Headroom Assessment Report

South West Water
Final Water Resources Management Plan 2019

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Prepared for: South West Water

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	Aug 2017	Draft for client review			
2	October 2017	Second Draft			
3	November 2017	Final			
4	December 2018	Final – with final demand, WAFU and climate change figures	PJS	Jane Sladen	Technical Director
5	January 2019	Final – with outputs from high demand scenario analysis	NM	Neil Mackenzie	Associate

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1. Introduction

1.1 Background

South West Water (SWW) is required to submit an assessment of its target headroom allowance every five years as part of its Water Resources Management Plan (WRMP) submission. The purpose of including a headroom allowance within the supply/demand balance is to include a margin between supply and demand to allow for the risk of variations in the forecast supply/demand balance due to uncertainty in the various components.

SWW carried out an assessment of supply/demand uncertainties and calculated a suitable headroom allowance for each Water Resource Zone (WRZ), in order to incorporate within the supply/demand balance for their Final WRMP submission of 2014 (excluding Bournemouth Water (BW) which was submitted independently for WRMP14). A summary of the results is given in Table 1-1.

Table 1-1: South West Water (including Bournemouth WRZ) WRMP14 Headroom Allowance (Ml/d)

Year	Colliford DYAA	Roadford DYAA	Wimbleball DYAA	Bournemouth DYAA*	Bournemouth DYCP*
2012/13	9.79	14.83	4.23	2.4	2.8
2015/16	10.33	15.18	4.54	2.3	2.8
2020/21	9.78	13.82	4.55	2.5	3.0
2025/26	8.78	12.10	4.17	2.7	3.4
2030/31	9.45	12.69	4.60	3.0	4.1
2035/36	8.30	11.20	4.32	3.4	4.7
2039/40	8.92	12.02	4.49	3.9	5.5

** Separate return to OFWAT*

The figures in Table 1-1 were based on Monte Carlo simulations to combine probability distributions for a number of key uncertainty factors, including accuracy of supply and demand data, demand forecast variation and impact of climate change on Water Available For Use (WAFU). SWW's headroom allowance values were selected from each distribution at a reducing profile of risk across the 25-year planning horizon. The most appropriate level of headroom uncertainty was considered to be the 85th percentile for the beginning of the planning period, declining to the 70th percentile by 2039/2040.

The methodology applied was the UKWIR's *An Improved Method for Assessing Headroom* (2002) which allows for a detailed, analytical approach to the determination of uncertainty through probabilistic simulation.

1.2 Objectives

AECOM has been commissioned to undertake the re-assessment of the headroom allowance for SWW's Final WRMP19 (and including BW's headroom for the first time, following the purchase of this Company by Pennon who now own both companies). The aim of the headroom assessment is to determine probability distributions to represent the range of uncertainty within the supply/demand balance for each relevant factor. These are then combined into overall probability distributions for each WRZ, to provide the target headroom for the relevant planning scenario and for each year across the 25-year planning horizon from 2020 to 2045. A time-varying profile of headroom can then be determined from the distribution for each period at an appropriate level of risk.

The key objectives of this analysis can be summarised as follows:

- Assess the risks and uncertainties which apply to the components of SWW's supply/demand balance, through consideration of operational data and other relevant information;
- Develop suitable probability distributions to represent each relevant uncertainty factor;
- Combine the individual probability distributions into a single distribution representing the WRZ's headroom uncertainty for each year in the planning horizon;
- Determine headroom allowance profiles, by selecting values from the combined headroom uncertainty distributions at appropriate levels of risk across the planning horizon for use in the final WRMP tables; and
- Determine additional headroom allowance profiles using high demand scenarios for sensitivity testing.

In the current report, Section 2 provides an overview of the methodology used to undertake the headroom assessment. Section 3 presents a review of the relevant uncertainty factors in SWW's supply/demand balance and the assumptions adopted for each of the individual probability distributions, whilst Section 4 summarises the results of the assessment. Section 5 provides the conclusions. The high demand analysis is presented in Appendix D.

2. Headroom assessment methodology

2.1 Overview

SWW has adopted the industry standard method for the calculation of target headroom allowance; the method is outlined in *An Improved Methodology for Assessing Headroom* (UKWIR, 2002) and referred to by the Environment Agency in their most recent update to the *Water Resources Planning Guideline* (April, 2017).

In this approach, a probability distribution is assigned to each individual risk or uncertainty factor within the supply/demand balance, based on known data and other relevant information. These probability distributions are then combined using the statistical technique of Monte Carlo simulation, which iteratively takes random samples from each distribution and sums them according to specified rules. The summed result of each iteration then forms a point on the curve of the combined distribution; by sampling the distributions over a large number of iterations it is then possible to build up a probability distribution to represent the overall risk or uncertainty of all factors taken together.

The Monte Carlo simulation software @RISK was used for the analysis, which operates in conjunction with the Microsoft Excel spreadsheet package. Due to the random nature of the Monte Carlo simulation technique, it is not possible to guarantee that identical results will be generated each time the same simulation is run. However, by selecting a suitably large number of iterations for the simulation, to give an acceptable mean standard error for the simulation results, it should be possible to obtain repeatable results to an acceptable level of accuracy. This study found that consistent results were obtained using 10,000 iterations.

2.2 Planning scenarios

For the WRMP14, SWW evaluated the supply/demand balance analysis separately in each Water Resource Zone (WRZ). This approach has been continued for the WRMP19, and therefore the analysis of headroom allowance has also been carried out at the WRZ level. Two planning scenarios have been considered in this headroom assessment:

- Dry Year Annual Average (DYAA) – based on Average Demand DO (ADO). The assessment of ADO is linked to the DYAA planning scenario. The UKWIR WR27 DO report (2012) defines the ADO as ‘the deployable output of a source for the average annual period’ and goes on to state that ‘the average demand is literally the average over the year computed as average over a normal year or average over a dry year’; and
- Dry Year Peak Week (DYCP) – based on dry year Average Demand in the Peak Week (ADPW) and Peak DO (PDO). Water companies “may also choose to explain how you will deal with a period of peak strain known as the critical period” (Environment Agency, April 2017). The assessment of PDO is associated with the ‘dry year critical period’ (DYCP) planning scenario, where the resource zone supply-demand balance is sensitive to peak demand. PDO is the “deployable output for the period in which there is highest demand” (UKWIR, 2014).

The DYCP is only assessed for Bournemouth WRZ. This is because the nature of WAFU constraints in the other WRZ’s means that a DYCP analysis is not required. This is consistent with WRMP14.

2.3 Uncertainty factors

Key areas of future risk and uncertainty relevant to SWW future supply/demand balance were identified through discussion and correspondence with SWW. A review of relevant data, including DO assessments/Water Available For Use (WAFU), demand forecasts, water quality data and other relevant information, was also carried out. The key areas of future risk and uncertainty were categorised with reference to the uncertainty factors specified in the 2002 UKWIR methodology and are shown in Table 2-1. These uncertainties, along with the assumptions adopted for SWW headroom calculations, are discussed further in Section 3.

Table 2-1: Headroom Uncertainty Factors

Factor	Name	Description
S1	Vulnerable Surface water licences	Risk of future loss of supply due to sustainability changes to surface water abstraction licences for environmental reasons
S2	Vulnerable Groundwater licences	Risk of future loss of supply due to sustainability changes to groundwater abstraction licences for environmental reasons
S3	Time Limited Licences	Risk of future loss of supply due to non-renewal of time limited abstraction licences
S4	Bulk Imports	Risk of future loss of supply due to changes in bulk supply agreements (imports only)
S5	Gradual Pollution	Risk of future loss of supply due to pollution and/or water quality issues which cannot be mitigated or recovered
S6	Accuracy of Supply-Side Data	Uncertainty surrounding the accuracy of supply side data e.g. percentage accuracy of abstraction meters
S8	Impact of Climate Change on Deployable Output	Uncertainty surrounding the future impact of climate change on supply (varying estimates of loss depending on scenario)
S9	New Sources	Uncertainty surrounding the available yield of major new resource developments included in the final planning supply-demand balance
D1	Accuracy of Sub-Component Demand Data	Uncertainty surrounding the accuracy of demand side data i.e. percentage accuracy of distribution input meters (generally located at service reservoirs)
D2	Demand Forecast Variation	Uncertainty surrounding future demand forecasts which may be higher or lower than assumed in the baseline supply-demand balance
D3	Impact of Climate Change on Demand	Risk of future increases in demand due to climate change impacts (varying estimates of demand effects depending on scenario)
D4	Demand Management Measures	Uncertainty surrounding the impact on future demand of demand management measures including leakage reduction, metering strategy and water efficiency activities.

3. Headroom assumptions

3.1 Overview of headroom assumptions

The key assumptions and relevant probability distributions used to inform the headroom analysis along with assumptions made for the WRMP14 headroom analysis are summarised in Table 3-1 and are discussed further in the following sections.

Table 3-1: Summary of assumptions informing the headroom analysis – WRMP14 and WRMP19

Factor	WRMP14	WRMP19
	Supply related	
S1 - Vulnerable surface water licences	No vulnerable surface water licences identified.	No change.
S2 - Vulnerable groundwater licences	No vulnerable groundwater licences identified.	No change.
S3 - Time limited licences	Environment Agency guidelines preclude these from the headroom analysis.	No change.
S4 - Bulk imports	No bulk imports into any WRZ's.	No change.
S5 - Gradual pollution causing a reduction in abstraction	No sources at risk in any WRZ.	No change.
S6 - Accuracy of supply-side data		
S6/1 - Uncertainty for yields constrained by pump capacity	No allowance included: groundwater DO assessments use actual pumping rates rather than nominal pumping capacities or groundwater sources are constrained by licence. BW main GW sources constrained by licence therefore this component does not apply	No change.
S6/2 - Meter uncertainty for licence critical sources	95% probability that the reading is within ±5%. Error is distributed normally around a mean of 0Ml/d. Standard deviation of ±2% of the total WAFU, distributed normally around a mean of 0Ml/d used in BW.	No change for SWW. Bournemouth WRZ uncertainty increased to +/- 5%.
S6/3 - Uncertainty for aquifer constrained groundwater sources	No allowance included: Wimbleball has some aquifer constrained sources however a high confidence in the ability of the drought curve to estimate the source performance meant it was not included. BW main groundwater sources constrained by licence therefore this component does not apply.	No change.
S6/4 - Uncertainty for climate and catchment characteristics affecting surface waters	95% probability that the value is within ±10%. Error is distributed normally around a mean of 0Ml/d. Not included in BW.	No change for SWW. Same uncertainty applied to Bournemouth WRZ.
S8 - Uncertainty of impact of climate change on source yield	Triangular distribution with upper and lower bounds of the impact of climate on supply, and the best estimate is the difference between the two.	No change; however new methodology to determine the upper and lower bounds used.
S9 - Uncertain output from new resource developments S9	No allowance included.	No change.
	Demand related	
D1 - Accuracy of sub-component data	95% probability that the recording is within ±2.5%. Error is distributed normally around a mean of 0Ml/d. Standard deviation of ±2% distributed normally around a mean of 0Ml/d used in BW.	No change for SWW. Bournemouth WRZ uncertainty increased to ±2.5%.

Factor	WRMP14	WRMP19
D2 - Demand forecast variation	Triangular distribution starting with 0 variation in first year, leading linearly to ±15% at the end of the planning period. Uncertainty from the baseline demand forecast used in BW.	No change for SWW WRMP14 SWW uncertainty applied to Bournemouth WRZ.
D3 - Uncertainty of impact of climate change on demand	Increase in consumption by 1% at the end of the planning period, ±20% for headroom – triangular distribution. Not considered by BW as was assumed to be included in the baseline demand forecast.	Increase in consumption by 0.71% in Colliford, 0.74% in Roadford, 0.72% in Wimbleball and 0.54% in Bournemouth.
D4 - Uncertain outcome from demand management measures	Assumed saving of 0.75Ml/d every year thought the planning period. Estimated pro rata on the basis of forecast DI between the three WRZs. Triangular distribution with 0 as most likely, ±10% Not included in BW.	Same saving and uncertainty applied; however, saving is estimated pro rata on the basis of forecast distribution input between the four WRZs, to include Bournemouth WRZ.

In summary, the changes from WRMP14 are small and unlikely to affect the target headroom allowance calculations significantly for the SWW WRZ's. More significant changes have been made for the Bournemouth WRZ. Further detail on how the assumptions were determined for each of the specified uncertainty factors is given in the sections below.

3.2 S1 Vulnerable surface water licences

No vulnerable surface water licences have been identified; therefore risk/uncertainty allowance for this factor was excluded from this assessment.

3.3 S2 Vulnerable groundwater licences

No vulnerable groundwater licences have been identified; therefore risk/uncertainty allowance for this factor was excluded from this assessment.

3.4 S3 Time limited Licences

The Environment Agency's Water *Resources Planning Guideline* (April 2017) states that companies may include an uncertainty allowance for the non-replacement of time-limited licences based on an assessment of environmental risks. Any allowance for uncertainty related to sustainability changes to permanent licences should not be included, "*as the Environment Agency or Natural Resources Wales will work with the company to ensure that these do not impact security of supply*". This factor was therefore excluded from the headroom analysis.

3.5 S4 Bulk imports

SWW (including Bournemouth) do not currently have any bulk imports, and therefore risk/uncertainty allowance for this factor was not included in this assessment.

3.6 S5 Gradual pollution

None of the sources are considered to be at risk from gradual pollution; therefore risk/uncertainty allowance for this factor was not included in this assessment.

3.7 S6 Accuracy of supply side data

3.7.1 S6/1: Uncertainty for yields constrained by pump capacity

There are no traditional groundwater sources in the Colliford WRZ, while Roadford and Wimbleball WRZ's groundwater DO assessments use actual pumping rates rather than nominal pumping capacities. Therefore, this component does not apply. In the case of Bournemouth WRZ, the main groundwater sources are constrained by licence and therefore are not included.

3.7.2 S6/2 Meter uncertainty for licence critical sources

It is assumed that all sources are subject to meter uncertainty. A ± 5% uncertainty allowance has therefore been included in this analysis with a 95% probability that the value is within this range. A normal probability distribution has been adopted to represent the range of uncertainty, around a mean of 0 Ml/d as shown in Table 3-2. It should be noted that the mean impact of climate change has been incorporated in the WAFU forecasts used and only the uncertainty in this estimate has been included in the S8 headroom component (i.e. with “best estimate” of the mean impact on WAFU = 0). This method was chosen to keep the assessment consistent with previous WRMP headroom assessments.

Table 3-2: S6/2 meter uncertainty probability distribution summary data for all WRZ's

	Colliford			Roadford			Wimbleball			Bournemouth DYAA			Bournemouth DYCP		
Year	WAFU (Ml/d)	5% WAFU	SD	WAFU (Ml/d)	5% WAFU	SD	WAFU (Ml/d)	5% WAFU	SD	WAFU (Ml/d)	5% WAFU	SD	WAFU (Ml/d)	5% WAFU	SD
2015/16	166.5	8.3	4.2	249.1	12.5	6.4	92.6	4.6	2.4	204.8	10.2	5.2	225.8	11.3	5.8
2016/17	166.3	8.3	4.2	248.5	12.4	6.3	90.5	4.6	2.4	204.8	10.2	5.2	225.8	11.3	5.8
2017/18	166.2	8.3	4.2	247.9	12.4	6.3	90.5	4.6	2.4	204.8	10.2	5.2	225.8	11.3	5.8
2018/19	166.1	8.3	4.2	245.3	12.4	6.3	90.4	4.6	2.4	204.8	10.2	5.2	225.8	11.3	5.8
2019/20	165.9	8.3	4.2	244.7	12.3	6.3	90.4	4.6	2.4	204.8	10.2	5.2	225.8	11.3	5.8
2020/21	165.8	8.3	4.2	244.1	12.3	6.3	90.3	4.6	2.4	204.8	10.2	5.2	225.8	11.3	5.8
2021/22	165.7	8.3	4.2	243.5	12.3	6.3	90.2	4.6	2.4	204.8	10.2	5.2	225.8	11.3	5.8
2022/23	165.5	8.3	4.2	242.9	12.2	6.2	90.2	4.6	2.4	204.8	10.2	5.2	225.8	11.3	5.8
2023/24	165.4	8.3	4.2	242.3	12.2	6.2	90.1	4.6	2.4	204.8	10.2	5.2	225.8	11.3	5.8
2024/25	165.3	8.3	4.2	241.7	12.2	6.2	90.1	4.6	2.3	204.8	10.2	5.2	225.8	11.3	5.8
2025/26	165.1	8.3	4.2	241.2	12.2	6.2	90.0	4.6	2.3	216.2	10.8	5.5	235.8	11.8	6.0
2026/27	165.0	8.2	4.2	240.6	12.1	6.2	89.9	4.6	2.3	216.2	10.8	5.5	235.8	11.8	6.0
2027/28	164.9	8.2	4.2	240.0	12.1	6.2	89.9	4.6	2.3	216.2	10.8	5.5	235.8	11.8	6.0
2028/29	164.7	8.2	4.2	239.4	12.1	6.2	89.8	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9
2029/30	164.6	8.2	4.2	238.8	12.0	6.1	89.8	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9
2030/31	164.5	8.2	4.2	238.2	12.0	6.1	89.7	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9
2031/32	164.4	8.2	4.2	238.0	12.0	6.1	89.7	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9
2032/33	164.4	8.2	4.2	237.8	12.0	6.1	89.7	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9
2033/34	164.3	8.2	4.2	237.6	12.0	6.1	89.7	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9
2034/35	164.3	8.2	4.2	237.4	12.0	6.1	89.6	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9
2035/36	164.2	8.2	4.2	237.2	12.0	6.1	89.6	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9
2036/37	164.2	8.2	4.2	237.0	11.9	6.1	89.6	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9
2037/38	164.1	8.2	4.2	236.8	11.9	6.1	89.6	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9
2038/39	164.1	8.2	4.2	236.6	11.9	6.1	89.6	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9
2039/40	164.0	8.2	4.2	236.4	11.9	6.1	89.5	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9
2040/41	164.0	8.2	4.2	236.2	11.9	6.1	89.5	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9
2041/42	163.9	8.2	4.2	236.0	11.9	6.1	89.5	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9
2042/43	163.9	8.2	4.2	235.8	11.9	6.1	89.5	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9
2043/44	163.9	8.2	4.2	235.5	11.9	6.1	89.5	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9
2044/45	163.8	8.2	4.2	235.3	11.9	6.1	89.4	4.6	2.3	204.0	10.2	5.2	231.4	11.6	5.9

3.7.3 S6/3 Uncertainty for aquifer constrained groundwater sources

Colliford, Roadford and Bournemouth WRZ’s do not have any aquifer constrained sources. An allowance for aquifer constrained sources in Wimbleball WRZ was excluded as SWW have a high confidence in the ability of the drought curve to estimate the source performance.

3.7.4 S6/4 Uncertainty for climate and catchment characteristics affecting surface waters

Uncertainty around the accuracy of river flow measurements has been included in this assessment. The 2002 UKWIR methodology suggests that an accuracy of ± 10% should be assumed for catchments/sources with long records and/or where the catchments are large. A ± 10% uncertainty allowance has therefore been chosen, with a 95% probability that the value is within this range. A normal probability distribution has been adopted to represent the range of uncertainty, around a mean of 0 Ml/d. This is shown in Table 3-3. It should be noted that the mean impact of climate change has been incorporated in the WAFU forecasts used as explained in Section 3.7.2.

Table 3-3: S6/4 climate and catchment uncertainty probability distribution summary data for all WRZ's

	Colliford			Roadford			Wimbleball			Bournemouth DYAA			Bournemouth DYCP		
Year	WAFU (Ml/d)	10% WAFU	SD	WAFU (Ml/d)	10% WAFU	SD	WAFU (Ml/d)	10% WAFU	SD	WAFU (Ml/d)	10% WAFU	SD	WAFU (Ml/d)	10% WAFU	SD
2015/16	166.5	16.6	8.5	249.1	24.9	12.71	92.6	9.3	4.7	204.8	20.5	10.5	225.8	22.6	11.5
2016/17	166.3	16.6	8.5	248.5	24.8	12.71	90.5	9.1	4.6	204.8	20.5	10.5	225.8	22.6	11.5
2017/18	166.2	16.6	8.5	247.9	24.8	12.71	90.5	9.0	4.6	204.8	20.5	10.5	225.8	22.6	11.5
2018/19	166.1	16.6	8.5	245.3	24.5	12.71	90.4	9.0	4.6	204.8	20.5	10.5	225.8	22.6	11.5
2019/20	165.9	16.6	8.5	244.7	24.5	12.71	90.4	9.0	4.6	204.8	20.5	10.5	225.8	22.6	11.5
2020/21	165.8	16.6	8.5	244.1	24.4	12.71	90.3	9.0	4.6	204.8	20.5	10.5	225.8	22.6	11.5
2021/22	165.7	16.6	8.5	243.5	24.4	12.71	90.2	9.0	4.6	204.8	20.5	10.5	225.8	22.6	11.5
2022/23	165.5	16.6	8.4	242.9	24.3	12.71	90.2	9.0	4.6	204.8	20.5	10.5	225.8	22.6	11.5
2023/24	165.4	16.5	8.4	242.3	24.2	12.71	90.1	9.0	4.6	204.8	20.5	10.5	225.8	22.6	11.5
2024/25	165.3	16.5	8.4	241.7	24.2	12.71	90.1	9.0	4.6	204.8	20.5	10.5	225.8	22.6	11.5
2025/26	165.1	16.5	8.4	241.2	24.1	12.71	90.0	9.0	4.6	216.2	21.6	11.0	235.8	23.6	12.0
2026/27	165.0	16.5	8.4	240.6	24.1	12.71	89.9	9.0	4.6	216.2	21.6	11.0	235.8	23.6	12.0
2027/28	164.9	16.5	8.4	240.0	24.0	12.71	89.9	9.0	4.6	216.2	21.6	11.0	235.8	23.6	12.0
2028/29	164.7	16.5	8.4	239.4	23.9	12.71	89.8	9.0	4.6	204.0	20.4	10.4	231.4	23.1	11.8
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2030/31	164.5	16.4	8.4	238.2	23.8	12.71	89.7	9.0	4.6	204.0	20.4	10.4	231.4	23.1	11.8
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2032/33	164.4	16.4	8.4	237.8	23.8	12.71	89.7	9.0	4.6	204.0	20.4	10.4	231.4	23.1	11.8
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2034/35	164.3	16.4	8.4	237.4	23.7	12.71	89.6	9.0	4.6	204.0	20.4	10.4	231.4	23.1	11.8
2035/36	164.2	16.4	8.4	237.2	23.7	12.71	89.6	9.0	4.6	204.0	20.4	10.4	231.4	23.1	11.8
2036/37	164.2	16.4	8.4	237.0	23.7	12.71	89.6	9.0	4.6	204.0	20.4	10.4	231.4	23.1	11.8
2037/38	164.1	16.4	8.4	236.8	23.7	12.71	89.6	9.0	4.6	204.0	20.4	10.4	231.4	23.1	11.8
2038/39	164.1	16.4	8.4	236.6	23.7	12.71	89.6	9.0	4.6	204.0	20.4	10.4	231.4	23.1	11.8
2039/40	164.0	16.4	8.4	236.4	23.6	12.71	89.5	9.0	4.6	204.0	20.4	10.4	231.4	23.1	11.8
2040/41	164.0	16.4	8.4	236.2	23.6	12.71	89.5	9.0	4.6	204.0	20.4	10.4	231.4	23.1	11.8
2041/42	163.9	16.4	8.4	236.0	23.6	12.71	89.5	9.0	4.6	204.0	20.4	10.4	231.4	23.1	11.8
2042/43	163.9	16.4	8.4	235.8	23.6	12.71	89.5	8.9	4.6	204.0	20.4	10.4	231.4	23.1	11.8
2043/44	163.9	16.4	8.4	235.5	23.6	12.71	89.5	8.9	4.6	204.0	20.4	10.4	231.4	23.1	11.8
2044/45	163.8	16.4	8.4	235.3	23.5	12.71	89.4	8.9	4.6	204.0	20.4	10.4	231.4	23.1	11.8

3.8 S8 Impact of climate change on WAFU

The minimum, mean and maximum climate change impacts on WAFU were calculated from eleven Future Flows hydrology monthly change factors. This dataset consists of 11 equally likely scenarios of climate to 2085/2086. These values were then used in this assessment to determine the uncertainties using a triangular distribution to

represent the potential variation from the most likely impacts if either the low or high impacts were to apply. The parameters of each triangular distribution were therefore calculated as follows:

Minimum = Low – most likely in Ml/d (a negative value)

Most Likely = 0 (i.e. zero uncertainty)

Maximum = High – most likely forecast in Ml/d (a positive value)

It was determined that there was no impact of climate change on WAFU for Bournemouth WRZ, therefore the two Bournemouth scenarios have not been shown in the Table 3-4. This approach is consistent with WRMP14. The minimum and maximum values for all other WRZ's are shown in Table 3-4; however, the most likely is not shown as it is zero for all WRZ's across all the years.

Table 3-4: S8 impact of climate change uncertainty probability distribution summary data for all WRZ's

	Colliford			Roadford			Wimbleball		
Year	WAFU (Ml/d)	Min	Max	WAFU (Ml/d)	Min	Max	WAFU (Ml/d)	Min	Max
2015/16	166.5	-0.9	0.6	249.1	-2.1	1.8	92.6	-0.5	0.2
2016/17	166.3	-1.2	0.8	248.5	-2.6	2.3	90.5	-0.6	0.3
2017/18	166.2	-1.4	1.0	247.9	-3.1	2.8	90.5	-0.8	0.3
2018/19	166.1	-1.6	1.1	245.3	-3.6	3.2	90.4	-0.9	0.4
2019/20	165.9	-1.9	1.3	244.7	-4.1	3.7	90.4	-1.0	0.5
2020/21	165.8	-2.1	1.4	244.1	-4.6	4.1	90.3	-1.1	0.5
2021/22	165.7	-2.3	1.6	243.5	-5.1	4.6	90.2	-1.3	0.6
2022/23	165.5	-2.6	1.8	242.9	-5.7	5.1	90.2	-1.4	0.6
2023/24	165.4	-2.8	1.9	242.3	-6.2	5.5	90.1	-1.5	0.7
2024/25	165.3	-3.0	2.1	241.7	-6.7	6.0	90.1	-1.6	0.7
2025/26	165.1	-3.3	2.2	241.2	-7.2	6.4	90.0	-1.8	0.8
2026/27	165.0	-3.5	2.4	240.6	-7.7	6.9	89.9	-1.9	0.9
2027/28	164.9	-3.8	2.6	240.0	-8.2	7.3	89.9	-2.0	0.9
2028/29	164.7	-4.0	2.7	239.4	-8.7	7.8	89.8	-2.2	1.0
2029/30	164.6	-4.2	2.9	238.8	-9.3	8.3	89.8	-2.3	1.0
2030/31	164.5	-4.5	3.0	238.2	-9.8	8.7	89.7	-2.4	1.1
2031/32	164.4	-4.5	3.1	238.0	-10.0	8.9	89.7	-2.5	1.1
2032/33	164.4	-4.6	3.2	237.8	-10.1	9.0	89.7	-2.5	1.1
2033/34	164.3	-4.7	3.2	237.6	-10.3	9.2	89.7	-2.5	1.2
2034/35	164.3	-4.8	3.3	237.4	-10.5	9.4	89.6	-2.6	1.2
2035/36	164.2	-4.9	3.3	237.2	-10.7	9.5	89.6	-2.6	1.2
2036/37	164.2	-4.9	3.4	237.0	-10.8	9.7	89.6	-2.7	1.2
2037/38	164.1	-5.0	3.4	236.8	-11.0	9.8	89.6	-2.7	1.2
2038/39	164.1	-5.1	3.5	236.6	-11.2	10.0	89.6	-2.8	1.2
2039/40	164.0	-5.2	3.5	236.4	-11.4	10.2	89.5	-2.8	1.3
2040/41	164.0	-5.3	3.6	236.2	-11.5	10.3	89.5	-2.8	1.3
2041/42	163.9	-5.3	3.7	236.0	-11.7	10.5	89.5	-2.9	1.3
2042/43	163.9	-5.4	3.7	235.8	-11.9	10.6	89.5	-2.9	1.3
2043/44	163.9	-5.5	3.8	235.5	-12.1	10.8	89.5	-3.0	1.3
2044/45	163.8	-5.6	3.8	235.3	-12.3	10.9	89.4	-3.0	1.4

3.9 S9 New sources

There are no new sources proposed in WRMP19; therefore, this component is not included in this headroom analysis.

3.10 D1 Accuracy of sub-component demand data

A small allowance of ± 2.5% has been included to represent the uncertainty in the accuracy of distribution input (DI) meters, with a 95% probability that the value is within this range. A normal probability distribution has been adopted to represent the range of uncertainty, around a mean of 0 Ml/d. It should be noted that these meters are typically located at the point of distribution and are not the same as those used to measure abstraction, so this avoids double-counting with factor S6/2 (see Section 3.7.2). The parameters of the normal distribution, for each year in the planning horizon and for each planning scenario, are defined as follows:

Mean = 0

Standard Deviation (σ) = 2.5% of Company Distribution Input / 4

This ensures that the probability of the variation from DI due to meter error lying within the range ± 2.5% of DI is 99.99%. The variation lies almost entirely between a minimum value of -2.5% of DI and a maximum value of +2.5% of DI, as shown in Table 3-5.

Table 3-5: D1 demand uncertainty probability distribution summary data for all WRZ's

	Colliford			Roadford			Wimbleball			Bournemouth DYAA			Bournemouth DYCP		
Year	DI (Ml/d)	2.5% DI	SD	DI (Ml/d)	2.5% DI	SD	DI (Ml/d)	2.5% DI	SD	DI (Ml/d)	2.5% DI	SD	DI (Ml/d)	2.5% DI	SD
2015/16	144.9	3.6	1.8	217.9	5.4	2.8	77.0	1.9	1.0	145.3	3.6	1.9	184.3	4.6	2.4
2016/17	146.7	3.7	1.9	221.1	5.5	2.8	78.5	2.0	1.0	146.2	3.7	1.9	186.2	4.7	2.4
2017/18	150.0	3.7	1.9	226.1	5.7	2.9	80.3	2.0	1.0	149.5	3.7	1.9	188.8	4.7	2.4
2018/19	147.3	3.7	1.9	222.3	5.6	2.8	79.4	2.0	1.0	149.0	3.7	1.9	188.0	4.7	2.4
2019/20	146.7	3.7	1.9	221.5	5.5	2.8	79.2	2.0	1.0	148.5	3.7	1.9	187.5	4.7	2.4
2020/21	146.0	3.6	1.9	221.1	5.5	2.8	79.7	2.0	1.0	148.4	3.7	1.9	187.5	4.7	2.4
2021/22	145.0	3.6	1.8	221.6	5.5	2.8	80.0	2.0	1.0	148.4	3.7	1.9	187.5	4.7	2.4
2022/23	145.0	3.6	1.9	221.0	5.5	2.8	80.4	2.0	1.0	148.4	3.7	1.9	187.6	4.7	2.4
2023/24	144.2	3.6	1.8	221.7	5.5	2.8	80.6	2.0	1.0	148.5	3.7	1.9	187.6	4.7	2.4
2024/25	144.5	3.6	1.8	220.7	5.5	2.8	81.2	2.0	1.0	148.5	3.7	1.9	187.8	4.7	2.4
2025/26	144.2	3.6	1.8	221.0	5.5	2.8	81.5	2.0	1.0	148.6	3.7	1.9	187.9	4.7	2.4
2026/27	144.0	3.6	1.8	222.0	5.5	2.8	81.0	2.0	1.0	148.7	3.7	1.9	188.1	4.7	2.4
2027/28	144.1	3.6	1.8	222.0	5.5	2.8	81.4	2.0	1.0	148.8	3.7	1.9	188.3	4.7	2.4
2028/29	144.4	3.6	1.8	222.0	5.5	2.8	81.6	2.0	1.0	149.0	3.7	1.9	188.6	4.7	2.4
2029/30	144.2	3.6	1.8	222.5	5.6	2.8	81.9	2.0	1.0	149.1	3.7	1.9	188.8	4.7	2.4
2030/31	144.2	3.6	1.8	222.8	5.6	2.8	82.1	2.1	1.0	149.2	3.7	1.9	189.0	4.7	2.4
2031/32	144.7	3.6	1.8	222.9	5.6	2.8	81.9	2.0	1.0	149.3	3.7	1.9	189.2	4.7	2.4
2032/33	145.3	3.6	1.9	222.6	5.6	2.8	82.0	2.1	1.0	149.4	3.7	1.9	189.3	4.7	2.4
2033/34	146.0	3.7	1.9	222.2	5.6	2.8	82.1	2.1	1.0	149.4	3.7	1.9	189.5	4.7	2.4
2034/35	146.2	3.7	1.9	222.3	5.6	2.8	82.2	2.1	1.0	149.5	3.7	1.9	189.6	4.7	2.4
2035/36	146.0	3.6	1.9	222.7	5.6	2.8	82.4	2.1	1.1	149.6	3.7	1.9	189.8	4.7	2.4
2036/37	146.4	3.7	1.9	222.8	5.6	2.8	82.2	2.1	1.0	149.6	3.7	1.9	189.9	4.7	2.4
2037/38	146.6	3.7	1.9	223.1	5.6	2.8	82.0	2.1	1.0	149.7	3.7	1.9	190.0	4.7	2.4
2038/39	147.0	3.7	1.9	223.1	5.6	2.8	81.9	2.0	1.0	149.7	3.7	1.9	190.1	4.8	2.4
2039/40	147.2	3.7	1.9	223.0	5.6	2.8	82.0	2.1	1.0	149.8	3.7	1.9	190.2	4.8	2.4
2040/41	147.7	3.7	1.9	222.8	5.6	2.8	82.2	2.1	1.0	149.8	3.7	1.9	190.3	4.8	2.4
2041/42	147.8	3.7	1.9	222.9	5.6	2.8	82.3	2.1	1.0	149.9	3.7	1.9	190.4	4.8	2.4
2042/43	148.4	3.7	1.9	222.5	5.6	2.8	82.5	2.1	1.1	150.0	3.7	1.9	190.5	4.8	2.4
2043/44	149.0	3.7	1.9	222.1	5.6	2.8	82.6	2.1	1.1	150.0	3.8	1.9	190.7	4.8	2.4
2044/45	149.2	3.7	1.9	221.9	5.5	2.8	83.1	2.1	1.1	150.1	3.8	1.9	190.8	4.8	2.4

3.11 D2 Demand forecast variation

A triangular distribution has been used to express the probability distribution, starting with zero forecast variation in 2015/16 and leading linearly to an assumed error of ±15% at the end of the planning period. The Min and Max values are shown in Table 3-6 however the most likely is not shown as it is zero for all WRZ's across all the years. This approach is consistent with WRMP14.

Table 3-6: D2 headroom uncertainty probability distribution summary data for all WRZ's

	Colliford			Roadford			Wimbleball			Bournemouth DYAA			Bournemouth DYCP		
Year	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max
2015/16	144.9	0.0	0.0	217.9	0.0	0.0	77.0	0.0	0.0	145.3	0.0	0.0	184.3	0.0	0.0
2016/17	146.7	-0.8	0.8	221.1	-1.1	1.1	78.5	-0.4	0.4	146.2	-0.8	0.8	186.2	-1.0	1.0
2017/18	150.0	-1.5	1.5	226.1	-2.3	2.3	80.3	-0.9	0.9	149.5	-1.6	1.6	188.8	-2.0	2.0
2018/19	147.3	-2.3	2.3	222.3	-3.4	3.4	79.4	-1.3	1.3	149.0	-2.3	2.3	188.0	-3.0	3.0
2019/20	146.7	-3.1	3.1	221.5	-4.6	4.6	79.2	-1.7	1.7	148.5	-3.1	3.1	187.5	-3.9	3.9
2020/21	146.0	-3.9	3.9	221.1	-5.7	5.7	79.7	-2.1	2.1	148.4	-3.9	3.9	187.5	-4.9	4.9
2021/22	145.0	-4.6	4.6	221.6	-6.9	6.9	80.0	-2.6	2.6	148.4	-4.7	4.7	187.5	-5.9	5.9
2022/23	145.0	-5.4	5.4	221.0	-8.0	8.0	80.4	-3.0	3.0	148.4	-5.4	5.4	187.6	-6.9	6.9
2023/24	144.2	-6.2	6.2	221.7	-9.2	9.2	80.6	-3.4	3.4	148.5	-6.2	6.2	187.6	-7.9	7.9
2024/25	144.5	-6.9	6.9	220.7	-10.3	10.3	81.2	-3.9	3.9	148.5	-7.0	7.0	187.8	-8.9	8.9
2025/26	144.2	-7.7	7.7	221.0	-11.5	11.5	81.5	-4.3	4.3	148.6	-7.8	7.8	187.9	-9.9	9.9
2026/27	144.0	-8.5	8.5	222.0	-12.6	12.6	81.0	-4.7	4.7	148.7	-8.5	8.5	188.1	-10.9	10.9
2027/28	144.1	-9.3	9.3	222.0	-13.8	13.8	81.4	-5.2	5.2	148.8	-9.3	9.3	188.3	-11.8	11.8
2028/29	144.4	-10.0	10.0	222.0	-14.9	14.9	81.6	-5.6	5.6	149.0	-10.1	10.1	188.6	-12.8	12.8
2029/30	144.2	-10.8	10.8	222.5	-16.1	16.1	81.9	-6.0	6.0	149.1	-10.9	10.9	188.8	-13.8	13.8
2030/31	144.2	-11.6	11.6	222.8	-17.2	17.2	82.1	-6.4	6.4	149.2	-11.6	11.6	189.0	-14.8	14.8
2031/32	144.7	-12.3	12.3	222.9	-18.4	18.4	81.9	-6.9	6.9	149.3	-12.4	12.4	189.2	-15.8	15.8
2032/33	145.3	-13.1	13.1	222.6	-19.5	19.5	82.0	-7.3	7.3	149.4	-13.2	13.2	189.3	-16.8	16.8
2033/34	146.0	-13.9	13.9	222.2	-20.7	20.7	82.1	-7.7	7.7	149.4	-14.0	14.0	189.5	-17.8	17.8
2034/35	146.2	-14.7	14.7	222.3	-21.8	21.8	82.2	-8.2	8.2	149.5	-14.8	14.8	189.6	-18.7	18.7
2035/36	146.0	-15.4	15.4	222.7	-23.0	23.0	82.4	-8.6	8.6	149.6	-15.5	15.5	189.8	-19.7	19.7
2036/37	146.4	-16.2	16.2	222.8	-24.1	24.1	82.2	-9.0	9.0	149.6	-16.3	16.3	189.9	-20.7	20.7
2037/38	146.6	-17.0	17.0	223.1	-25.2	25.2	82.0	-9.5	9.5	149.7	-17.1	17.1	190.0	-21.7	21.7
2038/39	147.0	-17.7	17.7	223.1	-26.4	26.4	81.9	-9.9	9.9	149.7	-17.9	17.9	190.1	-22.7	22.7
2039/40	147.2	-18.5	18.5	223.0	-27.5	27.5	82.0	-10.3	10.3	149.8	-18.6	18.6	190.2	-23.7	23.7
2040/41	147.7	-19.3	19.3	222.8	-28.7	28.7	82.2	-10.7	10.7	149.8	-19.4	19.4	190.3	-24.7	24.7
2041/42	147.8	-20.1	20.1	222.9	-29.8	29.8	82.3	-11.2	11.2	149.9	-20.2	20.2	190.4	-25.7	25.7
2042/43	148.4	-20.8	20.8	222.5	-31.0	31.0	82.5	-11.6	11.6	150.0	-21.0	21.0	190.5	-26.6	26.6
2043/44	149.0	-21.6	21.6	222.1	-32.1	32.1	82.6	-12.0	12.0	150.0	-21.7	21.7	190.7	-27.6	27.6
2044/45	149.2	-22.4	22.4	221.9	-33.3	33.3	83.1	-12.5	12.5	150.1	-22.5	22.5	190.8	-28.6	28.6

3.12 D3 Impact of climate change on demand

Demand forecasts conducted by SWW suggest an increase in consumption of due to climate change of 0.71% in Colliford, 0.74% in Roadford, 0.72% in Wimbleball and 0.54% in Bournemouth by 2044/45. A potential variation of ±20% has been assumed and a triangular distribution was used to represent the uncertainty. This differs from WRMP14 which assumed a 1% increase in consumption due to climate change by the end of the planning period.

Table 3-7: D3 headroom uncertainty probability distribution summary data for all WRZ's

	Colliford			Roadford			Wimbleball			Bournemouth DYAA			Bournemouth DYCP		
Year	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max
2015/16	144.9	0.0	0.0	217.9	0.0	0.0	77.0	0.0	0.0	145.3	0.0	0.0	184.3	0.0	0.0
2016/17	146.7	0.0	0.0	221.1	0.0	0.0	78.5	0.0	0.0	146.2	0.0	0.0	186.2	0.0	0.0
2017/18	150.0	0.0	0.0	226.1	0.0	0.0	80.3	0.0	0.0	149.5	0.0	0.0	188.8	0.0	0.0
2018/19	147.3	0.0	0.0	222.3	0.0	0.0	79.4	0.0	0.0	149.0	0.0	0.0	188.0	0.0	0.0
2019/20	146.7	0.0	0.0	221.5	0.0	0.0	79.2	0.0	0.0	148.5	0.0	0.0	187.5	0.0	0.0
2020/21	146.0	0.0	0.0	221.1	-0.1	0.1	79.7	0.0	0.0	148.4	0.0	0.0	187.5	0.0	0.0
2021/22	145.0	0.0	0.0	221.6	-0.1	0.1	80.0	0.0	0.0	148.4	0.0	0.0	187.5	0.0	0.0
2022/23	145.0	-0.1	0.1	221.0	-0.1	0.1	80.4	0.0	0.0	148.4	0.0	0.0	187.6	0.0	0.0
2023/24	144.2	-0.1	0.1	221.7	-0.1	0.1	80.6	0.0	0.0	148.5	0.0	0.0	187.6	-0.1	0.1
2024/25	144.5	-0.1	0.1	220.7	-0.1	0.1	81.2	0.0	0.0	148.5	-0.1	0.1	187.8	-0.1	0.1
2025/26	144.2	-0.1	0.1	221.0	-0.1	0.1	81.5	0.0	0.0	148.6	-0.1	0.1	187.9	-0.1	0.1
2026/27	144.0	-0.1	0.1	222.0	-0.1	0.1	81.0	0.0	0.0	148.7	-0.1	0.1	188.1	-0.1	0.1
2027/28	144.1	-0.1	0.1	222.0	-0.1	0.1	81.4	0.0	0.0	148.8	-0.1	0.1	188.3	-0.1	0.1
2028/29	144.4	-0.1	0.1	222.0	-0.1	0.1	81.6	-0.1	0.1	149.0	-0.1	0.1	188.6	-0.1	0.1
2029/30	144.2	-0.1	0.1	222.5	-0.2	0.2	81.9	-0.1	0.1	149.1	-0.1	0.1	188.8	-0.1	0.1
2030/31	144.2	-0.1	0.1	222.8	-0.2	0.2	82.1	-0.1	0.1	149.2	-0.1	0.1	189.0	-0.1	0.1
2031/32	144.7	-0.1	0.1	222.9	-0.2	0.2	81.9	-0.1	0.1	149.3	-0.1	0.1	189.2	-0.1	0.1
2032/33	145.3	-0.1	0.1	222.6	-0.2	0.2	82.0	-0.1	0.1	149.4	-0.1	0.1	189.3	-0.1	0.1
2033/34	146.0	-0.1	0.1	222.2	-0.2	0.2	82.1	-0.1	0.1	149.4	-0.1	0.1	189.5	-0.1	0.1
2034/35	146.2	-0.1	0.1	222.3	-0.2	0.2	82.2	-0.1	0.1	149.5	-0.1	0.1	189.6	-0.1	0.1
2035/36	146.0	-0.1	0.1	222.7	-0.2	0.2	82.4	-0.1	0.1	149.6	-0.1	0.1	189.8	-0.1	0.1
2036/37	146.4	-0.2	0.2	222.8	-0.2	0.2	82.2	-0.1	0.1	149.6	-0.1	0.1	189.9	-0.1	0.1
2037/38	146.6	-0.2	0.2	223.1	-0.2	0.2	82.0	-0.1	0.1	149.7	-0.1	0.1	190.0	-0.2	0.2
2038/39	147.0	-0.2	0.2	223.1	-0.3	0.3	81.9	-0.1	0.1	149.7	-0.1	0.1	190.1	-0.2	0.2
2039/40	147.2	-0.2	0.2	223.0	-0.3	0.3	82.0	-0.1	0.1	149.8	-0.1	0.1	190.2	-0.2	0.2
2040/41	147.7	-0.2	0.2	222.8	-0.3	0.3	82.2	-0.1	0.1	149.8	-0.1	0.1	190.3	-0.2	0.2
2041/42	147.8	-0.2	0.2	222.9	-0.3	0.3	82.3	-0.1	0.1	149.9	-0.1	0.1	190.4	-0.2	0.2
2042/43	148.4	-0.2	0.2	222.5	-0.3	0.3	82.5	-0.1	0.1	150.0	-0.2	0.2	190.5	-0.2	0.2
2043/44	149.0	-0.2	0.2	222.1	-0.3	0.3	82.6	-0.1	0.1	150.0	-0.2	0.2	190.7	-0.2	0.2
2044/45	149.2	-0.2	0.2	221.9	-0.3	0.3	83.1	-0.1	0.1	150.1	-0.2	0.2	190.8	-0.2	0.2

3.13 D4 Demand management measures

An assumption has been made by SWW that demand management measures will save 0.75 Ml/d every year throughout the planning period. The savings have been estimated on a pro rata basis of forecast DI between the four WRZs (Table 3-8), by adopting a triangular distribution with the most likely outcome that the savings will be made (i.e. an uncertainty of 0) and an allowance of ±10%. The minimum and maximum values are shown in

Table 3-9 however the most likely is not shown as it is zero for all WRZ's across all the years. This approach is consistent with WRMP14.

Table 3-8: Distribution of demand management savings across the WRZ's

WRZ	2015/2016 DI (Ml/d)	Ratio	Demand management savings Ml/d per year
Colliford	144.9	0.25	0.19
Roadford	217.9	0.37	0.28
Wimbleball	77.0	0.13	0.10
Bournemouth	145.3	0.25	0.19
Total	**585.1**	**1.00**	**0.75**

Table 3-9: D4 headroom uncertainty probability distribution summary data for all WRZ's

	Colliford			Roadford			Wimbleball			Bournemouth DYAA			Bournemouth DYCP		
Year	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max
2015/16	144.9	0.0	0.0	217.9	0.0	0.0	77.0	0.0	0.0	145.3	0.0	0.0	184.3	0.0	0.0
2016/17	146.7	0.0	0.0	221.1	0.0	0.0	78.5	0.0	0.0	146.2	0.0	0.0	186.2	0.0	0.0
2017/18	150.0	0.0	0.0	226.1	-0.1	0.1	80.3	0.0	0.0	149.5	0.0	0.0	188.8	0.0	0.0
2018/19	147.3	-0.1	0.1	222.3	-0.1	0.1	79.4	0.0	0.0	149.0	-0.1	0.1	188.0	-0.1	0.1
2019/20	146.7	-0.1	0.1	221.5	-0.1	0.1	79.2	0.0	0.0	148.5	-0.1	0.1	187.5	-0.1	0.1
2020/21	146.0	-0.1	0.1	221.1	-0.1	0.1	79.7	0.0	0.0	148.4	-0.1	0.1	187.5	-0.1	0.1
2021/22	145.0	-0.1	0.1	221.6	-0.2	0.2	80.0	-0.1	0.1	148.4	-0.1	0.1	187.5	-0.1	0.1
2022/23	145.0	-0.1	0.1	221.0	-0.2	0.2	80.4	-0.1	0.1	148.4	-0.1	0.1	187.6	-0.1	0.1
2023/24	144.2	-0.1	0.1	221.7	-0.2	0.2	80.6	-0.1	0.1	148.5	-0.1	0.1	187.6	-0.1	0.1
2024/25	144.5	-0.2	0.2	220.7	-0.3	0.3	81.2	-0.1	0.1	148.5	-0.2	0.2	187.8	-0.2	0.2
2025/26	144.2	-0.2	0.2	221.0	-0.3	0.3	81.5	-0.1	0.1	148.6	-0.2	0.2	187.9	-0.2	0.2
2026/27	144.0	-0.2	0.2	222.0	-0.3	0.3	81.0	-0.1	0.1	148.7	-0.2	0.2	188.1	-0.2	0.2
2027/28	144.1	-0.2	0.2	222.0	-0.3	0.3	81.4	-0.1	0.1	148.8	-0.2	0.2	188.3	-0.2	0.2
2028/29	144.4	-0.2	0.2	222.0	-0.4	0.4	81.6	-0.1	0.1	149.0	-0.2	0.2	188.6	-0.2	0.2
2029/30	144.2	-0.3	0.3	222.5	-0.4	0.4	81.9	-0.1	0.1	149.1	-0.3	0.3	188.8	-0.3	0.3
2030/31	144.2	-0.3	0.3	222.8	-0.4	0.4	82.1	-0.1	0.1	149.2	-0.3	0.3	189.0	-0.3	0.3
2031/32	144.7	-0.3	0.3	222.9	-0.4	0.4	81.9	-0.2	0.2	149.3	-0.3	0.3	189.2	-0.3	0.3
2032/33	145.3	-0.3	0.3	222.6	-0.5	0.5	82.0	-0.2	0.2	149.4	-0.3	0.3	189.3	-0.3	0.3
2033/34	146.0	-0.3	0.3	222.2	-0.5	0.5	82.1	-0.2	0.2	149.4	-0.3	0.3	189.5	-0.3	0.3
2034/35	146.2	-0.4	0.4	222.3	-0.5	0.5	82.2	-0.2	0.2	149.5	-0.4	0.4	189.6	-0.4	0.4
2035/36	146.0	-0.4	0.4	222.7	-0.6	0.6	82.4	-0.2	0.2	149.6	-0.4	0.4	189.8	-0.4	0.4
2036/37	146.4	-0.4	0.4	222.8	-0.6	0.6	82.2	-0.2	0.2	149.6	-0.4	0.4	189.9	-0.4	0.4
2037/38	146.6	-0.4	0.4	223.1	-0.6	0.6	82.0	-0.2	0.2	149.7	-0.4	0.4	190.0	-0.4	0.4
2038/39	147.0	-0.4	0.4	223.1	-0.6	0.6	81.9	-0.2	0.2	149.7	-0.4	0.4	190.1	-0.4	0.4
2039/40	147.2	-0.4	0.4	223.0	-0.7	0.7	82.0	-0.2	0.2	149.8	-0.4	0.4	190.2	-0.4	0.4
2040/41	147.7	-0.5	0.5	222.8	-0.7	0.7	82.2	-0.2	0.2	149.8	-0.5	0.5	190.3	-0.5	0.5
2041/42	147.8	-0.5	0.5	222.9	-0.7	0.7	82.3	-0.3	0.3	149.9	-0.5	0.5	190.4	-0.5	0.5
2042/43	148.4	-0.5	0.5	222.5	-0.8	0.8	82.5	-0.3	0.3	150.0	-0.5	0.5	190.5	-0.5	0.5
2043/44	149.0	-0.5	0.5	222.1	-0.8	0.8	82.6	-0.3	0.3	150.0	-0.5	0.5	190.7	-0.5	0.5
2044/45	149.2	-0.5	0.5	221.9	-0.8	0.8	83.1	-0.3	0.3	150.1	-0.5	0.5	190.8	-0.5	0.5

3.14 Relationship between headroom components

Interdependencies between uncertainty factors have been incorporated within the Monte Carlo analysis. Interdependency is where the sampled value of one probability distribution is not completely independent of the value of another, i.e. there is some relationship between the two variables. The only interdependency identified in this assessment is between the impact of climate change on WAFU and on demand, i.e. the greater the increase in demand due to climate change, the greater the reduction in WAFU (both of which impacts have a positive effect on the calculated headroom allowance). This has been modelled by setting a positive correlation between the probability distribution functions for factor S8 and factor D3 respectively, in each year across the planning horizon.

3.15 Summary of key changes in assumptions from WRMP14

This assessment is consistent with WRMP14 in all categories except for the impact of climate change on WAFU (S8). There has been a change in the methodology for estimating the impact of climate change on WAFU (including uncertainty) since WRMP14. Previously, UKCP09 monthly flow factors were used to obtain “dry” and “wet” predictions, which were used to give an estimate of uncertainty to include in the headroom. The Environment Agency’s *Estimating impacts of climate change on water supply* (June 2017) specifies that where a WRZ is classified as Low Vulnerability and rainfall-runoff models are available, a “Tier 2” analysis should be undertaken as a minimum. Although some rainfall runoff models are available for groundwater modelling, there are none available for surface water modelling, and since 90% of SWW resources are surface water, a Tier 1 analysis has been adopted. This assessment therefore used a dataset consisting of 11 equally likely scenarios of climate to 2085/2086 (Future Flows hydrology monthly change factors), to determine the minimum, mean and maximum climate change impacts on WAFU.

For WRMP14, separate headroom assessments were carried out by BW and SWW; however, this assessment combines the two regions to produce one headroom allowance assessment. Bournemouth has been included as a WRZ in this assessment, and the headroom assessment methodology and assumptions have been aligned with the SWW approach as demonstrated in Table 3-1.

4. Results

4.1 Target headroom allowance

The results of the probabilistic assessment are summarised in Table 4-1 below (the full results from @RISK spreadsheet is contained in Appendix A), which shows the target headroom for the WRZ's at the end of the planning period. The DYCP is only assessed for Bournemouth WRZ. This is because the nature of WAFU constraints in the other WRZ's means that a DYCP analysis is not required.

Table 4-1: Target headroom (Ml/d) at the end of the planning period (2044/45)

WRZ	Probability								
	55%	60%	65%	70%	75%	80%	85%*	90%	95%
Colliford WRZ (Ml/d)	0.96	2.67	4.57	6.52	8.57	10.97	**13.68**	16.91	21.61
Roadford WRZ (Ml/d)	2.36	4.88	7.62	10.20	13.01	16.38	**20.38**	25.26	32.05
Wimbleball WRZ (Ml/d)	0.38	1.32	2.33	3.37	4.46	5.65	**7.10**	8.99	11.68
Bournemouth WRZ DYAA (Ml/d)	1.84	3.73	5.84	7.97	10.52	13.15	**15.92**	19.20	24.54
Bournemouth WRZ DYCP (Ml/d)	2.29	4.51	6.87	9.32	12.12	15.27	**18.36**	22.70	29.11

** Risk Percentile to be used at the end of the planning period*

4.2 Risk profile

The company headroom values presented in Table 4-2 below vary according to the selected probability point on each combined headroom distribution from which these values are taken. In order to determine a single profile of target headroom allowance across the 25-year planning period, for each planning scenario, it is necessary to select the appropriate level of risk on which to base the target headroom allowance for each year. SWW can then incorporate the corresponding headroom value into its supply-demand balance across the planning period.

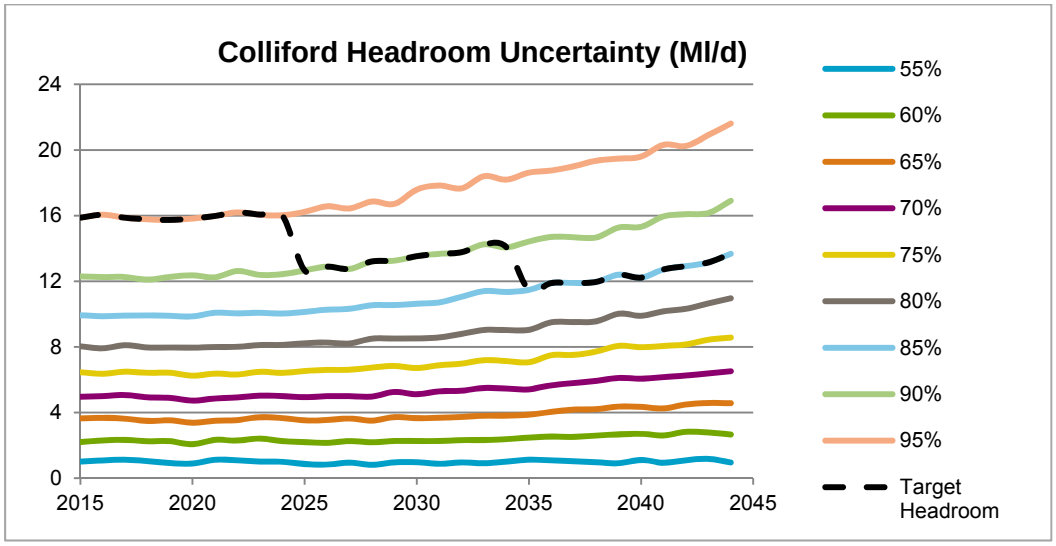
For WRMP14 the risk profile chosen was the 85th percentile at the start of the planning period, falling to the 70th by the end of the planning period. In its 2020 Direction, OFWAT has instructed companies to use 95% uncertainty (or equivalent for complex methods) for the first five years of the planning period forecasts. The level of acceptable risk was therefore determined to be 95% in the beginning of the planning period, falling to 85% at the end of the planning period. This was considered to be most appropriate in order to ensure the headroom is not so large that it drives unnecessary expenditure, and not too small that it leaves the possibility that the planned level of service cannot be met. A higher level of risk is more acceptable in the future than in the early years (first 5 years) because as time progresses, the uncertainties for which headroom allows reduce and there is more time to adapt to any changes. This is in line with the Environment Agency's WRPG (April 2017), which promotes the use of a glide path approach.

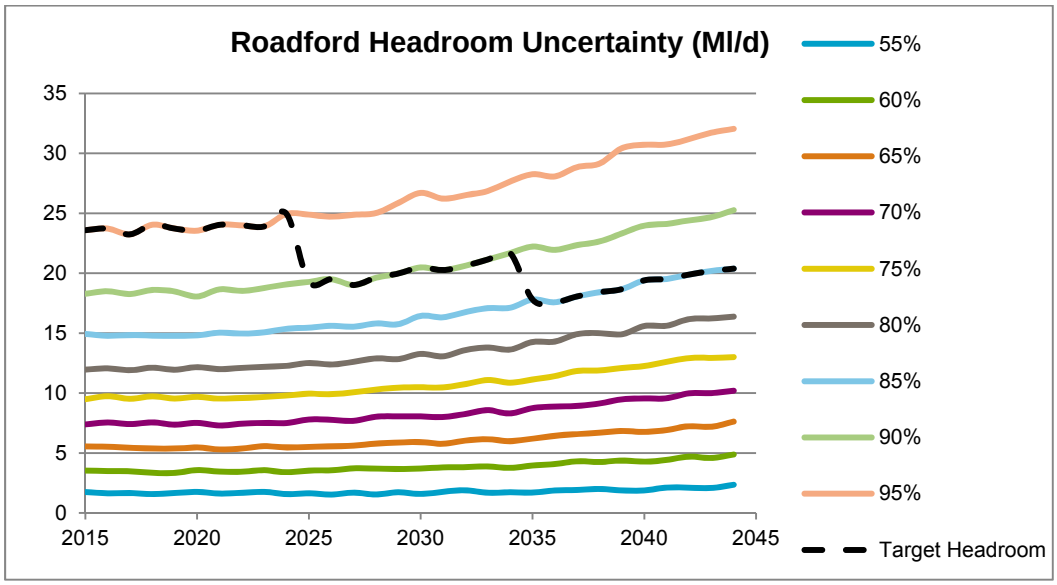
Table 4-2 WRMP19 Target headroom risk profile

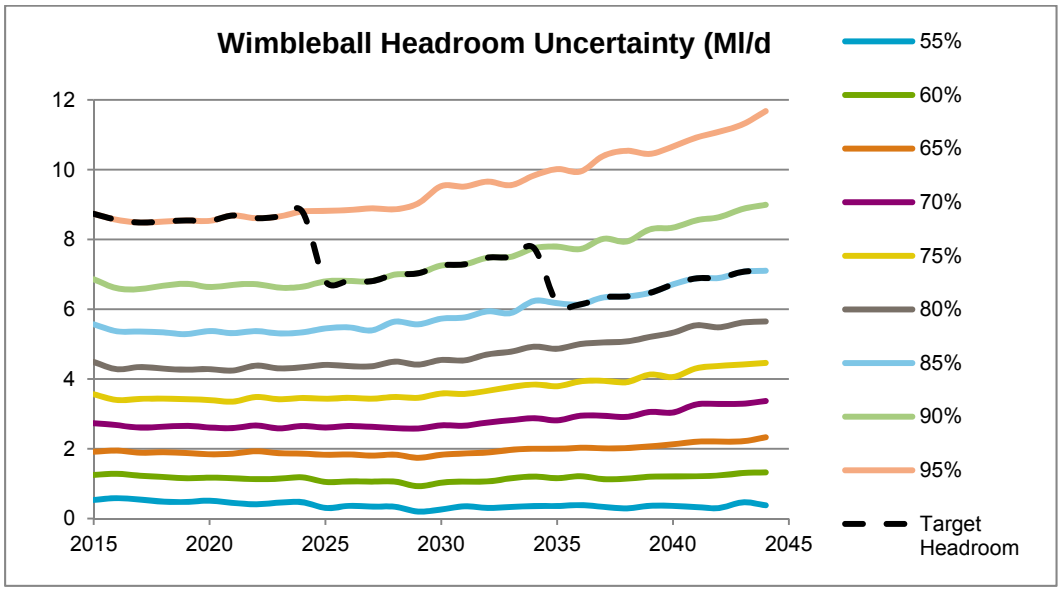
Component	2020/21 - 2024/25	2025/26 - 2029/30	2030/31 - 2034/35	2035/36 - 2039/40	2040/41 – 2044/45
Risk of variation (reduced surplus/ increased deficit) in the supply-demand balance	5%	10%	10%	15%	15%
Headroom distribution probability	95%	90%	90%	85%	85%

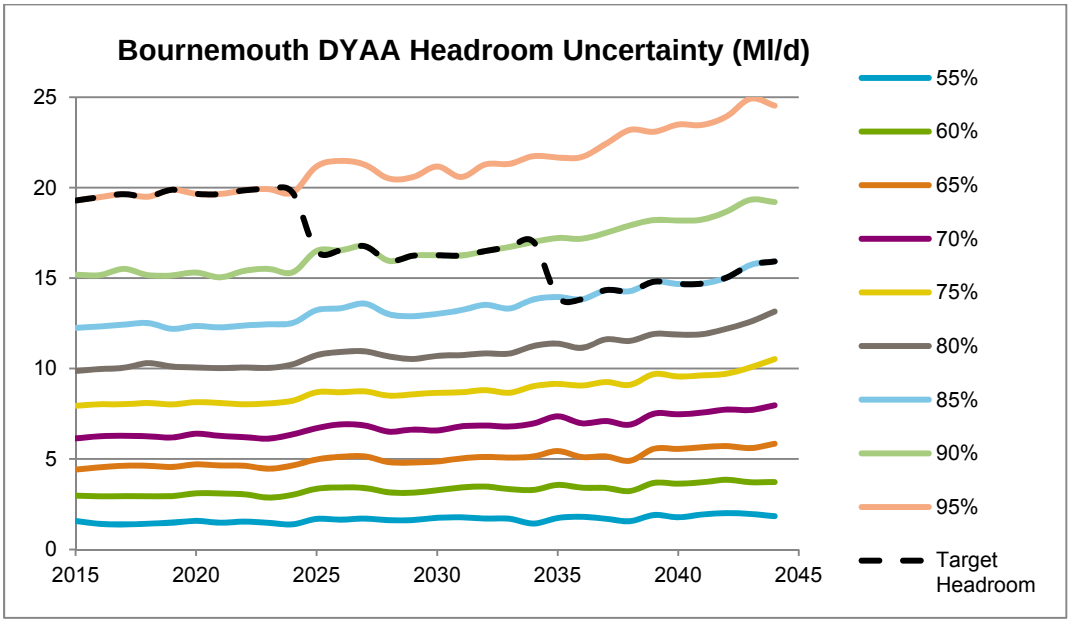
Figure 4-1 below summarises how the headroom uncertainty varies over time in each WRZ as well as the target headroom based on the acceptable level of risk over the planning period. Generally, the uncertainty increases with time; however, the glide path approach means that the headroom allowance is actually lower at the end of the planning period than it is at the start. This is because a lower level of risk is acceptable in the early years (hence using the 95th percentile value) as there is little time to react and implement mitigation measures, while in the longer term there is more time to implement appropriate measures and so a higher level of risk is acceptable (85th percentile).

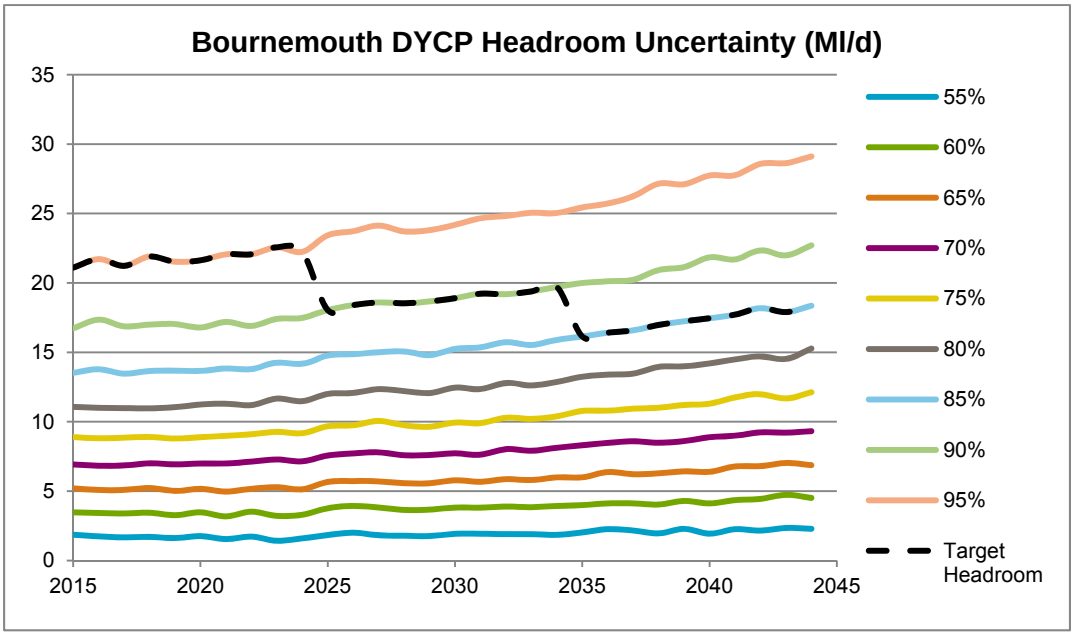
Figure 4-1: Target headroom risk profile







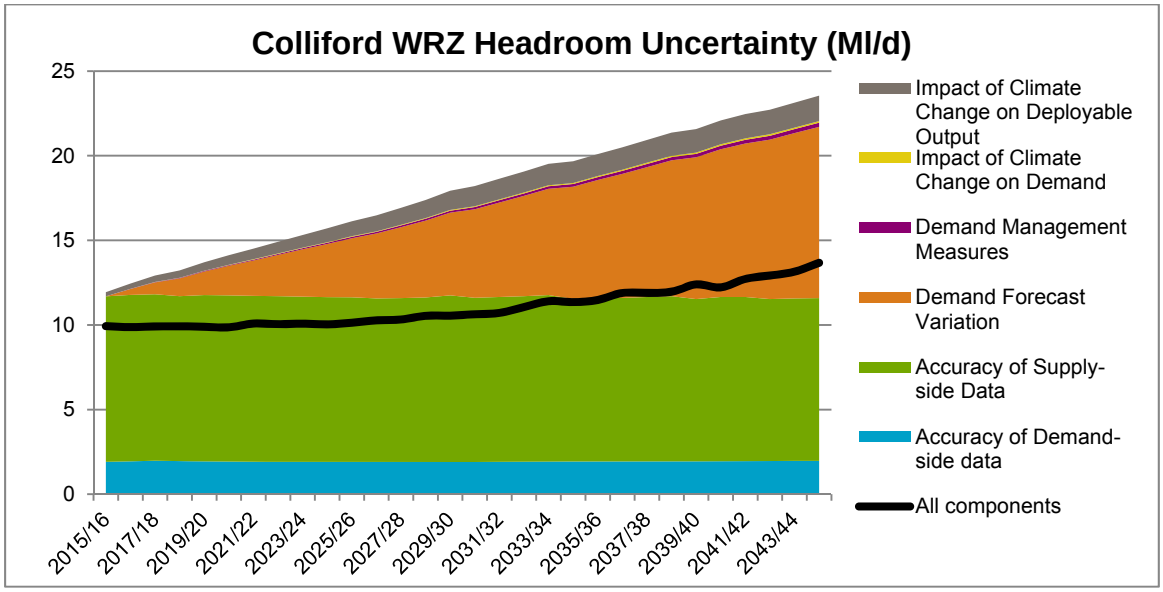


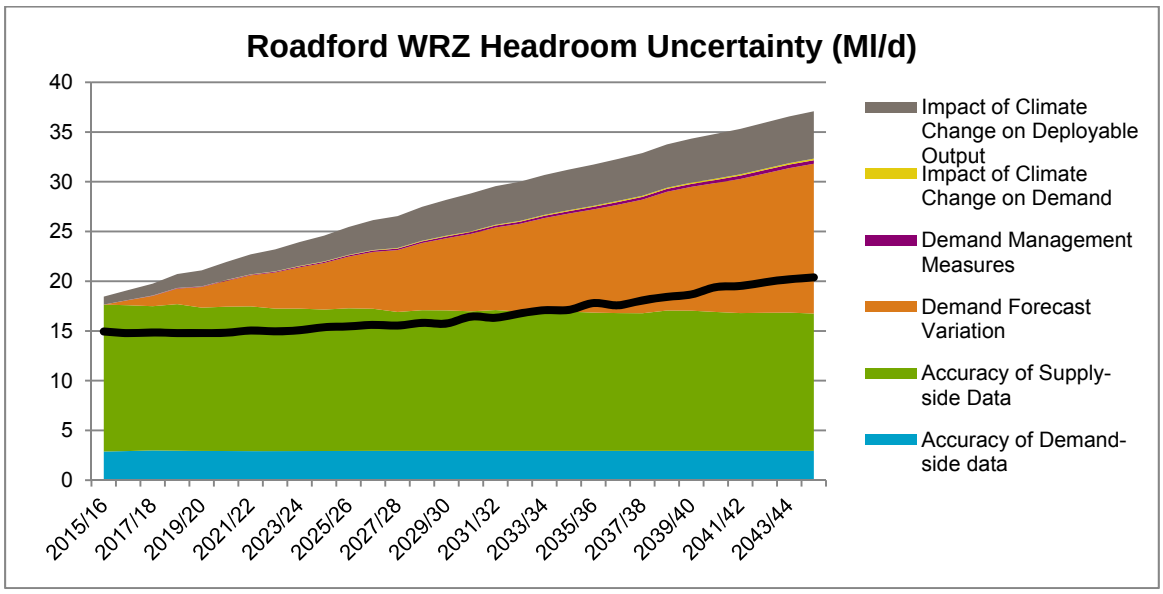


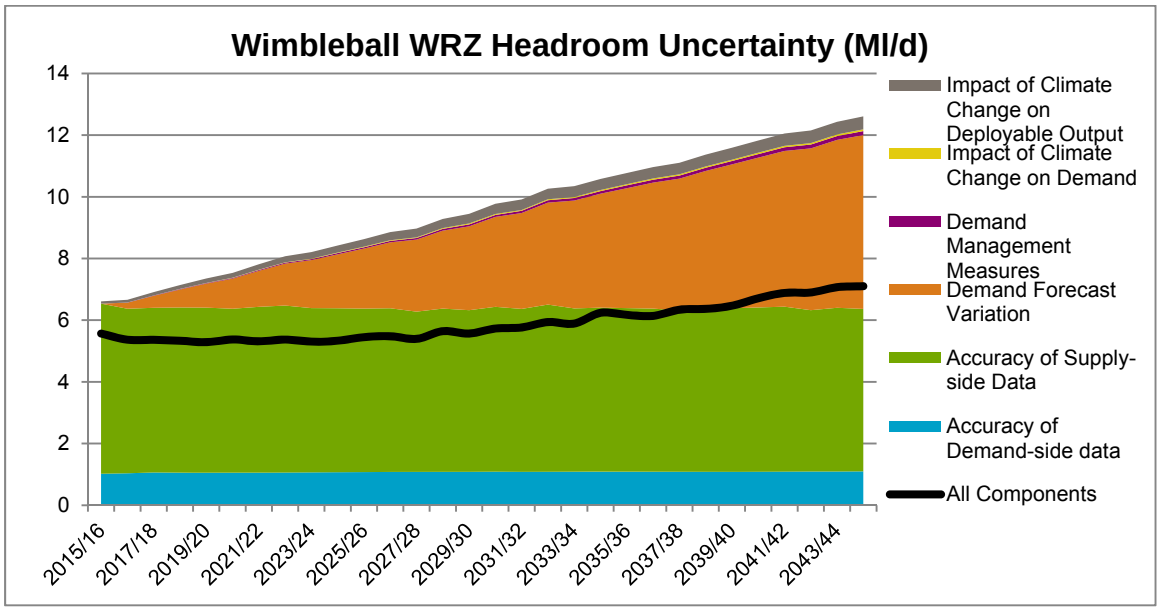
4.3 Headroom by uncertainty factor

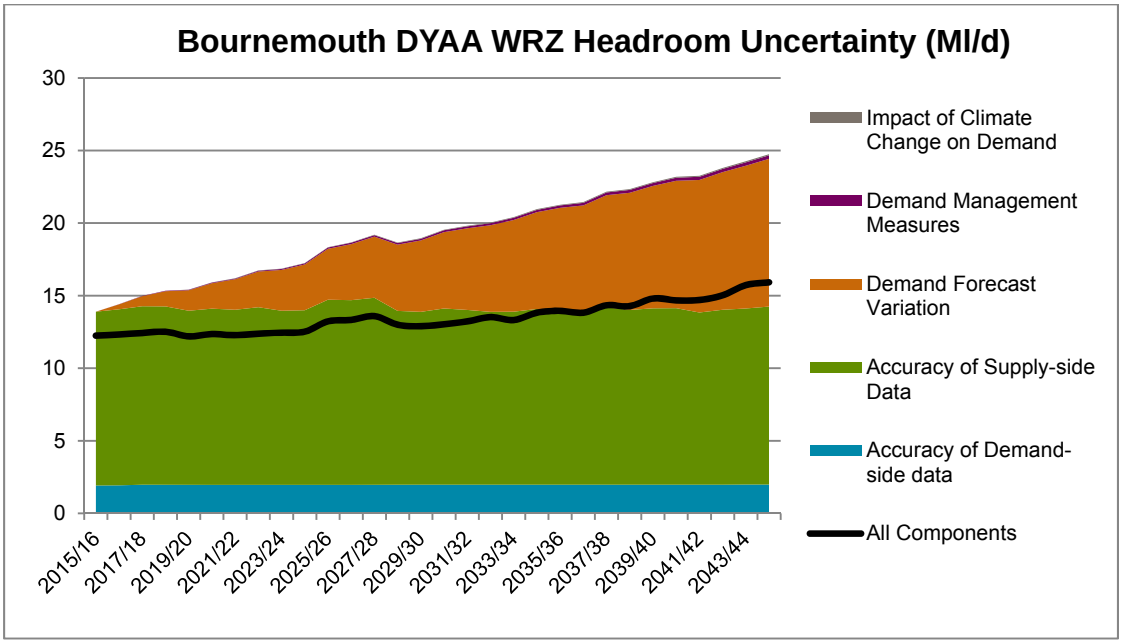
The relative contribution of the different components of the target headroom assessment is shown in Figure 4-2 below. It should be noted that the sum of the different categories does not match the target headroom. This is because the sum of the individual categories does not provide a statistically correct percentile impact for the overall target headroom. The sum of all these components' results is greater than the overall target headroom result, because statistically, the probability of all components experiencing the same percentile impact simultaneously is much smaller than a single headroom component experiencing a percentile impact. By using @Risk to sum all the categories within the model runs, the sums are done during each iteration of the model and therefore the target headroom allowance is lower than the sum of the individual categories.

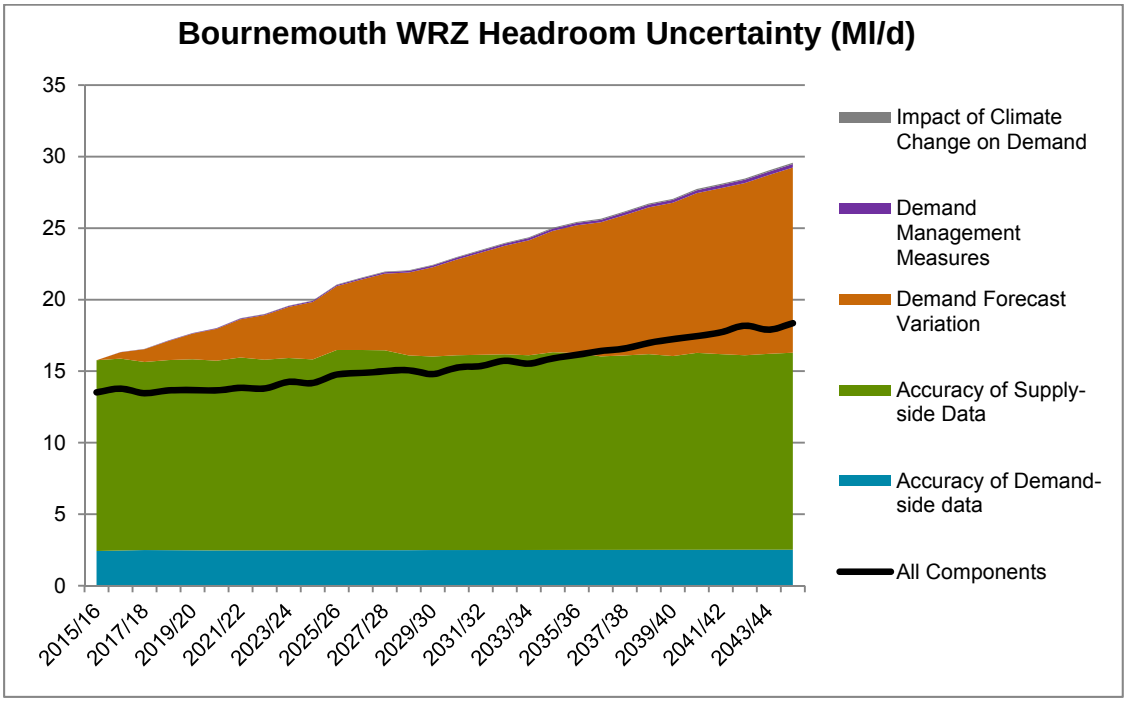
Figure 4-2: Relative contribution of the different categories to the target headroom at the 85th percentile







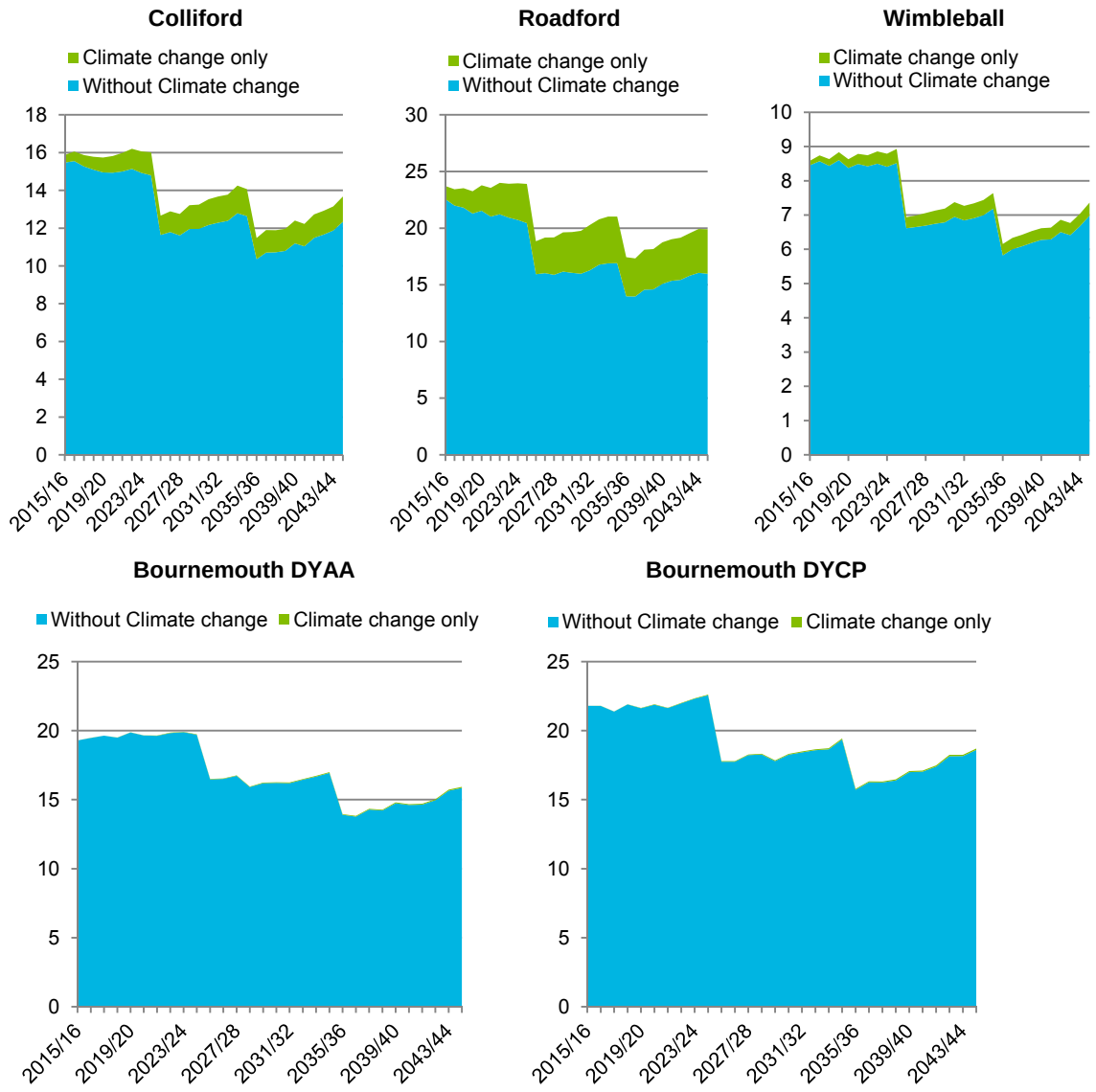




4.4 Impact of climate change on the target headroom

The impact of climate change on the target headroom allowance has been assessed separately in accordance with the Environment Agency's WRPG (April 2017). The full results can be found in Appendix B and a summary of the results is shown in Figure 4-3. The impact of climate change on the headroom allowance is largest in Roadford WRZ; however as shown in Figure 4-2, the overall contribution of the climate change components is relatively small when compared to the other components in all WRZ's. It can also be seen that the impact of climate change on WAFU has a larger contribution to the headroom allowance than the impact of climate change on demand in Colliford, Roadford and Wimbleball WRZ's. The impact of climate change in Bournemouth WRZ is very limited since there is no impact on the WAFU, only an impact of climate change on demand.

Figure 4-3: Estimated contribution (Ml/day) of climate change (green) to total headroom



4.5 Overall assessment of results

Details on how the different factors contribute to uncertainty and hence the headroom allowance can be found in Appendix C. The uncertainty associated with the impact of climate and catchment characteristics on surface waters (S6/4) has the largest contribution to the headroom allowance across the whole planning period. As the forecast moves further into the future, uncertainties associated with the demand forecast variation and the impact of climate change on WAFU also increase. Uncertainties associated with demand management measures and impact of climate change on demand also start to contribute to the headroom allowance towards the end of the planning period, however the contribution of these components is small.

4.6 Comparison with WRMP14

The results of the WRMP19 assessment are compared with WMP14 in Table 4-3 below. It should be noted that in WRMP14 the risk profile chosen was the 85th percentile at the start of the planning period, falling to the 70th by the end of the planning period. The chosen risk profile for this assessment is uncertainties at the 95th percentile at the start of the planning period, falling to the 85th percentile by the end of the planning period. The WRMP14 results presented in Table 4-3 are therefore not the headroom allowance in WRMP14 (which used different percentiles), but the values for the 95th and 85th percentiles, in order to provide a like for like comparison.

The headroom allowance for Bournemouth WRZ is significantly higher than in WRMP14. This is mainly because the WRMP14 assessment for Bournemouth did not consider S6/4 as all their sources are licence constrained and therefore they assumed that they did not need to include this component. Following discussions with SWW, it

was decided that this approach was not appropriate in this assessment, as the purpose of the S6/4 component is to estimate uncertainty in river flow measurement, regardless of whether the supply is considered to be sufficient. This combined with an increase in the uncertainty factors for S6/2 and D2 have resulted in a higher headroom allowance, since these three components have the largest impact on the headroom allowance as shown in Appendix C.

Table 4-3: SWW headroom allowance summary and comparison with previous results

WRZ	Headroom allowance (Ml/d) in WRMP14		Headroom allowance (Ml/d) in WRMP19	
	Start of planning period (95th Perc)	End of planning period (85th Perc)	Start of planning period (95th Perc)	End of planning period (85th Perc)
Colliford	15.53	15.50	15.87	13.68
Roadford	23.72	21.52	23.59	20.38
Wimbleball	6.66	7.50	8.73	7.10
Bournemouth (DYAA)*	2.4	3.9	19.29	15.92
Bournemouth (DYCP)*	2.8	5.5	21.10	18.36

Overall the headroom allowance at the start of the planning period is similar to the WRMP14 allowance for Colliford, Roadford and Wimbleball. The allowance at the end of the planning period however is lower than WRMP14 for these WRZ's. This is because the impact of climate change on the headroom allowance is much lower in this assessment than in WRMP14, as shown in Table 4-4. This is likely due to the change in the methodology for estimating the impact of climate change on WAFU (including uncertainty) since WRMP14.

Table 4-4: Comparison of the impact of climate change on the headroom allowance between WRMP14 and WRMP19

WRZ	Estimated impact of climate change on headroom (%)		Estimated impact of climate change on headroom (%)	
	Start of planning period WRMP14	End of planning period WRMP14	Start of planning period WRMP19	End of planning period WRMP19
Colliford	4.6	33.1	2.6	9.8
Roadford	3.9	28.7	5.0	19.2
Wimbleball	4.2	31.5	1.5	5.4
Bournemouth (DYAA)	N/a	N/a	0	0.5
Bournemouth (DYCP)	N/a	N/a	0	0.5

5. Conclusions and recommendations

A target headroom allowance assessment for SWW and BW's combined WRMP19 submission has been prepared. The assessment runs through to 2044/45 and has adopted the latest guidance given by the Environment Agency.

In general, the assumptions made for WRMP14 have been followed through with this assessment. A slight change has taken place for category S8 (the impact of climate change on WAFU) and D3 (the impact of climate change on demand) due to the new methodology for assessing the impact of climate change.

A glide path approach has been adopted, whereby the level of acceptable risk is maintained at 95% for the next AMP period, reducing to 85% at the end of the planning period. This is in line with the latest Environment Agency guidance.

Appendix A @Risk Spreadsheet Outputs

A.1 Colliford Headroom Allowance by Probability

	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2015/16	-0.17	1.01	2.20	3.65	4.96	6.46	8.04	9.93	12.29	15.87
2016/17	-0.11	1.08	2.30	3.67	5.01	6.36	7.92	9.87	12.26	16.06
2017/18	-0.16	1.12	2.34	3.63	5.07	6.49	8.10	9.91	12.26	15.87
2018/19	-0.18	1.05	2.25	3.49	4.93	6.42	7.97	9.92	12.10	15.78
2019/20	-0.18	0.91	2.26	3.53	4.89	6.43	7.97	9.90	12.27	15.74
2020/21	-0.34	0.90	2.07	3.38	4.73	6.25	7.95	9.86	12.37	15.82
2021/22	-0.11	1.12	2.34	3.50	4.86	6.37	7.99	10.08	12.24	15.98
2022/23	-0.13	1.10	2.30	3.54	4.93	6.32	8.01	10.05	12.63	16.20
2023/24	-0.33	1.02	2.42	3.72	5.03	6.49	8.12	10.08	12.39	16.06
2024/25	-0.25	1.01	2.26	3.67	5.01	6.42	8.12	10.03	12.43	16.02
2025/26	-0.34	0.86	2.20	3.53	4.94	6.53	8.22	10.13	12.66	16.23
2026/27	-0.49	0.84	2.16	3.55	5.00	6.60	8.27	10.27	12.89	16.57
2027/28	-0.32	0.95	2.26	3.64	5.00	6.61	8.21	10.32	12.75	16.44
2028/29	-0.52	0.82	2.19	3.51	4.98	6.74	8.51	10.54	13.21	16.86
2029/30	-0.34	0.97	2.27	3.73	5.26	6.84	8.51	10.55	13.25	16.71
2030/31	-0.34	0.98	2.27	3.66	5.12	6.71	8.52	10.63	13.53	17.58
2031/32	-0.61	0.88	2.27	3.69	5.29	6.88	8.58	10.71	13.67	17.84
2032/33	-0.38	0.96	2.32	3.73	5.33	6.98	8.80	11.06	13.77	17.66
2033/34	-0.54	0.91	2.33	3.81	5.50	7.19	9.03	11.40	14.25	18.40
2034/35	-0.42	1.01	2.37	3.81	5.46	7.14	9.03	11.35	14.07	18.19
2035/36	-0.35	1.13	2.48	3.87	5.41	7.07	9.04	11.48	14.43	18.62
2036/37	-0.37	1.09	2.54	4.04	5.67	7.49	9.50	11.90	14.70	18.75
2037/38	-0.51	1.03	2.51	4.18	5.79	7.51	9.52	11.89	14.68	19.01
2038/39	-0.59	0.97	2.61	4.21	5.94	7.72	9.56	11.96	14.67	19.35
2039/40	-0.65	0.91	2.66	4.37	6.11	8.07	10.02	12.40	15.28	19.47
2040/41	-0.44	1.11	2.71	4.35	6.06	7.98	9.90	12.22	15.32	19.60
2041/42	-0.63	0.94	2.61	4.25	6.16	8.06	10.17	12.72	15.95	20.32
2042/43	-0.50	1.10	2.83	4.49	6.26	8.15	10.32	12.92	16.09	20.24
2043/44	-0.60	1.18	2.79	4.59	6.39	8.44	10.65	13.15	16.16	20.91
2044/45	-0.74	0.96	2.67	4.57	6.52	8.57	10.97	13.68	16.91	21.61

A.2 Roadford Headroom Allowance by Probability

	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2015/16	-0.06	1.75	3.54	5.56	7.39	9.49	11.96	14.94	18.29	23.59
2016/17	-0.25	1.64	3.50	5.52	7.55	9.74	12.06	14.78	18.50	23.72
2017/18	-0.08	1.66	3.48	5.44	7.42	9.53	11.91	14.84	18.27	23.24
2018/19	-0.22	1.58	3.35	5.37	7.56	9.73	12.12	14.79	18.60	24.05
2019/20	-0.17	1.66	3.35	5.37	7.37	9.55	11.95	14.78	18.47	23.72
2020/21	-0.08	1.76	3.58	5.47	7.52	9.69	12.17	14.82	18.06	23.55
2021/22	-0.25	1.62	3.45	5.30	7.30	9.53	12.00	15.04	18.65	24.04
2022/23	-0.23	1.68	3.45	5.38	7.45	9.60	12.11	14.96	18.53	24.00
2023/24	-0.16	1.76	3.57	5.58	7.51	9.67	12.19	15.07	18.76	23.90
2024/25	-0.35	1.58	3.40	5.47	7.50	9.79	12.27	15.37	19.08	24.95
2025/26	-0.42	1.64	3.54	5.51	7.80	9.96	12.51	15.46	19.27	24.89
2026/27	-0.32	1.54	3.56	5.56	7.77	9.90	12.38	15.61	19.50	24.71
2027/28	-0.27	1.70	3.72	5.62	7.69	10.07	12.61	15.54	19.02	24.88
2028/29	-0.34	1.55	3.71	5.79	8.03	10.30	12.90	15.81	19.62	25.02
2029/30	-0.27	1.73	3.67	5.87	8.07	10.46	12.84	15.75	19.98	25.86
2030/31	-0.33	1.58	3.71	5.92	8.06	10.49	13.27	16.44	20.48	26.70
2031/32	-0.32	1.78	3.80	5.77	8.01	10.47	13.07	16.32	20.26	26.22
2032/33	-0.08	1.89	3.84	6.04	8.26	10.75	13.59	16.76	20.63	26.51
2033/34	-0.35	1.69	3.88	6.16	8.58	11.10	13.80	17.09	21.14	26.86
2034/35	-0.29	1.73	3.76	5.98	8.30	10.87	13.63	17.12	21.68	27.65
2035/36	-0.48	1.70	3.96	6.20	8.75	11.13	14.27	17.80	22.22	28.26
2036/37	-0.30	1.88	4.09	6.45	8.88	11.42	14.30	17.58	21.95	28.08
2037/38	-0.24	1.92	4.32	6.57	8.93	11.85	14.92	18.07	22.35	28.86
2038/39	-0.42	2.00	4.25	6.70	9.14	11.89	15.00	18.42	22.65	29.14
2039/40	-0.37	1.88	4.38	6.84	9.48	12.10	14.91	18.67	23.32	30.43
2040/41	-0.50	1.88	4.28	6.76	9.56	12.26	15.60	19.41	23.98	30.72
2041/42	-0.42	2.12	4.43	6.92	9.57	12.61	15.62	19.52	24.12	30.74
2042/43	-0.53	2.12	4.70	7.24	9.98	12.93	16.17	19.89	24.40	31.19
2043/44	-0.47	2.08	4.59	7.20	10.00	12.93	16.23	20.19	24.68	31.72
2044/45	-0.28	2.36	4.88	7.62	10.20	13.01	16.38	20.38	25.26	32.05

A.3 Wimbleball Headroom Allowance by Probability

	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2015/16	-0.11	0.53	1.25	1.91	2.73	3.56	4.48	5.57	6.86	8.73
2016/17	-0.14	0.58	1.28	1.95	2.68	3.40	4.28	5.37	6.60	8.56
2017/18	-0.11	0.54	1.23	1.88	2.61	3.43	4.34	5.36	6.58	8.48
2018/19	-0.22	0.48	1.19	1.90	2.63	3.44	4.30	5.33	6.67	8.51
2019/20	-0.17	0.48	1.15	1.88	2.66	3.42	4.27	5.29	6.73	8.55
2020/21	-0.19	0.51	1.17	1.84	2.61	3.40	4.28	5.37	6.63	8.53
2021/22	-0.24	0.45	1.16	1.86	2.59	3.35	4.24	5.31	6.70	8.69
2022/23	-0.27	0.41	1.13	1.93	2.67	3.48	4.38	5.37	6.72	8.61
2023/24	-0.22	0.45	1.14	1.87	2.58	3.42	4.30	5.30	6.62	8.66
2024/25	-0.25	0.47	1.18	1.86	2.65	3.45	4.34	5.33	6.64	8.80
2025/26	-0.35	0.30	1.05	1.83	2.61	3.43	4.40	5.45	6.80	8.82
2026/27	-0.37	0.36	1.06	1.84	2.65	3.46	4.37	5.48	6.81	8.84
2027/28	-0.33	0.34	1.06	1.80	2.63	3.43	4.36	5.39	6.80	8.89
2028/29	-0.37	0.34	1.06	1.83	2.59	3.48	4.50	5.64	6.99	8.86
2029/30	-0.47	0.20	0.93	1.74	2.58	3.46	4.41	5.57	7.03	9.03
2030/31	-0.47	0.26	1.02	1.83	2.67	3.58	4.54	5.73	7.25	9.53
2031/32	-0.39	0.35	1.06	1.86	2.66	3.57	4.53	5.76	7.29	9.52
2032/33	-0.44	0.30	1.06	1.89	2.75	3.66	4.71	5.94	7.48	9.66
2033/34	-0.51	0.33	1.15	1.96	2.82	3.77	4.78	5.89	7.50	9.55
2034/35	-0.48	0.36	1.20	2.00	2.87	3.84	4.92	6.24	7.75	9.83
2035/36	-0.41	0.36	1.16	2.00	2.81	3.79	4.86	6.17	7.79	10.02
2036/37	-0.39	0.38	1.21	2.03	2.94	3.93	5.00	6.14	7.72	9.95
2037/38	-0.52	0.33	1.13	2.01	2.94	3.95	5.05	6.34	8.02	10.40
2038/39	-0.55	0.29	1.14	2.01	2.91	3.91	5.07	6.37	7.94	10.54
2039/40	-0.49	0.36	1.20	2.07	3.05	4.13	5.21	6.47	8.29	10.45
2040/41	-0.52	0.36	1.21	2.12	3.04	4.05	5.32	6.71	8.34	10.66
2041/42	-0.54	0.33	1.21	2.20	3.27	4.30	5.54	6.88	8.55	10.92
2042/43	-0.59	0.30	1.23	2.21	3.28	4.38	5.48	6.90	8.64	11.09
2043/44	-0.44	0.46	1.31	2.21	3.29	4.42	5.62	7.07	8.87	11.30
2044/45	-0.52	0.38	1.32	2.33	3.37	4.46	5.65	7.10	8.99	11.68

A.4 Bournemouth DYAA Headroom Allowance by Probability

	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2015/16	0.10	1.57	2.97	4.42	6.14	7.94	9.86	12.25	15.19	19.29
2016/17	-0.08	1.41	2.94	4.54	6.26	8.03	9.97	12.33	15.17	19.48
2017/18	-0.15	1.38	2.94	4.63	6.29	8.03	10.04	12.43	15.51	19.64
2018/19	-0.06	1.43	2.94	4.62	6.26	8.09	10.30	12.52	15.17	19.50
2019/20	0.03	1.48	2.95	4.56	6.19	8.02	10.11	12.20	15.16	19.89
2020/21	-0.11	1.58	3.10	4.70	6.40	8.14	10.06	12.35	15.31	19.66
2021/22	0.00	1.48	3.09	4.64	6.28	8.09	10.02	12.27	15.04	19.64
2022/23	0.04	1.54	3.05	4.63	6.21	8.02	10.06	12.38	15.40	19.85
2023/24	0.06	1.47	2.87	4.46	6.12	8.08	10.04	12.45	15.51	19.92
2024/25	-0.15	1.39	3.02	4.64	6.36	8.22	10.23	12.52	15.32	19.73
2025/26	0.12	1.69	3.36	4.98	6.70	8.69	10.74	13.23	16.50	21.18
2026/27	0.06	1.65	3.43	5.12	6.91	8.69	10.92	13.33	16.53	21.48
2027/28	-0.03	1.71	3.40	5.14	6.85	8.74	10.95	13.59	16.76	21.27
2028/29	-0.02	1.62	3.16	4.82	6.51	8.50	10.67	13.00	15.95	20.50
2029/30	-0.03	1.63	3.14	4.81	6.63	8.58	10.53	12.90	16.24	20.59
2030/31	0.23	1.75	3.27	4.86	6.58	8.66	10.70	13.03	16.27	21.17
2031/32	0.16	1.77	3.43	5.03	6.80	8.69	10.74	13.23	16.25	20.59
2032/33	-0.04	1.71	3.47	5.12	6.85	8.81	10.84	13.52	16.50	21.29
2033/34	0.02	1.70	3.33	5.08	6.80	8.66	10.83	13.32	16.72	21.32
2034/35	-0.13	1.43	3.29	5.14	6.96	9.03	11.25	13.82	16.99	21.75
2035/36	0.10	1.74	3.57	5.44	7.36	9.15	11.38	13.95	17.22	21.67
2036/37	0.23	1.81	3.42	5.11	6.97	9.06	11.14	13.83	17.17	21.69
2037/38	-0.04	1.70	3.40	5.14	7.10	9.25	11.62	14.34	17.50	22.42
2038/39	-0.12	1.56	3.23	4.91	6.90	9.10	11.53	14.28	17.91	23.19
2039/40	0.04	1.90	3.68	5.57	7.51	9.70	11.91	14.80	18.21	23.09
2040/41	0.08	1.78	3.63	5.56	7.47	9.56	11.88	14.68	18.18	23.49
2041/42	0.14	1.93	3.71	5.65	7.56	9.62	11.90	14.70	18.24	23.47
2042/43	0.15	2.01	3.85	5.72	7.73	9.71	12.20	15.02	18.67	23.93
2043/44	-0.01	1.96	3.72	5.60	7.71	10.07	12.59	15.73	19.33	24.92
2044/45	-0.21	1.84	3.73	5.84	7.97	10.52	13.15	15.92	19.20	24.54

A.5 Bournemouth DYCP Headroom Allowance by Probability

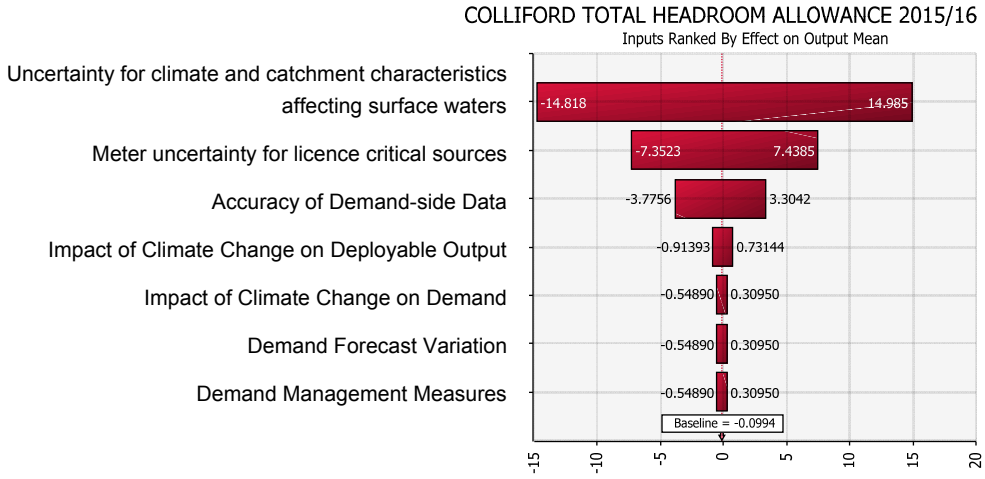
	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2015/16	0.07	1.86	3.48	5.20	6.92	8.89	11.07	13.52	16.72	21.10
2016/17	0.06	1.74	3.42	5.09	6.83	8.80	11.01	13.78	17.35	21.71
2017/18	0.09	1.67	3.40	5.09	6.85	8.85	10.98	13.46	16.87	21.23
2018/19	0.03	1.71	3.44	5.23	7.00	8.90	10.96	13.66	17.00	21.90
2019/20	0.02	1.62	3.27	5.01	6.93	8.79	11.05	13.68	17.04	21.53
2020/21	0.05	1.76	3.47	5.16	6.99	8.88	11.24	13.66	16.79	21.63
2021/22	-0.10	1.55	3.18	4.97	6.99	8.98	11.30	13.83	17.19	22.06
2022/23	0.06	1.72	3.52	5.17	7.13	9.10	11.20	13.79	16.90	22.06
2023/24	-0.22	1.42	3.22	5.28	7.28	9.27	11.67	14.26	17.41	22.57
2024/25	-0.16	1.60	3.30	5.13	7.15	9.17	11.48	14.17	17.48	22.24
2025/26	0.06	1.84	3.77	5.66	7.56	9.67	12.00	14.77	18.04	23.43
2026/27	0.11	2.01	3.94	5.73	7.72	9.74	12.07	14.87	18.40	23.72
2027/28	-0.11	1.82	3.82	5.70	7.79	10.06	12.35	15.00	18.59	24.13
2028/29	-0.06	1.79	3.65	5.57	7.58	9.74	12.21	15.06	18.53	23.71
2029/30	0.03	1.76	3.67	5.57	7.60	9.64	12.07	14.80	18.66	23.80
2030/31	-0.02	1.92	3.81	5.78	7.72	9.94	12.46	15.25	18.90	24.18
2031/32	-0.02	1.93	3.81	5.67	7.63	9.90	12.35	15.36	19.22	24.65
2032/33	0.05	1.90	3.89	5.86	8.03	10.29	12.79	15.73	19.18	24.82
2033/34	0.07	1.90	3.84	5.80	7.91	10.21	12.61	15.53	19.39	25.05
2034/35	-0.04	1.85	3.94	5.99	8.12	10.39	12.87	15.90	19.71	25.03
2035/36	0.16	2.02	3.99	5.99	8.31	10.78	13.24	16.14	19.99	25.44
2036/37	0.24	2.26	4.11	6.38	8.47	10.79	13.39	16.41	20.12	25.71
2037/38	0.19	2.16	4.12	6.22	8.59	10.94	13.47	16.58	20.23	26.24
2038/39	-0.10	1.96	4.04	6.28	8.48	11.01	13.95	16.97	20.93	27.15
2039/40	0.29	2.28	4.29	6.43	8.60	11.21	13.99	17.23	21.14	27.11
2040/41	-0.04	1.93	4.12	6.39	8.89	11.30	14.20	17.45	21.84	27.74
2041/42	-0.14	2.26	4.35	6.78	8.99	11.75	14.49	17.71	21.69	27.76
2042/43	-0.03	2.16	4.44	6.80	9.23	11.98	14.70	18.18	22.35	28.58
2043/44	0.07	2.35	4.73	7.03	9.21	11.67	14.52	17.90	21.98	28.63
2044/45	0.09	2.29	4.51	6.87	9.32	12.12	15.27	18.36	22.70	29.11

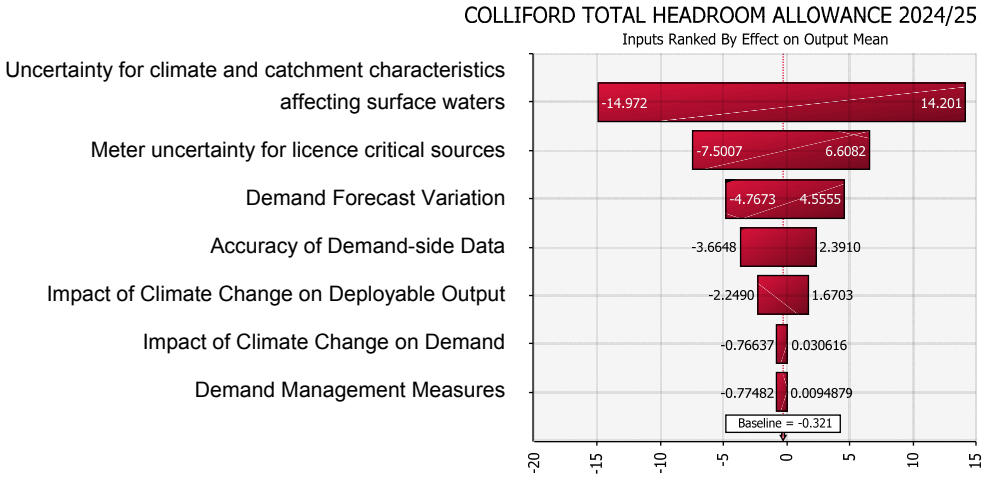
Appendix B Target headroom with and without climate change

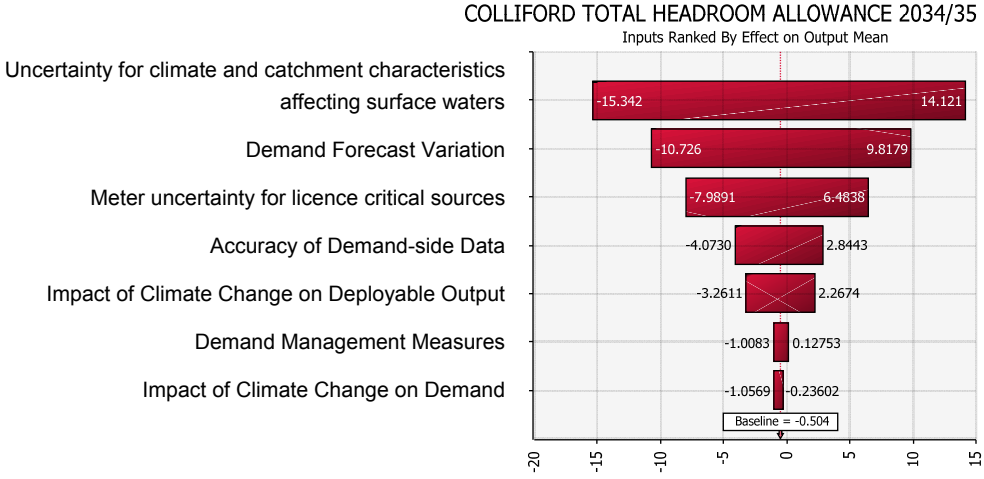
		Colliford			Roadford			Wimbleball			Bournemouth DYAA			Bournemouth DYCP		
Percentile	**Year**	**Without Climate change**	**Climate change only**	***Total check***	**Without Climate change**	**Climate change only**	***Total check***	**Without Climate change**	**Climate change only**	***Total check***	**Without Climate change**	**Climate change only**	***Total check***	**Without Climate change**	**Climate change only**	***Total check***
95TH PERC	2015/16	15.47	0.41	*15.87*	22.42	1.17	*23.59*	8.60	0.13	*8.73*	19.29	0.00	*19.29*	21.10	0.00	*21.10*
95TH PERC	2016/17	15.55	0.51	*16.06*	22.27	1.46	*23.72*	8.39	0.17	*8.56*	19.47	0.00	*19.48*	21.71	0.00	*21.71*
95TH PERC	2017/18	15.27	0.60	*15.87*	21.57	1.68	*23.24*	8.29	0.20	*8.48*	19.63	0.01	*19.64*	21.22	0.01	*21.23*
95TH PERC	2018/19	15.09	0.69	*15.78*	22.04	2.01	*24.05*	8.28	0.23	*8.51*	19.49	0.01	*19.50*	21.88	0.01	*21.90*
95TH PERC	2019/20	14.95	0.78	*15.74*	21.48	2.24	*23.72*	8.28	0.27	*8.55*	19.87	0.02	*19.89*	21.51	0.02	*21.53*
95TH PERC	2020/21	14.94	0.88	*15.82*	21.09	2.46	*23.55*	8.24	0.29	*8.53*	19.64	0.02	*19.66*	21.60	0.02	*21.63*
95TH PERC	2021/22	15.00	0.98	*15.98*	21.27	2.77	*24.04*	8.36	0.33	*8.69*	19.62	0.02	*19.64*	22.03	0.03	*22.06*
95TH PERC	2022/23	15.13	1.06	*16.20*	20.99	3.01	*24.00*	8.26	0.35	*8.61*	19.83	0.03	*19.85*	22.03	0.03	*22.06*
95TH PERC	2023/24	14.92	1.14	*16.06*	20.64	3.26	*23.90*	8.28	0.38	*8.66*	19.89	0.03	*19.92*	22.53	0.04	*22.57*
95TH PERC	2024/25	14.80	1.22	*16.02*	21.33	3.62	*24.95*	8.37	0.43	*8.80*	19.70	0.03	*19.73*	22.19	0.04	*22.24*
90TH PERC	2025/26	11.64	1.02	*12.66*	16.29	2.98	*19.27*	6.48	0.32	*6.80*	16.47	0.03	*16.50*	18.01	0.04	*18.04*
90TH PERC	2026/27	11.79	1.10	*12.89*	16.35	3.16	*19.50*	6.47	0.34	*6.81*	16.50	0.03	*16.53*	18.36	0.04	*18.40*
90TH PERC	2027/28	11.62	1.14	*12.75*	15.80	3.22	*19.02*	6.45	0.36	*6.80*	16.72	0.04	*16.76*	18.55	0.05	*18.59*
90TH PERC	2028/29	11.96	1.25	*13.21*	16.16	3.46	*19.62*	6.61	0.38	*6.99*	15.91	0.04	*15.95*	18.48	0.05	*18.53*
90TH PERC	2029/30	11.96	1.29	*13.25*	16.30	3.68	*19.98*	6.62	0.41	*7.03*	16.20	0.04	*16.24*	18.61	0.06	*18.66*
90TH PERC	2030/31	12.17	1.36	*13.53*	16.57	3.92	*20.48*	6.81	0.44	*7.25*	16.22	0.05	*16.27*	18.84	0.06	*18.90*
90TH PERC	2031/32	12.29	1.39	*13.67*	16.37	3.89	*20.26*	6.86	0.43	*7.29*	16.20	0.05	*16.25*	19.16	0.06	*19.22*
90TH PERC	2032/33	12.39	1.38	*13.77*	16.64	3.98	*20.63*	7.03	0.45	*7.48*	16.45	0.05	*16.50*	19.12	0.06	*19.18*
90TH PERC	2033/34	12.79	1.46	*14.25*	17.06	4.08	*21.14*	7.06	0.44	*7.50*	16.67	0.05	*16.72*	19.31	0.07	*19.39*
90TH PERC	2034/35	12.64	1.43	*14.07*	17.48	4.20	*21.68*	7.28	0.47	*7.75*	16.94	0.06	*16.99*	19.64	0.07	*19.71*
85TH PERC	2035/36	10.35	1.12	*11.48*	14.38	3.42	*17.80*	5.85	0.33	*6.17*	13.90	0.05	*13.95*	16.08	0.06	*16.14*
85TH PERC	2036/37	10.70	1.19	*11.90*	14.22	3.35	*17.58*	5.82	0.32	*6.14*	13.78	0.05	*13.83*	16.35	0.07	*16.41*
85TH PERC	2037/38	10.73	1.17	*11.89*	14.54	3.52	*18.07*	6.00	0.33	*6.34*	14.28	0.06	*14.34*	16.51	0.07	*16.58*
85TH PERC	2038/39	10.79	1.17	*11.96*	14.93	3.49	*18.42*	6.03	0.34	*6.37*	14.22	0.06	*14.28*	16.90	0.07	*16.97*
85TH PERC	2039/40	11.20	1.20	*12.40*	15.05	3.62	*18.67*	6.13	0.34	*6.47*	14.74	0.06	*14.80*	17.16	0.08	*17.23*
85TH PERC	2040/41	11.04	1.19	*12.22*	15.67	3.74	*19.41*	6.36	0.35	*6.71*	14.61	0.06	*14.68*	17.37	0.08	*17.45*
85TH PERC	2041/42	11.49	1.24	*12.72*	15.82	3.70	*19.52*	6.53	0.36	*6.88*	14.64	0.06	*14.70*	17.63	0.08	*17.71*
85TH PERC	2042/43	11.67	1.25	*12.92*	16.14	3.74	*19.89*	6.54	0.36	*6.90*	14.96	0.07	*15.02*	18.10	0.09	*18.18*
85TH PERC	2043/44	11.88	1.27	*13.15*	16.38	3.81	*20.19*	6.70	0.37	*7.07*	15.65	0.07	*15.73*	17.81	0.09	*17.90*
85TH PERC	2044/45	12.34	1.34	*13.68*	16.48	3.90	*20.38*	6.72	0.38	*7.10*	15.85	0.07	*15.92*	18.26	0.09	*18.36*

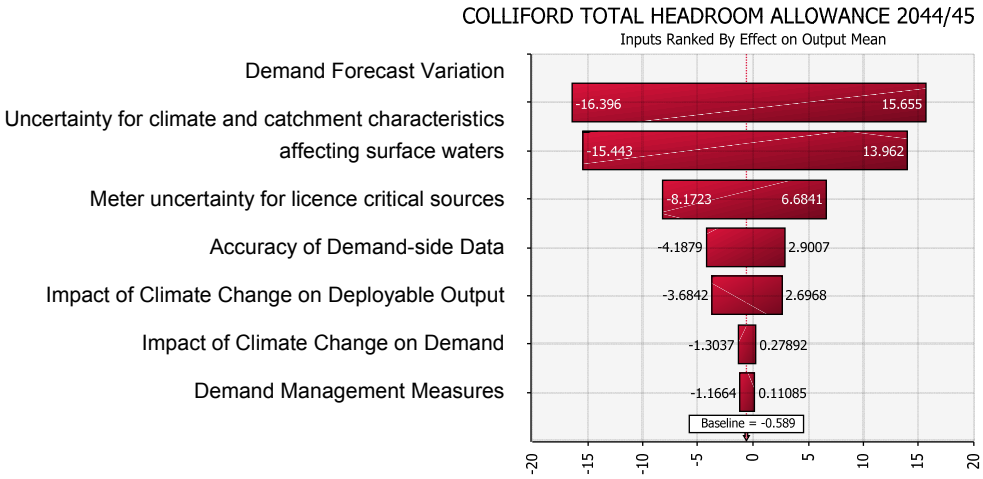
Appendix C @Risk Graphical Outputs

C.1 Colliford

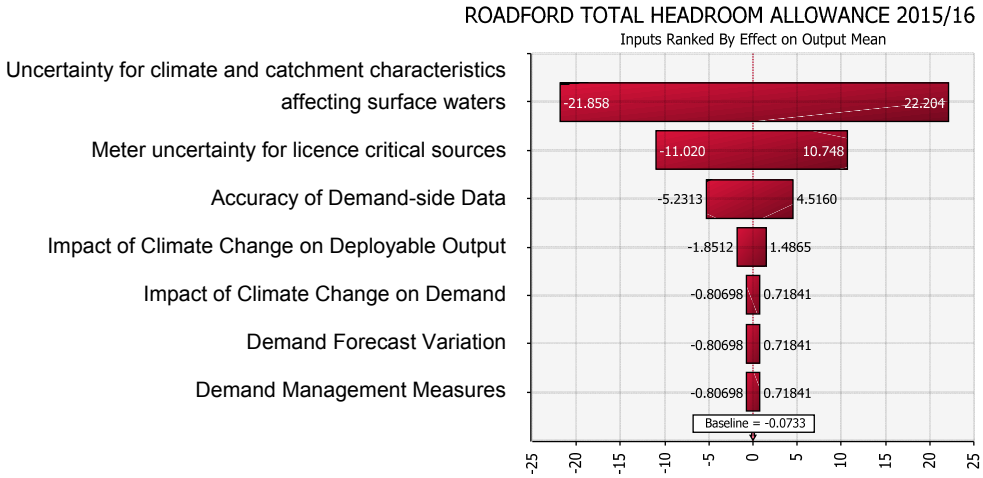







COLLIFORD TOTAL HEADROOM ALLOWANCE 2044/45
Inputs Ranked By Effect on Output Mean
Demand Forecast Variation
Uncertainty for climate and catchment characteristics affecting surface waters
Meter uncertainty for licence critical sources
Accuracy of Demand-side Data
Impact of Climate Change on Deployable Output
Impact of Climate Change on Demand
Demand Management Measures
-16.396
15.655
-15.443
13.962
-8.1723
6.6841
-4.1879
2.9007
-3.6842
2.6968
-1.3037
0.27892
-1.1664
0.11085
Baseline = -0.589
-20
-15
-10
-5
0
5
10
15
20

C.2 Roadford


ROADFORD TOTAL HEADROOM ALLOWANCE 2015/16
Inputs Ranked By Effect on Output Mean
Uncertainty for climate and catchment characteristics affecting surface waters
Meter uncertainty for licence critical sources
Accuracy of Demand-side Data
Impact of Climate Change on Deployable Output
Impact of Climate Change on Demand
Demand Forecast Variation
Demand Management Measures
-21.858
22.204
-11.020
10.748
-5.2313
4.5160
-1.8512
1.4865
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-10
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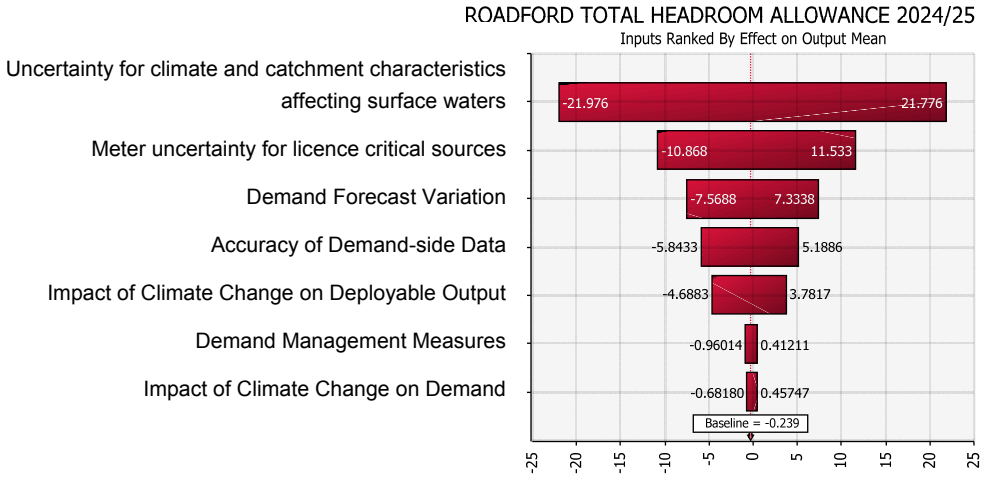
5
10
15
20
25


ROADFORD TOTAL HEADROOM ALLOWANCE 2024/25
Inputs Ranked By Effect on Output Mean
Uncertainty for climate and catchment characteristics affecting surface waters
Meter uncertainty for licence critical sources
Demand Forecast Variation
Accuracy of Demand-side Data
Impact of Climate Change on Deployable Output
Demand Management Measures
Impact of Climate Change on Demand
-21.976
21.776
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11.533
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7.3338
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5.1886
-4.6883
3.7817
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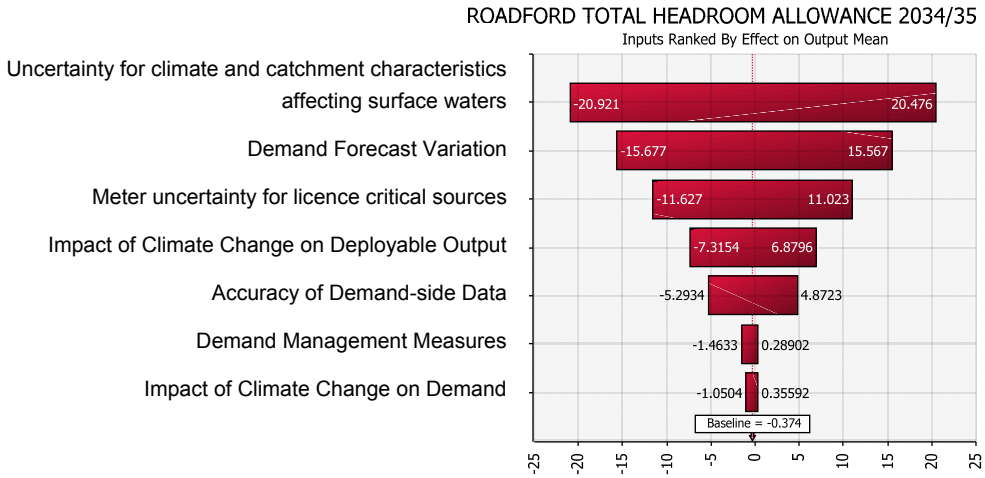
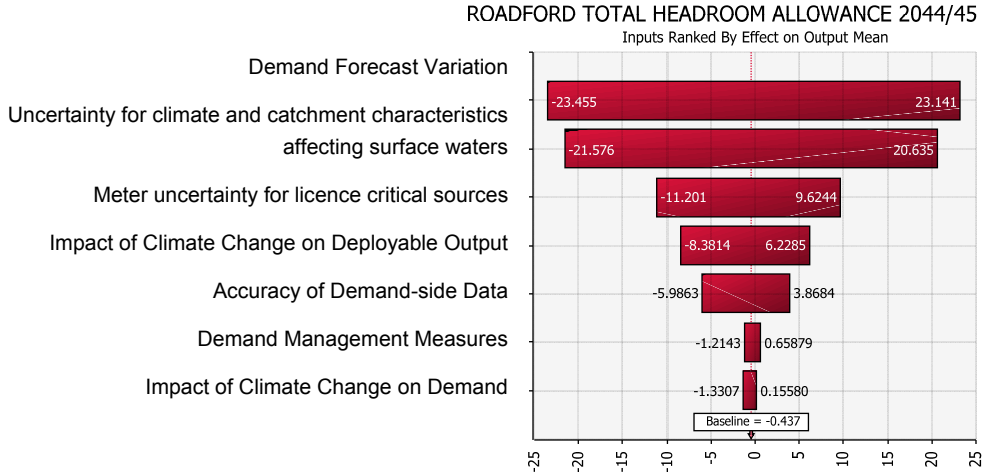
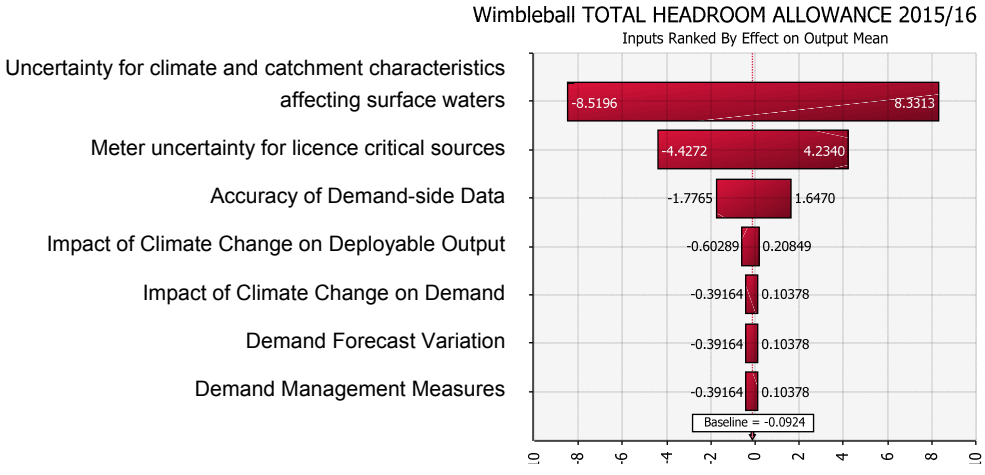
10
15
20
25

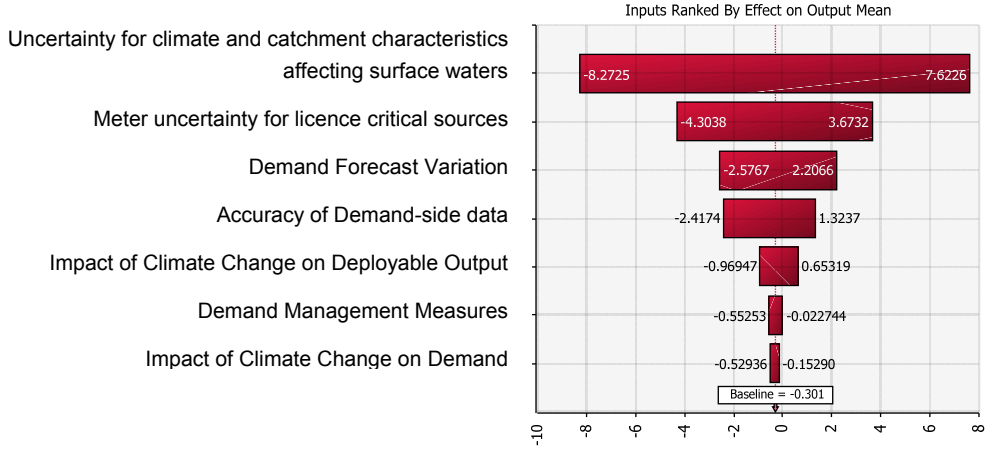




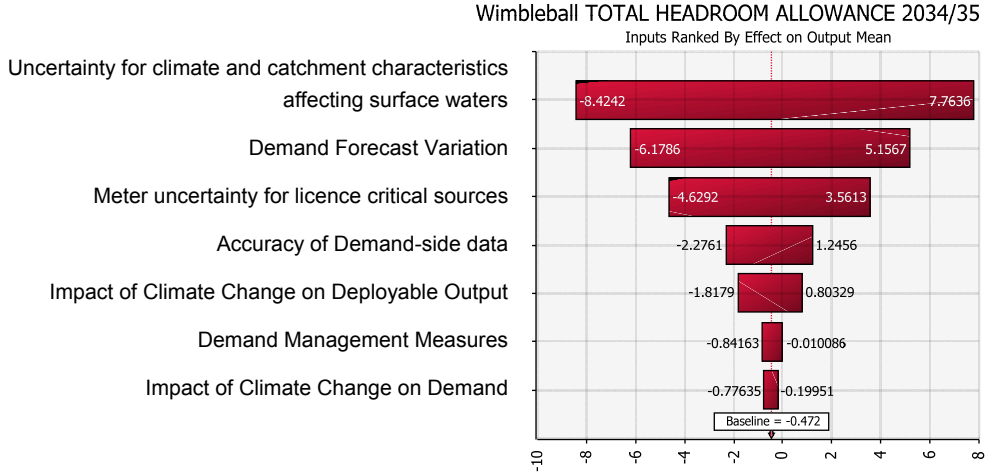
C.3 Wimbleball



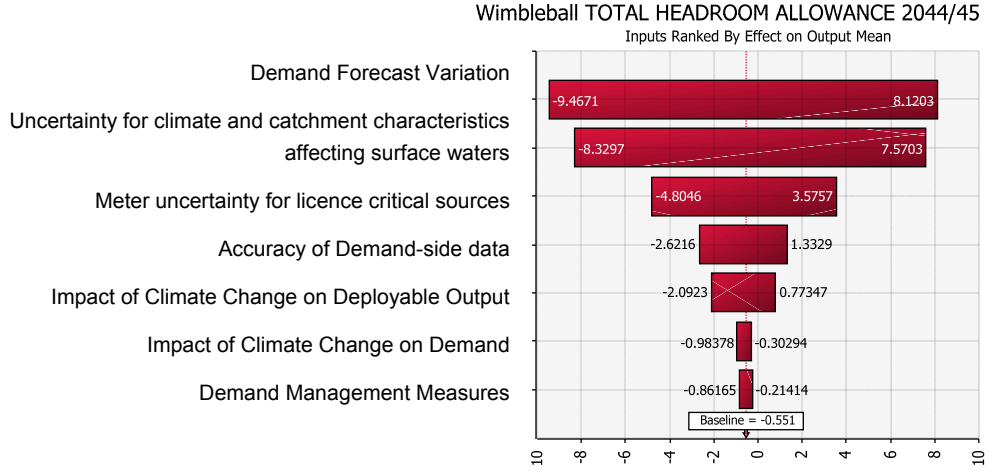
Wimbleball TOTAL HEADROOM ALLOWANCE 2024/25



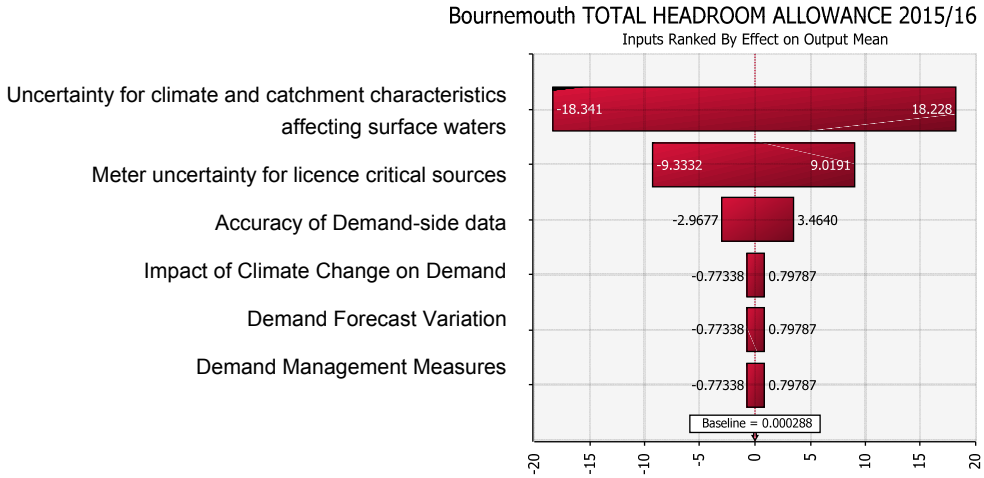
Wimbleball TOTAL HEADROOM ALLOWANCE 2034/35

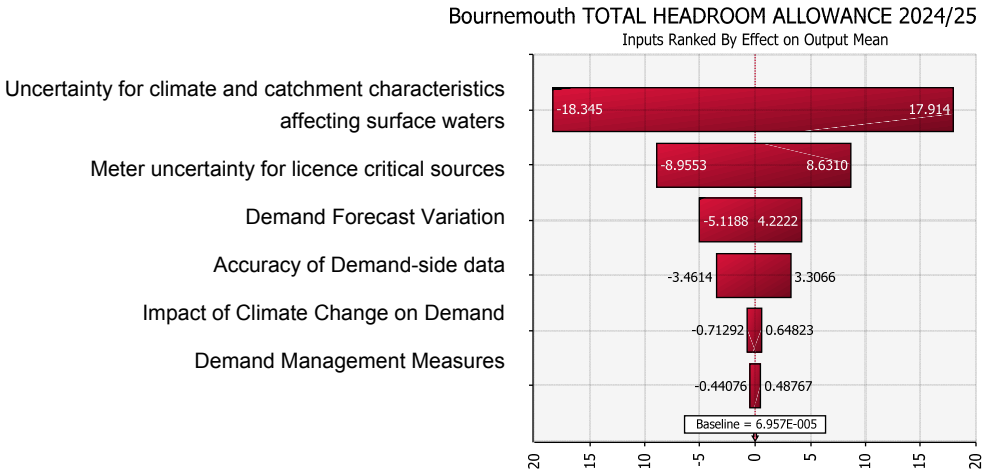


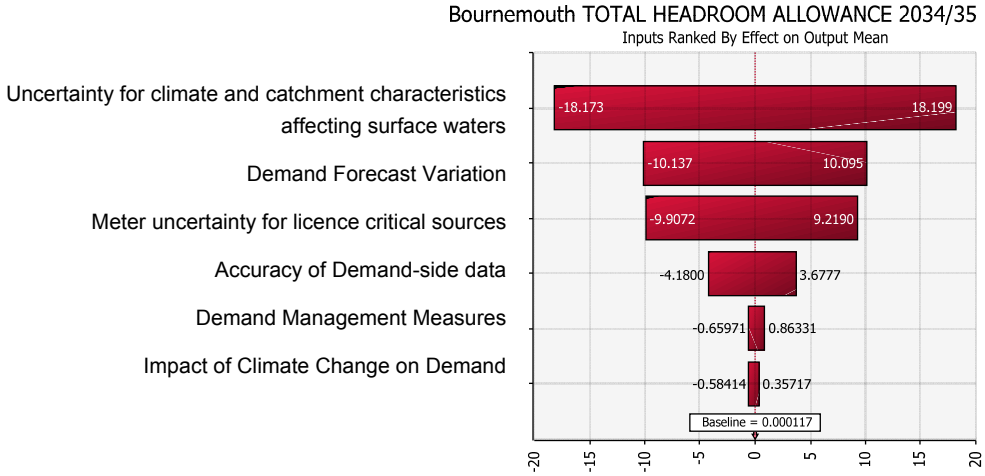
Wimbleball TOTAL HEADROOM ALLOWANCE 2044/45

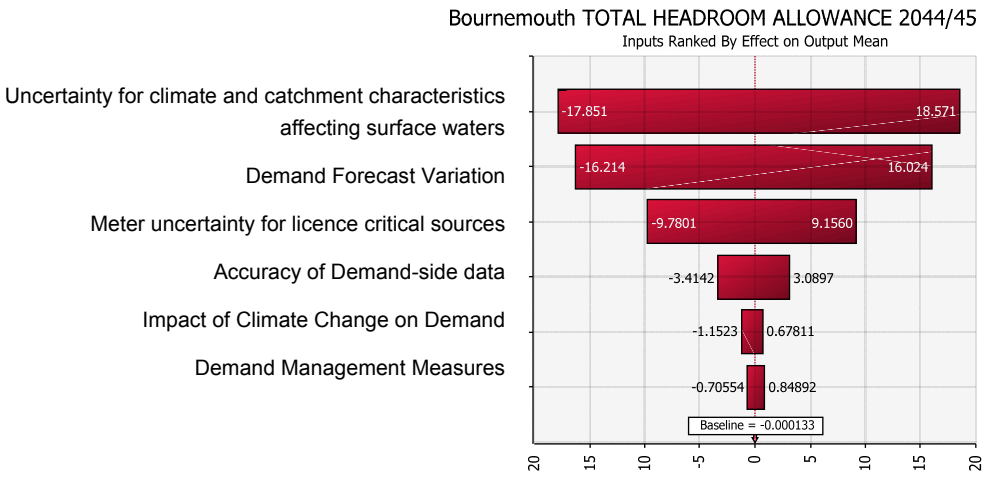


C.4 Bournemouth DYAA

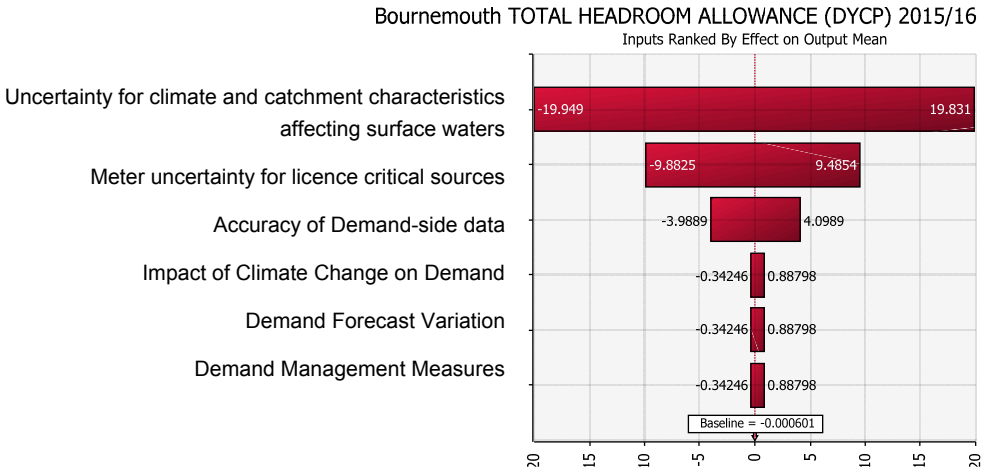


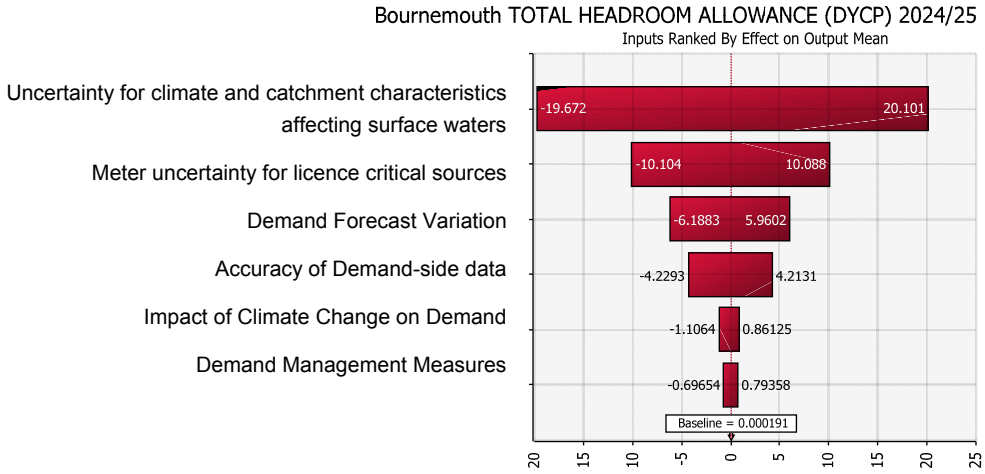




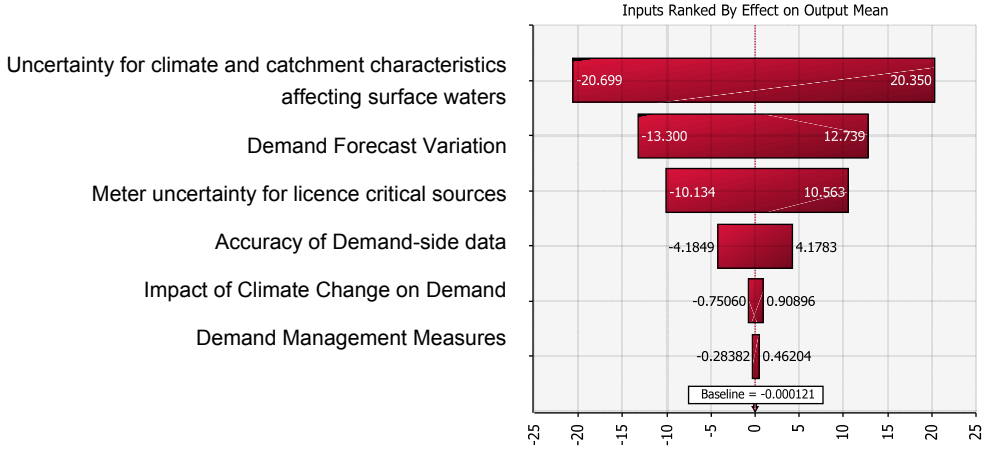


C.5 Bournemouth DYCP

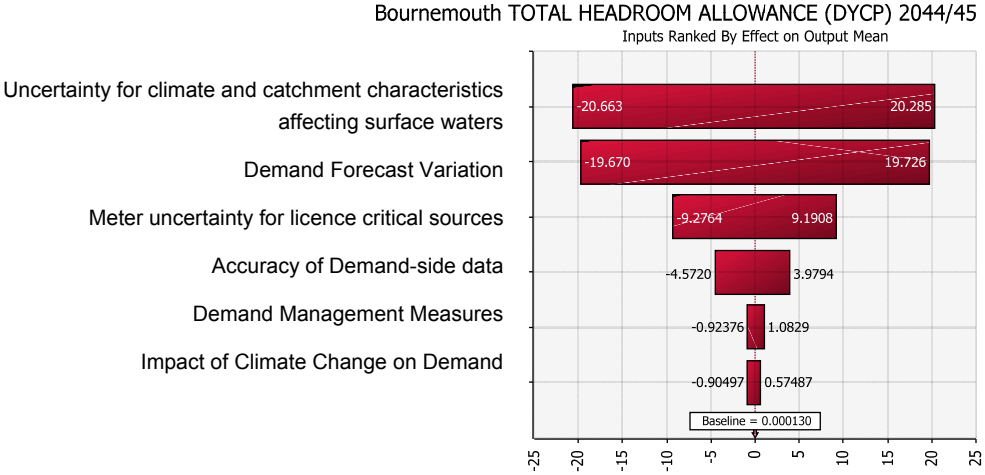




Bournemouth TOTAL HEADROOM ALLOWANCE (DYCP) 2034/35



Bournemouth TOTAL HEADROOM ALLOWANCE (DYCP) 2044/45



Appendix D High Demand Scenario Analysis

D.1 Introduction

For the WRMP14, additional analysis was undertaken to determine headroom allowance profiles using high demand scenarios for sensitivity testing. These scenarios were based on high household demand and high non-household demand, estimates of which were at the higher end of the plausible range of forecast demand. This analysis has also been undertaken for the WRMP19, the results of which are reported in this appendix.

D.2 Factor D2 and demand forecast variation

For the high demand scenario analysis, a triangular distribution has been used to express the probability distribution, using the high demand forecast as the central or most likely value, the baseline demand forecast as the minimum value, and 25% of the difference between the baseline and the high demand forecasts added to the high demand forecast as the maximum value. This approach is consistent with the high demand scenario analysis undertaken for WRMP14. The values used are shown in Table D-1 and Table D-2.

Table D-1: D2 high household demand headroom uncertainty probability distribution summary data

	Colliford			Roadford			Wimbleball			Bournemouth DYAA			Bournemouth DYCP		
Year	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max
2015/16	146.3	-1.5	0.4	220.1	-2.2	0.5	77.8	-0.8	0.2	146.5	-1.1	0.3	185.9	-1.6	0.4
2016/17	148.1	-1.5	0.4	223.3	-2.2	0.5	79.3	-0.8	0.2	147.5	-1.2	0.3	188.0	-1.8	0.4
2017/18	152.2	-2.2	0.6	229.4	-3.3	0.8	81.5	-1.2	0.3	151.3	-1.8	0.4	191.4	-2.6	0.6
2018/19	150.1	-2.9	0.7	226.5	-4.3	1.1	81.0	-1.6	0.4	151.3	-2.4	0.6	191.4	-3.4	0.8
2019/20	150.3	-3.6	0.9	226.8	-5.3	1.3	81.2	-2.0	0.5	151.4	-2.9	0.7	191.7	-4.2	1.1
2020/21	150.2	-4.2	1.1	227.5	-6.4	1.6	82.2	-2.4	0.6	152.0	-3.5	0.9	192.5	-5.1	1.3
2021/22	149.8	-4.8	1.2	228.9	-7.3	1.8	82.8	-2.8	0.7	152.5	-4.0	1.0	193.3	-5.8	1.4
2022/23	150.1	-5.1	1.3	228.7	-7.7	1.9	83.3	-3.0	0.7	152.7	-4.3	1.1	193.7	-6.1	1.5
2023/24	149.5	-5.4	1.3	229.9	-8.2	2.1	83.7	-3.2	0.8	153.0	-4.6	1.1	194.2	-6.5	1.6
2024/25	150.1	-5.6	1.4	229.4	-8.6	2.2	84.5	-3.3	0.8	153.3	-4.8	1.2	194.6	-6.9	1.7
2025/26	150.1	-5.9	1.5	230.2	-9.2	2.3	85.0	-3.6	0.9	153.7	-5.1	1.3	195.2	-7.3	1.8
2026/27	150.1	-6.2	1.5	231.6	-9.6	2.4	84.8	-3.7	0.9	154.0	-5.3	1.3	195.7	-7.6	1.9
2027/28	150.6	-6.5	1.6	232.0	-10.0	2.5	85.3	-3.9	1.0	154.4	-5.6	1.4	196.3	-8.0	2.0
2028/29	151.1	-6.6	1.7	232.3	-10.3	2.6	85.6	-4.0	1.0	154.7	-5.7	1.4	196.8	-8.2	2.1
2029/30	151.2	-6.9	1.7	233.3	-10.8	2.7	86.1	-4.2	1.1	155.1	-6.0	1.5	197.5	-8.6	2.2
2030/31	151.3	-7.1	1.8	233.9	-11.1	2.8	86.5	-4.4	1.1	155.4	-6.2	1.5	197.9	-8.9	2.2
2031/32	152.1	-7.4	1.8	234.3	-11.5	2.9	86.4	-4.5	1.1	155.7	-6.4	1.6	198.3	-9.2	2.3
2032/33	152.8	-7.5	1.9	234.3	-11.7	2.9	86.5	-4.6	1.1	155.9	-6.5	1.6	198.7	-9.4	2.3
2033/34	153.8	-7.7	1.9	234.2	-12.0	3.0	86.8	-4.7	1.2	156.1	-6.7	1.7	199.1	-9.6	2.4
2034/35	154.1	-7.9	2.0	234.6	-12.3	3.1	87.1	-4.8	1.2	156.4	-6.9	1.7	199.5	-9.9	2.5
2035/36	154.0	-8.1	2.0	235.1	-12.5	3.1	87.3	-4.9	1.2	156.5	-7.0	1.7	199.8	-10.0	2.5
2036/37	154.8	-8.3	2.1	235.7	-12.9	3.2	87.3	-5.1	1.3	156.8	-7.2	1.8	200.3	-10.4	2.6
2037/38	155.1	-8.6	2.1	236.3	-13.2	3.3	87.2	-5.2	1.3	157.1	-7.4	1.8	200.7	-10.7	2.7
2038/39	155.6	-8.6	2.2	236.4	-13.3	3.3	87.2	-5.3	1.3	157.2	-7.5	1.9	200.9	-10.8	2.7
2039/40	156.0	-8.8	2.2	236.5	-13.5	3.4	87.4	-5.4	1.3	157.4	-7.6	1.9	201.1	-10.9	2.7
2040/41	156.8	-9.1	2.3	236.7	-13.9	3.5	87.7	-5.5	1.4	157.7	-7.8	2.0	201.6	-11.3	2.8
2041/42	157.0	-9.2	2.3	237.1	-14.2	3.5	87.9	-5.6	1.4	157.9	-8.0	2.0	202.0	-11.5	2.9
2042/43	157.7	-9.3	2.3	236.8	-14.3	3.6	88.2	-5.7	1.4	158.0	-8.1	2.0	202.2	-11.7	2.9
2043/44	158.4	-9.5	2.4	236.6	-14.5	3.6	88.4	-5.8	1.4	158.2	-8.2	2.0	202.5	-11.8	3.0
2044/45	158.9	-9.7	2.4	236.7	-14.9	3.7	89.0	-5.9	1.5	158.5	-8.4	2.1	203.0	-12.2	3.0

Table D-2: D2 high non-household demand headroom uncertainty probability distribution summary

	Colliford			Roadford			Wimbleball			Bournemouth DYAA			Bournemouth DYCP		
Year	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max	DI (Ml/d)	Min	Max
2015/16	146.1	-1.2	0.3	218.6	-0.7	0.2	77.1	-0.1	0.0	146.0	-0.7	0.2	184.6	-0.4	0.1
2016/17	148.0	-1.3	0.3	221.8	-0.7	0.2	78.6	-0.1	0.0	146.9	-0.7	0.2	186.6	-0.4	0.1
2017/18	151.3	-1.3	0.3	226.8	-0.7	0.2	80.3	-0.1	0.0	150.2	-0.7	0.2	189.2	-0.4	0.1
2018/19	148.6	-1.3	0.3	222.9	-0.7	0.2	79.5	-0.1	0.0	149.7	-0.7	0.2	188.4	-0.4	0.1
2019/20	148.2	-1.5	0.4	222.2	-0.7	0.2	79.2	0.0	0.0	149.3	-0.8	0.2	187.8	-0.4	0.1
2020/21	147.6	-1.6	0.4	221.8	-0.7	0.2	79.8	0.0	0.0	149.3	-0.9	0.2	187.8	-0.4	0.1
2021/22	146.7	-1.7	0.4	222.3	-0.7	0.2	80.0	0.0	0.0	149.4	-1.0	0.2	187.9	-0.4	0.1
2022/23	146.9	-1.9	0.5	221.7	-0.7	0.2	80.4	0.0	0.0	149.5	-1.0	0.3	187.9	-0.3	0.1
2023/24	146.1	-1.9	0.5	222.4	-0.8	0.2	80.6	0.0	0.0	149.6	-1.1	0.3	188.0	-0.3	0.1
2024/25	146.7	-2.2	0.5	221.5	-0.8	0.2	81.2	0.0	0.0	149.7	-1.2	0.3	188.1	-0.3	0.1
2025/26	146.6	-2.4	0.6	221.8	-0.8	0.2	81.5	0.0	0.0	149.9	-1.3	0.3	188.3	-0.3	0.1
2026/27	146.5	-2.5	0.6	222.8	-0.8	0.2	81.0	0.0	0.0	150.1	-1.3	0.3	188.5	-0.3	0.1
2027/28	146.9	-2.8	0.7	222.8	-0.9	0.2	81.4	0.0	0.0	150.3	-1.4	0.4	188.7	-0.3	0.1
2028/29	147.4	-3.0	0.7	222.9	-0.9	0.2	81.6	0.0	0.0	150.5	-1.5	0.4	188.9	-0.3	0.1
2029/30	147.4	-3.2	0.8	223.5	-0.9	0.2	81.9	0.0	0.0	150.7	-1.6	0.4	189.2	-0.3	0.1
2030/31	147.5	-3.3	0.8	223.8	-1.0	0.2	82.1	0.0	0.0	150.9	-1.7	0.4	189.3	-0.3	0.1
2031/32	148.2	-3.5	0.9	223.9	-1.1	0.3	81.9	0.0	0.0	151.1	-1.8	0.5	189.5	-0.3	0.1
2032/33	149.0	-3.7	0.9	223.8	-1.1	0.3	82.0	-0.1	0.0	151.3	-1.9	0.5	189.7	-0.3	0.1
2033/34	149.9	-3.9	1.0	223.5	-1.2	0.3	82.2	-0.1	0.0	151.5	-2.1	0.5	189.8	-0.3	0.1
2034/35	150.3	-4.1	1.0	223.6	-1.3	0.3	82.4	-0.1	0.0	151.7	-2.2	0.6	190.0	-0.3	0.1
2035/36	150.3	-4.3	1.1	224.1	-1.4	0.3	82.6	-0.2	0.0	151.9	-2.3	0.6	190.1	-0.3	0.1
2036/37	151.1	-4.7	1.2	224.2	-1.5	0.4	82.4	-0.2	0.1	152.1	-2.5	0.6	190.2	-0.3	0.1
2037/38	151.5	-4.9	1.2	224.6	-1.5	0.4	82.3	-0.2	0.1	152.3	-2.6	0.7	190.3	-0.3	0.1
2038/39	152.2	-5.2	1.3	224.8	-1.6	0.4	82.2	-0.3	0.1	152.5	-2.8	0.7	190.4	-0.3	0.1
2039/40	152.7	-5.5	1.4	224.8	-1.7	0.4	82.4	-0.3	0.1	152.8	-3.0	0.7	190.5	-0.3	0.1
2040/41	153.5	-5.8	1.4	224.6	-1.8	0.5	82.6	-0.4	0.1	153.0	-3.2	0.8	190.6	-0.3	0.1
2041/42	153.9	-6.1	1.5	224.8	-1.9	0.5	82.8	-0.4	0.1	153.3	-3.4	0.8	190.8	-0.3	0.1
2042/43	154.9	-6.5	1.6	224.5	-2.0	0.5	83.0	-0.5	0.1	153.5	-3.6	0.9	190.9	-0.3	0.1
2043/44	155.8	-6.8	1.7	224.2	-2.1	0.5	83.2	-0.6	0.1	153.8	-3.8	0.9	191.0	-0.3	0.1
2044/45	156.3	-7.1	1.8	224.1	-2.2	0.6	83.7	-0.6	0.2	154.1	-4.0	1.0	191.1	-0.3	0.1

D.3 Results of high demand scenario analysis

The results of the additional analysis undertaken using high demand scenarios are summarised in Tables D-3 and D-4 below. The full outputs from the @RISK spreadsheets are contained in Sections D-4 to D-13.

The headroom allowance values calculated using the high household demand forecast are lower than the WRMP19 target headroom allowance values throughout the planning period, as would be expected. The 95% probability values from the high household demand scenario are similar to the 85% probability values from the WRMP19 target headroom allowance values. While the headroom allowance values calculated using the high non-household demand forecast are higher than those calculated using the high household demand forecast, the values are less similar to those of the WRMP19 target headroom allowance.

Table D-3: Results of high household demand scenario analysis (Ml/d) at the end of the planning period (2044/45)

WRZ	Probability								
	55%	60%	65%	70%	75%	80%	85%*	90%	95%
Colliford WRZ (Ml/d)	-1.76	-0.42	0.85	2.25	3.76	5.50	**7.34**	9.83	13.67
Roadford WRZ (Ml/d)	-2.31	-0.47	1.61	3.97	6.21	8.55	**11.54**	14.99	20.40
Wimbleball WRZ (Ml/d)	-1.39	-0.64	0.10	0.87	1.66	2.60	**3.60**	4.97	7.11
Bournemouth WRZ DYAA (Ml/d)	-0.56	0.94	2.53	4.24	6.00	7.95	**10.36**	13.31	17.87
Bournemouth WRZ DYCP (Ml/d)	-1.25	0.51	2.28	4.35	6.35	8.57	**11.21**	14.60	19.48

** Risk Percentile to be used at the end of the planning period*

Table D-4: Results of high non-household demand scenario analysis (Ml/d) at the end of the planning period (2044/45)

WRZ	Probability								
	55%	60%	65%	70%	75%	80%	85%*	90%	95%
Colliford WRZ (Ml/d)	-1.08	0.11	1.39	2.72	4.15	5.87	**7.91**	10.31	13.87
Roadford WRZ (Ml/d)	0.74	2.55	4.37	6.50	8.68	11.14	**13.82**	17.67	23.23
Wimbleball WRZ (Ml/d)	-0.01	0.63	1.30	2.04	2.90	3.83	**4.81**	6.01	7.79
Bournemouth WRZ DYAA (Ml/d)	0.38	1.95	3.48	5.15	7.01	8.98	**11.36**	13.88	18.24
Bournemouth WRZ DYCP (Ml/d)	1.54	3.37	5.21	6.95	8.99	11.18	**13.68**	16.76	21.62

** Risk Percentile to be used at the end of the planning period*

The full outputs from the @RISK spreadsheets are contained in Sections D-4 to D-13 below.

D.4 High Household Demand - Colliford Headroom Allowance by Probability

	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2015/16	-0.46	0.80	2.01	3.26	4.59	6.03	7.69	9.62	11.95	15.50
2016/17	-0.43	0.83	2.12	3.31	4.65	6.07	7.65	9.44	11.75	15.35
2017/18	-0.79	0.48	1.89	3.15	4.47	5.93	7.52	9.45	11.81	15.23
2018/19	-0.81	0.28	1.46	2.77	4.20	5.73	7.24	9.12	11.57	15.20
2019/20	-0.97	0.26	1.62	2.78	4.08	5.60	7.11	8.96	11.24	14.94
2020/21	-1.25	-0.04	1.19	2.51	3.81	5.31	6.86	8.79	11.39	14.86
2021/22	-1.45	-0.24	0.95	2.14	3.62	5.14	6.85	8.72	10.96	14.62
2022/23	-1.65	-0.39	0.87	2.16	3.62	5.24	6.93	8.68	11.07	14.67
2023/24	-1.57	-0.26	1.07	2.40	3.71	5.08	6.68	8.47	10.76	14.20
2024/25	-1.73	-0.52	0.74	2.09	3.48	4.98	6.70	8.63	10.95	14.24
2025/26	-1.83	-0.64	0.62	1.93	3.32	4.72	6.31	8.42	10.68	14.24
2026/27	-1.92	-0.67	0.67	2.02	3.37	4.84	6.41	8.15	10.47	14.00
2027/28	-2.03	-0.72	0.55	1.80	3.21	4.62	6.31	8.13	10.59	14.32
2028/29	-2.19	-0.94	0.38	1.68	3.04	4.49	6.21	8.17	10.66	14.25
2029/30	-2.16	-0.83	0.37	1.60	2.96	4.47	6.13	8.02	10.52	14.25
2030/31	-2.27	-1.01	0.26	1.57	2.95	4.38	6.13	8.12	10.51	14.12
2031/32	-2.32	-1.04	0.16	1.52	2.91	4.32	5.89	7.89	10.35	14.01
2032/33	-2.36	-1.09	0.17	1.46	2.85	4.32	6.01	8.10	10.54	13.84
2033/34	-2.45	-1.20	0.09	1.35	2.79	4.22	5.72	7.75	10.16	13.91
2034/35	-2.40	-1.13	0.19	1.34	2.77	4.25	5.83	7.82	10.36	13.74
2035/36	-2.53	-1.35	0.01	1.39	2.79	4.31	5.98	7.85	10.29	13.63
2036/37	-2.58	-1.33	-0.06	1.19	2.66	4.26	5.78	7.67	10.12	13.79
2037/38	-2.64	-1.39	-0.22	1.11	2.48	4.02	5.82	7.67	10.22	13.70
2038/39	-2.76	-1.48	-0.10	1.24	2.68	4.19	5.85	7.74	10.24	13.82
2039/40	-2.77	-1.49	-0.21	1.16	2.63	4.15	5.78	7.69	10.18	13.80
2040/41	-2.82	-1.61	-0.31	0.94	2.41	3.92	5.63	7.60	10.11	13.53
2041/42	-2.80	-1.44	-0.13	1.09	2.48	3.96	5.62	7.65	10.08	13.61
2042/43	-2.89	-1.70	-0.34	0.98	2.46	3.95	5.58	7.54	10.05	13.59
2043/44	-2.95	-1.66	-0.33	0.98	2.33	3.79	5.44	7.49	9.90	13.60
2044/45	-3.10	-1.76	-0.42	0.85	2.25	3.76	5.50	7.34	9.83	13.67

D.5 High Non-Household Demand - Colliford Headroom Allowance by Probability

	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2015/16	-0.41	0.76	2.00	3.27	4.64	6.10	7.76	9.53	12.00	15.42
2016/17	-0.47	0.78	2.05	3.33	4.63	6.12	7.71	9.59	12.01	15.67
2017/18	-0.50	0.75	2.08	3.34	4.69	6.01	7.63	9.48	11.85	15.36
2018/19	-0.45	0.78	1.93	3.24	4.55	6.00	7.59	9.49	11.81	15.48
2019/20	-0.52	0.65	1.92	3.20	4.46	5.85	7.44	9.43	11.80	15.42
2020/21	-0.61	0.52	1.80	3.08	4.35	5.95	7.53	9.49	11.80	15.55
2021/22	-0.71	0.51	1.84	3.05	4.43	5.93	7.61	9.42	11.70	15.25
2022/23	-0.94	0.35	1.69	2.94	4.39	5.87	7.56	9.41	11.70	15.24
2023/24	-0.91	0.27	1.54	2.93	4.30	5.73	7.33	9.19	11.49	15.02
2024/25	-0.88	0.37	1.49	2.87	4.14	5.58	7.31	9.26	11.53	14.96
2025/26	-0.94	0.32	1.58	2.87	4.20	5.55	7.16	9.19	11.44	14.77
2026/27	-1.06	0.20	1.41	2.73	4.06	5.54	7.21	9.21	11.59	14.95
2027/28	-1.09	0.18	1.42	2.64	3.98	5.48	7.10	8.95	11.41	14.86
2028/29	-1.20	0.00	1.22	2.58	3.90	5.28	6.89	8.85	11.34	14.94
2029/30	-1.21	-0.12	1.15	2.46	3.77	5.24	6.87	8.86	11.17	14.57
2030/31	-1.32	-0.17	1.10	2.47	3.86	5.39	6.91	8.87	11.19	14.73
2031/32	-1.28	-0.10	1.02	2.32	3.64	5.20	6.81	8.70	11.00	14.65
2032/33	-1.41	-0.18	1.00	2.34	3.73	5.21	6.88	8.72	11.19	14.69
2033/34	-1.48	-0.24	1.04	2.22	3.59	5.17	6.66	8.56	10.91	14.71
2034/35	-1.55	-0.28	0.96	2.21	3.56	5.08	6.68	8.60	10.80	14.60
2035/36	-1.57	-0.37	0.92	2.16	3.54	5.02	6.80	8.61	10.93	14.61
2036/37	-1.76	-0.50	0.82	2.15	3.60	4.98	6.54	8.49	10.81	14.51
2037/38	-1.74	-0.47	0.81	2.10	3.39	4.92	6.59	8.41	10.73	14.44
2038/39	-1.76	-0.55	0.67	2.02	3.30	4.89	6.45	8.39	10.54	14.15
2039/40	-1.99	-0.74	0.52	1.90	3.24	4.76	6.39	8.21	10.57	14.23
2040/41	-1.95	-0.78	0.50	1.77	3.10	4.60	6.24	8.12	10.53	13.97
2041/42	-1.95	-0.75	0.46	1.67	3.08	4.43	6.12	8.08	10.48	13.98
2042/43	-2.13	-0.88	0.42	1.71	3.03	4.45	6.10	8.10	10.60	14.16
2043/44	-2.27	-1.04	0.19	1.50	2.90	4.49	6.10	8.08	10.33	13.68
2044/45	-2.36	-1.08	0.11	1.39	2.72	4.15	5.87	7.91	10.31	13.87

D.6 High Household Demand - Roadford Headroom Allowance by Probability

	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2015/16	-0.71	1.02	2.92	4.83	6.91	9.14	11.53	14.36	17.88	23.65
2016/17	-0.49	1.33	3.21	5.06	6.94	9.01	11.29	14.27	17.95	23.34
2017/18	-1.18	0.71	2.70	4.62	6.68	8.91	11.23	13.99	17.48	23.05
2018/19	-1.21	0.60	2.43	4.33	6.35	8.46	10.97	13.73	17.14	22.65
2019/20	-1.34	0.47	2.35	4.36	6.33	8.29	10.67	13.26	16.91	22.18
2020/21	-1.71	-0.01	1.82	3.64	5.78	7.84	10.39	13.27	16.60	22.59
2021/22	-2.06	-0.31	1.60	3.52	5.63	7.88	10.24	13.32	16.64	21.81
2022/23	-2.04	-0.24	1.61	3.47	5.38	7.59	9.98	12.78	16.29	21.46
2023/24	-2.45	-0.59	1.22	3.18	5.06	7.41	9.98	12.85	16.37	21.67
2024/25	-2.57	-0.65	1.18	3.30	5.25	7.35	9.81	12.69	16.34	21.75
2025/26	-2.50	-0.59	1.15	3.13	5.07	7.00	9.41	12.22	15.77	21.04
2026/27	-2.61	-0.91	0.99	2.89	4.93	7.12	9.44	12.39	15.79	21.31
2027/28	-2.88	-1.08	0.67	2.60	4.71	6.88	9.44	12.49	16.24	21.70
2028/29	-2.86	-0.97	0.85	2.88	4.93	7.21	9.58	12.39	15.97	21.31
2029/30	-2.83	-0.99	0.79	2.63	4.69	6.72	8.96	11.90	15.88	20.95
2030/31	-3.17	-1.25	0.63	2.60	4.57	6.76	9.23	12.05	15.76	20.82
2031/32	-3.18	-1.28	0.52	2.53	4.40	6.70	9.23	12.17	15.68	20.94
2032/33	-3.23	-1.35	0.61	2.69	4.58	6.78	9.02	11.86	15.44	20.82
2033/34	-3.17	-1.35	0.42	2.53	4.49	6.57	9.03	11.88	15.52	20.81
2034/35	-3.56	-1.70	0.20	2.31	4.40	6.67	9.17	12.06	15.63	20.73
2035/36	-3.62	-1.69	0.21	2.12	4.19	6.51	8.93	11.77	15.53	21.19
2036/37	-3.64	-1.62	0.18	2.32	4.45	6.68	9.03	12.07	15.80	20.97
2037/38	-3.53	-1.67	0.19	2.33	4.29	6.39	8.72	11.60	15.30	20.58
2038/39	-3.54	-1.77	0.11	2.00	4.21	6.55	9.04	11.86	15.37	20.57
2039/40	-3.69	-1.86	0.04	2.05	4.14	6.33	8.87	11.87	15.61	20.80
2040/41	-3.71	-1.91	0.04	2.01	4.00	6.26	8.69	11.55	15.17	20.47
2041/42	-3.99	-1.96	-0.03	1.84	3.88	6.23	8.63	11.58	15.28	20.91
2042/43	-3.96	-2.05	0.10	2.02	3.95	6.12	8.72	11.38	15.38	21.00
2043/44	-3.87	-2.00	-0.13	1.78	3.84	6.09	8.71	11.59	15.21	20.82
2044/45	-4.24	-2.31	-0.47	1.61	3.97	6.21	8.55	11.54	14.99	20.40

D.7 High Non-Household Demand - Roadford Headroom Allowance by Probability

	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2015/16	-0.38	1.47	3.38	5.35	7.21	9.40	11.85	14.85	18.50	23.93
2016/17	-0.17	1.73	3.47	5.40	7.26	9.56	11.89	14.65	18.36	23.38
2017/18	-0.36	1.43	3.37	5.34	7.43	9.62	11.82	14.63	18.27	23.48
2018/19	-0.30	1.40	3.19	5.15	7.11	9.43	11.82	14.67	18.02	23.46
2019/20	-0.38	1.45	3.33	5.12	7.15	9.42	11.76	14.59	18.03	23.21
2020/21	-0.30	1.48	3.29	5.12	7.11	9.20	11.63	14.39	18.00	23.64
2021/22	-0.21	1.60	3.33	5.19	7.13	9.16	11.53	14.28	17.80	23.22
2022/23	-0.42	1.37	3.19	5.08	7.12	9.27	11.62	14.46	17.91	23.25
2023/24	-0.50	1.33	3.18	5.02	7.13	9.36	11.69	14.57	18.15	23.39
2024/25	-0.15	1.57	3.24	5.19	7.06	9.06	11.30	13.97	17.65	23.19
2025/26	-0.34	1.57	3.31	5.24	7.14	9.15	11.44	14.42	17.94	22.98
2026/27	-0.49	1.33	3.06	5.04	6.95	9.11	11.53	14.40	18.04	23.12
2027/28	-0.52	1.28	3.15	5.17	7.13	9.33	11.70	14.38	17.64	23.25
2028/29	-0.54	1.36	3.11	4.94	6.89	9.21	11.38	14.28	17.88	22.85
2029/30	-0.56	1.14	3.08	5.00	6.93	9.15	11.59	14.38	17.66	22.96
2030/31	-0.70	1.05	2.87	4.78	6.73	8.95	11.43	14.46	17.88	23.17
2031/32	-0.75	1.10	2.95	5.01	6.99	9.10	11.48	14.23	17.54	23.06
2032/33	-0.59	1.08	2.97	4.93	6.86	8.92	11.32	14.17	17.61	22.88
2033/34	-0.60	1.35	3.13	4.95	7.06	9.14	11.52	14.57	17.93	23.27
2034/35	-0.69	1.23	3.10	4.99	6.86	9.00	11.41	14.07	17.52	23.09
2035/36	-0.74	0.95	2.70	4.53	6.74	8.94	11.33	14.20	17.74	23.17
2036/37	-0.57	1.22	3.10	4.96	6.89	8.98	11.39	14.34	17.98	23.07
2037/38	-0.88	0.97	2.80	4.66	6.76	8.90	11.25	14.28	17.88	23.02
2038/39	-1.05	0.74	2.77	4.68	6.69	9.14	11.90	14.51	18.19	23.24
2039/40	-0.88	0.88	2.61	4.55	6.69	8.98	11.38	14.01	17.61	22.91
2040/41	-0.77	0.96	2.81	4.71	6.72	8.94	11.35	14.07	17.71	23.21
2041/42	-0.92	0.85	2.72	4.65	6.72	8.80	11.27	13.90	17.38	22.63
2042/43	-1.04	0.91	2.92	4.86	6.72	8.87	11.40	14.30	17.89	23.36
2043/44	-1.05	0.82	2.63	4.57	6.60	8.90	11.36	14.18	17.58	22.84
2044/45	-0.94	0.74	2.55	4.37	6.50	8.68	11.14	13.82	17.67	23.23

D.8 High Household Demand - Wimbleball Headroom Allowance by Probability

	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2015/16	-0.23	0.42	1.05	1.76	2.51	3.31	4.17	5.28	6.67	8.62
2016/17	-0.32	0.34	1.03	1.75	2.47	3.26	4.16	5.18	6.50	8.51
2017/18	-0.45	0.21	0.88	1.59	2.31	3.14	3.95	5.02	6.25	8.14
2018/19	-0.58	0.08	0.74	1.42	2.16	3.00	3.89	4.93	6.19	8.13
2019/20	-0.70	-0.01	0.69	1.38	2.09	2.86	3.72	4.86	6.13	8.01
2020/21	-0.82	-0.14	0.55	1.27	2.00	2.84	3.72	4.72	5.99	7.94
2021/22	-0.98	-0.36	0.32	1.01	1.78	2.65	3.53	4.48	5.84	7.84
2022/23	-0.96	-0.34	0.36	1.06	1.78	2.58	3.47	4.55	5.83	7.81
2023/24	-1.07	-0.44	0.21	0.91	1.72	2.54	3.48	4.47	5.77	7.73
2024/25	-1.16	-0.43	0.25	0.94	1.69	2.50	3.39	4.39	5.61	7.61
2025/26	-1.24	-0.58	0.13	0.90	1.70	2.49	3.37	4.34	5.66	7.48
2026/27	-1.27	-0.59	0.10	0.77	1.52	2.38	3.28	4.36	5.67	7.61
2027/28	-1.35	-0.70	-0.06	0.68	1.46	2.23	3.15	4.23	5.47	7.58
2028/29	-1.41	-0.75	-0.03	0.70	1.46	2.33	3.18	4.19	5.41	7.47
2029/30	-1.49	-0.85	-0.18	0.57	1.35	2.17	3.09	4.12	5.40	7.42
2030/31	-1.46	-0.80	-0.09	0.58	1.32	2.10	3.00	4.09	5.36	7.35
2031/32	-1.58	-0.87	-0.13	0.57	1.30	2.10	3.01	4.06	5.33	7.31
2032/33	-1.65	-0.99	-0.28	0.43	1.22	2.05	3.04	4.15	5.49	7.24
2033/34	-1.67	-0.91	-0.18	0.56	1.28	2.05	2.95	4.01	5.30	7.47
2034/35	-1.67	-0.97	-0.28	0.45	1.22	2.03	2.93	3.99	5.34	7.29
2035/36	-1.73	-1.04	-0.30	0.43	1.17	2.00	2.84	3.92	5.29	7.18
2036/37	-1.75	-1.08	-0.37	0.37	1.10	1.93	2.92	3.94	5.28	7.23
2037/38	-1.80	-1.10	-0.36	0.38	1.15	1.96	2.84	3.88	5.21	7.16
2038/39	-1.89	-1.15	-0.44	0.27	1.04	1.86	2.76	3.85	5.30	7.28
2039/40	-1.80	-1.16	-0.49	0.26	1.07	1.88	2.84	3.84	5.17	7.05
2040/41	-1.86	-1.12	-0.40	0.33	1.08	1.95	2.84	3.84	5.19	7.08
2041/42	-1.99	-1.24	-0.56	0.17	1.02	1.83	2.72	3.77	5.17	7.19
2042/43	-1.96	-1.26	-0.58	0.17	0.96	1.82	2.73	3.86	5.11	7.07
2043/44	-1.97	-1.29	-0.60	0.09	0.81	1.66	2.65	3.68	5.05	7.04
2044/45	-2.08	-1.39	-0.64	0.10	0.87	1.66	2.60	3.60	4.97	7.11

D.9 High Non-Household Demand - Wimbleball Headroom Allowance by Probability

	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2015/16	-0.14	0.57	1.23	1.91	2.71	3.55	4.42	5.49	6.80	8.82
2016/17	-0.13	0.55	1.21	1.91	2.62	3.45	4.34	5.39	6.58	8.54
2017/18	-0.15	0.52	1.22	1.92	2.64	3.46	4.32	5.31	6.62	8.54
2018/19	-0.20	0.53	1.19	1.92	2.58	3.36	4.20	5.22	6.52	8.53
2019/20	-0.26	0.41	1.12	1.82	2.52	3.29	4.16	5.16	6.62	8.53
2020/21	-0.19	0.47	1.13	1.86	2.59	3.37	4.25	5.24	6.56	8.45
2021/22	-0.25	0.42	1.10	1.83	2.55	3.37	4.20	5.24	6.49	8.41
2022/23	-0.25	0.38	1.08	1.77	2.50	3.30	4.19	5.21	6.49	8.51
2023/24	-0.27	0.40	1.07	1.80	2.54	3.34	4.21	5.21	6.41	8.27
2024/25	-0.29	0.36	1.00	1.74	2.48	3.24	4.12	5.15	6.46	8.47
2025/26	-0.32	0.31	0.99	1.70	2.42	3.21	4.14	5.19	6.49	8.37
2026/27	-0.38	0.33	0.99	1.68	2.42	3.17	4.09	5.14	6.49	8.29
2027/28	-0.41	0.23	0.92	1.66	2.45	3.23	4.13	5.15	6.36	8.39
2028/29	-0.39	0.30	0.97	1.67	2.38	3.15	4.06	5.12	6.30	8.35
2029/30	-0.38	0.24	0.90	1.62	2.37	3.15	4.00	4.97	6.40	8.28
2030/31	-0.39	0.24	0.88	1.59	2.28	3.08	3.97	4.96	6.24	8.17
2031/32	-0.44	0.24	0.94	1.59	2.29	3.11	3.94	4.98	6.29	8.12
2032/33	-0.42	0.20	0.86	1.57	2.27	3.11	4.06	5.12	6.27	8.12
2033/34	-0.52	0.21	0.90	1.59	2.28	3.05	3.97	5.03	6.26	8.11
2034/35	-0.54	0.14	0.81	1.55	2.25	3.03	3.87	4.90	6.23	8.07
2035/36	-0.55	0.14	0.84	1.53	2.24	3.03	3.91	5.02	6.28	8.27
2036/37	-0.60	0.12	0.83	1.49	2.26	3.06	3.97	5.02	6.34	8.16
2037/38	-0.57	0.11	0.79	1.51	2.22	3.04	3.91	4.92	6.23	8.04
2038/39	-0.60	0.05	0.72	1.40	2.20	3.01	3.86	4.88	6.23	8.08
2039/40	-0.60	0.11	0.79	1.50	2.25	3.04	3.84	4.88	6.18	8.10
2040/41	-0.67	-0.03	0.71	1.42	2.17	3.00	3.89	4.88	6.20	8.07
2041/42	-0.71	-0.06	0.60	1.38	2.13	2.85	3.74	4.76	6.18	8.19
2042/43	-0.65	0.01	0.66	1.34	2.09	2.92	3.79	4.76	6.08	8.01
2043/44	-0.78	-0.11	0.56	1.29	2.12	2.93	3.87	4.96	6.28	8.18
2044/45	-0.70	-0.01	0.63	1.30	2.04	2.90	3.83	4.81	6.01	7.79

D.10 High Household Demand – Bournemouth DYAA Headroom Allowance by Probability

	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2015/16	-0.40	1.03	2.56	4.23	5.96	7.78	9.80	12.12	15.21	19.10
2016/17	-0.21	1.24	2.72	4.14	5.80	7.69	9.59	11.86	14.78	19.21
2017/18	-0.32	1.07	2.62	4.28	5.88	7.64	9.75	11.95	14.85	19.31
2018/19	-0.52	1.11	2.56	4.13	5.69	7.50	9.45	11.75	14.60	19.17
2019/20	-0.82	0.66	2.19	3.74	5.44	7.26	9.29	11.58	14.36	18.90
2020/21	-0.95	0.57	2.14	3.68	5.39	7.21	9.13	11.60	14.54	18.79
2021/22	-1.08	0.40	1.90	3.45	5.15	6.96	8.95	11.37	14.43	18.79
2022/23	-1.09	0.37	1.86	3.41	5.17	6.95	8.98	11.27	13.89	18.19
2023/24	-1.18	0.30	1.89	3.48	5.12	6.85	8.90	11.14	14.14	18.77
2024/25	-1.16	0.29	1.67	3.25	4.92	6.69	8.87	11.25	14.24	18.76
2025/26	-1.11	0.36	1.92	3.58	5.35	7.19	9.30	11.67	14.64	19.55
2026/27	-1.28	0.28	1.77	3.38	5.16	7.11	9.27	11.71	14.85	19.51
2027/28	-1.56	0.16	1.87	3.43	5.26	7.11	9.10	11.71	14.69	19.07
2028/29	-1.54	0.00	1.64	3.25	4.95	6.71	8.67	10.88	13.71	17.86
2029/30	-1.54	-0.06	1.42	2.99	4.74	6.54	8.57	10.84	13.68	18.11
2030/31	-1.49	0.03	1.59	3.23	4.77	6.43	8.52	10.85	13.57	17.82
2031/32	-1.56	-0.06	1.38	2.95	4.65	6.61	8.54	10.85	13.77	18.04
2032/33	-1.55	0.02	1.48	2.90	4.59	6.44	8.43	10.83	13.72	17.93
2033/34	-1.62	-0.16	1.44	2.96	4.72	6.43	8.44	10.71	13.69	17.66
2034/35	-1.90	-0.34	1.18	2.77	4.48	6.40	8.29	10.71	13.71	18.00
2035/36	-1.61	-0.13	1.39	2.95	4.52	6.27	8.20	10.57	13.65	17.94
2036/37	-1.81	-0.38	1.18	2.71	4.44	6.28	8.30	10.65	13.60	17.92
2037/38	-1.94	-0.35	1.12	2.72	4.50	6.28	8.24	10.56	13.65	18.18
2038/39	-2.08	-0.44	1.24	2.77	4.52	6.28	8.18	10.52	13.50	17.85
2039/40	-1.90	-0.38	1.29	2.85	4.46	6.11	8.20	10.55	13.38	17.75
2040/41	-1.92	-0.49	1.17	2.80	4.41	6.22	8.26	10.57	13.49	17.64
2041/42	-1.97	-0.48	1.02	2.53	4.18	5.88	7.94	10.45	13.46	17.90
2042/43	-1.93	-0.50	0.99	2.61	4.26	6.15	8.07	10.42	13.48	17.77
2043/44	-1.92	-0.54	0.88	2.38	4.19	5.86	7.94	10.52	13.62	17.66
2044/45	-2.07	-0.56	0.94	2.53	4.24	6.00	7.95	10.36	13.31	17.87

D.11 High Non-Household Demand – Bournemouth DYAA Headroom Allowance by Probability

	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2015/16	-0.29	1.19	2.77	4.36	5.99	7.82	9.77	12.31	14.92	19.23
2016/17	-0.12	1.30	2.82	4.32	5.92	7.68	9.64	11.95	14.84	19.12
2017/18	-0.13	1.37	2.93	4.43	6.04	7.63	9.62	11.83	14.87	19.44
2018/19	-0.24	1.12	2.72	4.36	6.02	7.78	9.81	12.09	14.86	19.31
2019/20	-0.14	1.35	2.92	4.51	6.05	7.92	9.83	12.05	14.90	19.36
2020/21	-0.16	1.37	2.81	4.35	6.06	7.72	9.86	12.08	14.99	19.54
2021/22	-0.23	1.30	2.69	4.23	6.01	7.69	9.63	11.84	14.87	19.52
2022/23	-0.23	1.26	2.81	4.22	5.84	7.56	9.44	11.90	14.82	19.22
2023/24	-0.27	1.16	2.72	4.23	5.85	7.67	9.60	11.86	14.88	19.04
2024/25	-0.30	1.21	2.80	4.42	6.01	7.70	9.65	11.91	14.86	19.40
2025/26	-0.33	1.29	2.86	4.49	6.24	8.13	10.19	12.70	15.75	20.32
2026/27	-0.31	1.33	2.85	4.52	6.27	8.18	10.14	12.63	15.64	19.95
2027/28	-0.43	1.13	2.80	4.47	6.26	8.11	10.19	12.52	15.74	20.27
2028/29	-0.28	1.12	2.70	4.20	5.77	7.49	9.31	11.45	14.55	19.24
2029/30	-0.50	0.99	2.51	4.10	5.86	7.67	9.48	11.68	14.29	18.75
2030/31	-0.47	1.06	2.48	4.07	5.55	7.42	9.45	11.78	14.89	19.27
2031/32	-0.49	0.98	2.46	4.13	5.84	7.57	9.48	11.67	14.56	18.97
2032/33	-0.56	0.88	2.49	4.13	5.76	7.56	9.45	11.79	14.84	19.36
2033/34	-0.50	0.98	2.45	4.08	5.71	7.42	9.43	11.64	14.71	18.67
2034/35	-0.55	0.89	2.48	3.97	5.72	7.32	9.52	11.71	14.43	18.64
2035/36	-0.40	1.01	2.57	4.06	5.67	7.32	9.29	11.72	14.60	18.75
2036/37	-0.67	0.76	2.43	4.00	5.66	7.34	9.34	11.64	14.28	18.53
2037/38	-0.79	0.75	2.36	3.92	5.61	7.49	9.52	11.75	14.54	18.71
2038/39	-0.78	0.73	2.25	3.85	5.61	7.42	9.35	11.74	14.48	18.76
2039/40	-0.77	0.65	2.29	3.84	5.42	7.31	9.31	11.59	14.58	19.08
2040/41	-0.76	0.69	2.19	3.83	5.56	7.33	9.21	11.44	14.30	18.52
2041/42	-0.76	0.77	2.33	3.82	5.38	7.11	9.09	11.25	14.24	18.61
2042/43	-0.91	0.62	2.13	3.63	5.34	7.27	9.16	11.52	14.34	18.64
2043/44	-0.77	0.69	2.23	3.76	5.27	7.01	9.03	11.24	14.17	18.34
2044/45	-1.03	0.38	1.95	3.48	5.15	7.01	8.98	11.36	13.88	18.24

D.12 High Household Demand – Bournemouth DYCP Headroom Allowance by Probability

	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2015/16	-0.25	1.40	3.02	4.71	6.52	8.53	10.50	13.17	16.27	21.08
2016/17	-0.56	1.14	2.91	4.57	6.33	8.36	10.69	13.27	16.36	21.12
2017/18	-0.69	1.03	2.63	4.48	6.14	8.11	10.52	13.22	16.51	21.21
2018/19	-0.80	0.93	2.52	4.23	5.96	7.84	10.08	12.64	15.98	20.86
2019/20	-1.06	0.56	2.29	4.05	5.86	7.82	9.88	12.47	15.82	20.60
2020/21	-1.31	0.41	2.15	3.85	5.59	7.71	10.00	12.44	15.85	20.60
2021/22	-1.41	0.24	1.91	3.79	5.55	7.45	9.55	12.15	15.47	20.41
2022/23	-1.44	0.23	1.89	3.60	5.50	7.43	9.71	12.25	15.40	20.30
2023/24	-1.63	0.05	1.81	3.51	5.23	7.27	9.52	12.21	15.40	20.23
2024/25	-1.84	-0.15	1.44	3.19	5.12	7.11	9.43	12.00	15.31	20.27
2025/26	-1.87	-0.12	1.54	3.33	5.23	7.37	9.65	12.21	15.77	21.07
2026/27	-1.91	-0.06	1.73	3.54	5.49	7.68	9.83	12.45	15.97	20.86
2027/28	-2.03	-0.38	1.44	3.22	5.06	7.17	9.56	12.10	15.48	20.85
2028/29	-2.14	-0.50	1.22	3.05	4.96	7.01	9.50	12.28	15.48	20.45
2029/30	-2.05	-0.29	1.29	3.23	5.08	7.08	9.16	11.84	15.34	20.18
2030/31	-2.36	-0.64	1.18	2.96	4.76	6.90	9.41	12.04	15.47	20.41
2031/32	-2.20	-0.45	1.27	2.93	4.73	6.74	8.99	11.71	15.19	20.06
2032/33	-2.18	-0.55	1.15	2.87	4.74	6.83	9.13	12.03	15.37	20.06
2033/34	-2.37	-0.63	1.20	2.94	4.74	6.85	8.96	11.70	15.01	20.23
2034/35	-2.40	-0.72	1.03	2.93	4.85	6.77	9.05	11.57	15.12	19.81
2035/36	-2.57	-0.93	0.83	2.58	4.57	6.71	9.08	11.83	15.11	20.02
2036/37	-2.52	-0.85	0.99	2.70	4.59	6.53	8.72	11.51	14.91	19.58
2037/38	-2.53	-0.83	0.87	2.63	4.55	6.70	8.98	11.69	14.91	19.99
2038/39	-2.65	-0.96	0.80	2.67	4.49	6.49	8.79	11.44	14.82	20.20
2039/40	-2.88	-1.09	0.70	2.63	4.54	6.74	8.94	11.49	14.74	19.75
2040/41	-2.83	-1.09	0.64	2.54	4.50	6.37	8.75	11.43	14.87	19.67
2041/42	-2.91	-1.25	0.50	2.28	4.19	6.14	8.46	11.22	14.65	19.83
2042/43	-2.90	-1.22	0.57	2.36	4.32	6.41	8.70	11.21	14.41	19.70
2043/44	-2.98	-1.23	0.51	2.25	4.31	6.32	8.65	11.28	14.62	19.60
2044/45	-3.02	-1.25	0.51	2.28	4.35	6.35	8.57	11.21	14.60	19.48

D.13 High Non-Household Demand - Bournemouth DYCP Headroom Allowance by Probability

	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2015/16	-0.09	1.47	3.12	4.79	6.66	8.50	10.75	13.27	16.57	21.43
2016/17	-0.15	1.42	3.08	4.81	6.57	8.62	10.71	13.28	16.37	21.32
2017/18	0.00	1.52	3.19	4.97	6.61	8.56	10.65	13.40	16.74	21.43
2018/19	-0.17	1.64	3.15	4.91	6.80	8.72	10.95	13.48	16.62	21.36
2019/20	-0.10	1.55	3.25	4.86	6.78	8.82	11.01	13.64	16.78	21.35
2020/21	-0.13	1.56	3.19	5.00	6.86	8.72	11.13	13.66	16.92	21.66
2021/22	-0.14	1.59	3.20	5.03	7.02	9.09	11.20	13.60	16.59	21.14
2022/23	-0.16	1.54	3.27	5.04	6.78	8.61	10.88	13.43	16.65	21.46
2023/24	-0.23	1.44	3.20	4.83	6.71	8.69	10.89	13.39	16.75	21.41
2024/25	-0.21	1.47	3.17	4.90	6.80	8.62	10.86	13.40	16.67	21.77
2025/26	-0.21	1.47	3.34	5.24	7.13	9.24	11.48	14.00	17.47	22.52
2026/27	-0.01	1.84	3.43	5.17	7.19	9.12	11.34	14.11	17.36	21.94
2027/28	-0.13	1.60	3.35	5.11	7.11	9.18	11.38	14.26	17.59	22.48
2028/29	-0.09	1.67	3.35	5.11	7.01	8.94	11.08	13.79	17.08	21.92
2029/30	-0.05	1.64	3.29	5.03	6.89	8.85	11.06	13.76	16.93	21.92
2030/31	-0.04	1.68	3.33	5.20	7.05	9.02	11.18	13.78	17.17	21.87
2031/32	0.01	1.55	3.31	5.00	6.75	8.84	10.98	13.58	16.86	21.97
2032/33	-0.10	1.56	3.32	5.17	7.02	9.03	11.29	13.88	17.11	22.20
2033/34	-0.13	1.66	3.46	5.21	7.11	9.03	11.24	14.16	17.41	21.66
2034/35	-0.14	1.45	3.09	4.97	6.79	8.94	11.19	13.70	17.05	21.70
2035/36	-0.02	1.80	3.52	5.29	7.07	9.12	11.24	14.12	17.35	21.93
2036/37	-0.03	1.64	3.33	5.01	6.89	8.87	11.05	13.72	17.05	21.96
2037/38	-0.18	1.55	3.25	5.06	6.96	8.95	11.16	13.86	17.56	22.37
2038/39	-0.15	1.62	3.33	5.17	6.94	8.90	11.21	13.88	17.05	21.65
2039/40	-0.18	1.43	3.21	5.04	7.09	9.18	11.42	13.88	17.35	21.93
2040/41	0.00	1.62	3.36	5.02	6.82	9.03	11.27	13.91	17.34	22.14
2041/42	0.08	1.66	3.31	5.07	7.00	8.95	11.16	13.57	16.87	21.94
2042/43	-0.04	1.58	3.28	5.07	6.87	8.92	11.10	13.67	17.29	22.25
2043/44	-0.20	1.46	3.26	5.04	6.99	8.99	11.49	13.98	17.06	22.11
2044/45	0.02	1.54	3.37	5.21	6.95	8.99	11.18	13.68	16.76	21.62