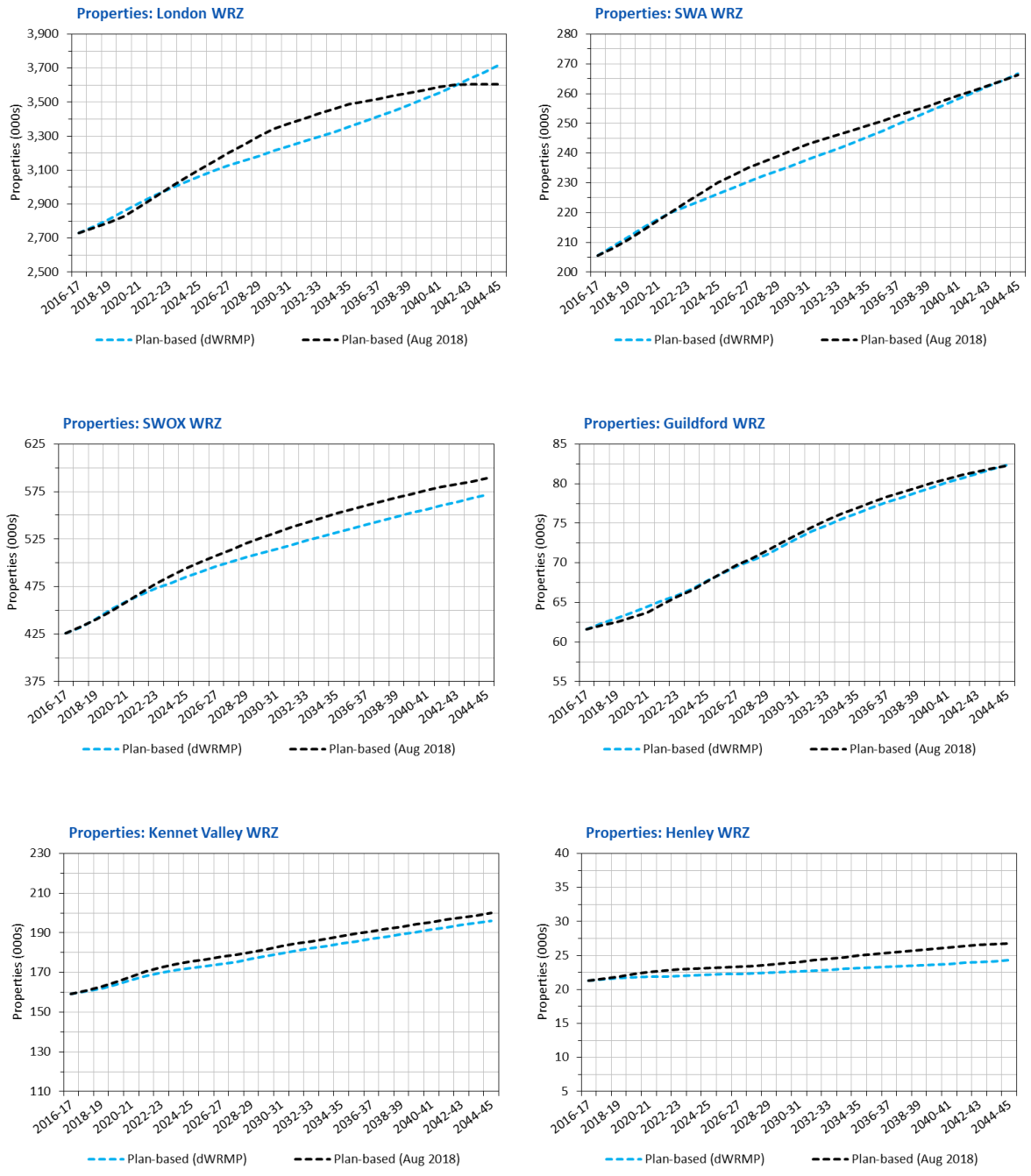


Figure 34: Property growth: Plan-based (dWRMP) vs. Plan-based (August 2018) WRZs

5.13 For the other five WRZs, the pattern of higher property growth in the **Plan-based (August 2018)** scenario pre-2030 is repeated. However, post-2030, property growth totals are more similar, although the dampening impact of the 'return-to-trend' assumptions associated with the ONS 2016-based projections generally slows growth under the **Plan-based (August 2018)**.

Population Growth Profiles

5.14 Population growth profiles are presented for the Thames Water supply area, in total, and for each individual WRZ (Figure 8 – Figure 14). The previous and latest Plan-based scenarios are illustrated alongside trend-based projections. The ONS 2016-based projection (**ONS-2016**) is presented alongside the two variant 2016-based projections (**ONS-2016 High** and **ONS-2016 Low**). An ONS 2014-based scenario (**ONS-2014**) is included to illustrate how the official projections have altered in the latest round.

5.15 For the 'All WRZs' geography, the **Plan-based (August 2018)** scenario follows a not-dissimilar trajectory to the **ONS-2014** projection, with 22.8% population growth by 2044/45. Relative to all other scenarios, it is a higher growth scenario, with over 2.2 million additional people estimated over the WRMP period across the combined WRZ area.

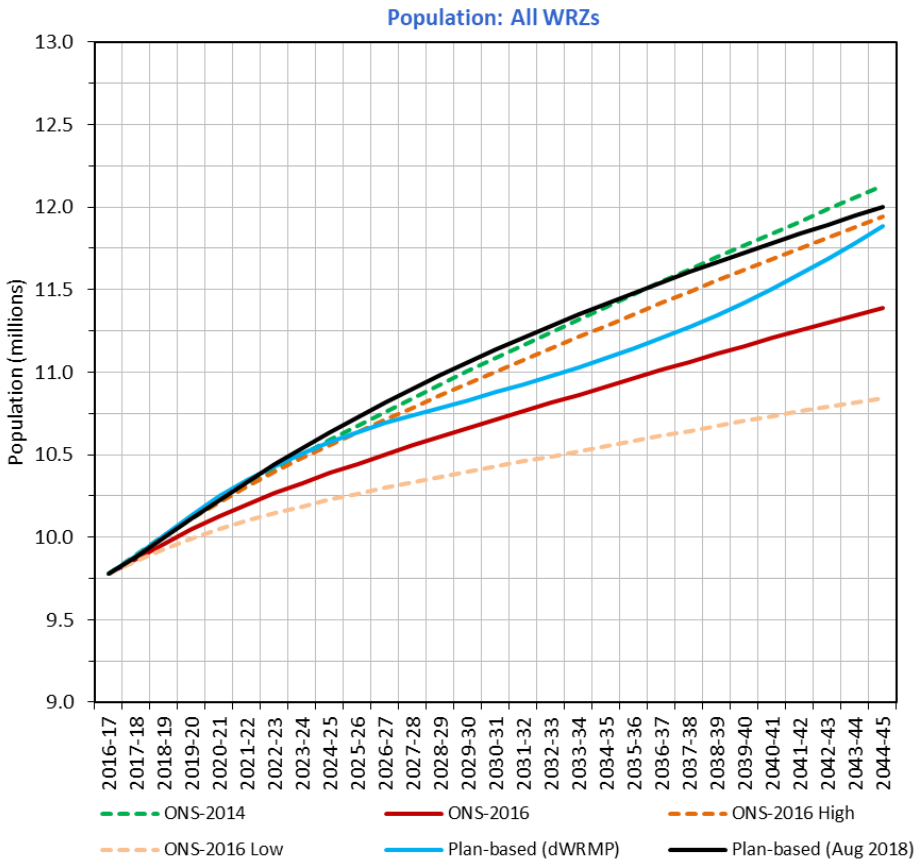
5.16 The combination of new evidence that underpins the **Plan-based (August 2018)** scenario, results in an additional 120,000 population growth, compared to the **Plan-based (dWRMP)** scenario.

5.17 The **ONS-2016** evidence estimates lower overall growth at just 16.5%, reflecting the lower international migration assumptions and the altered fertility and mortality outlook that are implied by this projection. The **High** and **Low** variants of the **ONS-2016** scenario, based on higher and lower international migration assumptions, suggest a growth range of 10.9%–22.1% by 2044/45 (1.1 million–2.2 million additional people). The **ONS-2016 High** variant records growth at a similar level to the **Plan-based (dWRMP)** scenario.

5.18 The relationship between the scenarios varies by WRZ. The growth in the London WRZ drives the overall profile for the supply area, although its **Plan-based (August 2018)** scenario outcome is lower than the **ONS-High**, in contrast to all other WRZs. The new evidence and assumptions driving the **Plan-based (August 2018)** scenario result in an additional 110,000 population growth in the London WRZ compared to the **Plan-based (dWRMP)** scenario.

5.19 In the SWOX and Henley WRZs, the **Plan-based (August 2018)** scenario results in a higher population growth outcome than the **Plan-based (dWRMP)** scenario. The **Plan-based (August 2018)** and **Plan-based (dWRMP)** scenarios produce similar outcomes for the Kennet Valley WRZ, whilst the newer evidence suggests slightly lower growth in the SWA and Guildford WRZs. In all non-London WRZs, the new Plan-based evidence exceeds the growth outcomes of the latest ONS trend scenarios.

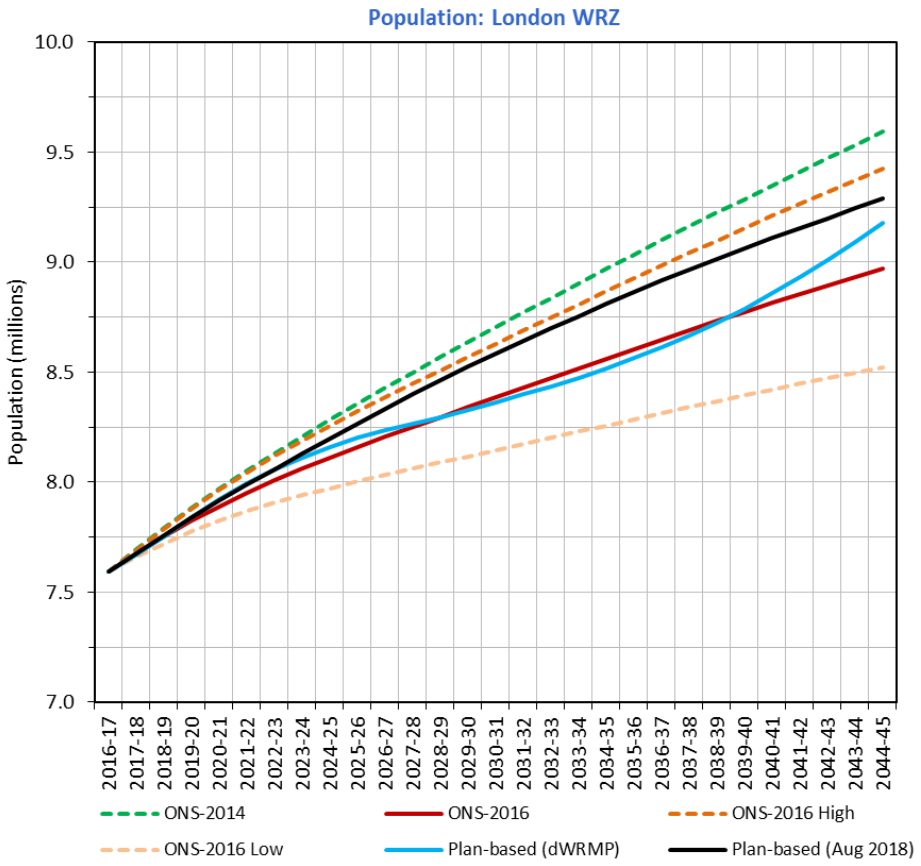
All WRZs



All WRZs	Population			
	2016/17	2044/45	Change	% Change
ONS-2014	9,779,115	12,130,067	2,350,953	24.0%
Plan-based (Aug 2018)	9,779,115	12,003,988	2,224,874	22.8%
ONS-2016 High	9,779,115	11,941,524	2,162,409	22.1%
Plan-based (dWRMP)	9,779,115	11,883,642	2,104,527	21.5%
ONS-2016	9,779,115	11,390,784	1,611,669	16.5%
ONS-2016 Low	9,779,115	10,843,156	1,064,041	10.9%

Figure 35: Population growth comparison: WRZ total

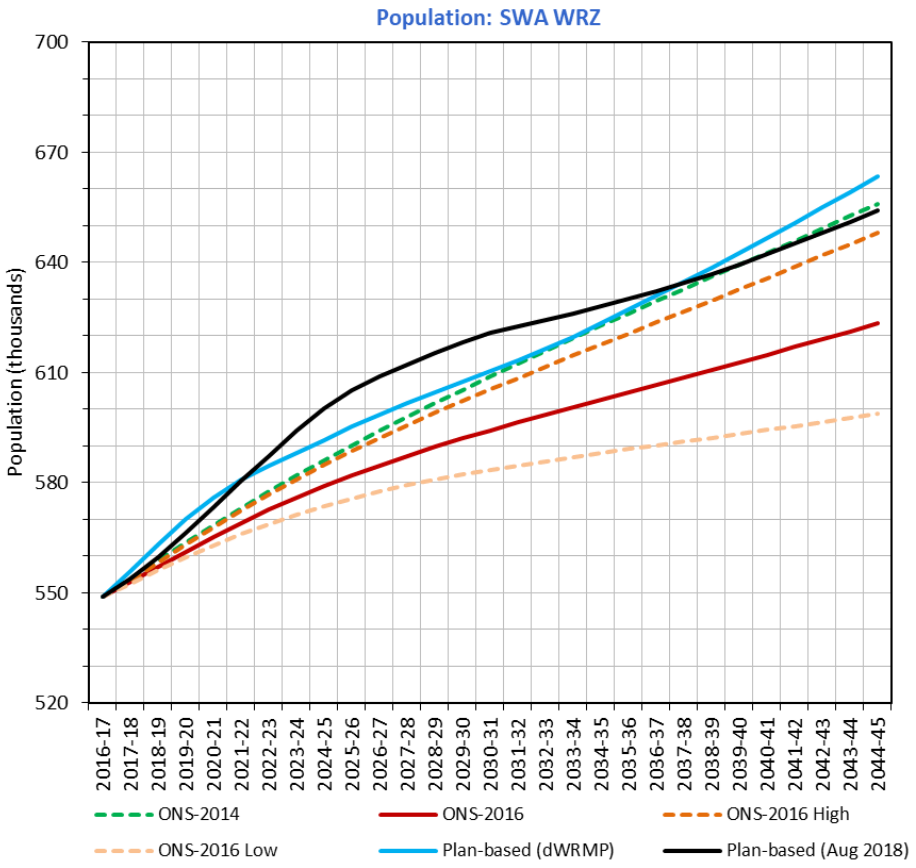
London WRZ



London WRZ	Population			
	2016/17	2044/45	Change	% Change
ONS-2014	7,595,624	9,593,722	1,998,098	26.3%
ONS-2016 High	7,595,624	9,422,978	1,827,354	24.1%
Plan-based (Aug 2018)	7,595,624	9,289,686	1,694,062	22.3%
Plan-based (dWRMP)	7,595,624	9,179,714	1,584,089	20.9%
ONS-2016	7,595,624	8,970,567	1,374,943	18.1%
ONS-2016 Low	7,595,624	8,520,185	924,561	12.2%

Figure 36: Population growth comparison: London WRZ

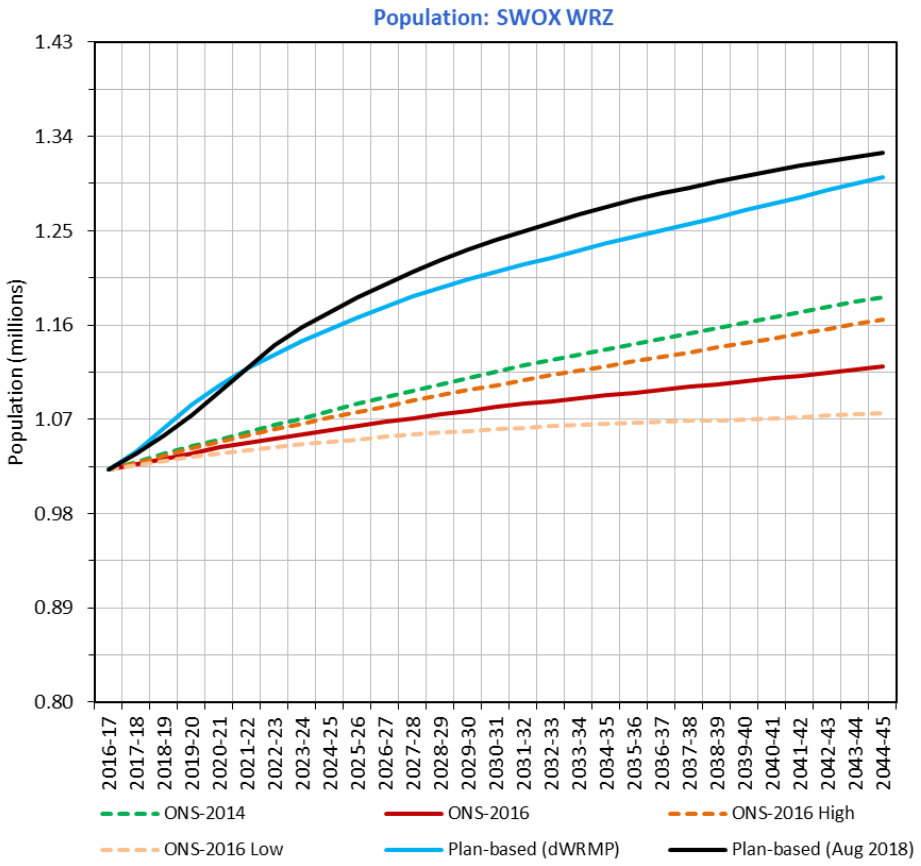
SWA WRZ



SWA WRZ	Population			
	2016/17	2044/45	Change	% Change
Plan-based (dWRMP)	548,844	663,353	114,509	20.9%
ONS-2014	548,844	655,950	107,106	19.5%
Plan-based (Aug 2018)	548,844	654,035	105,191	19.2%
ONS-2016 High	548,844	648,113	99,269	18.1%
ONS-2016	548,844	623,372	74,528	13.6%
ONS-2016 Low	548,844	598,948	50,104	9.1%

Figure 37: Population growth comparison: SWA WRZ

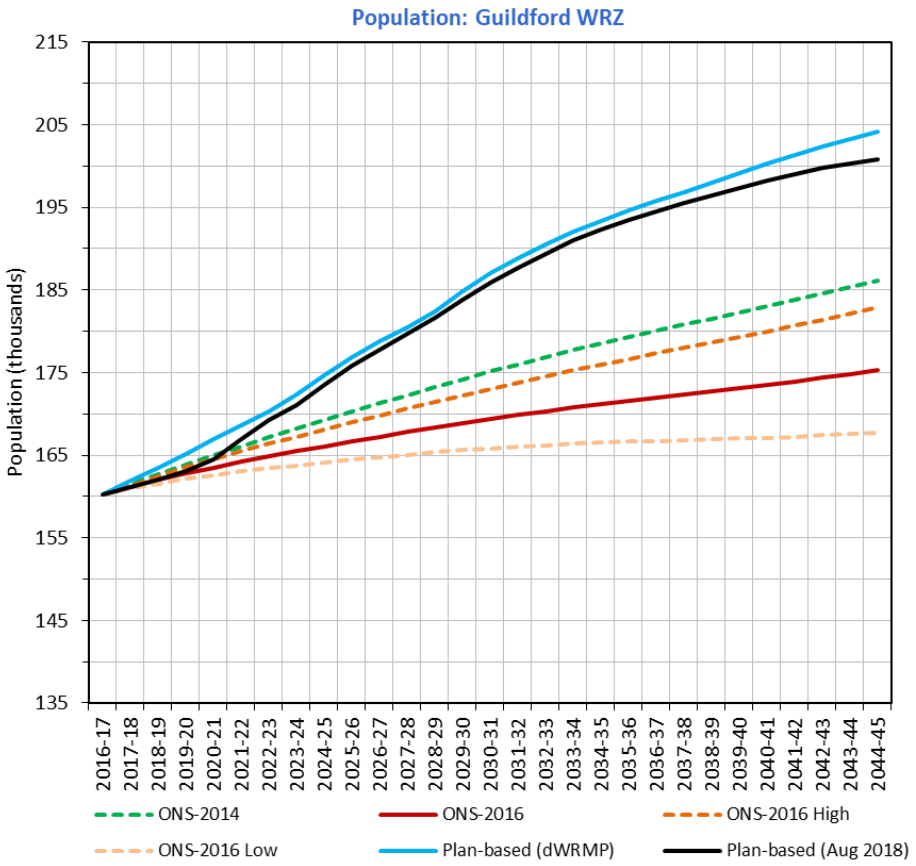
SWOX WRZ



SWOX WRZ	Population			
	2016/17	2044/45	Change	% Change
Plan-based (Aug 2018)	1,021,824	1,324,389	302,564	29.6%
Plan-based (dWRMP)	1,021,824	1,301,332	279,508	27.4%
ONS-2014	1,021,824	1,186,855	165,031	16.2%
ONS-2016 High	1,021,824	1,165,421	143,597	14.1%
ONS-2016	1,021,824	1,120,320	98,496	9.6%
ONS-2016 Low	1,021,824	1,075,615	53,790	5.3%

Figure 38: Population growth comparison: SWOX WRZ

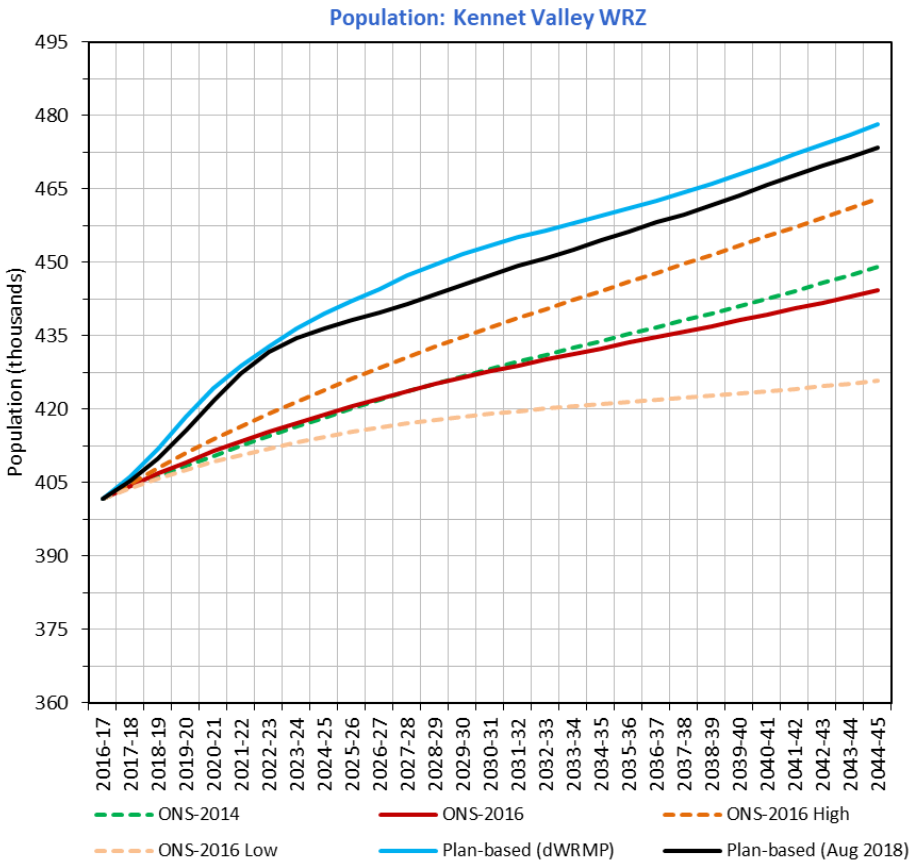
Guildford WRZ



Guildford WRZ	Population			
	2016/17	2044/45	Change	% Change
Plan-based (dWRMP)	160,186	204,205	44,019	27.5%
Plan-based (Aug 2018)	160,186	200,952	40,766	25.4%
ONS-2014	160,186	186,181	25,996	16.2%
ONS-2016 High	160,186	182,889	22,703	14.2%
ONS-2016	160,186	175,278	15,092	9.4%
ONS-2016 Low	160,186	167,717	7,531	4.7%

Figure 39: Population growth comparison: Guildford WRZ

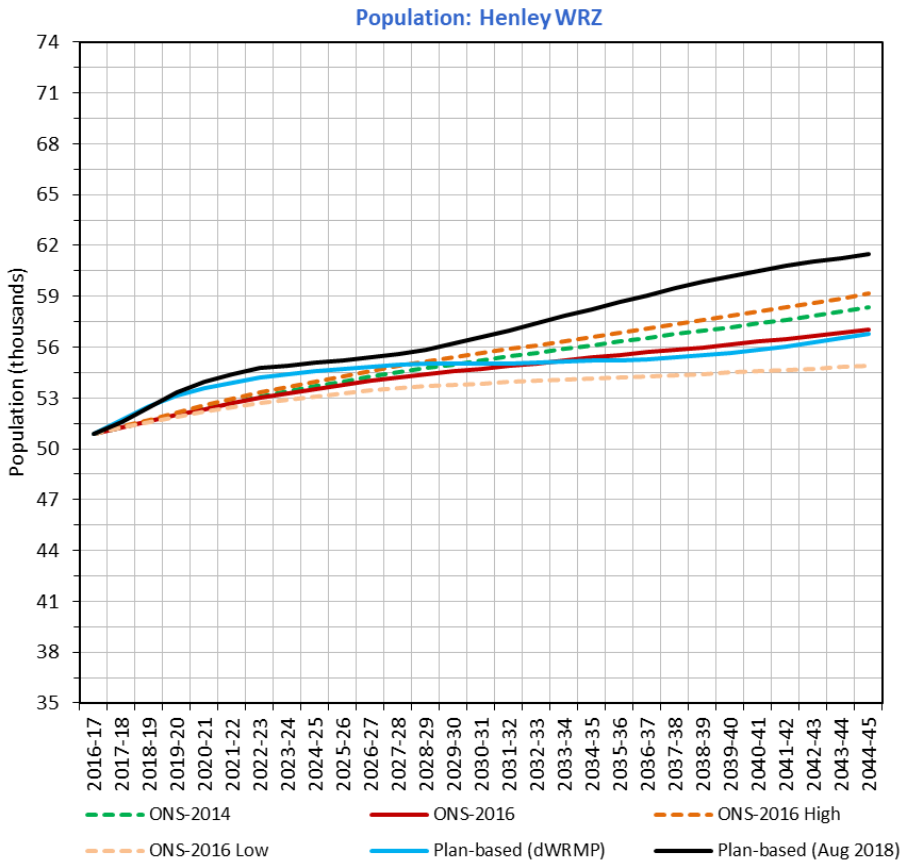
Kennet Valley WRZ



Kennet Valley WRZ	Population			
	2016/17	2044/45	Change	% Change
Plan-based (dWRMP)	401,735	478,241	76,506	19.0%
Plan-based (Aug 2018)	401,735	473,456	71,721	17.9%
ONS-2016 High	401,735	462,978	61,243	15.2%
ONS-2014	401,735	449,032	47,297	11.8%
ONS-2016	401,735	444,228	42,492	10.6%
ONS-2016 Low	401,735	425,776	24,041	6.0%

Figure 40: Population growth comparison: Kennet Valley WRZ

Henley WRZ



Henley WRZ	Population			
	2016/17	2044/45	Change	% Change
Plan-based (Aug 2018)	50,901	61,471	10,570	20.8%
ONS-2016 High	50,901	59,145	8,244	16.2%
ONS-2014	50,901	58,327	7,426	14.6%
ONS-2016	50,901	57,019	6,118	12.0%
Plan-based (dWRMP)	50,901	56,796	5,895	11.6%
ONS-2016 Low	50,901	54,914	4,013	7.9%

Figure 41: Population growth comparison: Henley WRZ

6 Conclusions

Summarising the Evidence

6.1 In responding to the dWRMP representations, updated population and property forecasts have been provided for Thames Water to consider in formulating its final WRMP submission. To enable comparison, all forecasts have been re-based to an October 2016 population and property total that is consistent with the original dWRMP evidence.

6.2 In the new **Plan-based (August 2018)** scenario, population and property growth evidence from the GLA's 2016-based Housing-led projection has replaced the original London Borough forecasts from the **Plan-based (dWRMP)** scenario. Updated Local Plan evidence for non-London districts has provided the basis for a revised housing-led growth scenario in these areas. Plus, the original 'return-to-trend' assumptions that were based on ONS 2014-based evidence and applied to all local authority areas where plan-based evidence was not available, have been replaced with equivalent ONS 2016-based assumptions for the non-London Boroughs.

6.3 For the Thames Water supply area, the latest evidence, presented in the **Plan-based (August 2018)** scenario estimates slightly higher population growth (22.8%) than the previous, **Plan-based (dWRMP)** scenario (21.5%); an additional +120,000 population (Table 5).

Table 23: Plan-based scenarios – population and property forecasts

All WRZs	Population			
	2016/17	2044/45	Change	% Change
dWRMP	9,779,115	11,883,642	2,104,527	21.5%
August 2018	9,779,115	12,003,988	2,224,874	22.8%

All WRZs	Properties			
	2016/17	2044/45	Change	% Change
dWRMP	3,602,900	4,860,480	1,257,580	34.9%
August 2018	3,602,900	4,770,650	1,167,750	32.4%

6.4 This higher population growth is achieved on a lower property growth total; 32.4% in the latest evidence, versus 34.9% in the dWRMP. The **Plan-based (August 2018)** scenario records higher property growth than the **Plan-based (dWRMP)** scenario in the first half of the 2016/17–2044/45 WRMP plan-period, but lower growth thereafter. This trend is a reflection of two key factors:

- Higher property growth totals in the new draft London Plan and in the latest Local Plan statistics for non-London local authorities, both of which relate to the period prior to 2030.
- Lower property growth totals associated with the GLA's Housing-led scenario for London Boroughs post-2030, plus lower property growth totals in non-London local authorities resulting from the dampened 'return-to-trend' assumptions to 2045.

6.5 Population projection evidence from ONS has been considered alongside the **Plan-based (dWRMP)** and **Plan-based (August 2018)** scenarios. For the supply area in total, the **Plan-based (August 2018)** scenario follows a similar trajectory to the **ONS-2014** projection. The **ONS-2016** projection estimates lower overall population growth at just 16.5%, reflecting the lower international migration assumptions and the altered fertility and mortality outlook that are implied by this projection. The **High** and **Low** variants of the **ONS-2016** projection, based on higher and lower international migration assumptions, suggest a growth range of 10.9%–22.1% by 2044/45 (1.1 million–2.2 million additional people), each lower than the **Plan-based (August 2018)** evidence.

6.6 A summary of the **Plan-based (dWRMP)** and **Plan-based (August 2018)** population and property growth outcomes are presented here for the individual WRZs that make up the Thames Water supply area (Table 6, Table 7).

6.7 Population growth in the London WRZ drives the overall profile for the supply area, although its **Plan-based (August 2018)** scenario outcome is lower than the **ONS-High** equivalent, in contrast to all other WRZs.

6.8 In the SWOX and Henley WRZs, the **Plan-based (August 2018)** scenario results in a higher population growth outcome than the **Plan-based (dWRMP)** scenario. Both scenarios produce similar outcomes for the Kennet Valley WRZ, whilst the newer evidence suggests slightly lower growth in the SWA and Guildford WRZs. In all non-London WRZs, the new Plan-based evidence exceeds the growth outcomes of the latest ONS trend scenarios.

Table 24: Plan-based population growth – dWRMP vs August 2018

dWRMP	Population			
	2016/17	2044/45	Change	% Change
Guildford WRZ	160,186	204,205	44,019	27.5%
Henley WRZ	50,901	56,796	5,895	11.6%
Kennet Valley WRZ	401,735	478,241	76,506	19.0%
London WRZ	7,595,624	9,179,714	1,584,089	20.9%
SWA WRZ	548,844	663,353	114,509	20.9%
SWOX WRZ	1,021,824	1,301,332	279,508	27.4%
All WRZs	**9,779,115**	**11,883,642**	**2,104,527**	**21.5%**

August 2018	Population			
	2016/17	2044/45	Change	% Change
Guildford WRZ	160,186	200,952	40,766	25.4%
Henley WRZ	50,901	61,471	10,570	20.8%
Kennet Valley WRZ	401,735	473,456	71,721	17.9%
London WRZ	7,595,624	9,289,686	1,694,062	22.3%
SWA WRZ	548,844	654,035	105,191	19.2%
SWOX WRZ	1,021,824	1,324,389	302,564	29.6%
All WRZs	**9,779,115**	**12,003,988**	**2,224,874**	**22.8%**

Table 25: Plan-based property growth – dWRMP vs August 2018

dWRMP	Properties			
	2016/17	2044/45	Change	% Change
Guildford WRZ	61,637	82,346	20,709	33.6%
Henley WRZ	21,292	24,303	3,011	14.1%
Kennet Valley WRZ	159,064	196,144	37,080	23.3%
London WRZ	2,729,586	3,719,335	989,749	36.3%
SWA WRZ	205,640	266,720	61,080	29.7%
SWOX WRZ	425,681	571,633	145,951	34.3%
All WRZs	**3,602,900**	**4,860,480**	**1,257,580**	**34.9%**

August 2018	Properties			
	2016/17	2044/45	Change	% Change
Guildford WRZ	61,637	82,355	20,718	33.6%
Henley WRZ	21,292	26,804	5,513	25.9%
Kennet Valley WRZ	159,064	199,868	40,804	25.7%
London WRZ	2,729,586	3,606,670	877,083	32.1%
SWA WRZ	205,640	266,201	60,561	29.4%
SWOX WRZ	425,681	588,752	163,071	38.3%
All WRZs	**3,602,900**	**4,770,650**	**1,167,750**	**32.4%**

Recommendations

6.9 In response to dWRMP representations, a range of new evidence has been collected, reviewed and combined to produce an updated **Plan-based (August 2018)** population and property growth forecast for the Thames Water's supply area.

6.10 In submitting the final WRMP, with its demand forecasts underpinned by earlier plan-based evidence, it is recommended that Thames Water gives due consideration to the higher population growth estimated from the latest plan-based information.

6.11 In doing so, it should be recognised that this higher population growth is a result of plans for higher property growth prior to 2030, driven by the new draft London Plan and Local Plan statistics for non-London local authorities; but lower property growth thereafter, driven by the GLA's Housing-led scenario for London Boroughs post-2030, plus lower property growth totals in non-London local authorities resulting from the dampened ONS 'return-to-trend' assumptions to 2045.

6.12 With the renaissance in house building underway and with the UK's exit from the EU still being negotiated, it is recommended that Thames Water continues to monitor its final WRMP to take account of changing evidence on future housing growth and demographic change in its supply area.

Appendix A
Glossary

ABP	Address Based Premium
CPRE	Campaign to Protect Rural England
DCLG	Department for Communities and Local Government
dpa	Dwellings per annum
dWRMP	Draft Water Resources Management Plan
GARD	Group Against Reservoir Development
GLA	Greater London Authority
HMA	Housing Market Area
MYE	Mid-Year Estimate
OA	Output Area
ONS	Office for National Statistics
SHLAA	Strategic Housing Land Availability Assessment
SHMA	Strategic Housing Market Assessment
SNPP	Sub-national Population Projection
TW	Thames Water
WRZ	Water Resource Zone

Appendix B
Housing Growth Data for London Boroughs

B.1 Table 8 provides a comparison of housing growth evidence from the:

- 2016 London Plan;
- 2017 Draft London Plan;
- GLA 2015-based (interim) Housing-led projection;
- GLA 2016-based Housing-led projection;
- August 2017 dWRMP Plan-based scenario.

Table 26: London Borough GLA housing growth evidence (continued on next page)

London Borough	London Plan 2016[1] Annual Target (2015/16–2024/25)	Draft London Plan 2017[2] Annual Target (2019/20–2028/29)	2015-based Housing-led Scenario Assumed Development (per year)[3]			2016-based Housing-led Scenario Assumed Development (per year)[4]			dWRMP Annual Housing Growth Targets[5]		
			2016–2030	2030–2041	2016–2041	2016–2030	2030–2041	2016–2041	2016–2030	2030–2045	2016–2045
City of London	141	146	111	64	90	149	92	124	101	82	91
Barking & Dagenham	1,236	2,264	1,029	1,580	1,271	1,958	2,299	2,108	1,958	1,597	1,771
Barnet	2,349	3,134	2,021	944	1,547	2,683	795	1,852	1,845	2,083	1,968
Bexley	446	1,245	423	225	336	1,140	630	916	557	861	714
Brent	1,525	3,023	1,104	296	748	2,589	1,042	1,908	1,171	1,420	1,300
Bromley	641	1,424	588	421	514	1,139	312	775	708	1,344	1,037
Camden	889	1,086	839	600	734	1,127	816	990	1,106	1,325	1,219
Croydon	1,435	2,949	1,321	1,059	1,205	2,612	1,022	1,913	1,723	1,862	1,795
Ealing	1,297	3,419	1,090	663	902	2,719	774	1,863	2,067	1,823	1,941
Enfield	798	1,876	682	455	582	1,479	334	975	1,010	1,368	1,195
Greenwich	2,685	3,204	2,181	613	1,491	2,707	1,753	2,287	2,638	2,211	2,417
Hackney	1,725	1,492	1,464	1,140	1,321	1,565	860	1,255	1,464	1,140	1,296
Hammersmith & Fulham	1,031	2,295	857	533	714	1,966	1,451	1,740	1,922	926	1,407
Haringey	1,502	1,958	1,115	525	855	1,570	625	1,155	1,411	1,701	1,561
Harrow	593	1,392	516	440	483	1,244	301	829	772	955	867
Havering	1,170	1,875	896	387	672	1,426	328	943	1,142	1,334	1,241
Hillingdon	559	1,553	492	224	374	1,294	206	815	540	1,325	946
Hounslow	822	2,182	769	466	636	1,818	374	1,183	1,139	1,490	1,320
Islington	1,264	775	899	797	854	877	562	738	1,082	1,232	1,160

London Borough	London Plan 2016[1] Annual Target (2015/16–2024/25)	Draft London Plan 2017[2] Annual Target (2019/20–2028/29)	2015-based Housing-led Scenario Assumed Development (per year)[3]			2016-based Housing-led Scenario Assumed Development (per year)[4]			dWRMP Annual Housing Growth Targets[5]		
			2016–2030	2030–2041	2016–2041	2016–2030	2030–2041	2016–2041	2016–2030	2030–2045	2016–2045
Kensington & Chelsea	733	488	651	166	438	534	348	452	794	463	622
Kingston upon Thames	643	1,364	507	398	459	1,099	509	839	601	608	604
Lambeth	1,559	1,589	1,332	1,663	1,477	1,470	758	1,157	1,442	1,505	1,474
Lewisham	1,385	2,117	1,188	629	942	1,883	733	1,377	1,137	1,212	1,176
Merton	411	1,328	379	274	333	1,036	379	747	534	905	726
Newham	3,076	5,335	2,584	881	1,834	4,379	1,502	3,113	3,290	2,766	3,019
Redbridge	1,123	1,979	1,007	519	792	1,547	546	1,107	1,233	1,423	1,332
Richmond upon Thames	315	811	290	236	266	694	223	486	338	838	597
Southwark	2,736	2,554	2,017	1,001	1,570	2,474	1,829	2,190	2,869	1,696	2,263
Sutton	363	939	334	247	296	874	263	605	432	814	629
Tower Hamlets	4,195	4,026	3,147	1,041	2,220	3,943	1,360	2,806	3,550	2,172	2,837
Waltham Forest	862	1,794	779	655	725	1,538	502	1,082	954	1,166	1,063
Wandsworth	1,812	2,310	1,617	821	1,267	2,115	894	1,578	2,040	949	1,476
Westminster	1,068	1,010	878	730	813	1,188	545	905	1,163	1,095	1,128
London	**42,389**	**64,936**	**35,104**	**20,691**	**28,762**	**56,837**	**24,967**	**42,814**	**44,730**	**43,690**	**44,192**

[1] Source: Mayor of London, March 2016. *The London Plan (consolidated with alterations since 2011)*
The London Plan 2016 figures for Hackney, Newham and Tower Hamlets include the London Legacy Development Corporation (LLDC) area targets.

[2] Source: Mayor of London, December 2017. *The London Plan: The spatial development strategy for Greater London (Draft for Public* Consultation)
The Draft London Plan 2017 figures for Hackney, Newham and Tower Hamlets include the LLDC area targets. The targets for Brent, Ealing and Hammersmith & Fulham include the Old Oak and Park Royal Development Corporation (OPDC) area targets.

[3] Source: GLA 2017, *2015-based Projections*
[4] Source: GLA 2017, *2016-based Projections*
The Assumed Development growth figures from the GLA are provided up to 2041.

[5] Note that these figures were used by Edge Analytics in the development of the dWRMP Plan-based forecast in August 2017

Appendix C
Definition of the London WRZ

Non-London Authorities:

- Epping Forest
- Broxbourne
- Dartford
- Sevenoaks
- Elmbridge
- Epsom & Ewell
- Spelthorne
- Tandridge
- East Hertfordshire

London Boroughs:

- City of London
- Barnet
- Bexley
- Brent
- Bromley
- Camden
- Croydon
- Ealing
- Enfield
- Greenwich
- Hackney
- Hammersmith & Fulham
- Haringey
- Hounslow
- Islington
- Kensington & Chelsea
- Kingston upon Thames
- Lambeth
- Lewisham
- Merton
- Newham
- Redbridge
- Richmond upon Thames
- Southwark
- Sutton
- Tower Hamlets
- Waltham Forest
- Wandsworth
- Westminster

Note that the London Boroughs of Barking & Dagenham, Harrow, Havering and Hillingdon are not part of the London WRZ.

Appendix D

Local Plan Status & Housing Trajectory Summaries, August 2018

The following tables provide an indication of Local Plan status for each of the non-London local authorities which form part of Thames Water's supply area. For each local authority, an indication of the source and derivation of the latest (August 2018) housing trajectory is provided.

Whilst not a definitive classification, the Local Plan of each local authority has been allocated to one of six status categories based upon evidence collected.

Emerging	Local Plan in early stages of development
Consultation	Local Plan under development and at a key consultation stage
Submission	Preparation for submission for Examination to the Secretary of State (i.e. soon to be submitted)
Submitted	Submitted for Examination to the Secretary of State
Examination	At Examination, recently at Examination, or Examination soon to commence
Adopted	Local Plan adopted

A total of 31 local authorities are ordered by standard region (East of England, South East and South West).

East of England

District	Local Plan Status		Housing Trajectory	
			Data Source *(publication date)*	**Notes**
Broxbourne	Submitted	Submitted for Examination March 2018, examination due Autumn 2018.	Pre-submission Local Plan *(October 2017)*	Local Plan housing trajectory linked to June 2017 OAN of 454 dpa 2016–2033, with 'return-to-trend' assumptions applied from 2033 onwards.
Dacorum	Emerging	Currently at 'Issues and Options Stage', Call for Sites completed in Winter 2017.	2016/17 AMR *(February 2018)*	Housing trajectory linked to the 2013 Core Strategy requirement of 460 dpa 2006–2031, with 'return-to-trend' assumptions applied from 2031 onwards.
East Hertfordshire	Examination	Council received the Inspector's Final Report and Schedule of Main Modifications on 9th July, following the Examination of the Local Plan. Plan likely to be adopted Autumn 2018.	2016/17 AMR *(no publication date)*	Housing trajectory (projected completions) linked to the SHMA FOAN of 839 dpa 2011–2033, with 'return-to-trend' assumptions applied from 2033 onwards.
Epping Forest	Submission	Submission was delayed by a legal challenge, this has been dismissed, enabling Local Plan to be submitted (as of 29/06/2018).	Local Plan Submission Version *(December 2017)*	Housing trajectory linked to the OAN of 11,400 2011–2033, with 'return-to-trend' assumptions applied from 2033 onwards.

South East

District	Local Plan Status		Housing Trajectory	
			Data Source *(publication date)*	**Notes**
Aylesbury Vale	Examination	Vale of Aylesbury Plan (VALP) at examination July 2018.	Five year housing land supply position statement *(June 2018)*	Housing trajectory linked to the Sept 2017 HEDNA addendum FOAN of 970 dpa 2013–2033. This OAN does not include the unmet need from Wycombe, Chiltern and South Bucks (+8,000), as the Council states that this is a 'policy-on' approach that has not been tested at examination. The presented trajectory does, however, result in a higher level of growth than the OAN (but less than the OAN plus the total unmet need). 'Return-to-trend' assumptions are applied from 2033 onwards.
Basingstoke & Deane	Adopted	Basingstoke and Deane Local Plan (2011 to 2029) adopted 26/05/2016.	2016/17 AMR *(no publication date)*	Housing trajectory linked to adopted Local Plan housing target of 850 dpa 2011–2029. 'Return-to-trend' assumptions are applied from 2029 onwards.
Cherwell	Adopted/ Submitted	Cherwell Local Plan 2011-2031 (Part 1), Readopted Dec 2016 Cherwell Local Plan 2011–2031 (Part1) Partial Review – Oxford's Unmet Housing Need, submitted 05/03/2018.	Housing Land Supply Update *(July 2018)*	Housing trajectory is linked to the Local Plan target of 1,142 dpa (2011–2031). Oxford's unmet need of 4,400 between 2021–2031 has been included, as the Council has submitted its Local Plan Review setting out how they plan to accommodate this. 'Return-to-trend' assumptions are applied from 2031 onwards.
Chiltern	Emerging	Joint Local Plan being prepared with South Bucks for the 2014–2036 plan period.	HEDNA OAN *(June 2017)*	In the absence of a 5-year supply/AMR trajectory, the HEDNA OAN of 333 dpa has been applied up to 2033. Cherwell and South Bucks have a joint unmet need of approximately 5,700, although it is not clear how this is split between the two districts. Aylesbury Vale are planning for a higher number of homes than their OAN suggests (see Aylesbury Vale note above), so it has been considered prudent to use the lower OAN figure of 333 for Chiltern (which is lower than the August 2017 figures). 'Return-to-trend' assumptions are applied from 2033 onwards.

District	Local Plan Status		Housing Trajectory	
			Data Source *(publication date)*	**Notes**
Dartford	Consultation	Strategic Issues Consultation ended 20/07/2018.	2016/17 AMR *(December 2017)*	Projected housing delivery is based on the Core Strategy (2011) target of 'up to' 17,300 homes 2006–2026. Five-year supply figures have been applied up to 2022. Between 2022/23 and 2025/26, it has been assumed that the residual requirement of the Core Strategy target is achieved (1,118 dpa), with the 'return-to-trend' assumptions applied from 2026 onwards.
Elmbridge	Emerging	Strategic Options Consultation ended 24/02/2017, position statement published July 2017. In May 2018, the Council published its response to the NPPF consultation.	2016/17 AMR *(February 2018)*	Housing trajectory is based on the five-year supply (2017/18–2021/22) anticipated completions, which is linked to the SHMA OAN of 474 dpa As no Local Plan target has been set, the 'return-to-trend' assumptions are applied from 2022 onwards.
Epsom & Ewell	Consultation	Issues & Options consultation completed late 2017.	AMR 2016/17 *(no publication date)*	Housing trajectory (total supply) linked to SHMA OAHN figure of 418 dpa (as no Local Plan housing target is currently in place). 'Return-to-trend' assumptions are applied from 2032 onwards.
Guildford	Examination	Examination was held June/July 2018, Council are now at 'main modifications' stage, likely published for consultation in September 2018.	Housing Delivery Topic Paper *(December 2017)*	Housing trajectory linked to SHMA OAHN figure of 654 dpa (2015–2034), with 'return-to-trend' assumptions applied from 2034 onwards.
Mole Valley	Consultation	At the 'Preferred Options' stage. Strategic Options consultation finished September 2017, Call for Sites finished February 2018.	Five Year Housing Land Supply Annual Review April 2018 to 2023 *(no publication date)*	Five year supply (249 dpa 2018/19–2022/23) calculated against both the OAHN and MHCLG housing requirement figures. As the Local Plan is emerging there is no set housing target; therefore, 'return-to-trend' assumptions applied from 2023 onwards.
Oxford	Consultation	Preferred Options Consultation ended August 2017.	2016/17 AMR *(October 2017)*	Housing trajectory (projected completions) linked to target in adopted Local Plan (2006–2026) of 400 dpa. 'Return-to-trend' assumptions are applied from 2026 onwards. Oxford acknowledges that it has an 'unmet need' of 15,000, based on the 2014 Oxfordshire SHMA OAN. The Council anticipates this unmet need will be accommodated by its neighbouring authorities (Cherwell, South Oxfordshire, Vale of White Horse, West Oxfordshire).

District	Local Plan Status		Housing Trajectory	
			Data Source *(publication date)*	**Notes**
Reading UA	Submitted	Submitted for Examination March 2018, Examination due September 2018.	Submission Draft Local Plan *(March 2018)*	Housing trajectory (total projected completions) linked to the Local Plan housing provision target of 671 dpa (2013–2036). 'Return-to-trend' assumptions are applied from 2036 onwards.
Sevenoaks	Consultation	Consultation on Draft Local Plan running until September 2018.	2016/17 AMR *(no publication date)*	Housing trajectory linked to the adopted Core Strategy (2011) target of 165 dpa (2006–2026). 'Return-to-trend' assumptions are applied from 2026 onwards.
Slough UA	Emerging	Preferred Spatial Strategy stage - an interim Sustainability Appraisal of the Emerging Preferred Spatial Strategy was published in February 2018.	2016/17 AMR *(no publication date)*	Housing trajectory linked to Core Strategy (2008) target of 315 dpa to 2016, then an 'interim target' of 550 dpa to 2026, as it is recognised that the Core Strategy target is too low. Until a new housing requirement is determined, the interim target has been used by the Council to calculate its 5-year supply. The 'return-to-trend' assumptions are applied from 2026 onwards.
South Bucks	Emerging	Joint Local Plan being prepared with Chiltern for the 2014–2036 plan period.	2016 Site Allocations	Cherwell and South Bucks have a joint unmet need of approximately 5,700 (to be accommodated by Aylesbury Vale - see note above), although it is not clear how this is split between the two districts. As stated in the 2016/17 AMR, the Council is currently not in a position to publish a Housing Land Supply Trajectory for 2016/17 for South Bucks. The Council's 2016 site allocations (consistent with figures used in August 2017 dWRMP forecast) have been used, with the 'return-to-trend' assumptions applied from 2020 onwards.
South Oxfordshire	Emerging	Emerging – consultation was late 2017, sites being assessed summer 2018.	Housing Land Supply Statement *(April 2018)*	Housing trajectory is linked to the Oxfordshire SHMA OAN mid-point of 775 dpa (2011–2033). The housing trajectory extends to 2023 (as it based on the 5-year supply). It has been assumed that the residual OAN requirement applies from 2023 to 2033, to achieve the OAN mid-point requirement of 17,500 additional homes by 2033. 'Return-to-trend' assumptions are applied from 2033 onwards. Note that this trajectory does **not** include any of Oxford's unmet need, as the Council states that it would not be appropriate to include this in South Oxfordshire's annual requirement until Plan Examination and Adoption.

District	Local Plan Status		Housing Trajectory	
			Data Source *(publication date)*	**Notes**
Spelthorne	Consultation	Issues & Options Consultation ended June 2018.	2016/17 AMR *(November 2017)*	Housing trajectory (projected completions) linked to SHMA OAN of 552 dpa (to 2026). 'Return-to-trend' assumptions are applied from 2026 onwards.
Tandridge	Draft	Submission for examination is planned in winter 2018.	Local Plan Housing Topic Paper *(2018)*	Housing trajectory linked to Local Plan target of 6,125 2013–2033, with 'return-to-trend' assumptions applied from 2033 onwards.
Vale of White Horse	Examination	Local Plan 2031 Pt 1: Strategic Sites and Policies, adopted 14/12/2016 Local Plan 2031 Pt 2: Detailed Policies and Additional Sites, submitted for Examination 23/02/2018, Examination commenced 03/07/2018.	Housing Land Supply Statement *(April 2018)*	Housing trajectory linked to the 2014 Oxfordshire SHMA OAHN (1,138 dpa 2011–2031), with an additional 2,200 homes to meet the unmet need of neighbouring authorities. The housing trajectory extends to 2023 (as it based on the 5-year supply). It has been assumed that the residual OAHN requirement applies from 2023 to 2031, to achieve the OAN requirement of 22,760 (20,560 + 2,200) additional homes by 2031. 'Return-to-trend' assumptions are applied from 2031 onwards.
Waverley	Adopted	Local Plan adopted 20/02/2018.	Waverley Borough Local Plan Part 1: Strategic Policies and Sites *(February 2018)*	Housing trajectory linked to the adopted Local Plan requirement of 590 dpa 2013–2032, which includes an uplift of 83 dpa to account for half of Woking's unmet need. 'Return-to-trend' assumptions are applied from 2032 onwards.
West Berkshire UA	Emerging	The Council published its Local Plan Review Scoping Report in February 2018, beginning the process of reviewing its existing plan and extending it from 2026 to 2036 (adoption anticipated November 2020).	AMR 2016/17 *(March 2018)*	Housing trajectory (projected completions) linked to the Core Strategy (2012) requirement of at least 10,500 homes (525 dpa) between 2006 and 2026. The March 2018 Berkshire SHMA update produced an OAN of 600 dpa (2013–2036) for West Berkshire. The trajectory (to 2026) indicates that the Core Strategy target is met over the plan period and that the allocations will help meet the OAN up to 2023/24. 'Return-to-trend' assumptions are applied from 2026 onwards.

District	Local Plan Status		Housing Trajectory	
			Data Source *(publication date)*	**Notes**
West Oxfordshire	Examination	The examination process of the new Local Plan was resumed in 2017 after being suspended in 2015. The Council is expecting the new plan to be adopted in summer 2018.	West Oxfordshire Local Plan 2031, Schedule of Further Main Modifications *(February 2018)*	Housing trajectory linked to Local Plan requirement of 15,950 (798 dpa 2011–2031). 'Return-to-trend' assumptions are applied from 2031 onwards.
Windsor & Maidenhead UA	Examination	The new Borough Local Plan (BLP) was submitted for examination on 31/01/2018. Stage 1 hearings were held 26–28 June 2018.	Borough Local Plan 2013–2033 Submission version *(January 2018)*	Housing trajectory linked to the Borough Local Plan housing provision target of at least 14,240 new homes between 2013 and 2033. 'Return-to-trend' assumptions are applied from 2033 onwards.
Wokingham UA	Emerging	Update to the adopted Local Plan is in early stages of development.	Five Year Housing Land Supply Statement at 30 November 2017 *(Republished April 2018)*	Housing trajectory linked to an OAN of 894 dpa (2013–2036). The housing trajectory extends to 2022 (as it based on the 5-year supply). It has been assumed that the residual OAHN requirement applies from 2022 to 2036, to achieve the OAN requirement of 20,562 by 2036. 'Return-to-trend' assumptions are applied from 2036 onwards. (A later, March 2018, update to the Berkshire SHMA resulted in an OAN of 801 dpa for Wokingham – as of July 2018, the Council has not updated its housing trajectory to reflect this).
Wycombe	Examination	New Wycombe District Local Plan submitted for examination on 28/03/2018. Examination hearing started on 16/07/2018.	Wycombe Monitoring Report Monitoring, Period 1st April 2015 to 31st March 2017 *(March 2018)*	Housing trajectory linked to the September 2017 HEDNA Addendum OAN of 12,824 2013–2033 (the Council considers this to be appropriate in the interim until a Local Plan target is identified). 2,275 of this is considered to be 'unmet need' and will be accommodated by Aylesbury Vale (see note above). Therefore, the overall housing target for 2013–2033 is 10,925. 'Return-to-trend' assumptions are applied from 2033 onwards.

South West

District	Local Plan Status		Housing Trajectory	
			Data Source *(publication date)*	**Notes**
Cotswold	Examination	The Council received the Inspector's Report on the submitted Cotswold District Local Plan 2011-2031 on 05/06/2018, which concluded that the Plan provides an appropriate basis for the planning of the district provided that the Main Modifications are incorporated.	Housing Land Supply *(June 2018)*	Housing trajectory is linked to Local Plan housing requirement of 8,400 2011–2031 (420 dpa). 'Return-to-trend' assumptions are applied from 2031 onwards.
Swindon UA	Consultation	The Council is in the early stages of the Review of the Swindon Borough Local Plan to extend the plan horizon beyond 2026. Joint Spatial Framework with Wiltshire produced, with consultation carried out late 2017.	Housing Completions Monitoring Report *(April 2017)*	Housing trajectory is linked to the current adopted Local Plan requirement of 22,000, 2011–2026. 'Return-to-trend' assumptions are applied from 2026 onwards.
Wiltshire UA	Consultation	Local Plan Review is underway, to extend Local Plan to 2036. Joint Spatial Framework with Swindon produced, with consultation carried out late 2017.	Housing Land Supply Statement, Base date: April 2017 *(March 2018)*	Housing trajectory linked to the 2015 Core Strategy requirement of 42,000 between 2006 and 2026 (2,100 dpa). 'Return-to-trend' assumptions are applied from 2026 onwards.