

Population, Household and Dwelling Forecasts for WRMP14: Phase 2 Draft Final Report

Affinity Water

June 2013



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Introduction

This report updates the methodology used to produce a range of population and household projections for a group of water companies for WRMP14. This report includes the results from Phase 2 of the project which provides an update of the projections provided to companies in 2012 to include the latest available information, including the Census 2011. This report updates the relevant sections of the approach, results and the most-likely forecast to reflect the changes between Phase 1 and Phase 2.

The projections for Phase 1 and Phase 2 have been produced in accordance with Water Resource Planning Guideline (Joint Regulator, 2012) and the Method of Estimating Population and Household Projections (EA, 2012) report. The companies included in the study include:

- Southern Water
- Thames Water
- Wessex Water
- Sembcorp Bournemouth Water
- Portsmouth Water
- South East Water
- Sutton & East Surrey Water
- Affinity Water (Central, East and South East)
- Welsh Water

Three sets of forecasts have been provided each year in the period 2010/11 to 2039/40 for:

- Total Population;
- Household population;
- Communal population;
- Households;
- Household Occupancy;
- Dwellings

The three sets of forecasts are:

- Plan-based (using information provided by local authorities)
- Trend-based (using the latest information from official statistics)
- Most Likely (Experian's best view on likely outcomes based on information available).

The **first section** of the report presents the methodology used to produce the projections whilst **section 2**, explains the rationale and approach for producing the most-likely forecast.

Section 3 presents the results of the forecasts for Phase 2 and compares them with Phase 1 for each company.

Section 4 provides an explanation of estimates of uncertainty associated with the forecasts for each company.

1 Approach

1.1 Outputs

Three sets of forecasts have been produced:

- Plan-based (using information provided by local authorities)
- Trend-based (using the latest information from official statistics)
- Most Likely (Experian's best view on likely outcomes based on information available).

The forecasts have been produced at Census output area¹ and provided to each company at this detailed level and aggregated to entire (water and sewerage) supply area and Water Resource Zone (WRZ).

1.2 Data sources

A wide array of data has been used to produce the Phase 2 forecasts. The key data inputs for Phase 1 and Phase 2 and their vintage are detailed in the table below. Further details of these sources are provided in Appendix A.

Table 1: Summary of data sources for Phase 1 and Phase 2

Source	Phase 1	Phase 2
Local Plans	Local authority provided planned dwelling data and local authority plans	Local authority provided planned dwelling data and local authority plans
LA population projections	ONS 2010 sub-national population projections – Local Authority	ONS 2011-interim sub-national population projections - Local Authority
National projections	ONS 2010 National population projections, principal and variant projections	
Household projections	DCLG 2008 household projections – Local Authority	DCLG 2011-interim household projections
Mid-year population estimates	ONS indicative mid-year estimates 2006-2010 – Local Authority	ONS revised mid-year estimates 2002-2010 - Local authority
	ONS mid-year estimates 2001-2005 – Local Authority	
Small Area estimates	ONS mid-year estimates 2001-2010 – Lower Super Output Area	Census 2011
	Census 2001	
	Experian Output Area level datasets, 2001-2040	
Property pipeline information	Property Pipeline information supplied by Emap Glenigan (April 2012).	Property Pipeline information supplied by Emap Glenigan (April 2012).

1.3 Methodology

1.3.1 Collecting information for the plan-based projections

The first task was to update the information collected from each of the local authorities from Phase 1 that are covered by the company boundaries (water and sewerage) of the companies involved in this study. This involved confirming with local authorities whether the information provided for phase 1 was still up to date and relevant. For those local authorities that did not respond to the data request in phase 1 a data collection template was sent. Emails were sent to local authorities over a two day period from 12th to 13th March with a request for response by 8th April. Follow up emails were sent in the following days and weeks depending on the responses received.

The contacts list was generated from a combination of water company contacts, Experian contacts and contacts provided by DCLG.

¹ Experian have maintained the use of 2001 Census Output Areas. Further information is contained elsewhere in this document.

Information for London was taken from the London plan:

The London Plan Spatial Development Strategy for Greater London, July 2011

<http://www.london.gov.uk/priorities/planning/londonplan>

Some key points regarding the data collection exercise:

- Where authorities provided data for Phase 1 the relevant contacts were asked to update/ verify the data for Phase 2
- E-mails were targeted to individuals within the local authority where we had named contacts
- E-mails were tailored to each local authority (each e-mail was sent individually) so it was clear which water company we were collecting the information from (particularly important as some local authorities have 3 or more water companies operating in their area).
- Collaborative approach was extremely helpful to local authorities as the potential burden was greatly reduced.
- The data collection exercise will be re-run in full for Phase 2. We expect that data collection rates will be higher for phase 2, as we have developed a relationship with local authorities and more local authorities will have completed their local plans.
- A full log of contact for all local authorities has been produced and provided to the companies.

The table below shows the response rate achieved for each water company for Phase 1 and Phase 2. The response rates for Affinity Water Central improved from 48% for Phase 1 to 70% for Phase 2. For East and South East the response rates remained unchanged.

Table 2: Local authority response rates from Phase 1 and Phase 2 by company

Water company	% of LAUAs responded	
	Phase 1	Phase 2
Sembcorp Bournemouth Water	63%	63%
Portsmouth Water	67%	67%
South East Water	54%	59%
Southern Water	54%	74%
Sutton and East Surrey Water	36%	73%
Thames Water	54%	63%
Affinity Water Central	48%	70%
Affinity Water East	67%	67%
Affinity Water South East	40%	40%
Wessex Water	47%	65%

Where information was not supplied by the local authority directly, it was collected from alternative sources. A hierarchical system was used, with the most recent sources given preference if contact with an authority was not established:

1. Directly from each local authority
2. Directly from County Councils
3. From Local Authority Plans, Core Strategies, Local Development Frameworks or Annual Monitoring Plans – depending on availability and date of publication.

1.3.2 District and household level forecasts

In accordance with EA guidance, the starting point for our output area (OA) level population and household projections is to create a set of district level population and household targets, which are used as control totals for the subsequent OA level work.

1.3.2.1 *Trend-based projections*

The first set of household projections are trend based: they are neither a forecast of what analysts expect to happen nor a statement of policy. The Phase 2 trend based local authority district level population and household targets are based on the ONS 2011-based interim sub-national population projections and the 2011-based interim DCLG household projections. The ONS and DCLG projections only extend to 2021 – they have been extended to 2040 using a simple extrapolation of the last 5 years of the projection.

The DCLG 2011 household projections and ONS 2011-based interim sub-national population projections include results from the Census 2011.

The Phase 1 projections were based on the 2010-based sub-national population projections and the 2008-based DCLG household projections, neither of which included results from the Census 2011.

Trend-based projections are a key input to producing plan-based projections.

Further analysis of the trend based population projections is included in section 3.2.

1.3.2.2 *Local authority plan-based projections*

WRPG states that water companies should take account of local authority plans in their population and household projections. To account for planned future developments, local authority plan household and population projections are constructed. These take information from the local authority data collection exercise discussed in 1.3.1. Here annual dwelling figures from each of the plans from 2011 onwards are converted to households and added on to the base year to produce a plan-based household forecast.

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

The local authority plans cover different periods of time – typically they only extend as far as 2025 but most are shorter. Once the plans finish there is a decision on the likely trajectory of the plan-based projections. Given the wide range of plans (and different statuses of plans) covered by this study, we have applied trend based assumptions to extend the plan-based forecasts. Here we apply the growth in household numbers from the trend-based forecasts to the number of dwellings. This is an option presented in the Environment Agency methodology report.

The Greater London Authority (GLA) produced population and household projections for London boroughs as part of the evidence base for the London Plan. A GLA controlled set of plan-based projections has also been produced as part of this project.

1.3.2.3 *Most-likely projections*

As part of the project specification there is a requirement to produce a most-likely forecast of population and households – which is what Experian think will be the most likely outcome given data available and our expertise.

Experian have revised the methodology used for creating the most-likely projections for Phase 2 in light of recent evidence and data availability. The approach selects the most appropriate population projection for each local authority based on analysis of recent trends. The most-likely household forecast is based on first controlling the plan based household projection to Experian's regional dwelling completions forecast and a second adjustment to account for underlying long-term growth. The approach for the most likely forecast is detailed in section 2.

1.3.3 OA population and household targets

The next task is to drill down below the district level targets to a more refined geographic area. Experian have used Census OAs (e.g. 33UGFY0003) for the analysis of small spatial areas. This is so that information from Census 2011, the key source of data for small area demographics, can be used. Moreover, it facilitates the incorporation of new property developments that are easily coded at OA level. Output areas figures can then be aggregated to the geographical levels required.

Experian have produced the OA projections using the Census 2001 output area boundaries. ONS have made small changes to the output areas for the 2011 Census but have provided a mapping between the 2001 and 2011 boundaries. Experian have used the 2001 boundaries to maintain consistency with Phase 1 and to incorporate Experian's output area forecasts which are currently based on 2001 boundaries. However note that the data includes the Census 2011 results for households, dwellings, household and communal population.

The various stages taken to construct the OA population and household projections are set out below:

1. Age forwards Census 2001 OA residents in households using a cohort survival approach (e.g. the number of 20_24 year olds this year is based on 4/5 times the number of 20_24 year olds in the previous year (i.e. 1/5 move up to the next age group) plus 1/5 times the number of 16_19 year olds the previous year (i.e. 1/5 move up to the 20_24 year olds from the 16-19 age group).
2. Births are estimated by applying district level fertility rates to its constituent OA level population of females aged 15_44. Death and migration rates at OA level are also estimated by applying district level rates.
3. Control the aged forwards OA figures from step 1 to Census 2011 values.
4. Source OA level counts of communal population from Census 2011. The counts are controlled to district level targets post 2011.
5. Calculate household population by subtracting communal population from total population.
6. Estimates of the number of households in each OA are taken from Census 2011 and pushed forward by combining the growth in OA household population (from Stage 5) with changes to average household size in its encompassing district.
7. Calibrate the OA household estimates to align with district level household targets for the trend-based, plan and most-likely. At this stage we have an initial set of household and population projections, 2011-2040, by OA. The methodology that we use to build residential property pipeline information into our demographic forecasts utilizes site level planning application and contract progress data that is sourced from Emap Glenigan. To utilize Emap Glenigans site level planning application and contract progress data in our demographic forecasts we first need to establish the likelihood that each site in the property pipeline has of being "built-out". To do this we use a procedure (developed in consultation) with Emap Glenigans that assigns "build out" probabilities according to the stage that each site has reached in the planning /contracting process and the insight (based on experience) that this information provides regarding the likelihood that the associated scheme will be completed (for more details, see appendix C).
8. All projects are assumed to start and be completed between 2011 and 2023. All developments are aggregated to OA level. This adjustment adds additional local flavour to the household projections by accounting for possible new developments.
9. Overall constraining procedures are applied to the OA household and population projections to ensure that they are consistent with our broader view of population and household projections at the district level for the trend-

based, plan-based and most-likely approach. Not every output area will have housing projects sourced from Emap Glenigans. As a consequence of the LAUAD constraint, those OAs without a new development will see a reduction in housing growth to balance developments elsewhere in the district for the LAUAD target to be achieved.

1.3.4 Bespoke spatial analysis

Experian’s household and population calculations for each of the WRZs areas were carried out using Alteryx and Micromarketer, two spatial analysis programmes. The methodology follows the Environment Agency guidance and ONS postcode best fit approach to producing small area estimates.

Three inputs are fed into the calculations:

- Client supplied WRZ GIS boundaries
- Output Area (OA) boundaries
- Current year population and area (in sq km) for each OA and postcode

The Alteryx programme first identifies which OAs are located entirely within each boundary of a given WRZ. The sum of the total population of all of these OAs can then be derived and will account for the majority of each WRZs total population.

This leaves only areas around the borders of the WRZs for examination, areas which will not contain any complete OAs but will be made up typically of elements of a number OAs (the remainder of the OA falling into another WRZ or falling outside each water companies total area). For each of these OAs we calculate the proportion of cut OA population that is inside each WRZ as a proportion of the full OA population using Census postcode area level data. These rates are kept fixed in the forecast.

The proportions are then applied to the population and households of these OAs to give the population falling inside the given WRZs. For each WRZ these population shares can then be aggregated, and combined with the population calculated from the ‘whole’ OAs we reach a final figure for the WRZs total population.

An example of the Alteryx output is shown below for a small WRZ area in the East of England. The total population for this area is comprised of the sum of the seven OAs that fall entirely within the area boundaries plus the shares of an additional twelve OAs where the area boundary splits the OA boundary. Note that where the Output Area splits the area that the share values can range between 0% and 100%. Where the share is 0% the OA cut population is zero however some of the OA area falls within the area boundary. Where the share is 100%, the OA cut population equals the full population but not necessarily all of the OA area falls within the DMA boundary.

Table 3: Best-fit example

Output Area falls entirely within WRZ

WRZ	OutputArea	CutArea	CutPop	FullArea	FullPop	Share
Example X	00KFNA0015	0.016	276	0.016	276	100%
Example X	00KFNA0021	0.084	334	0.084	334	100%
Example X	00KFNA0023	0.017	298	0.017	298	100%
Example X	00KFNA0028	0.028	272	0.028	272	100%
Example X	00KFNA0030	0.020	305	0.020	305	100%
Example X	00KFNA0031	0.043	254	0.043	254	100%
Example X	00KFNA0032	0.022	186	0.022	186	100%

Output Area splits WRZ

WRZ	OutputArea	CutArea	CutPop	FullArea	FullPop	Share
Example X	00KFNA0006	0.313	266	0.316	266	100%
Example X	00KFNA0007	0.033	284	0.092	318	89%
Example X	00KFNA0012	0.008	0	0.031	213	0%

Example X	00KFNA0014	0.018	294	0.020	294	100%
Example X	00KFNA0017	0.018	293	0.028	293	100%
Example X	00KFNA0018	0.009	0	0.028	264	0%
Example X	00KFNA0022	0.020	300	0.023	300	100%
Example X	00KFNA0026	0.016	98	0.059	323	30%
Example X	00KFNA0029	0.030	85	0.044	250	34%
Example X	00KFNG0009	0.135	62	0.253	304	20%
Example X	22ULGD0005	0.045	47	0.273	327	14%
Example X	22ULGD0006	0.117	0	0.425	331	0%

2 Deriving a most-likely forecast

2.1 Background

The most-likely forecast is what we think is the most likely outcome for population and households based on our expertise and the latest information available. It was decided to review the methodology used to derive the most-likely forecast for Phase 1 in light of recent evidence of growth. This section presents the drivers, rationale and approach for the Phase 2 most likely forecast. The following drivers are considered:

1. Population trends
2. Trends in household occupancy
3. Dwelling completions

2.2 Population trends

For Phase 1 we found little evidence of population coming off trend and therefore decided that the ONS trend-based projections would be the most likely outcome for population growth at local authority level. The most-likely population projections were therefore the same as the trend-based projections for Phase 1. The release of the Census 2011 confirmed that ONS was underestimating population growth, with almost 500,000 additional people found in 2011 compared with previous estimates for the same year in England and Wales. However, this effect was not uniform across local authorities as shown in the table below. For example, the Census found that population in City of London population was 51% lower than previously estimated and the population of Isles of Scilly was 14.7% higher than previously estimated. From a regional perspective, the Census 2011 found that the population in London was 1.3% higher than estimated; in the South East it was 1% higher and 0.6% higher in the East of England. In Wales the population was 1.2% higher than previously estimated whilst in the South West, the Census 2011 is only 0.1% higher than previously estimated.

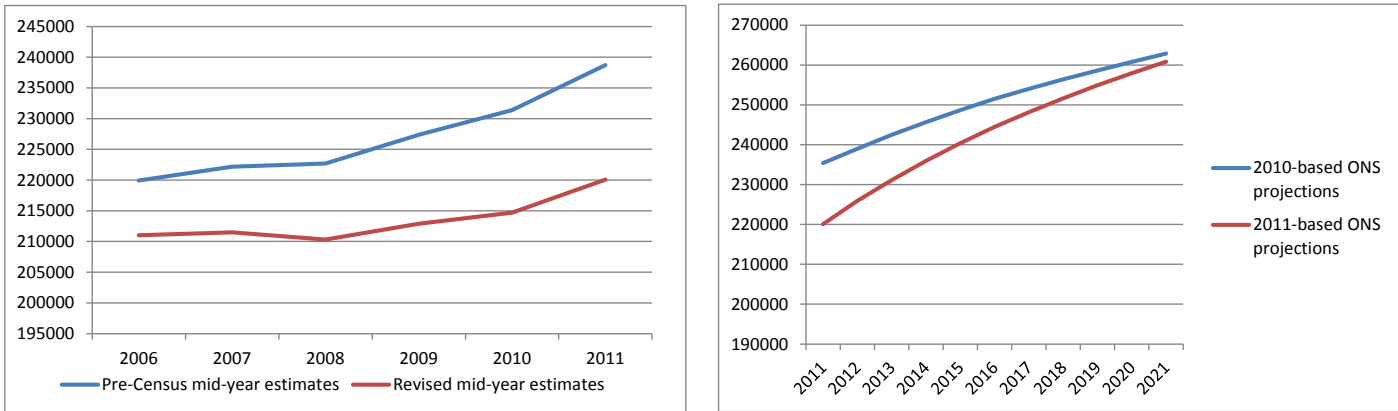
Table 4: Top 10 and bottom 10 differences between mid-year population estimates (MYE) and the Census 2011 based MYE

Top 10	Area	% difference (% of Census MYE 2011)	Difference (MYE - Census based MYE)	Bottom 10	Area	% difference (% of Census MYE 2011)	Difference (MYE - Census based MYE)
1	City of London	51%	3751	1	Isles of Scilly UA	-14.7%	-327
2	Westminster	12%	26877	2	Cambridge	-13.2%	-16237
3	Camden	8%	18626	3	Brent	-11.1%	-34783
4	Kingston upon Thames	8%	13476	4	Newham	-9.3%	-28794
5	Tendring	7%	10218	5	Waltham Forest	-8.6%	-22266
6	Runnymede	7%	5664	6	Watford	-8.0%	-7255
7	Welwyn Hatfield	7%	7582	7	Hackney	-7.9%	-19616
8	Oadby and Wigston	6%	3622	8	Leicester UA	-7.8%	-25639
9	Wokingham UA	6%	9018	9	Greenwich	-7.7%	-19735
10	Merton	6%	11421	10	Bournemouth UA	-7.4%	-13667

Since the release of the 2011 Census, ONS has published updated population projections which have been used to produce the Phase 2 trend-based projections. However ONS have created the 2011-based sub-national population projections by applying assumptions from the 2010-based projections to the 2011 Census results. The assumptions for the 2010-based projections were based on trends taken from the mid-year estimates prior to the release of the Census 2011. This approach has implications in some areas – particularly in areas where the Census 2011 results are significantly different to the previous mid-year estimates.

Figure 1a below demonstrates the issue for Camden in London, where the Census 2011 found that the population was 8.5% lower than previously estimated. The revised mid-year estimates show a shallower growth profile for the 5 year period that is used to inform trend-based growth projections. Figure 1b shows that when the assumptions from the 2010-based projections are applied to the 2011 Census point for Camden that growth is stronger than under the 2010-based projections and the growth profile compared with the mid-year estimates looks too strong. The opposite effect also occurs in areas where ONS underestimated the population and resulting projections will typically look too weak.

Figure 1a and 1b: Revised mid-year population estimates and the interim population projections, Camden

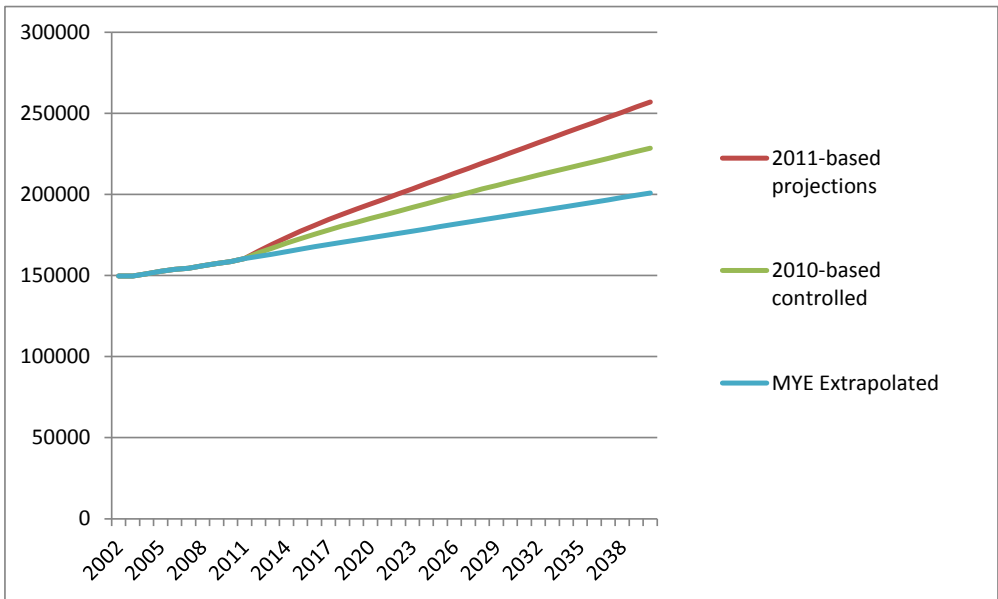


For the reasons outlined above Experian has selected the most likely projection for each local authority from the following set of projections:

- 2010-based sub-national projections (controlled to Census 2011)
- 2011-based interim sub-national projection
- Extrapolation of 2002-2011 revised mid-year estimates.

An example of these alternative projections is shown in figure 2 below for Kingston-upon-Thames. For this example, we have chosen the MYE extrapolated projection for the most-likely population forecast, since the 2011-based and 2010-based projections appear too strong given the trend between 2001 and 2011.

Figure 2: Alternative trend-based projections for Kingston-upon-Thames

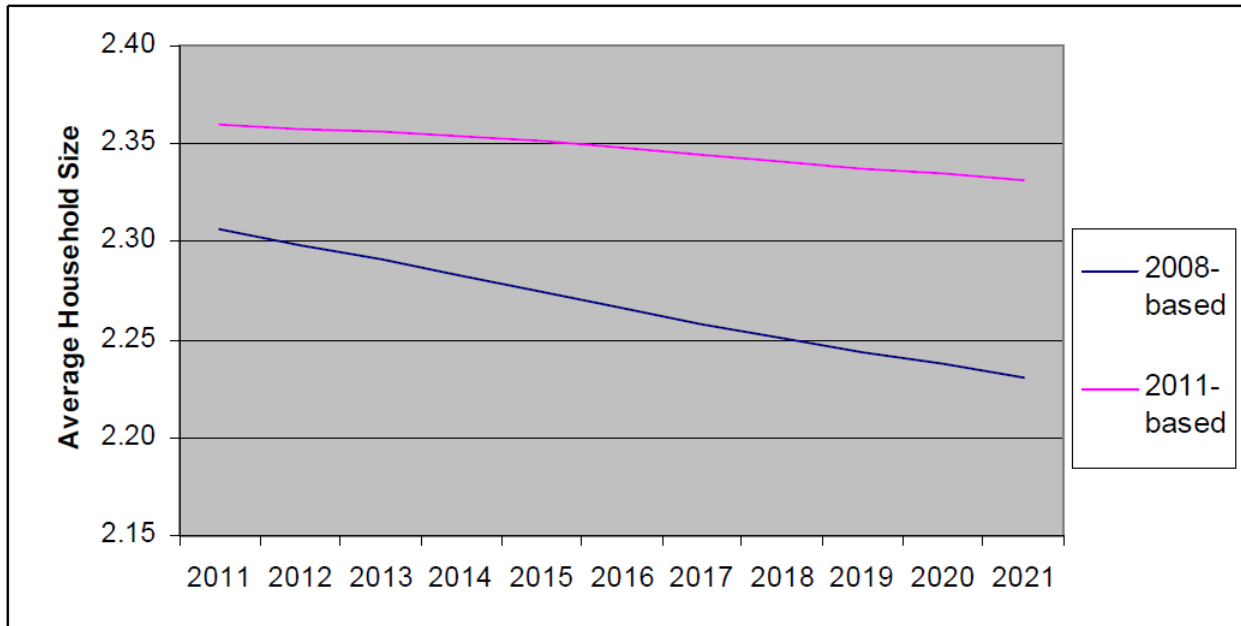


Further analysis of population growth is available in the Phase 1 report.

2.3 Trends in household occupancy

The results from the Census 2011 showed that household occupancy did not decline as rapidly as previously projected by previous official household projections. Results from the Census 2011 showed that in some areas – most notably in London – occupancy actually increased between 2001 and 2011. Figure 3 shows that the latest DCLG household projections capture the slowed decline in occupancy rates – although as these are long-term projections they do not capture short-term deviations to trend that may occur as a result of economic and policy changes.

Figure 3: Comparison between occupancy (average household size) projections from the 2008 and 2011 DCLG household projections

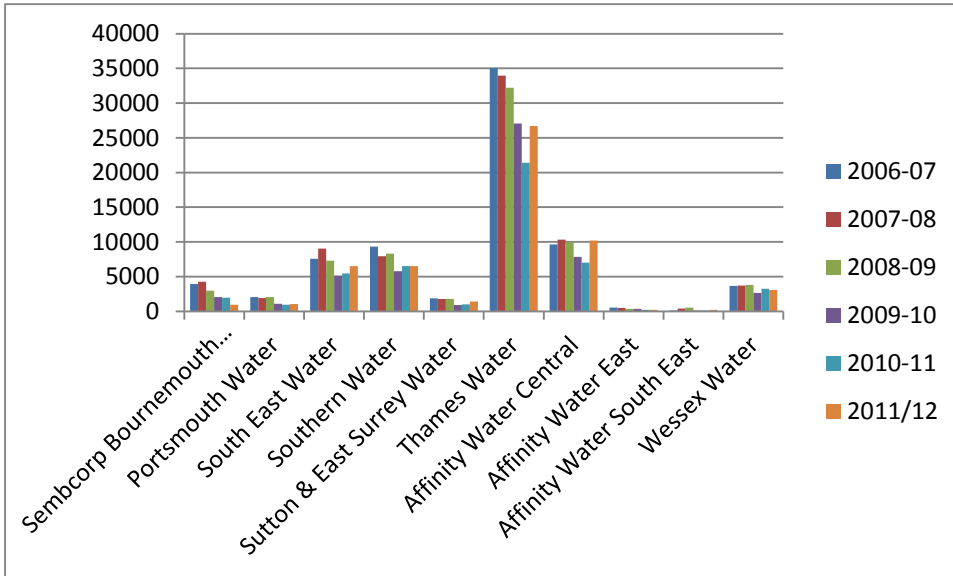


For Phase 1 our analysis looked at estimated changes in occupancy and under the most-likely forecast we derived adjustments to trend-based occupancy forecasts to account for the economic slowdown and drive our household forecast. In section 2.4 we find that the plan-based forecasts are much closer to our expectations of future growth than under Phase 1 and therefore are a good basis for use for the most-likely forecast rather than modelling occupancy directly. Changes to occupancy will be derived under the most-likely forecast when household population is divided by the number of households.

2.4 Dwelling completions

As a result of the weak economic conditions, dwelling completions have slowed at national level and these trends have also been prevalent in each water company area as shown in figure 4 below. In the Affinity Water Central area the decline in dwelling completions was notable falling from around 10,000 between 2006 and 2009 to around 7,000 between 2009 and 2011. However 2011/12 showed completions returning to 10,000 showing signs of recovery in the region. The other Affinity Water areas experienced a dramatic decline – completions in East in 2010-2012 were just 54% of levels seen previously, whilst the figure was just 36% in South East.

Fig 4: Net additions to dwelling stock by water company area



The plan-based forecasts produced for this project take dwelling targets from each of the local authority local plans.

For the targets in the plans to be achieved there will need to be an improvement in the volume of house building – which we expect to begin to come on stream in 2014. Figure 5 shows the annual dwelling targets for each of the water companies – figure 6 represents these targets relative to the levels delivered on average between 2004 and 2008 and 2009-2012. For Affinity Water Central the plans require annual build of around 10,000 dwellings per annum which is much higher (124%) than recent trends but in line with levels achieved between 2004 and 2012. The plan-based target then appears realistic but is still challenging given market conditions. The targets for East and South East are high relative to completion rates in the last two years, however they are also in line with pre-recession build rates.

Fig 5: Annual dwelling targets 2013-2018

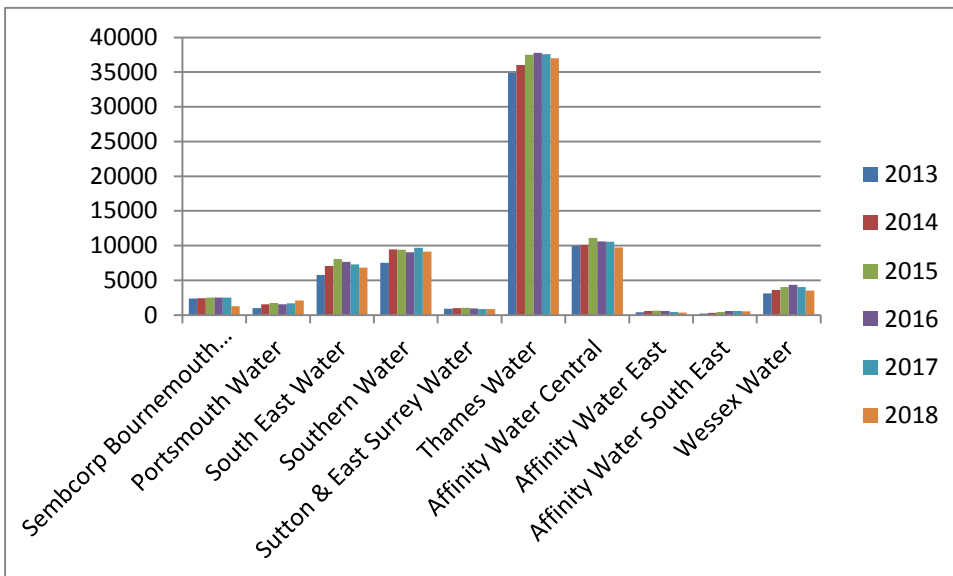
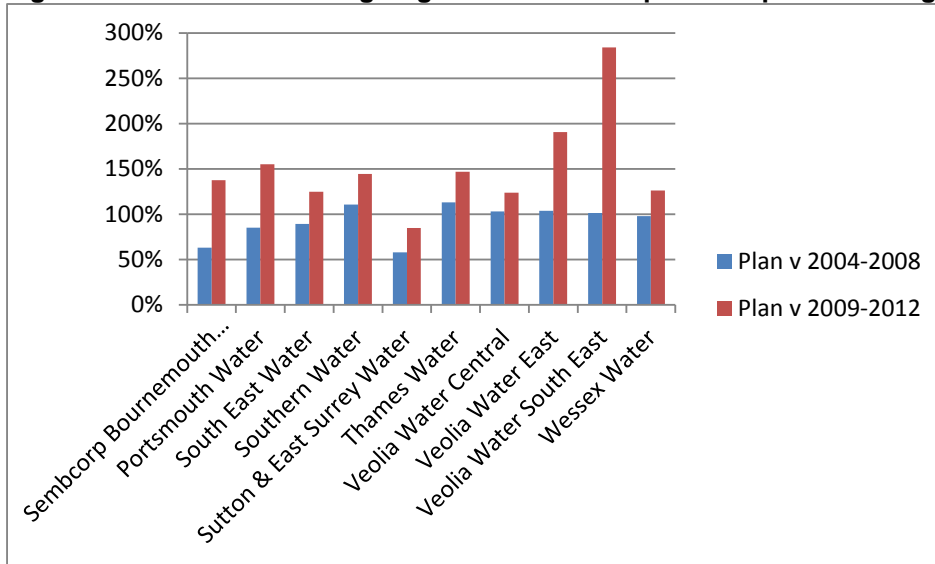
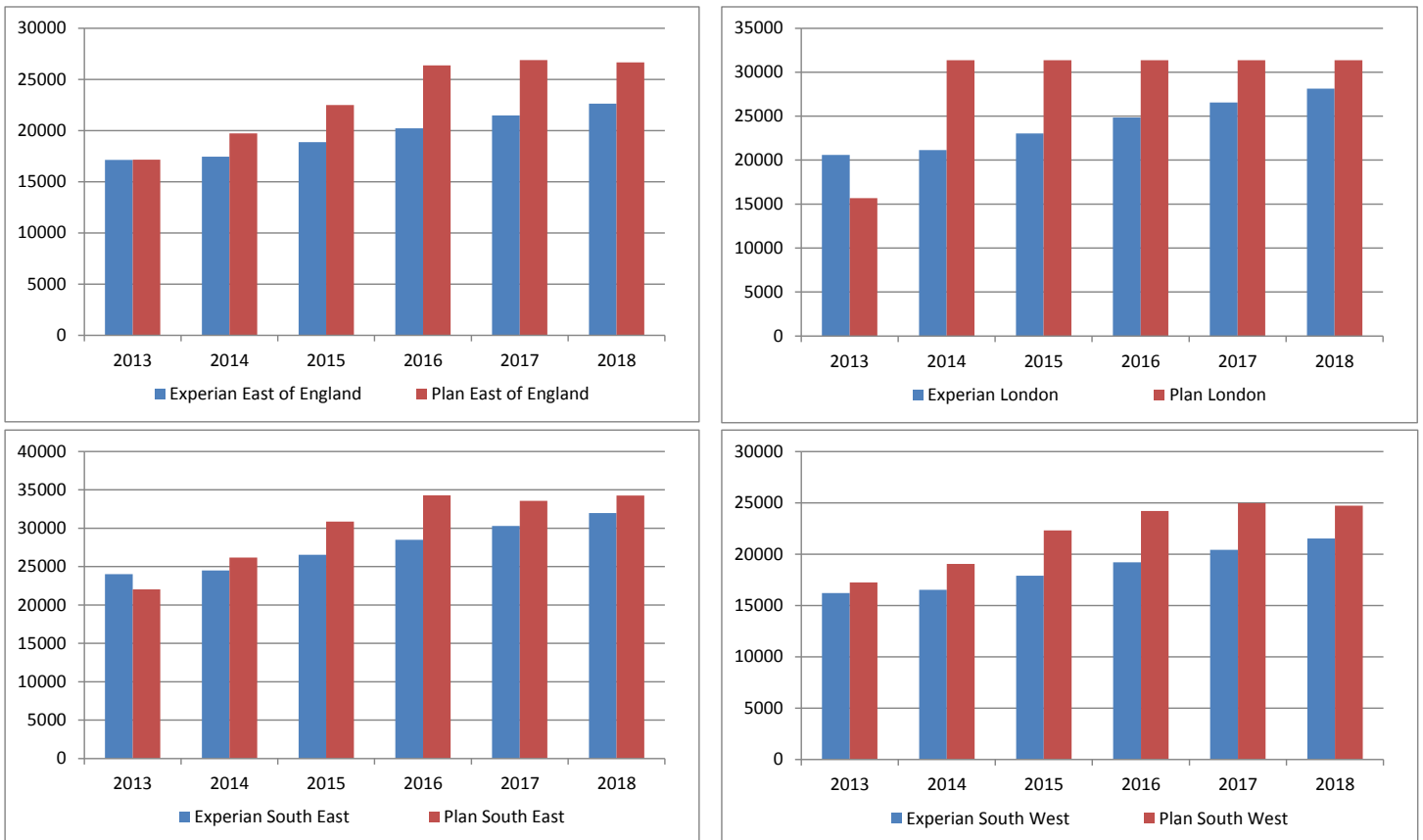


Fig 6: Future annual dwelling targets % relative to previous period average annual housing delivery



Experian’s dwelling completion forecasts by region suggest that the plan based forecasts will not be achieved in the short-run as the market remains weak as shown in figure 7.

Fig 7: Future planned dwellings and Experian dwelling completions forecasts by region



2.5 Most-likely forecast - approach

The most-likely forecast has been created using a three stage process:

1. Select the most-likely trend-based population projection
2. Control the plan-based household forecasts for each local authority to Experian's regional household completions forecast
3. Adjust the controlled forecast to the difference between the plan and trend based projection in the medium to long term.

The first step ensures that the number of households forecast is in line with our forecasts of new dwellings produced by Experian's construction futures team. This forecast considers economic conditions and other factors facing house builders over the short to medium term before assuming a trend.

The second step ensures that the most-likely forecast considers not only what local authorities are planning for but also underlying trends that may be above or below what is being planned for in the medium to long-run. Most local authority plans do not cover the entire WRMP period and many assume slower growth in the long-term, whilst at the same time population trends suggest many more houses will need to be built than are currently planned for. The most-likely therefore seeks to find a compromise between the two in the long-run.

3 Phase 2 Results

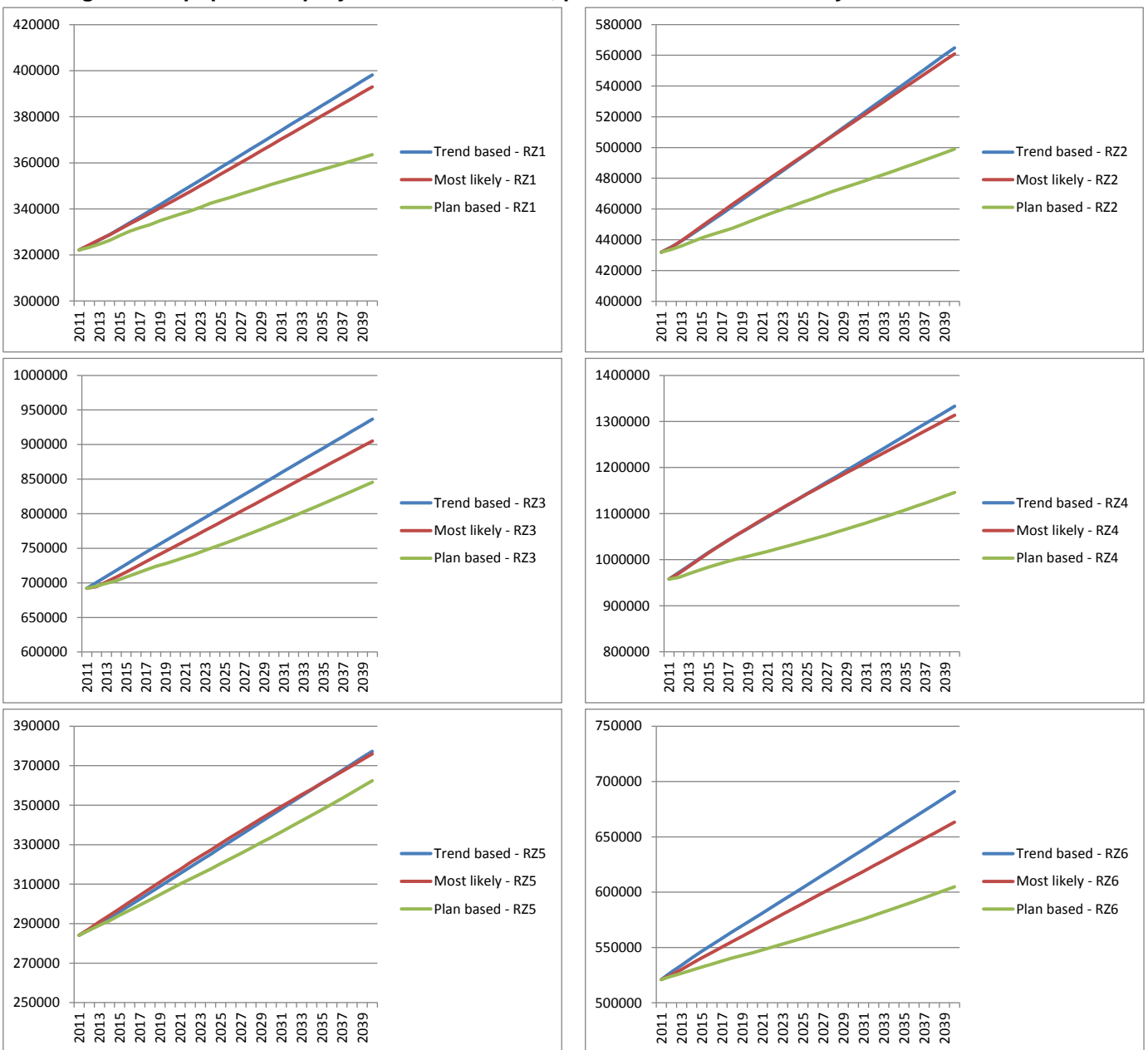
The Phase 2 results have been provided to each of the companies via Experian’s FTP site. Results have been provided at output area level and aggregated to water resource zone level for each company taking part in the study. In this section we present the results and compare the plan, trend and most likely forecasts. We also explore how the forecasts differ to those provided for Phase 1. Analysis of the projections used for PR09 and the impact of the economic downturn is available in the Phase 1 report.

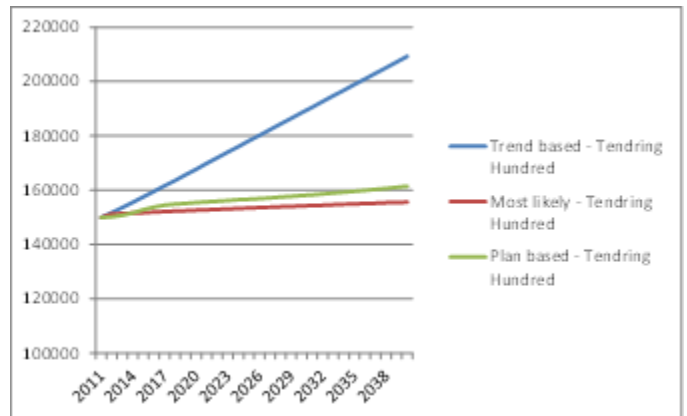
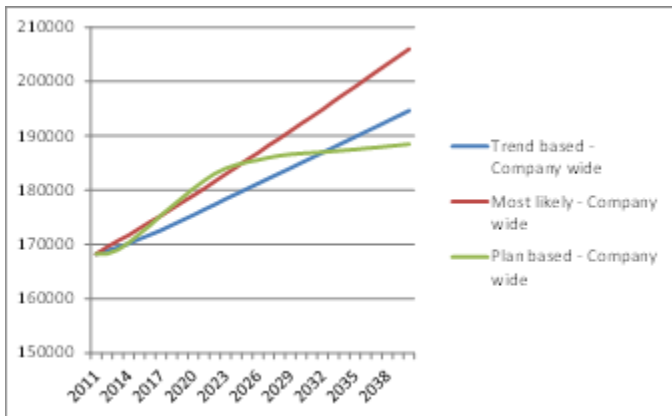
3.1.1 Affinity Water population projections

Affinity Water Central has 6 water resource zones, numbered 1 to 6. Affinity East has one WRZ: Tendring Hundred. Information for Affinity South East is presented at company wide level.

Figure 8 presents the trend-based, plan-based and most likely forecasts for each WRZ.

Fig 8: WRZ population projections under trend, plan based and most-likely forecasts





The trend-based projections are higher than the most-likely forecasts for all Affinity Central WRZs with the exception of RZ5 where the most-likely forecast is slightly stronger in the short to medium term. At the company level, the difference is equivalent to 89,000 people by 2040. The most notable differences between trend and most-likely are in RZ3 and RZ6. These differences indicate where alternative projections have been chosen for districts covered by these areas – projections that we believe are more likely than the ONS 2011-based projection.

The plan-based population projections are the weakest variant across all Affinity Central WRZs. At the company level the difference is equivalent to 480,000 people.

The plan-based projection for Affinity South East is stronger than trend out to 2021, after which the rate of growth slows below trend. The most-likely forecast for South East is actually the strongest forecast in the long-run, indicating the strength of recent population which was not captured in the ONS 2011-based population projections.

Conversely for Tendring Hundred, the most-likely forecast is the weakest population forecast, indicating slow population growth between 2002 and 2011 that has not been factored properly into the ONS trend-based projections. The ONS trend based projection is very strong and appears unrealistic given recent trends.

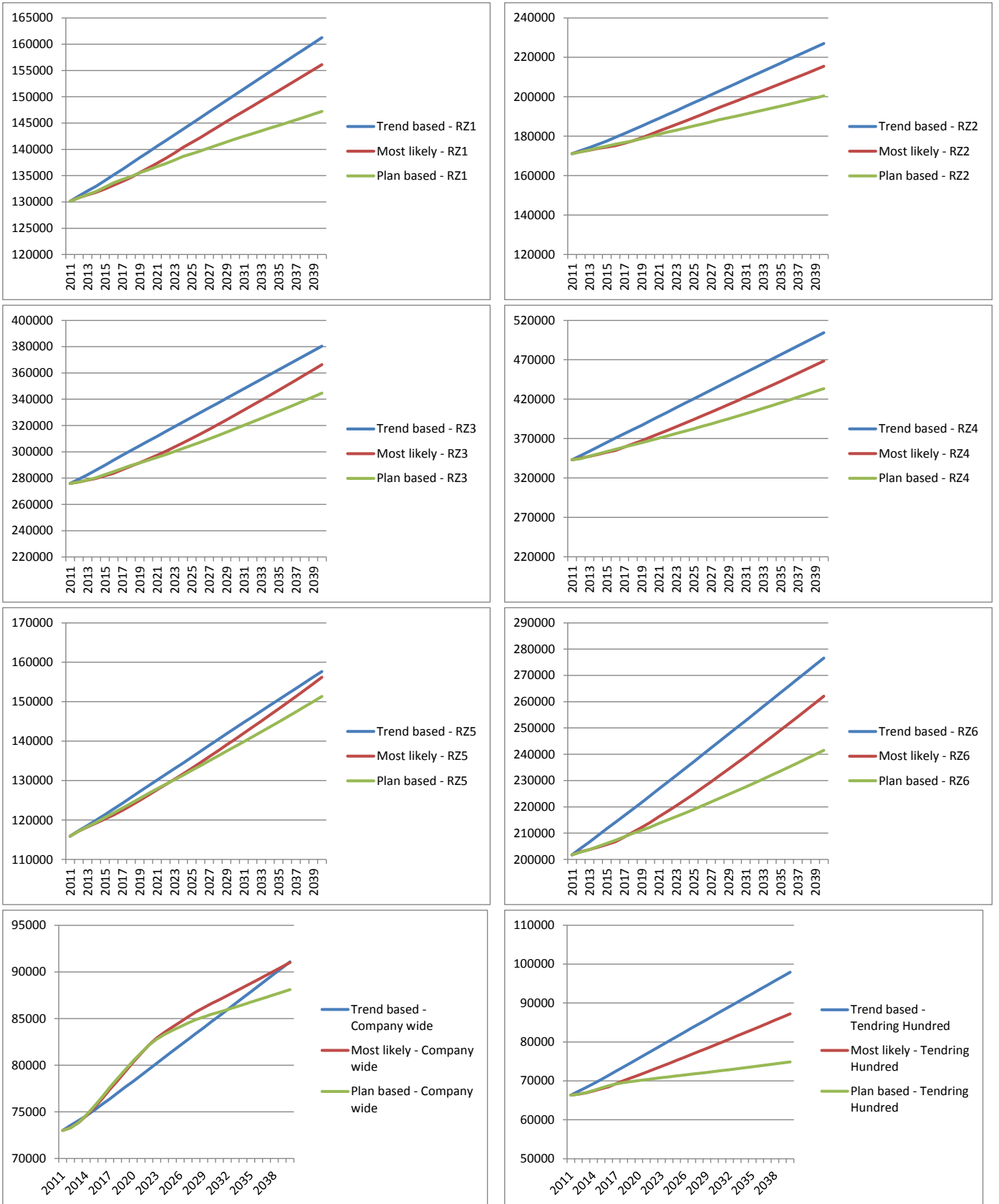
3.1.2 Affinity Water household projections

The trend based household projections for Affinity Central Water area are stronger than both the most-likely and plan-based household forecasts across all WRZ areas. The most-likely forecasts are 5% lower than the trend-based projections by 2040 – equivalent to 83,000 households, whilst the plan-based forecasts are 11% lower than trend by 2040 – equivalent to 189,000 households. Figure 9 demonstrates that the most-likely forecasts are generally slightly weaker than plan in the short-run but stronger in the long-term as the approach considers the long-term impact of strong population growth. The most-likely forecast will tend to sit between trend and plan by the end of the forecast period. The gap between the most-likely forecast and trend is smallest in RZ5.

For the South East the plan-based profile exhibits strong growth – due to local authority plans – until the mid-2020s, after this period growth slows. The most-likely forecast has a stronger rate of growth than plan in the longer term, meaning that the outturn in household numbers under most-likely is comparable to trend by 2040.

In Tendring Hundred the most-likely forecast sits between plan and trend.

Fig 9: WRZ household projections under, plan based and most-likely forecasts



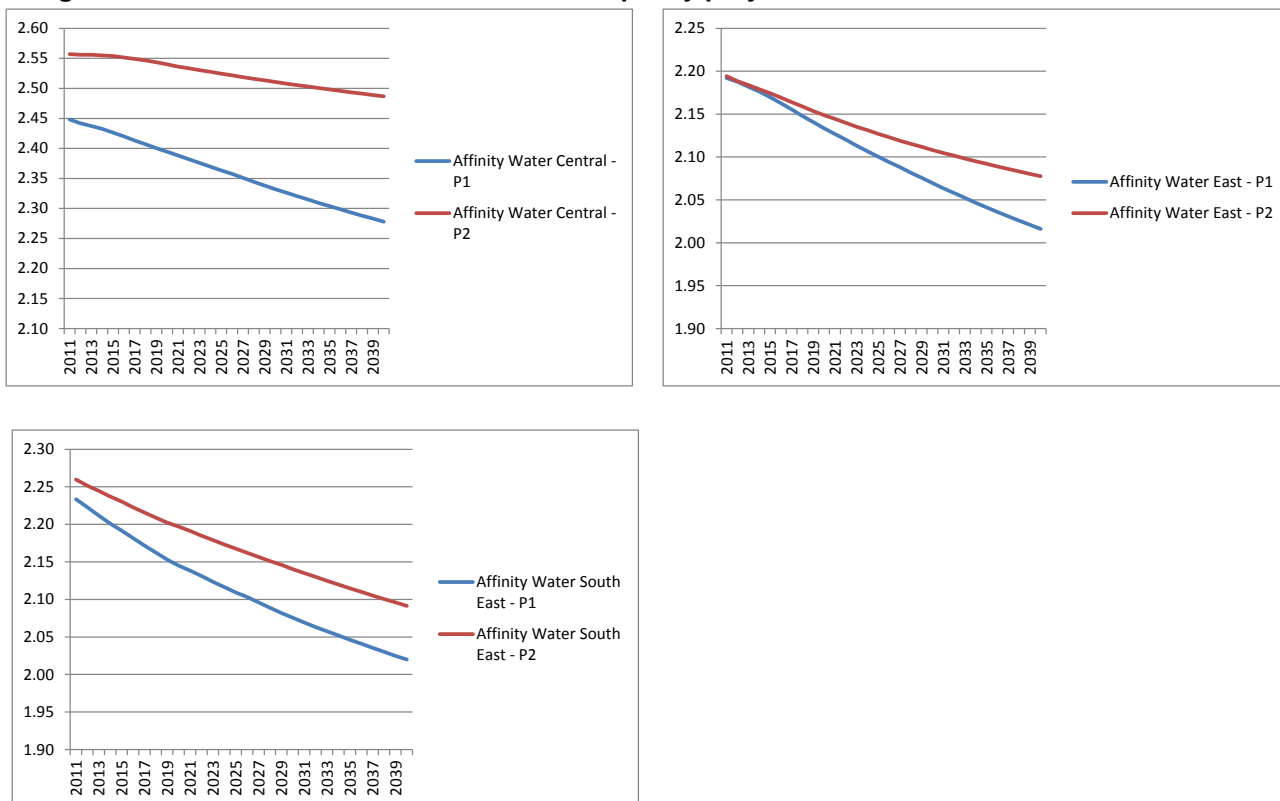
3.1.3 Comparison with Phase 1 projections

Figure 10 shows the change in occupancy projections between Phase 1 and Phase 2. The first chart shows that at over 2.55, occupancy in Affinity Water Central was much higher in the Census 2011 than 2.45 people per

household estimated in Phase 1. The trend-based projection is for a slower decline in household occupancy between 2011 and 2040. A similar relationship is found in South East where the occupancy rate was higher in 2011 than estimated in Phase 1 and is expected to decline at a slower rate than previously projected. For Affinity Water East, the chart shows that the occupancy rate in the Census was the same as previously estimated, however occupancy is forecast to decline at a slower rate than under Phase 1.

The trend-based occupancy projection is applied to the plan-based household projections to produce plan-based population projections.

Fig 10: Phase 1 and Phase 2 trend-based occupancy projections



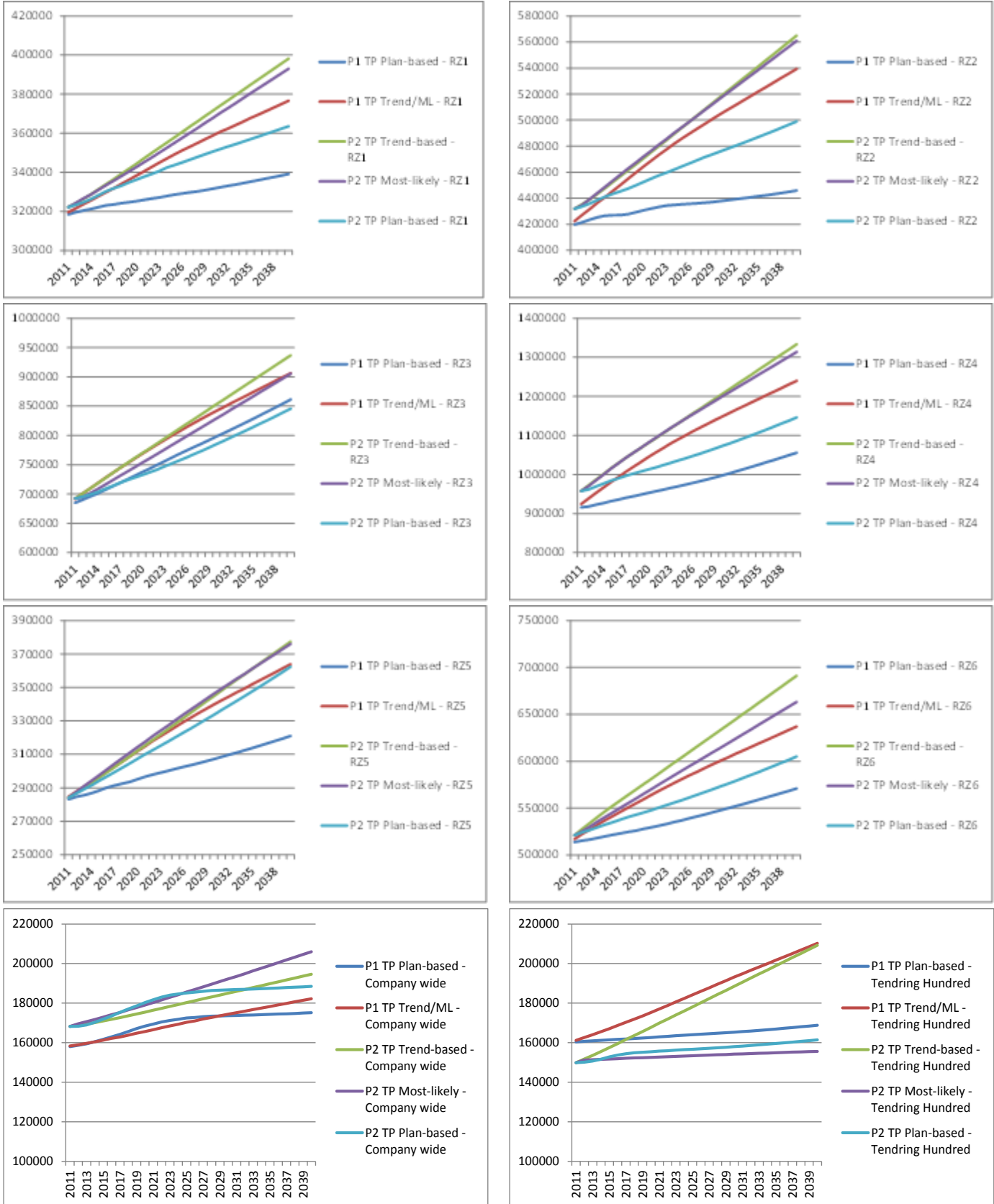
The Phase 1 projections did not include the Census 2011. The population in 2011 was around 81,000 higher in the Affinity Water Central company area than estimated in Phase 1. This is because more people were found in the 2011 Census in the area than previously estimated by ONS. Similarly 10,500 more people were identified by the Census in South East yet Phase 1 overestimated the number of people, by 9,800, in Affinity East.

For Affinity Central population projections for Phase 2 are stronger than for Phase 1 across all variants. By 2039/40, the Phase 2 trend-based population projection is around 268,000 higher than for Phase 1. The plan-based forecast reflects the slower decline in occupancy in the forecasts leading to stronger population growth under the Phase 2 plan-based forecast than Phase 1 – equivalent to around 248,000 people at the end of the forecast period. The most-likely forecast for Phase 2 is also stronger and is around 179,000 higher by 2039/40 than for Phase 1.

The rise in population growth stems from the ONS 2011-based population projections which are stronger for the local authorities covering the company area than for Phase 1. This is due to the higher starting point from the Census and the ONS trend-based population growth assumptions for each local authority.

The story is similar for South East whilst in Tendring Hundred the growth trajectories under Phase 2 mirror those from Phase 1 – only the starting point is different.

Fig 11: Comparing population projections for Phase 1 and Phase 2



The Phase 2 household projections show that unlike population the Census 2011 found around 21,000 fewer households than estimated for Phase 1 in the Affinity Central area.

At Central company level the Phase 2 trend-based household forecasts are weaker than Phase 1, whilst the plan and most-likely forecasts are slightly stronger. The weaker trend-based growth can be explained by the change in the occupancy forecast which is large enough to offset the increased population growth under Phase 2. Changes to the plan-based forecast represent changes to local authority plans and information provided by authorities to Experian. In many cases the profile for the plan-based projections is very similar between Phase 1 and Phase 2 with differences in levels due to the inclusion of the Census data in 2011.

At WRZ level the most notable shifts between Phase 1 and Phase 2 are as follows:

RZ1 – the Phase 1 and Phase 2 plan-based household projections are extremely similar. Most-likely is lower than Phase 1 as a result of the new methodology which is more closely aligned to plans in the short-term but factors in trend-based growth in the long-term.

RZ2 – the Phase 2 plan-based forecast has a stronger growth profile than for Phase 1 as a result of changes to local authority dwelling targets. The trend-based forecast for the area is weaker under Phase 2 than Phase 1.

RZ3 – the Phase 2 plan-based forecast is weaker for Phase 2 than Phase 1 reflecting changes in local authority plans. It could be that existing plans have been updated, or new plans have been produced. Also different information may have been provided to Experian.

RZ4 – The Phase 1 and Phase 2 plan-based forecasts only differ due to the different starting point in 2011 – the growth profile remains the same. The most-likely forecast is weaker under Phase 2 reflecting the change in methodology.

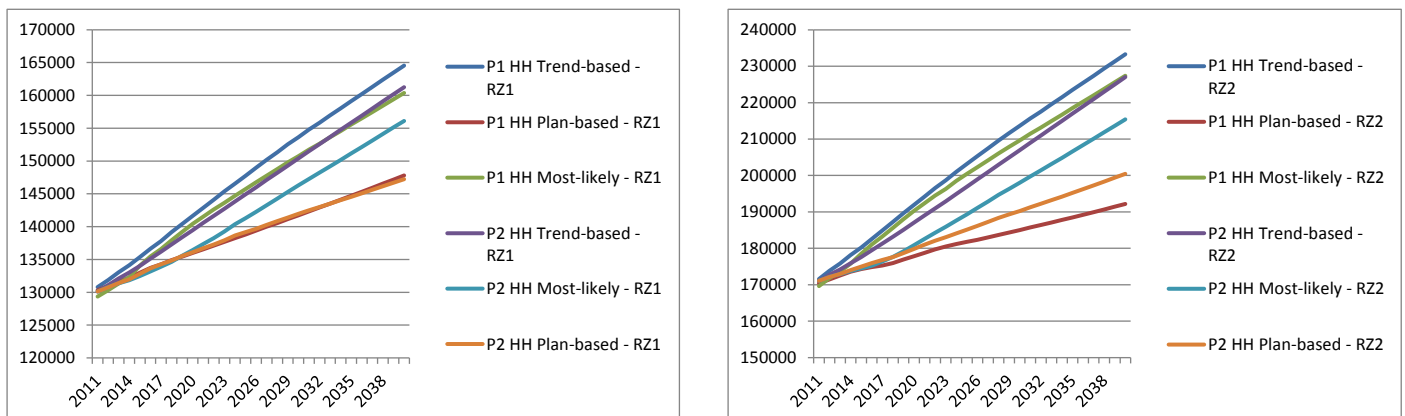
RZ5 – the plan-based forecast for Phase 2 is stronger than Phase 1 as a result of changes to local authority plans that cover the area.

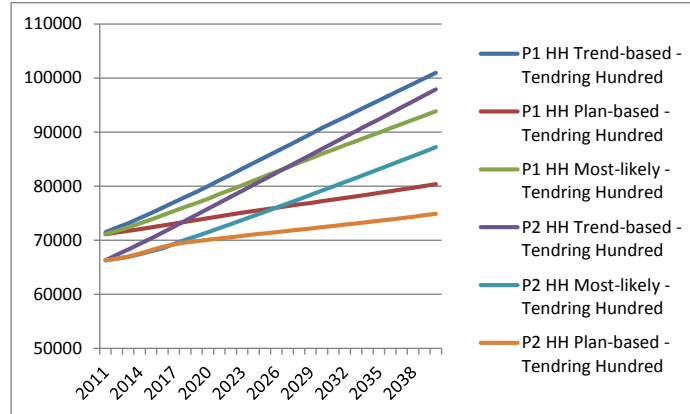
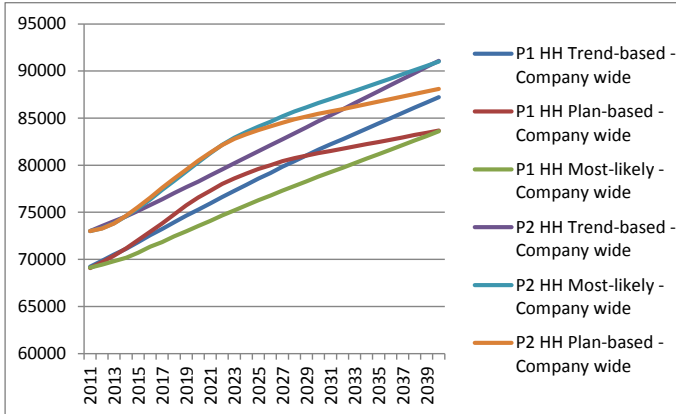
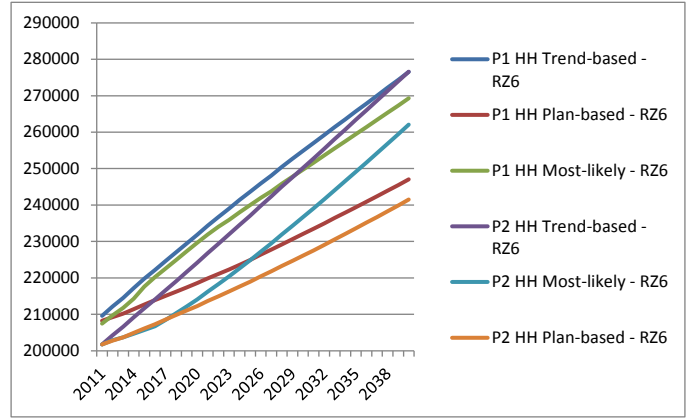
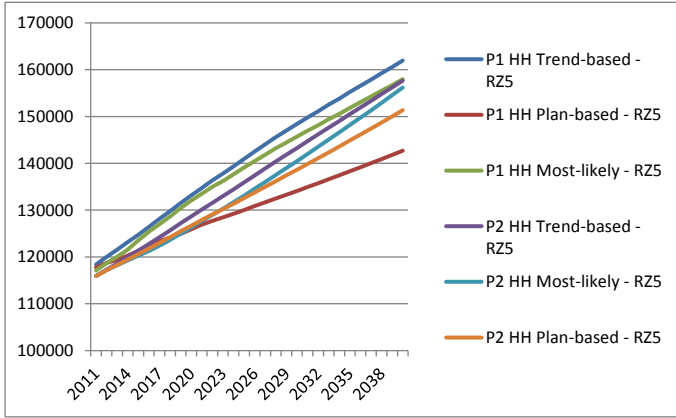
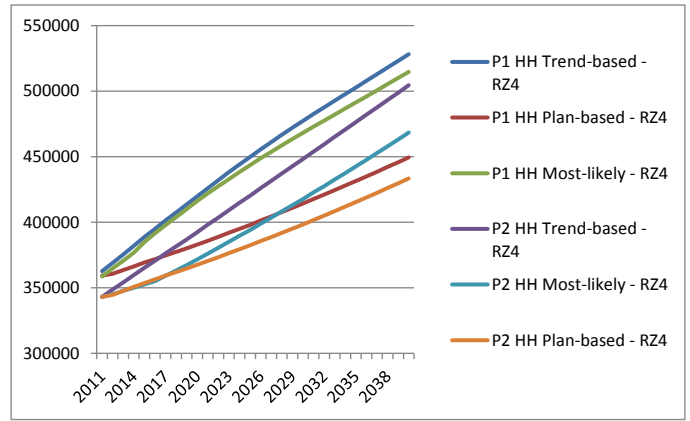
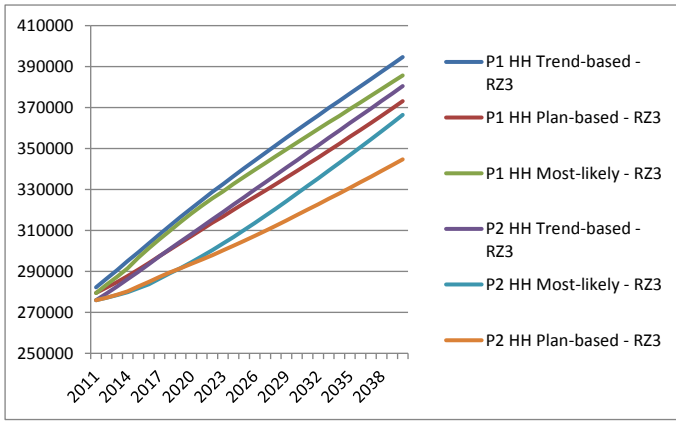
RZ6 – the plan-based forecasts have a similar profile under Phase 1 and Phase 2 indicating no major changes to local authority plan information. The difference in levels is mainly due to the different starting point in 2011.

South East – the forecasts across all variants follow a very similar trajectory with differences in levels due to the different starting point in 2011 where the Census 2011 found around 4,000 additional household compared with Phase 1.

Tending Hundred – the profile of the plan-based household forecast is changed slightly indicating minor changes in the local authority plan information. Again the differences to levels are mainly due to the inclusion of the Census data in 2011 where the Census found that there were around 3,000 fewer households in the area in 2011 than estimated for Phase 1.

Fig 12: Comparing household projections for Phase 1 and Phase 2





4 Uncertainty analysis

4.1 Background

Projections become increasingly uncertain the further they are carried forward and long-term projections should be used with caution. The outputs from the project include estimates of uncertainty for the population and household projections. The three different forecasts are built from different assumptions and therefore recognise that the future is inherently uncertain.

There is no objective basis to put error bands around the plan based projections due to the recent changes in the planning system. Previous plans and the scale of housing development was set at the regional level, whilst the latest plans are produced at the local level. Measuring the accuracy of previous plans is also complicated by the economic downturn. Analysis for the most-likely forecast found that the plan-based forecasts are more credible for Phase 2 in many cases than they were for the Phase 1 forecasts, reflecting the fact that local authority plans are in a more advanced state than they were 12 months ago. The plans also appear to factor in the current sluggishness in house building, with targets reduced for the next 5 years compared with under Phase 1.

One of the limitations of the traditional deterministic approach – used in the UK to produce the official population projections – is that no probabilities are attached to the principal projections, so users are given no information about the uncertainty associated with them or, with respect to the variants, are given no indication of how these compare to the principal projections in terms of certainty². In theory it is possible however to produce a range of uncertainty around the trend-based population projections, based on comparisons with previous official projections against mid-year population estimates and we explore using this approach in this section.

ONS themselves do not produce measures of uncertainty around population projections. To help understand the uncertainty, a number of variant projections are produced based on alternative plausible demographic scenarios at national level. We have applied the assumptions to local authority projections to produce alternative scenarios at water resource zone level.

ONS have not produced variant projections for the 2011-based projections, however the assumptions used to create the 2011-based projections are the same as those used to create the 2010-based analysis so the scenario analysis using the old variants is still valid.

4.2 Stochastic analysis

For Phase 1 Experian undertook stochastic analysis which used differences calculated between previous ONS population projections and ONS mid-year population estimates to estimate confidence bands around current population projection. This analysis was limited for a number of reasons – mainly due to repeated methodological change and no actual values to compare against (see Phase 1 report for further details). The release of the Census 2011 and the revised of mid-year estimates for the intercensal years means that we can now compare estimates for 2011 (rolled forward from the 2001 Census) against actual population figures for 2011. It is then possible to apply the measured errors for 2011 to future time periods at local authority level and estimate confidence bands around future projections.

The analysis involved the following steps:

² ONS Chapter 6: Variants, 2010-based NPP Reference Volume, March 2012

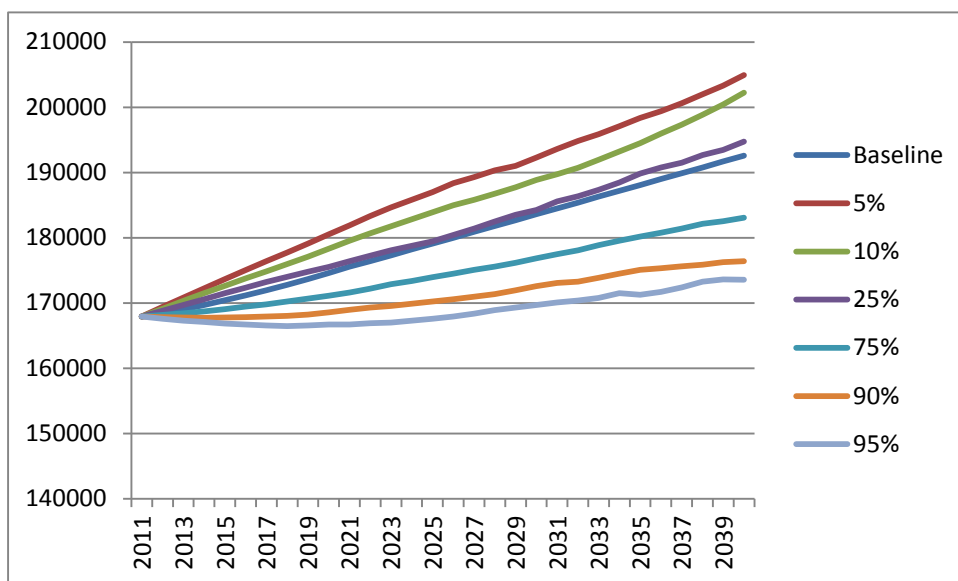
1. Calculate the percentage errors (and their direction) between estimates of population and actual population from the ONS data.
2. Fit a statistical distribution to the errors.
3. Generate a large number of scenarios in each of which:
 - a. Each LADs population at future census points (2021 2031 2040) had an error applied to it from the distribution. Note that errors in 2031/2040 compounded on earlier errors.
 - b. Adjusted and smoothed the growth profile between census points in order to reach these error points.
4. Calculated the confidence intervals from the resultant scenarios.

The results of the population stochastic analysis for South East are presented in Figure 13.

The first point to note is that the confidence intervals are not symmetrical – demonstrating that there is some bias on the downside as ONS underestimated population growth in many local authority areas. The second point to note is that the baseline (which is the trend-based population projection) falls within the 75% confidence interval.

The blue 75% line shows that 75% of observations fell above the line, whilst the purple 25% line shows that 25% of observations were above the line. In other words 50% of all scenario observations fell between the blue 75% line and the purple 25% line. We can therefore state that given past errors that the 50% probability interval for South East population is 182,000-194,000 in 2040. The 90% probability interval for the population is 174,000 - 205,000 in 2040.

Fig 13: Stochastic analysis for example water resource zone – Affinity South East (company wide)



4.3 Scenario analysis

ONS do not produce measures of uncertainty around the population projections as it is not possible to do so using the deterministic approach used. Instead they provide a number of variant projections to demonstrate the uncertainty that different assumptions have on the population projections. However these variants are only produced at national level. Experian have applied the national variant assumptions from 8 scenarios to local authorities to simulate the variants at a lower geographical level that can then be applied to forecasts at water resource zone level. The variants chosen for this analysis:

- High fertility
- Low fertility
- High life expectancy

- Low life expectancy
- High net migration
- Low net migration
- High population (combining all the 'high scenarios' above)
- Low population (combining all the 'low scenarios' above)

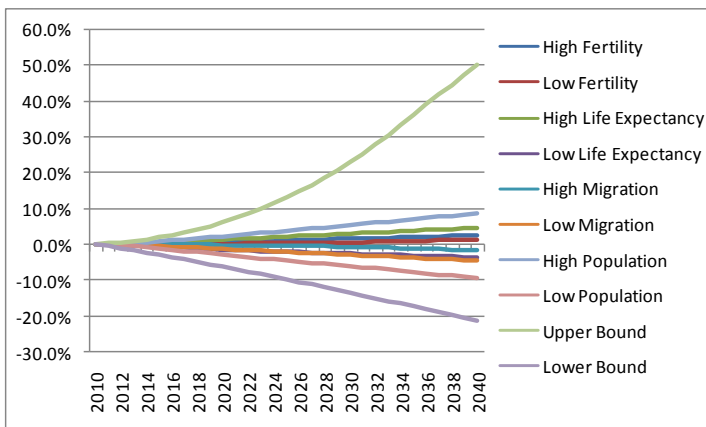
ONS have not produced variants for the 2011-based projections so we are unable to update our previous scenario analysis. However, the analysis from Phase 1 is still valid since ONS did not update the assumptions for natural change and migration for the 2011-based projections.

4.3.1 Scenario results

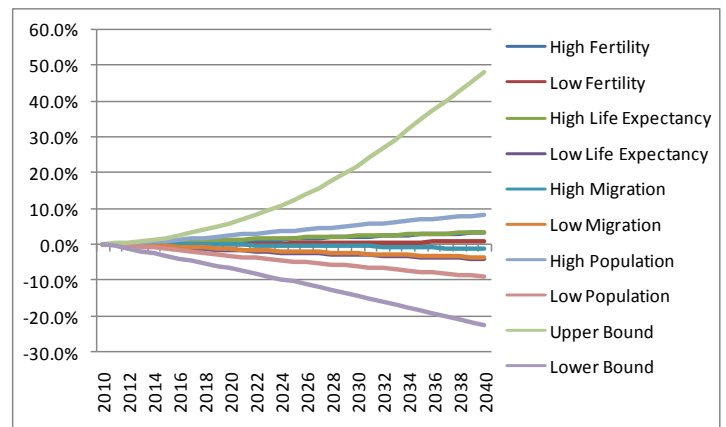
Results are presented in terms of percentage difference from the trend projection. In all cases the 'high population' and 'low population' scenarios represent the greatest difference from baseline – which at most is around +/- 10% compared with the baseline. However, it should be considered that the scenarios apply national assumptions and differences in migration flows particularly could have a much larger impact on population growth or decline at a local level.

The upper band and lower band uncertainty scenarios provide a maximum extent that the projections could fall within and therefore the bands are typically quite wide – especially on the upside. The upper and lower band scenarios can be interpreted as the outcome if average errors that have occurred at local authority level in the region continue and are compounded into the future. The results for the Veolia Water WRZs suggest that in the past, ONS projections have tended to underestimate rather than overestimate the scale of population growth in the area.

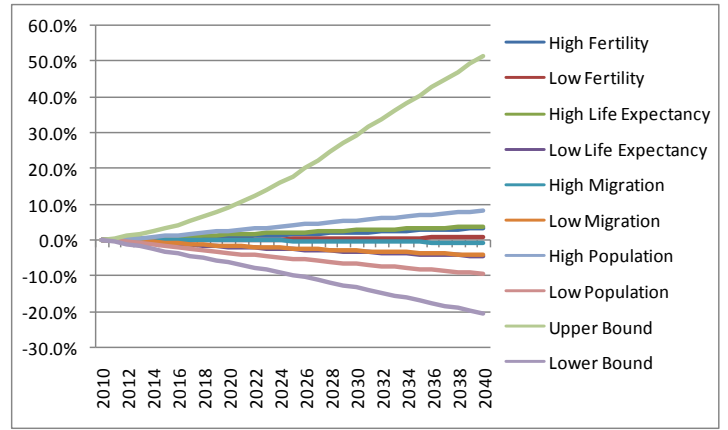
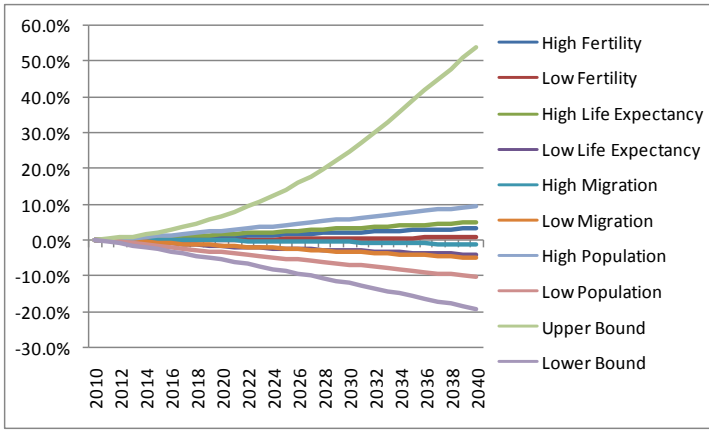
Fig 14: Uncertainty scenarios for Affinity Water WRZs



1

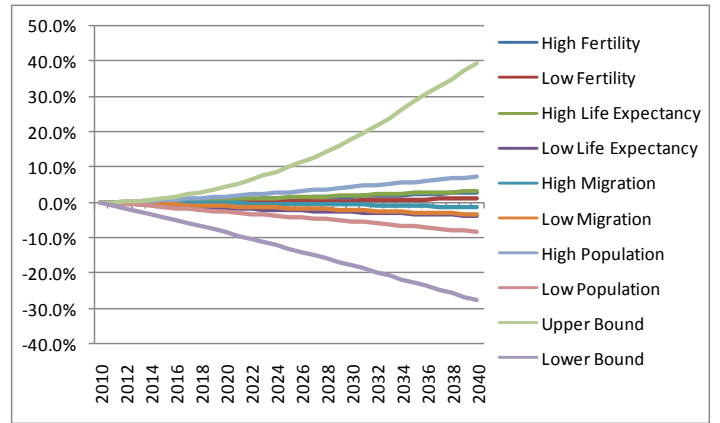
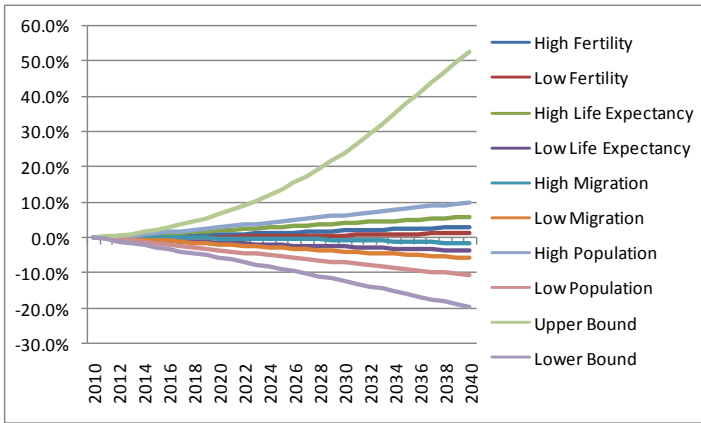


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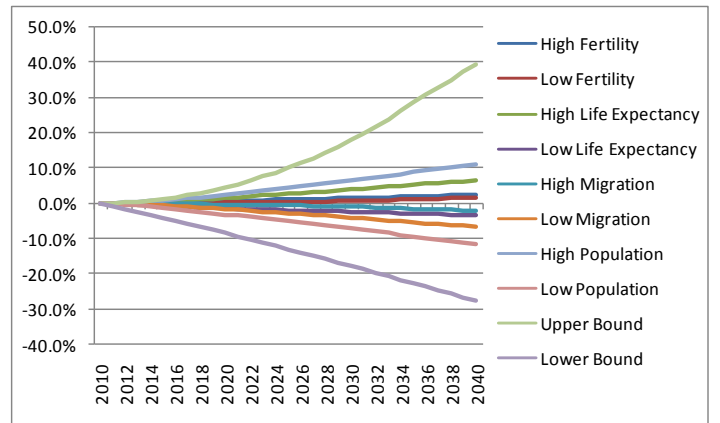
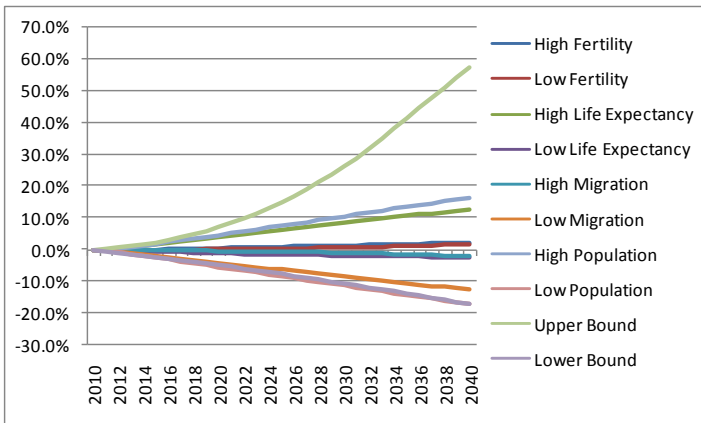
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Veolia East – Tendring Hundred

Veolia South East – Company wide

Appendix A: Phase 2 Data Sources

- Local authority provided planned dwelling data and local authority plans (see Contact Log)
- ONS 2011 interim sub-national population projections – Local Authority, released 28 September 2012 – projections used to produce the trend-based Phase 2 projections
<http://www.ons.gov.uk/ons/rel/snpp/sub-national-population-projections/Interim-2011-based/stb-2011-based-snpp.html>
- ONS 2010 sub-national population projections – Local Authority, released 21st March 2012 – these were used to inform the Phase 2 most-likely projection and were the trend-based/ most-likely projection for Phase 1
<http://www.ons.gov.uk/ons/rel/snpp/sub-national-population-projections/2010-based-projections/stb-2010-based-snpp.html>
- ONS 2010 National population projections, principal and variant projections, released 26 October 2011
<http://www.ons.gov.uk/ons/rel/npp/national-population-projections/2010-based-projections/index.html>
- DCLG 2011 household projections – Local Authority, released 9th April 2013
<http://www.communities.gov.uk/publications/corporate/statistics/2033household1110>
- ONS revised mid-year estimates 2002-2010 – Local Authority, released 30th April 2013
<http://www.ons.gov.uk/ons/guide-method/method-quality/imps/improvements-to-local-authority-immigration-estimates/index.html>
- ONS mid-year estimates 2001-2010 – Lower Super Output Area, released September 2011
<http://www.ons.gov.uk/ons/rel/sape/soa-mid-year-pop-est-engl-wales-exp/mid-2010-release/index.html>
- Census of population, 2011, released January/ February 2013
http://www.nomisweb.co.uk/census/2011/key_statistics
- Census of population, 2001, released 30 March 2004.
<http://www.nomisweb.co.uk/home/census2001.asp>
- London Plan
The London Plan Spatial Development Strategy for Greater London, released July 2011
<http://www.london.gov.uk/priorities/planning/londonplan>
- GLA Population Projections 2011 Round, SHLAA, Borough SYA, released 16th December 2011
<http://data.london.gov.uk/datastore/package/gla-population-projections-2011-round-shlaa-borough-sya>
- 2011 round SHLAA based household projections - standard fertility variant, released 16th December 2011
<http://data.london.gov.uk/datastore/package/2011-round-shlaa-based-household-projections-standard-fertility-variant>
- Experian Output Area level datasets, 2001-2040, derived from Census 2001, and pushed forwards using information from the electoral role, PAF files and responses to household lifestyle surveys. Controlled to 2011 Census output area results (released Jan/ Feb 2013).

- Property Pipeline information supplied by Emap Glenigan (April 2012).

Appendix B: How property pipeline level data is built into the demographic forecasts

The methodology that we use to build residential property pipeline information into our demographic forecasts utilizes site level planning application and contract progress data that is sourced from Emap Glenigan. The approach adopted by Emap Glenigan involves weekly visits to the local planning authorities to gather information regarding new planning applications. In addition to this Emap Glenigan’s information gathering approach features regular phone calls to “plan applicants” (undertaken by a dedicated team of around 40 people) in order to establish the planning application/contract progress stage that each site has reached. Accordingly, through Emap Glenigan we are able to access real time information regarding the country’s residential property pipeline.

To utilize Emap Glenigan’s site level planning application and contract progress data in our demographic forecasts we first need to establish the likelihood that each site in the property pipeline has of being “built-out”. To do this we use a procedure (developed in consultation) with Emap that assigns “build out” probabilities according to the stage that each site has reached in the planning /contracting process and the insight (based on experience) that this information provides regarding the likelihood that the associated scheme will be completed. In particular the “build out” probability that is assigned to each site reflects the maximum of the probabilities that are shown in Table 2 regarding site planning and contract stages.

Table x: Emap Glenigan Probabilities

Planning Stage	Probability	Contract stage	Probability
Planning Not Required	0.98	Start on Site	1.00
Plans Appr on Appeal	0.95	Contract Awarded	0.75
Detail Plans Granted	0.90	Preferred Bidder Appt	0.50
Reserved Matters Granted	0.85	Bills Called	0.45
Detailed Plans Submitted	0.80	Tenders Returned	0.40
Detail Plans Withdrawn	0.60	Tender Currently Invited	0.30
Detail Plans Refused	0.55	Applications to Tender	0.25
Outline Plans Granted	0.54	Pre-Tender	0.20
Circular 18/84	0.53		
Outline Plans Submitted	0.52		
Appr Reserved Matters	0.55		
Listed Building Consent	0.48		
Pre-Planning	0.45		
Public Enquiry	0.40		
Outline Plans Refused	0.30		
Outline Plans Withdrawn	0.20		

To calculate the population that is associated with each site in the residential property pipeline the “build out” probability is simply multiplied by the number of units that are planned for each site and then multiplied again by our estimate of the average occupancy rate in the relevant Output Area.

The final stage in the methodology that we use to build residential property pipeline information into our demographic forecasts requires us to estimate when each “potential” new development is likely to be completed. If start and completion dates are not available for a given site we take a conservative view that the site will be completed 4 years after the date at which we are making our forecasts (if the number of units in the project is less than one thousand). If the number of units exceeds one thousand, the project is given a completion date 12 years after the start date. Finally simple linear interpolation techniques are used to determine the speed at which each site is “built out” (and hence population accumulated) over the construction period.

Appendix C

About us



Experian

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