Appendix F: HEADROOM

F.1 Calculation of Headroom

F.1.1 Introduction

F.1.1.1 Uncertainty in the Supply Demand Balance

Uncertainty in the supply demand balance falls into six broad categories:

1. Natural variability in the hydrological/hydrogeological conditions that affect the output available from sources. This uncertainty is typically taken into account when deployable output is calculated;
1. Uncertainty in the operational availability of supplies from sources. These are typically specified risks that are taken into account in outage allowances;
2. Variability in the magnitude of forecast demands depending on the assumptions made. This variability is usually taken into account through scenario analysis;
3. Specified uncertainties affecting the supply side and the demand side values used in the supply demand balance. These uncertainties are taken into account in the headroom allowance;
4. Uncertainty in whether and/or when any given demand side or supply side option can in fact be delivered. This form of uncertainty, which includes planning and other permission uncertainties, is generally treated deterministically by including an assumed lead time into the option selection process; and
5. Uncertainty due to legislation/regulations such as the Water Framework Directive, Habitats Directive, and the Environment Agency's Restoring Sustainable Abstractions programme.

F.1.1.2 Headroom

In all planning exercises it is inevitable that there will be uncertainties about what might happen in the future, and so it is important that the sources of uncertainties are understood and, wherever possible, managed. Protection against specified uncertainties can be built into the supply demand balance by including a headroom allowance. Headroom is defined as "a planning allowance that a prudent water company should take into account when developing plans to balance supplies and demands and to deliver its desired Level of Service". The allowance is called "target headroom" and is designed to cater for specified uncertainties in both demand side and supply side uncertainties.

Target headroom is the threshold of minimum acceptable headroom which, if breached, would represent an increased risk to the company that it would not able to meet its desired Target Levels of Service. This would then be the trigger for options to either increase the available supplies, reduce demands or a combination of both.

Available Headroom is defined as the difference between Water Available For Use (WAFU) and demand. Available Headroom tends to reduce over time, particularly as a result of increasing demands.

The EA Water Resource Planning Guideline does not prescribe what level of security of supply a company should aim for, and therefore what level of headroom allowance to use. It is left to each company to determine the target headroom that is used in its WRMP.

The analysis undertaken for the PR04 WRP used the improved headroom methodology (UKWIR, 2002) whose output is distributions of headroom uncertainty from which the appropriate level of target headroom is selected. The headroom calculations for the WRMP have been informed by work undertaken since PR04 as part of the AMP4 Water Resources Investigations. The methodology and basic assumptions used for the headroom assessments for those investigations were not changed from the PR04 analysis. However it was considered appropriate for the AMP4 Water Resources Investigations and then for the various stages of the WRMP process that the input parameters for the headroom components should be reviewed, and, where appropriate, the assumptions updated. The work to assess the target headroom for this WRMP has again followed the same approach, however where the values for deployable output and for forecast demands from which headroom uncertainty is calculated have been updated since the previous studies, then the updated values have been used for this WRMP.

F.1.2 Application of the Headroom Methodology for PR09

In contrast with the original UKWIR headroom method that provided a deterministic estimate of target headroom, the new UKWIR methodology gives estimates of headroom uncertainty. This requires the uncertainty for each of the headroom components to be defined as a probability distribution. All the headroom components are then combined using Monte Carlo simulation to give overall headroom uncertainty.

The new UKWIR methodology, which was introduced for the PR04 WRP and has also been applied for this WRMP, takes account of:

(a) Only those uncertainties that lie outside the direct control of the water company; and

(b) Only the principal uncertainties in the supply demand balance.

It does not consider:

(a) Outages (planned or unplanned);

(b) Uncertainty surrounding outage estimates; or

(c) Uncertainties within the control of the water company.

It is important to recognise that the relationship between headroom uncertainty and the supply demand balance will change as circumstances change. Early in the planning period, the deployable output available from certain sources may be seen as under threat from licence changes or gradual pollution and the uncertainty associated with these threats will be fairly reflected in headroom uncertainty. However, as threats come closer to becoming reality, a time will come when a loss of deployable output is certain and should be included as a reduction in WAFU rather than as a component of headroom uncertainty. This will result in a step-reduction in headroom uncertainty and a corresponding reduction in WAFU.

Following the approach for both PR04 and for the AMP4 Water Resources Investigations, the analysis for this WRMP has been undertaken using standard proformas for each WRZ. Although there are common features between each WRZ, the unique characteristics of the sources of supply in each WRZ mean that each of the headroom components has been considered individually. To ensure a consistent approach, it was decided for these earlier studies that one type of probability distribution function should be selected for each headroom component, and the same distribution and parameters applied across all of the WRZs, except where there are specific circumstances which mean that other assumptions are required. The same approach has been followed for the PR09 analysis.

A key feature of the application of the new UKWIR methodology is the selection of the percentile of the headroom uncertainty distribution that is used to set the value of target headroom at key intervals over the planning period. In its Water Resources Planning Guideline, the Environment Agency notes that “In general we would expect companies to accept a higher level of risk in future than at present”. The selection of the appropriate percentile of headroom uncertainty or the glidepath is discussed in section F.1.4.

F.1.2.1 Supply side Uncertainties

A summary of the supply side headroom components used in the PR09 analysis is given in Table F.1.

Headroom Component		
Code	**Uncertainty Factor**	**Explanation**
S1	Vulnerable surface water licences	EA WRPG does not allow Sustainability Reductions in headroom, therefore impact on deployable output only
S2	Vulnerable ground water licences	EA WRPG does not allow Sustainability Reductions in headroom, therefore impact on deployable output only
S3	Time limited licences	Presumption that licences will be renewed
S4	Bulk transfers – imports from other water companies	Sussex North WRZ only
S5	Gradual pollution	Process loss only
S6	Accuracy of supply side data	EA Guidance suggests impact on headroom should be small. In PR04 this category was sub-divided into 4; the same approach has been used for PR09
S6/1	Uncertainty for yields constrained by source infrastructure	Pump outputs measured by meter – hence accuracy of meter must determine accuracy of pump performance
S6/2	Meter uncertainty for licence critical sources	Meter uncertainty for licence critical sources – automatic shutdown should preclude negative headroom, SW standard is +/- 4%
S6/3	Uncertainty for aquifer constrained groundwater sources	Aquifer constrained deployable outputs – assume +/-5% accuracy on “drought curves”
S6/4	Uncertainty for surface water source	Surface water assessments
S7	Sustainability Reductions	EA Water Resources Planning Guideline instructs companies not to include this unless so specified by the EA
S8/1	Uncertainty of climate change	Most likely climate change impact included in the supply demand balance with the difference between maximum and minimum included in headroom
S9	Uncertainty of new source yields	Yield of future options, baseline deficits, the role of transfers

Table F.1 List of Supply side Headroom Components

Components S1 to S3 are not applicable to the company’s sources, and so these components have not been included in the analysis. Comments on each of the other supply side components are given below.

(S4) Bulk Supplies

The only significant bulk supply import into the company’s supply area is from Portsmouth Water into Sussex North WRZ. This supply has been introduced since PR04, and so it was included in the headroom calculations for the AMP4 Water Resource Investigations.

(S5) Gradual Pollution

Although various sources were included in the PR04 assessments, the ability to deal with deteriorating quality of raw water has been increased through investment in treatment processes. The number of sources where this headroom component applies has therefore been reduced.

At other sources, the probability distribution parameters associated with S5 have not been altered from the PR04 assessment, although there may have been changes to the values of deployable output to which the parameters apply.

(S6) Accuracy of Supply side Data

As noted above, the Water Resources Planning Guideline considers that this component of headroom uncertainty should be small. Nevertheless, the company believes that the sub-components under the S6 heading represent a significant uncertainty, and therefore should be included in the calculations.

For PR09, each source was assigned to one of the following categories of uncertainty:

- S6/1 - source infrastructure capacity;
- S6/2 - licence capacity;
- S6/3 – groundwater source yield capacity; and
- S6/4 - surface water quantity.

For PR09 probability distribution parameters were kept as those used for the previous PR04 assessment, but the values of deployable output to which the parameters are applied have changed as a result of more recent assessments of groundwater deployable output undertake for the AMP4 Water Resources Investigations and for this WRMP.

(S7) Sustainability Reduction

This component has not been included in the headroom analysis, as it is explicitly excluded from the Water Resources Planning Guideline. In June 2007, the Environment Agency wrote to the company to advise it of the Sustainability Reductions to be used in the statutory WRMP. The Table attached to the Environment Agency letter gave "indicative" changes to abstractions, and noted that it will update the Table "between now and December 2008". The Agency letter dated 28th November 2008 gave details of the PR09 National Environment Programme (NEP) being the "list of environmental improvements that we want you to include in your plan". The Annexes to the letter explain changes from the initial NEP in more detail. One of the changes is that the Environment Agency no longer gives the status of the River Itchen SAC as a s.52 Pilot.

At the time of the draft WRMP, the Environment Agency advised the company that it should assume that the full Sustainability Reduction would be implemented from 2015. Since the draft WRMP, the company has worked with the Environment Agency, Ofwat, Portsmouth, and Natural England to explore alternative approaches for the River Itchen. The outcome of that work is reflected in the draft Memorandum of Understanding which sets out assumptions, actions and an implementation programme in which full implementation of the Sustainability Reductions is not anticipated until the end of AMP6.

(S8) Uncertainty in the Impact of Climate Change

For the AMP4 Water Resources Investigations, the impact of climate change on source yield, was split between the deployable output line in the supply demand balance and headroom factor S8. A triangular probability distribution was used for the climate change factor instead of the default normal distribution. The most likely impact associated with climate change is included in the supply demand balance, with the difference between the minimum and maximum included in headroom. A similar approach, updated to include any revisions to deployable output has been undertaken for this WRMP.

(S9) The Uncertainty of New Source Yields

This component has not been included in the headroom analysis.

F.1.2.2 Demand side Uncertainties

A summary of the demand side components of uncertainty are listed in Table F.2.

Headroom Component		
Code	**Uncertainty Factor**	**Explanation**
D1	Accuracy of sub-component data	Meter reading
D2	Uncertainty of the demand forecast	Differences between the high, medium and low scenarios.
D3	Uncertainty of the impact of climate change on demand	Range of demands based on analysis using CC:DEW
D4	Uncertainty of demand management	Leakage reduction, impact of metering

Table F.2 List of Demand side Headroom Components

The parameters of the probability distributions for demand side components D1 and D3 were not adjusted from those used in the PR04 work, or in the AMP4 Water Resources Investigations; the values of the demand forecast, to which the parameters are applied however have been updated for this WRMP.

(D1) Accuracy of Sub-Component Demand Data

Meter accuracy may range from +/- 2% for a well-installed Magflow meter to +/- 5% for older, venturi or dall tube meters. There is usually no evidence that the errors are biased positively or negatively and a normal distribution with a mean of zero is appropriate.

By taking an error range, in-line with the type of meters and their age, installed within each Water Resource Zone, and applying it to the dry year demand forecast, a total accuracy range can be estimated. This probability distribution should be applied throughout the planning horizon unless the replacement of meters is expected to alter the accuracy range significantly (UKWIR, 2002).

(D2) Demand Forecast Variation

Demand forecasting is subject to uncertainty, and there is a risk that actual demand will depart from the dry year demand forecast assumed in a supply demand balance. The sensitivity of the demand forecast assumptions can be tested by estimating an upper and a lower demand forecast.

The key elements of uncertainty within the demand forecast (not including uncertainty over demand management savings) were considered to be from the population and property forecast, and from the estimation of base year demand for the three design scenarios (DYAA, DYCP, DY MDO), which provides the starting point on which the demand forecast is based. A triangular distribution was assumed characterised by estimates of the maximum and minimum departure from the central estimate of uncertainty. For the maximum estimate of the demand forecast, an increase of 10% in property / population forecast numbers by the end of the planning period (applied as a linear increase) was assumed, while 10% was added to the base year demand for each of the design scenarios. The minimum estimate was calculated in the same manner, but with a 10% decrease applied.

The analysis for this WRMP takes into account the fall in distribution input from the base year (2006-2007) for the draft and the 2007-2008 base year, and the one year of additional data for the calculation of dry year factors and rebasing. The combined effect of this is to increase the Headroom Uncertainty in the base year and early years of the forecast.

(D3) Uncertainty of Impact of Climate Change on Demand

The estimated impact of climate change on demand over the planning horizon is represented by a triangular distribution. Estimates of the “most likely” increase in demand were based on calculations from CC:DeW (see Appendix E) and were assumed to be increases of 1% and 1.9% for households and commercial/industrial respectively at the end of the planning period. The estimates for the lower and upper bounds of the triangular distribution were a minimum increase of 0% and a maximum increase of 50% of the “most likely” rate over the planning period; this gives a maximum of 1.5% and 2.9% for households and non-households respectively at the end of the planning period.

(D4) Uncertainty of Demand Management Measures

The factor D4 covers the uncertainty of the impact of demand management options on demand for water and can include factors such as leakage reduction, metering and the introduction of water efficiency schemes. D4 was estimated from the company's assumed measured PCC micro-component forecast with baseline metering, and the parameters of the distribution calculated as a difference from the "most likely" forecast. In this case, the micro-component assumption for measured PCC was increased by 15% by the end of the planning period (while keeping unmeasured PCC forecast the same) to provide an estimate of the maximum uncertainty from achieving lower demand savings than assumed in the current forecast; for the minimum the measured PCC micro-component forecast was reduced by 5% at the end of the planning period to account for achieving slightly greater savings than those currently envisaged.

When modelling future supply demand balance scenarios, it may be necessary to include demand management measures to maintain Target Levels of Service. The size of the reductions in demand that such measures might achieve is often uncertain and the date by which demand reductions materialise is often even more uncertain, particularly for indirect measures such as education initiatives that require customers to change their water-using habits. The designation of the company's WRZs as an "area of serious water stress" (Defra letter dated 29th November 2007) and other factors means that an ambitious metering programme with associated long-term savings in demand has been included in this WRMP, and so the contribution of D4 – uncertainty of demand management - to headroom uncertainty becomes more important towards the end of the planning period..

F.1.2.3 Uncertainties not Allowed for in the Plan

In its Water Resource Planning Guideline published in April 2007, the Environment Agency stated that "Companies should not make allowances for the risk of non-renewal of time-limited licences in headroom" (section 9.3); that instruction has not been changed in the current Guideline (November 2008). Ministers have instructed the Environment Agency to ensure that time-limited licences do not present a risk to security of supply. In additional to the risk of non-renewal of licences, there are similar risks to the baseline deployable output from a range of environmental drivers such as the Habitats Directive, the RSA programme and eventually the WFD. The Water Resource Planning Guideline states that "any notice given will provide sufficient time to restore the supply-demand balance…", with the inference that there is no need for a headroom allowance to guard against the risk from time-limited licences reducing deployable output, and thus WAFU.

The guideline also notes that "headroom uncertainty should not be significantly influenced by the headroom components accuracy of supply side data (S6) and "accuracy of sub-component data (D1)2". However accuracy of supply side data attributed to uncertainty surrounding source outputs such as uncertainty about deployable output has been included in the WRMP headroom analysis as these are valid risks to the security of the source output available to the company. For surface water sources this component is likely to relate to uncertainties over historic rainfall estimates, rainfall/runoff models and drought severity, whereas for groundwater this is likely to relate to drought severity (Rest Water Levels) and interpretation of the physical constraints such as location of adits, water bearing fissures, borehole screen etc., in relation to the drought bounding curves.

F.1.3 Input Data and Assumptions

The PR04 Headroom analysis followed the guidelines in the UKWIR 2002 methodology to assign types of probability distribution to the individual headroom components. The UKWIR Headroom Methodology report (UKWIR, 2002) acknowledges that the process of defining probability distributions "involves a lot of judgement" and numbers need to be estimated from often limited information. The boundaries of these distributions had where possible therefore been set using site-specific information and historic evidence of risk, which required consultation with Southern Water's operational and planning staff. In addition the modelling work using MISER undertaken for the AMP4 Water Resource Investigations was used to inform the PR09 review of headroom input data. As noted in earlier sections, the base values of the supply side and the demand side numbers on which the headroom distributions are applied have been updated, and the parameters of the distributions have been reviewed and where necessary revised.

Spreadsheet models incorporating the Monte Carlo analysis Since the draft WRMP, software package, @RISK , were created for each of the 10 WRZs. Data were input into each model in the form of defined probability distributions at five yearly intervals throughout the planning period. A Table for each WRZ that gives the values of the probability distributions for each of the headroom components is given in Table F.3 to Table F.12.

AMP 4

	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5/1 gradual pollution of sources in this planning period	Otterbourne	45.5	Triangular	0	0.02	0.03	Otterbourne	45.5	Triangular	0	0.02	0.03
S5/2 gradual pollution of sources in this planning period	Testwood	115.7	Triangular	0	0.02	0.03	Testwood	112.7	Triangular	0	0.02	0.03
S6/1 Uncertainty for yields constrained by pump capacity	Barton Stacey	1.8	Triangular	-0.01	0.02	0.04	Barton Stacey	1.13	Triangular	-0.01	0.02	0.04
	Horsebridge	2.88	Triangular	-0.01	0.02	0.04	Horsebridge	2.88	Triangular	-0.01	0.02	0.04
	Totford	4.55	Triangular	-0.01	0.02	0.04	Totford	4.55	Triangular	-0.01	0.02	0.04
	Twyford	23	Triangular	-0.01	0.02	0.04	Twyford	18	Triangular	-0.01	0.02	0.04
	Otterbourne G	68.18	Triangular	-0.01	0.02	0.04	Otterbourne G	54.76	Triangular	-0.01	0.02	0.04
S6/2 Meter uncertainty for licence critical sources	Easton/Romsey Road	27.3	Triangular	0	0	0.04	Easton/Romsey Road	27.3	Triangular	0	0	0.04
	Timsbury	13					Timsbury	13				
S6/3 Uncertainty for aquifer constrained groundwater sources	N/A						N/A					
S6/4: Uncertainty of climate constrained surface water sources	Otterbourne	45.46	Normal	0	0.03		Otterbourne	45.46	Normal	0	0.03	
	Testwood	115.7					Testwood	112.7				
S8 Uncertainty of Climate Change Yield	Testwood	2	Triangular	0	17.74	19.17	Testwood	2	Triangular	0	17.63	18.73
S9/1 Uncertainty of New Source Yield							N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	1.94				Normal	0	1.61	
D2 Demand forecast variation.			Triangular	-9.1	0	26.89			Triangular	-6.02	0	17.77
D3 Effect of climate change on demand			Triangular	0	3.73	4.66			Triangular	0	3.1	3.87
D4 Uncertainty of impact of demand management			Normal	0	0.65				Normal	0	0.43	

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	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5/1 gradual pollution of sources in this planning period												
S5/2 gradual pollution of sources in this planning period												
S6/1 Uncertainty for yields constrained by pump capacity												
	Horsebridge	2.88	Triangular	-0.01	0.02	0.04	Horsebridge	2.88	Triangular	-0.01	0.02	0.04
S6/2 Meter uncertainty for licence critical sources	Easton/Romsey Road	27.3	Triangular	-0.01	0.02	0.04	Easton/Romsey Road	18.17	Triangular	-0.01	0.02	0.04
	Barton Stacey	1.82	Triangular	-0.01	0.02	0.04	Barton Stacey	1.12	Triangular	-0.01	0.02	0.04
	Otterbourne GW	67.58	Triangular	-0.01	0.02	0.04	Otterbourne GW	54.16	Triangular	-0.01	0.02	0.04
	Totford	4.55	Triangular	-0.01	0.02	0.04	Totford	4.54	Triangular	-0.01	0.02	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	Timsbury	13	Triangular	-0.01	0.02	0.04	Timsbury	9.5	Triangular	-0.01	0.02	0.04
	Twyford	23	Triangular	-0.01	0.02	0.04	Twyford	18	Triangular	-0.01	0.02	0.04
S6/4: Uncertainty of climate constrained surface water sources	Otterbourne	44.46	Normal	0	0.03		Otterbourne	44.46	Normal	0	0.03	
	Testwood	105					Testwood	105				
S8 Uncertainty of Climate Change Yield	Groundwater	140.1	Triangular	0	0.022	0.044	Groundwater	108.37	Triangular	0	0.022	0.044
	Surface water	149.5	Triangular	0	0	0	Surface water	149.5	Triangular	0	0	0
S9/1 Uncertainty of New Source Yield												
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	1.94				Normal	0	1.61	
D2 Demand forecast variation.			Triangular	-21.4	0	24.49			Triangular	-12.75	0	14.59
D3 Effect of climate change on demand			Triangular	-1.27	0	0.88			Triangular	-1.27	0	0.88
D4 Uncertainty of impact of demand management			Triangular	-6.02	0	6.02			Triangular	-3.58	0	3.58

FWRMP

	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5/1 gradual pollution of sources in this planning period												
S5/2 gradual pollution of sources in this planning period												
S6/1 Uncertainty for yields constrained by pump capacity												
	Horsebridge	5	Triangular	-0.01	0.02	0.04	Horsebridge	5	Triangular	-0.01	0.02	0.04
S6/2 Meter uncertainty for licence critical sources	Easton/Romsey Road	27.3	Triangular	-0.01	0.02	0.04	Easton/Romsey Road	18.17	Triangular	-0.01	0.02	0.04
	Barton Stacey	1.82	Triangular	-0.01	0.02	0.04	Barton Stacey	1.12	Triangular	-0.01	0.02	0.04
	Otterbourne GW	53.5	Triangular	-0.01	0.02	0.04	Otterbourne GW	48	Triangular	-0.01	0.02	0.04
	Totford	4.55	Triangular	-0.01	0.02	0.04	Totford	4.54	Triangular	-0.01	0.02	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	Timsbury	11.8	Triangular	-0.01	0.02	0.04	Timsbury	10	Triangular	-0.01	0.02	0.04
	Twyford	22.8	Triangular	-0.01	0.02	0.04	Twyford	17.5	Triangular	-0.01	0.02	0.04
S6/4: Uncertainty of climate constrained surface water sources	Otterbourne	44.46	Normal	0	0.03		Otterbourne	44.46	Normal	0	0.03	
	Testwood	105					Testwood	105				
S8 Uncertainty of Climate Change Yield	Groundwater	126.77	Triangular	-0.91%	0.00%	1.58%	Groundwater	104.33	Triangular	-1.20%	0.00%	1.44%
	Surface water	149.46	Triangular	0.00%	0.00%	0.00%	Surface water	149.46	Triangular	0.00%	0.00%	0.00%
S9/1 Uncertainty of New Source Yield												
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	1.94				Normal	0	1.61	
D2 Demand forecast variation.			Triangular	-16.3264475	0	16.6083489			Triangular	-11.3547373	0	11.5510372
D3 Effect of climate change on demand			Triangular	-2.1349045	0	1.06745225			Triangular	-1.68843997	0	0.84421998
D4 Uncertainty of impact of demand management			Triangular	-6.55303723	0	19.6591117			Triangular	-4.57869768	0	13.736093

Table F.3 Hampshire South – Headroom Input Data

AMP 4

	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by pump capacity	Andover	19.88	Triangular	-0.01	0.02	0.04	Andover	16	Triangular	-0.01	0.02	0.04
	Chilbolton	0.49	Triangular	-0.01	0.02	0.04	Chilbolton	0.49	Triangular	-0.01	0.02	0.04
	Faberstown	0.45	Triangular	-0.01	0.02	0.04	Faberstown	0.15	Triangular	-0.01	0.02	0.04
S6/2 Meter uncertainty for licence critical sources	Overton	1.64	Triangular	0	0	0.04	Overton	1.64	Triangular	0	0	0.04
	Whitchurch	1.64	Triangular	0	0	0.04	Whitchurch	1.64	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	Ibthorpe	4.26	Normal	0	0.03		Ibthorpe	2.94	Normal	0	0.03	
S6/4: Uncertainty of climate constrained surface water sources	N/A						N/A					
S8 Uncertainty of Climate Change Yield		2	Triangular	0	0.1	0.39		1	Triangular	0	0.08	0.32
S9/1 Uncertainty of New Source Yield												
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	0.21				Normal	0	0.17	
D2 Demand forecast variation.			Triangular	-1.01	0	2.86			Triangular	-0.67	0	1.89
D3 Effect of climate change on demand			Triangular	0	0.4	0.49			Normal	0	0.04	
D4 Uncertainty of impact of demand management			Normal	0	0.06				Normal	0	0.04	

PR09 Baseline

	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by pump capacity	Faberstown	0.45	Triangular	-0.01	0.02	0.04	Faberstown	0.15	Triangular	-0.01	0.02	0.04
S6/2 Meter uncertainty for licence critical sources	Andover	19.88	Triangular	0	0	0.04	Andover	16	Triangular	0	0	0.04
	Chilbolton	0.49	Triangular	0	0	0.04	Chilbolton	0.49	Triangular	0	0	0.04
	Ibthorpe	4.26	Triangular	0	0	0.04	Ibthorpe	2.94	Triangular	0	0	0.04
	Overton	1.64	Triangular	0	0	0.04	Overton	1.64	Triangular	0	0	0.04
	Whitchurch	1.64	Triangular	0	0	0.04	Whitchurch	1.64	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources												
S6/4: Uncertainty of climate constrained surface water sources												
S8 Uncertainty of Climate Change Yield	Groundwater	28.4	Triangular	0	0.022	0.044	Groundwater	22.9	Triangular	0	0.022	0.044
	Surface water	0	Triangular	0	0	0	Surface water	0	Triangular	0	0	0
S9/1 Uncertainty of New Source Yield												
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	0.21				Normal	0	0.17	
D2 Demand forecast variation.			Triangular	-1.86	0	2.13			Triangular	-1.29	0	1.89
D3 Effect of climate change on demand			Triangular	-0.14	0	0.1			Triangular	-0.14	0	0.1
D4 Uncertainty of impact of demand management			Triangular	-0.54	0	0.54			Triangular	-0.37	0	0.37

FWRMP

	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by pump capacity	Faberstown	0	Triangular	-0.01	0.02	0.04	Faberstown	0	Triangular	-0.01	0.02	0.04
S6/2 Meter uncertainty for licence critical sources	Andover	19.88	Triangular	0	0	0.04	Andover	16.02	Triangular	0	0	0.04
	Chilbolton	0.49	Triangular	0	0	0.04	Chilbolton	0.49	Triangular	0	0	0.04
	Ibthorpe	4.75	Triangular	0	0	0.04	Ibthorpe	2.94	Triangular	0	0	0.04
	Overton	1.64	Triangular	0	0	0.04	Overton	1.58	Triangular	0	0	0.04
	Whitchurch	1.64	Triangular	0	0	0.04	Whitchurch	1.64	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources												
S6/4: Uncertainty of climate constrained surface water sources												
S8 Uncertainty of Climate Change Yield	Groundwater	28.4	Triangular	-0.14%	0.00%	0.14%	Groundwater	22.67	Triangular	-0.13%	0.00%	0.13%
	Surface water	0	Triangular	0	0	0	Surface water	0	Triangular	0	0	0
S9/1 Uncertainty of New Source Yield												
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	0.21				Normal	0	0.17	
D2 Demand forecast variation.			Triangular	-0.47113349	0	1.72819301			Triangular	-1.21330323	0	1.23418334
D3 Effect of climate change on demand			Triangular	-0.20432351	0	0.10216175			Triangular	-0.1606927	0	0.08034635
D4 Uncertainty of impact of demand management			Triangular	-0.68801019	0	2.06403057			Triangular	-0.49343041	0	1.48029122

Table F.4 Hampshire Andover – Headroom Input Data

AMP 4

	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by pump capacity	Kingsclere	5.68	Triangular	-0.01	0.02	0.04	Kingsclere	3	Triangular	-0.01	0.02	0.04
	East Woodhay	3.5					East Woodhay	3				
S6/2 Meter uncertainty for licence critical sources	Kingsclere	5.68	Triangular	0	0	0.04	Kingsclere	3	Triangular	0	0	0.04
	East Woodhay	3.5					East Woodhay	3				
S6/3 Uncertainty for aquifer constrained groundwater sources	N/A						N/A					
S6/4: Uncertainty of climate constrained surface water sources	N/A						N/A					
S8 Uncertainty of Climate Change Yield		2	Triangular	0	0.03	0.13		2	Triangular	0	0.03	0.12
S9/1 Uncertainty of New Source Yield			Uniform	0	0.87				Uniform	0	0.46	
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	0.05				Normal	0	0.04	
D2 Demand forecast variation.			Triangular	-0.27	0	0.87			Triangular	-0.18	0	0.57
D3 Effect of climate change on demand			Triangular	0	0.09	0.12			Triangular	0	0.08	0.1
D4 Uncertainty of impact of demand management			Normal	0	0.02				Normal	0	0.01	

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	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by pump capacity	East Woodhay	3.5	Triangular	-0.01	0.02	0.04	East Woodhay	3	Triangular	-0.01	0.02	0.04
S6/2 Meter uncertainty for licence critical sources	Kingsclere	5.68	Triangular	0	0	0.04	Kingsclere	5.68	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources												
S6/4: Uncertainty of climate constrained surface water sources												
S8 Uncertainty of Climate Change Yield	Groundwater	9.2	Triangular	0	0.022	0.044	Groundwater	8.7	Triangular	0	0.022	0.044
	Surface water	0	Triangular	0	0	0	Surface water	0	Triangular	0	0	0
S9/1 Uncertainty of New Source Yield												
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	0.05				Normal	0	0.04	
D2 Demand forecast variation.			Triangular	-1.03	0	1.18			Triangular	-0.56	0	0.64
D3 Effect of climate change on demand			Triangular	-0.04	0	0.03			Triangular	-0.04	0	0.03
D4 Uncertainty of impact of demand management			Triangular	-0.24	0	0.24			Triangular	-0.13	0	0.13

FWRMP

	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by pump capacity	East Woodhay	5	Triangular	-0.01	0.02	0.04	East Woodhay	3	Triangular	-0.01	0.02	0.04
S6/2 Meter uncertainty for licence critical sources	Kingsclere	5.68	Triangular	0	0	0.04	Kingsclere	5.68	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources												
S6/4: Uncertainty of climate constrained surface water sources												
S8 Uncertainty of Climate Change Yield	Groundwater	10.68	Triangular	0.00%	0.00%	0.00%	Groundwater	8.68	Triangular	0.00%	0.00%	0.00%
	Surface water	0	Triangular	0	0	0	Surface water	0	Triangular	0	0	0
S9/1 Uncertainty of New Source Yield												
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	0.05				Normal	0	0.04	
D2 Demand forecast variation.			Triangular	-0.47113349	0	0.47681289			Triangular	-0.27892178	0	0.28229212
D3 Effect of climate change on demand			Triangular	-0.06596182	0	0.03298091			Triangular	-0.04826281	0	0.0241314
D4 Uncertainty of impact of demand management			Triangular	-0.1932739	0	0.57982169			Triangular	-0.11496972	0	0.34490915

Table F.5 Hampshire Kingsclere – Headroom Input Data

	AMP 4											
	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5/1 gradual pollution of sources in this planning perio	Knighton Chalk	2.56	Triangular	0	0.02	0.03	Knighton -Chalk	1.8	Triangular	0	0.02	0.03
	Ventnor	1.87	Triangular	0	0.02	0.03	Ventnor	1.42	Triangular	0	0.02	0.03
	Calbourne	2.34	Triangular	0	0.02	0.03	Calbourne	2.32	Triangular	0	0.02	0.03
	Niton	0.26	Triangular	0	0.02	0.03	Niton	0.17	Triangular	0	0.02	0.03
	St. Lawrence	0.48	Triangular	0	0.02	0.03	St. Lawrence	0.45	Triangular	0	0.02	0.03
	Carisbrooke	5.5	Triangular	0	0.02	0.03	Carisbrooke	2.62	Triangular	0	0.02	0.03
S6/1 Uncertainty for yields constrained by pump capac	Knighton (LGS)	5.3	Triangular	-0.01	0.02	0.04	Knighton Chalk	1.8	Triangular	0	0.02	0.04
	Knighton Chalk	2.56	Triangular	-0.01	0.02	0.04	Niton	0.17	Triangular	0	0.02	0.04
S6/2 Meter uncertainty for licence critical sources	N/A						N/A					
S6/3 Uncertainty for aquifer constrained groundwater s	Bowcombe	5.4	Normal	0	0.03		Calbourne	2.32	Normal	0	0.03	
	Calbourne	2.34	Normal	0	0.03		Carisbrooke	7.02	Normal	0	0.03	
	Carisbrooke	11.32	Normal	0	0.03		Chillerton	0.9	Normal	0	0.03	
	Chillerton	1.8	Normal	0	0.03		Kighton (LGS)	4.47	Normal	0	0.03	
	Luccombe	0	Normal	0	0.03		Luccombe	0	Normal	0	0.03	
	Niton	0.26	Normal	0	0.03		Shalcombe	0.39	Normal	0	0.03	
	Shalcombe	0.8	Normal	0	0.03		St. Lawrence	0.45	Normal	0	0.03	
	St. Lawrence	0.48	Normal	0	0.03		Ventnor Tunnel	1.42	Normal	0	0.03	
	Ventnor Tunnel	1.87	Normal	0	0.03							
S6/4: Uncertainty of climate constrained surface water	Sandown	8	Normal	0	0.03		Sandown	8	Normal	0	0.03	
S8 Uncertainty of Climate Change Yield	Sandown		Triangular	0	0.11	0.43	Sandown		Triangular	0	0.06	0.24
S9/1 Uncertainty of New Source Yield			Uniform	0	2.58				Uniform	0	3.13	
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	0.32				Normal	0	0.27	
D2 Demand forecast variation.			Triangular	-1.81	0	1.71			Triangular	-1.22	0	1.16
D3 Effect of climate change on demand			Triangular	0	0.32	0.4			Triangular	0	0.26	0.33
D4 Uncertainty of impact of demand management			Normal	0	0.01				Normal	0	0.01	

	PR09 Baseline											
	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5/1 gradual pollution of sources in this planning perio	Niton	0.21	Triangular	0	0.02	0.03	Niton	0.2	Triangular	0	0.02	0.03
S6/1 Uncertainty for yields constrained by pump capac	Knighton - LGS	4.6	Triangular	-0.01	0.02	0.04						
S6/2 Meter uncertainty for licence critical sources							Knighton - LGS	4.47	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater s	Bowcombe	1.6	Normal	0	0.03		Calbourne	0.87	Normal	0	0.03	
	Calbourne	0.95	Normal	0	0.03		Chillerton	0.9	Normal	0	0.03	
	Chillerton	1.13	Normal	0	0.03		Carisbrooke	9.96	Normal	0	0.03	
	Carisbrooke	10.96	Normal	0	0.03		Knighton - Chalk	1.4	Normal	0	0.03	
	Knighton - Chalk	2	Normal	0	0.03		Shalcombe	0.2	Normal	0	0.03	
	Shalcombe	0.37	Normal	0	0.03		St. Lawrence	0.31	Normal	0	0.03	
	St. Lawrence	0.36	Normal	0	0.03		Ventnor	1	Normal	0	0.03	
	Ventnor	1.24	Normal	0	0.03		Niton	0.2	Normal	0	0.03	
	Niton	0.21	Normal	0	0.03							
S6/4: Uncertainty of climate constrained surface water	Sandown	12	Normal	0	0.03		Sandown	10.00	Normal	0	0.03	
S8 Uncertainty of Climate Change Yield	Groundwater	23.4	Triangular	0	0.022	0.044	Groundwater	19.3	Triangular	0	0.022	0.044
	Surface water	12	Triangular	-0.192	0	0.192	Surface water	10	Triangular	-0.192	0	0.192
S9/1 Uncertainty of New Source Yield												
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	0.32				Normal	0	0.27	
D2 Demand forecast variation.			Triangular	-5.73	0	6.56			Triangular	-3.14	0	3.59
D3 Effect of climate change on demand			Triangular	-0.32	0	0.22			Triangular	-0.32	0	0.22
D4 Uncertainty of impact of demand management			Triangular	-0.66	0	0.66			Triangular	-0.36	0	0.36

	FWRMP											
	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5/1 gradual pollution of sources in this planning perio	Niton	0.21	Triangular	0	0.02	0.03	Niton	0.2	Triangular	0	0.02	0.03
S6/1 Uncertainty for yields constrained by pump capac	Knighton - LGS	4.45	Triangular	-0.01	0.02	0.04						
S6/2 Meter uncertainty for licence critical sources							Knighton - LGS	4.45	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater s	Bowcombe	4.25	Normal	0	0.03		Calbourne	0.97	Normal	0	0.03	
	Calbourne	1.05	Normal	0	0.03		Chillerton	1	Normal	0	0.03	
	Chillerton	1.23	Normal	0	0.03		Carisbrooke	10.46	Normal	0	0.03	
	Carisbrooke	11.96	Normal	0	0.03		Knighton - Chalk	1.38	Normal	0	0.03	
	Knighton - Chalk	1.97	Normal	0	0.03		Shalcombe	0.13	Normal	0	0.03	
	Shalcombe	0.33	Normal	0	0.03		St. Lawrence	0.28	Normal	0	0.03	
	St. Lawrence	0.39	Normal	0	0.03		Ventnor	1.15	Normal	0	0.03	
	Ventnor	1.2	Normal	0	0.03		Niton	0.2	Normal	0	0.03	
	Niton	0.21	Normal	0	0.03							
S6/4: Uncertainty of climate constrained surface water	Sandown	12	Normal	0	0.03		Sandown	10.00	Normal	0	0.03	
S8 Uncertainty of Climate Change Yield	Groundwater	27.04	Triangular	-0.55%	0.00%	0.81%	Groundwater	21.77	Triangular	-0.69%	0.00%	0.96%
	Surface water	12	Triangular	-5.75%	0.00%	5.67%	Surface water	10	Triangular	0.00%	0.00%	0.00%
S9/1 Uncertainty of New Source Yield												
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	0.32				Normal	0	0.27	
D2 Demand forecast variation.			Triangular	-3.73138885	0	3.79967288			Triangular	-2.55996381	0	2.60685267
D3 Effect of climate change on demand			Triangular	-0.51344973	0	0.25672487			Triangular	-0.40879159	0	0.2043958
D4 Uncertainty of impact of demand management			Triangular	-1.48277246	0	4.44831738			Triangular	-1.02222889	0	3.06668666

Table F.6 Isle of Wight – Headroom Input Data

AMP 4

	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by infrastructure	Weirwood	16	Triangular	-0.01	0.02	0.03	Halsingbourne	1.1	Triangular	-0.01	0.02	0.03
	Halsingbourne	1.3	Triangular	-0.01	0.02	0.03						
S6/2 Meter uncertainty for licence critical sources	Lodsworth	2.43	Triangular	0	0	0.04	Lodsworth	2.14	Triangular	0	0	0.04
	Rogate	2.27	Triangular	0	0	0.04	Rogate	2.27	Triangular	0	0	0.04
	Rotherfield	2.88	Triangular	0	0	0.04	Rotherfield	2.19	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	Hardham	24.67	Normal	0	0.03		Hardham	13.59	Normal	0	0.03	
	Smokey Alley	3.5	Normal	0	0.03		Smokey Alley	3.41	Normal	0	0.03	
	Steyning	1.46	Normal	0	0.03		Steyning	1.44	Normal	0	0.03	
S6/4: Uncertainty of climate constrained surface water sources	Hardham (ROR)	29.93	Normal	0	0.03		Hardham (ROR)	15.7	Normal	0	0.03	
							Weirwood	9.3	Normal	0	0.03	
S8 Uncertainty of Climate Change Yield	Hardham		Triangular	0	7.36	7.96	Hardham		Triangular	0	7.18	7.55
	Weirwood		Triangular	0	7.36	7.96	Weirwood		Triangular	0	7.18	7.55
S9/1 Uncertainty of New Source Yield			Uniform	0	6.55				Uniform	0	5.18	
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy	'+-1 approx		Normal	0	0.81		'+-1 approx		Normal	0	0.67	
D2 Demand forecast variation.			Triangular	-3.69	0	8.67			Triangular	-2.7	0	5.91
D3 Effect of climate change on demand	Max climate increase of 2.5%		Triangular	0	1.48	1.85			Triangular	0	1.23	1.54
D4 Uncertainty of impact of demand management	efficieny savings	2.97	Normal	0	1.36				Normal	0	0.93	

Water Resource Investigation

	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	Portsmouth	15	Triangular	0	0.02	0.03	Portsmouth	15	Triangular	0	0.02	0.03
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by infrastructure	Halsingbourne	0.77	Triangular	-0.01	0.02	0.04	Smock Alley	3.12	Triangular	-0.01	0.02	0.04
S6/2 Meter uncertainty for licence critical sources	Lodsworth	2.43	Triangular	0	0	0.04	Lodsworth	2.14	Triangular	0	0	0.04
	Rogate	2.27	Triangular	0	0	0.04	Rogate	2.27	Triangular	0	0	0.04
	Rotherfield	2.88	Triangular	0	0	0.04	Rotherfield	2.19	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	Hardham	24	Normal	0	0.03		Hardham	13	Normal	0	0.03	
	Smock Alley	3.12	Normal	0	0.03		Haslingbourne	0.7	Normal	0	0.03	
	Steyning	1.46	Normal	0	0.03		Steyning	1.25	Normal	0	0.03	
S6/4: Uncertainty of climate constrained surface water sources	Weirwood	34.7	Normal	0	0.03		Weirwood	16.09	Normal	0	0.03	
	Hardham (ROR)		Normal	0	0.03		Hardham (ROR)		Normal	0	0.03	
S8 Uncertainty of Climate Change Yield	Hardham		Triangular	0	10.97	19.04	Hardham		Triangular	0	6.24	10.84
	Weirwood		Triangular	0	10.97	19.04	Weirwood		Triangular	0	6.24	10.84
S9/1 Uncertainty of New Source Yield	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy	'+-1 approx		Normal	0	0.81		'+-1 approx		Normal	0	0.67	
D2 Demand forecast variation.			Triangular	-3.69	0	8.67			Triangular	-2.7	0	5.91
D3 Effect of climate change on demand	Max climate increase of 2.5%		Triangular	0	1.48	1.85			Triangular	0	1.23	1.54
D4 Uncertainty of impact of demand management	water scarcity metering scenario (*)		Normal	-1.1	0	2.22			Normal	-0.76	0	1.53

PR09 Baseline

	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	Portsmouth	15	Triangular	0	0.02	0.03	Portsmouth	15	Triangular	0	0.02	0.03
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by infrastructure	Rogate	1.08	Triangular	-0.01	0.02	0.04	Rogate	1.08	Triangular	-0.01	0.02	0.04
	Smock Alley	3.12	Triangular	-0.01	0.02	0.04	Halsingbourne	0.7	Triangular	-0.01	0.02	0.04
	Steyning	1.46	Triangular	-0.01	0.02	0.04	Smock Alley	3.12	Triangular	-0.01	0.02	0.04
							Steyning	1.25	Triangular	-0.01	0.02	0.04
S6/2 Meter uncertainty for licence critical sources	Lodsworth	2.43	Triangular	0	0	0.04	Lodsworth	2.14	Triangular	0	0	0.04
	Rotherfield	2.88	Triangular	0	0	0.04	Rotherfield	2.19	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	Hardham	27	Normal	0	0.025		Hardham	13	Normal	0	0.025	
	Halsingbourne	0.77	Normal	0	0.025							
S6/4: Uncertainty of climate constrained surface water sources	Hardham (ROR)	7.5	Normal	0	0.025		Hardham (ROR)	7.5	Normal	0	0.025	
	Weirwood	17	Normal	0	0.025		Weirwood	8.2	Normal	0	0.025	
S8 Uncertainty of Climate Change Yield	Groundwater	38.7	Triangular	0	0.022	0.044	Groundwater	23.5	Triangular	0	0.022	0.044
	Surface water	24.5	Triangular	-0.244	0	0.225	Surface water	15.7	Triangular	-0.244	0	0.225
S9/1 Uncertainty of New Source Yield	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy	'+-1 approx		Normal	0	0.81		'+-1 approx		Normal	0	0.67	
D2 Demand forecast variation.			Triangular	-9.92	0	11.36			Triangular	-5.53	0	6.33
D3 Effect of climate change on demand			Triangular	-0.52	0	0.36			Triangular	-0.52	0	0.36
D4 Uncertainty of impact of demand management			Triangular	-2.92	0	2.92			Triangular	-1.62	0	1.62

FWRMP

	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	Portsmouth	15	Triangular	0	0.02	0.03	Portsmouth	15	Triangular	0	0.02	0.03
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by infrastructure	Rogate	1.96	Triangular	-0.01	0.02	0.04	Rogate	1.6	Triangular	-0.01	0.02	0.04
	Smock Alley	3.32	Triangular	-0.01	0.02	0.04	Halsingbourne	0.8	Triangular	-0.01	0.02	0.04
	Steyning	1.2	Triangular	-0.01	0.02	0.04	Smock Alley	3.22	Triangular	-0.01	0.02	0.04
							Steyning	1	Triangular	-0.01	0.02	0.04
S6/2 Meter uncertainty for licence critical sources	Lodsworth	2.43	Triangular	0	0	0.04	Lodsworth	2.14	Triangular	0	0	0.04
	Rotherfield	2.88	Triangular	0	0	0.04	Rotherfield	2.19	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	Hardham	27	Normal	0	0.025		Hardham	13	Normal	0	0.025	
	Halsingbourne	0.8	Normal	0	0.025							
S6/4: Uncertainty of climate constrained surface water sources	Hardham (ROR)	7.5	Normal	0	0.025		Hardham (ROR)	7.5	Normal	0	0.025	
	Weirwood	17	Normal	0	0.025		Weirwood	8.7	Normal	0	0.025	
S8 Uncertainty of Climate Change Yield	Groundwater	39.59	Triangular	-0.19%	0.00%	0.06%	Groundwater	23.95	Triangular	-0.31%	0.00%	0.10%
	Surface water	24.5	Triangular	0.00%	0.00%	0.00%	Surface water	16.2	Triangular	0.00%	0.00%	0.00%
S9/1 Uncertainty of New Source Yield	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy	'+-1 approx		Normal	0	0.81		'+-1 approx		Normal	0	0.67	
D2 Demand forecast variation.			Triangular	-6.56975652	0	6.66626564			Triangular	-4.74521508		4.8149616
D3 Effect of climate change on demand			Triangular	-0.8681384	0	0.4340692			Triangular	-0.70225505	0	0.35112752
D4 Uncertainty of impact of demand management			Triangular	-2.72485415	0	8.17456245			Triangular	-1.97555932	0	5.92667795

Table F.7 Sussex North – Headroom Input Data

AMP 4

	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	Goldstone	19.01	Triangular	0	0.02	0.03	Goldstone	12.62	Triangular	0	0.02	0.03
S6/1 Uncertainty for yields constrained by infrastructure	Balsdean	12	Triangular	-0.01	0.02	0.04	Balsdean	7.8	Triangular	-0.01	0.02	0.04
	Falmer	7.5	Triangular	-0.01	0.02	0.04	Falmer	5.53	Triangular	-0.01	0.02	0.04
	Goldstone	19.01	Triangular	-0.01	0.02	0.04	Goldstone	12.62	Triangular	-0.01	0.02	0.04
	Housedean	6.22	Triangular	-0.01	0.02	0.04	Housedean	2.45	Triangular	-0.01	0.02	0.04
	Lewes Road	7	Triangular	-0.01	0.02	0.04	Lewes Road	3.36	Triangular	-0.01	0.02	0.04
	Mile Oak	11.02	Triangular	-0.01	0.02	0.04	Mile Oak	8.66	Triangular	-0.01	0.02	0.04
	Mossy Bottom	3.5	Triangular	-0.01	0.02	0.04	Mossy Bottom	3.3	Triangular	-0.01	0.02	0.04
	Patcham	9.05	Triangular	-0.01	0.02	0.04	Patcham	6.85	Triangular	-0.01	0.02	0.04
							Southover	14.42	Triangular	-0.01	0.02	0.04
S6/2 Meter uncertainty for licence critical sources	Aldrington	0	Triangular	0	0	0.04	Aldrington	0	Triangular	0	0	0.04
	Newmarket	14.75	Triangular	0	0	0.04	Newmarket	14.75	Triangular	0	0	0.04
	Sompting	11.5	Triangular	0	0	0.04	Sompting	11.31	Triangular	0	0	0.04
							Surrenden	3.5	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	N/A						N/A					
S6/4: Uncertainty of climate constrained surface water sources	N/A						N/A					
S8 Uncertainty of Climate Change Yield	Darwell		Triangular	0	0.69	2.77	N/A					
S9/1 Uncertainty of New Source Yield	Bewl Darwell transfer	25	Uniform	0	8.49		N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	1.64				Normal	0	1.37	
D2 Demand forecast variation.			Triangular	-6.65	0	14.82			Triangular	-5.19	0	11.56
D3 Effect of climate change on demand			Triangular	0	2.98	3.73			Triangular	0	2.48	3.1
D4 Uncertainty of impact of demand management			Normal	0	2.37				Normal	0	1.85	

Water Resource Investigation

	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by infrastructure	Housedean	6.22	Triangular	-0.01	0.02	0.04	Southover	14	Triangular	-0.01	0.02	0.04
	Mossy Bottom	2.16	Triangular	-0.01	0.02	0.04						
	Southover	14	Triangular	-0.01	0.02	0.04						
S6/2 Meter uncertainty for licence critical sources	Sompting	11.5	Triangular	0	0	0.04	Housedean	4.72	Triangular	0	0	0.04
							Lewes Road	2.65	Triangular	0	0	0.04
							Mile Oak	8.9	Triangular	0	0	0.04
							Mossy Bottom	1.82	Triangular	0	0	0.04
							Sompting	11.5	Triangular	0	0	0.04
							Surrenden	1.66	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	Balsdean	19.18	Normal	0	0.03		Balsdean	11.69	Normal	0	0.03	
	Falmer	5.18	Normal	0	0.03		Falmer	5.18	Normal	0	0.03	
	Goldstone	10.5	Normal	0	0.03		Goldstone	9.50	Normal	0	0.03	
	Lewes Road	2.9	Normal	0	0.03		Newmarket	8.50	Normal	0	0.03	
	Mile Oak	11	Normal	0	0.03		Patcham	9.10	Normal	0	0.03	
	Newmarket	10	Normal	0	0.03		Shoreham	5.30	Normal	0	0.03	
	Patcham	10.5	Normal	0	0.03							
	Shoreham	8.3	Normal	0	0.03							
	Surrenden	4.8	Normal	0	0.03							
S6/4: Uncertainty of climate constrained surface water sources	N/A						N/A					
S8 Uncertainty of Climate Change Yield			Triangular	0	0.81	3.24			Triangular	0	0.63	2.54
S9/1 Uncertainty of New Source Yield	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	1.64				Normal	0	1.37	
D2 Demand forecast variation.			Triangular	-6.65	0	14.82			Triangular	-5.19	0	11.56
D3 Effect of climate change on demand			Triangular	0	2.98	3.73			Triangular	0	2.48	3.1
D4 Uncertainty of impact of demand management			Triangular	-2.1	0	4.12			Normal	-1.65	0	3.33

PR09 Baseline

	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by infrastructure	Goldstone	7.5	Triangular	-0.01	0.02	0.04	Goldstone	6.5	Triangular	-0.01	0.02	0.04
	Housedean	5.5	Triangular	-0.01	0.02	0.04	Lewes Road	2.65	Triangular	-0.01	0.02	0.04
	Lewes Road	2.9	Triangular	-0.01	0.02	0.04	Newmarket	8	Triangular	-0.01	0.02	0.04
	Mossy Bottom	1.66	Triangular	-0.01	0.02	0.04	Shoreham	4.80	Triangular	-0.01	0.02	0.04
	Newmarket	9.5	Triangular	-0.01	0.02	0.04						
	Surrenden	4.55	Triangular	-0.01	0.02	0.04						
S6/2 Meter uncertainty for licence critical sources	Sompting	11.5	Triangular	0	0	0.04	Housedean	2.5	Triangular	0	0	0.04
							Mile Oak	8.9	Triangular	0	0	0.04
							Mossy Bottom	1.5	Triangular	0	0	0.04
							Surrenden	2.41	Triangular	0	0	0.04
							Sompting	11.5	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	Falmer	4.88	Normal	0	0.025		Falmer	3.58	Normal	0	0.025	
	Mile Oak	9.4	Normal	0	0.025		Southover	14.00	Normal	0	0.025	
	Shoreham	7.8	Normal	0	0.025		Balsdean	10.50	Normal	0	0.025	
	Southover	14	Normal	0	0.025		Patcham	8.60	Normal	0	0.025	
	Balsdean	17.3	Normal	0	0.025							
	Patcham	10	Normal	0	0.025							
S6/4: Uncertainty of climate constrained surface water sources	N/A						N/A					
S8 Uncertainty of Climate Change Yield	Groundwater	106.5	Triangular	0	0.022	0.044	Groundwater	85.4	Triangular	0	0.022	0.044
	Surfacewater	0	Triangular	0	0	0	Surfacewater	0	Triangular	0	0	0
S9/1 Uncertainty of New Source Yield	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	1.64				Normal	0	1.37	
D2 Demand forecast variation.			Triangular	-11.69	0	13.38			Triangular	-7.51	0	8.6
D3 Effect of climate change on demand			Triangular	-0.69	0	0.48			Triangular	-0.69	0	0.48
D4 Uncertainty of impact of demand management			Triangular	-3.7	0	3.7			Triangular	-2.37	0	2.37

FWRMP

	Peak Deployable Output						Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by infrastructure	Goldstone	12.5	Triangular	-0.01	0.02	0.04	Goldstone	11	Triangular	-0.01	0.02	0.04
	Housedean	6.25	Triangular	-0.01	0.02	0.04	Lewes Road	4.3	Triangular	-0.01	0.02	0.04
	Lewes Road	4.3	Triangular	-0.01	0.02	0.04	Newmarket	13.2	Triangular	-0.01	0.02	0.04
	Mossy Bottom	2.57	Triangular	-0.01	0.02	0.04	Shoreham	5.45	Triangular	-0.01	0.02	0.04
	Newmarket	14.75	Triangular	-0.01	0.02	0.04						
	Surrenden	3.3	Triangular	-0.01	0.02	0.04						
S6/2 Meter uncertainty for licence critical sources	Sompting	9.7	Triangular	0	0	0.04	Housedean	2.6	Triangular	0	0	0.04
							Mile Oak	9.75	Triangular	0	0	0.04
							Mossy Bottom	1.8	Triangular	0	0	0.04
							Surrenden	2.20	Triangular	0	0	0.04
							Sompting	9.7	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	Falmer	3.5	Normal	0	0.025		Falmer	2.40	Normal	0	0.025	
	Mile Oak	10.75	Normal	0	0.025		Southover	12.45	Normal	0	0.025	
	Shoreham	7.8	Normal	0	0.025		Balsdean	11.60	Normal	0	0.025	
	Southover	12.45	Normal	0	0.025		Patcham	10.10	Normal	0	0.025	
	Balsdean	17.20	Normal	0	0.025							
	Patcham	10.7	Normal	0	0.025							
S6/4: Uncertainty of climate constrained surface water sources	N/A						N/A					
S8 Uncertainty of Climate Change Yield	Groundwater	115.77	Triangular	-1.03%	0.00%	0.61%	Groundwater	96.55	Triangular	-1.99%	0.00%	1.20%
	Surfacewater	0	Triangular	0	0	0	Surfacewater	0	Triangular	0	0	0
S9/1 Uncertainty of New Source Yield	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	1.64				Normal	0	1.37	
D2 Demand forecast variation.			Triangular	-6.74160919	0	6.82808133			Triangular	-5.24388332		5.31127424
D3 Effect of climate change on demand			Triangular	-0.9552818	0	0.4776409			Triangular	-0.81784691	0	0.40892345
D4 Uncertainty of impact of demand management			Triangular	-2.76887577	0	8.30662731			Triangular	-2.16359241	0	6.49077722

Table F.8 Sussex Brighton – Headroom Input Data

AMP 4

Item	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	Arundel	4.32	Triangular	0	0.02	0.03	Arundel	3.13	Triangular	0	0.02	0.03
	Stanhope Lodge	7	Triangular	0	0.02	0.03	Stanhope Lodge	5.55	Triangular	0	0.02	0.03
S6/1 Uncertainty for yields constrained by infrastructure	Angmering	4	Triangular	-0.01	0.02	0.04	Angmering	3.55	Triangular	-0.01	0.02	0.04
	Arundel	4.32	Triangular	-0.01	0.02	0.04	Arundel	3.13	Triangular	-0.01	0.02	0.04
	Broadwater	18	Triangular	-0.01	0.02	0.04	Broadwater	18	Triangular	-0.01	0.02	0.04
	Burpham	7.7	Triangular	-0.01	0.02	0.04	Burpham	5.3	Triangular	-0.01	0.02	0.04
	Clapham	3.28	Triangular	-0.01	0.02	0.04	Clapham	3	Triangular	-0.01	0.02	0.04
	Findon	8	Triangular	-0.01	0.02	0.04	Findon	4.32	Triangular	-0.01	0.02	0.04
	Madehurst	9	Triangular	-0.01	0.02	0.04	Patching	2	Triangular	-0.01	0.02	0.04
	Northbrook	5.6	Triangular	-0.01	0.02	0.04						
S6/2 Meter uncertainty for licence critical sources	Warningcamp	5	Triangular	0	0	0.04	Madehurst	6.15	Triangular	0	0	0.04
							Northbrook	2.32	Triangular	0	0	0.04
							Stanhope Lodge	5.55	Triangular	0	0	0.04
							Warningcamp	5	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	N/A						N/A					
S6/4: Uncertainty of climate constrained surface water sources	N/A						N/A					
S8/1 Uncertainty of Climate Change Yield	Darwell		Triangular	0	0.69	2.77	N/A					
S9/1 Uncertainty of New Source Yield	Bewl Darwell transfer	25	Uniform	0	8.49		N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	1.64				Normal	0	1.37	
D2 Demand forecast variation.			Triangular	-6.65	0	14.82			Triangular	-5.19	0	11.56
D3 Effect of climate change on demand			Triangular	0	2.98	3.73			Triangular	0	2.48	3.1
D4 Uncertainty of impact of demand management			Normal	0	2.37				Normal	0	1.85	

Water Resource Investigation

Item	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	Arundel	0.12	Triangular	0	0.02	0.03	Arundel	0.07	Triangular	0	0.02	0.03
S6/1 Uncertainty for yields constrained by infrastructure	Arundel	4	Triangular	-0.01	0.02	0.04						
	Clapham	3.28	Triangular	-0.01	0.02	0.04						
	Findon	9.5	Triangular	-0.01	0.02	0.04						
S6/2 Meter uncertainty for licence critical sources	Angmering	4	Triangular	0	0	0.04	Angmering	3.44	Triangular	0	0	0.04
	Madehurst	4.5	Triangular	0	0	0.04	Arundel	2.27	Triangular	0	0	0.04
	Northbrook	4.5	Triangular	0	0	0.04	Clapham	1.95	Triangular	0	0	0.04
	Stanhope Lodge	7	Triangular	0	0	0.04	Madehurst	4.5	Triangular	0	0	0.04
	Warning Camp	5	Triangular	0	0	0.04	Northbrook	2.32	Triangular	0	0	0.04
							Stanhope Lodge	3.98	Triangular	0	0	0.04
							Warning Camp	5	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	Broadwater	15.5	Normal	0	0.03		Broadwater	13.00	Normal	0	0.03	
	Burpham	12.45	Normal	0	0.03		Burpham	8.00	Normal	0	0.03	
	Patching	2.9	Normal	0	0.03		Findon	4.80	Normal	0	0.03	
							Northbrook	2.79	Normal	0	0.03	
							Shoreham	5.30	Normal	0	0.03	
S6/4: Uncertainty of climate constrained surface water sources	N/A						N/A					
S8/1 Uncertainty of Climate Change Yield			Triangular	0	0.81	3.24			Triangular	0	0.63	2.54
S9/1 Uncertainty of New Source Yield	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	1.64				Normal	0	1.37	
D2 Demand forecast variation.			Triangular	-6.65	0	14.82			Triangular	-5.19	0	11.56
D3 Effect of climate change on demand			Triangular	0	2.98	3.73			Triangular	0	2.48	3.1
D4 Uncertainty of impact of demand management			Triangular	-2.1	0	4.12			Normal	-1.65	0	3.33

PR09 Baseline

Item	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	Arundel	0.12	Triangular	0	0.02	0.03	Arundel	0.07	Triangular	0	0.02	0.03
S6/1 Uncertainty for yields constrained by infrastructure	Arundel	4	Triangular	-0.01	0.02	0.04	Findon	4.6	Triangular	-0.01	0.02	0.04
	Clapham	3.28	Triangular	-0.01	0.02	0.04						
S6/2 Meter uncertainty for licence critical sources	Angmering	4	Triangular	0	0	0.04	Clapham	1.95	Triangular	0	0	0.04
	Madehurst	4.5	Triangular	0	0	0.04	Madehurst	4.5	Triangular	0	0	0.04
	Northbrook	7	Triangular	0	0	0.04	Stanhope Lodge	6	Triangular	0	0	0.04
	Stanhope Lodge	7	Triangular	0	0	0.04	Warning Camp	4	Triangular	0	0	0.04
	Warning Camp	5	Triangular	0	0	0.04	Angmering	4	Triangular	0	0	0.04
							Arundel	4	Triangular	0	0	0.04
							Northbrook	4.50	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	Broadwater	15.5	Normal	0	0.025		Broadwater	13.00	Normal	0	0.025	
	Patching	2.2	Normal	0	0.025		Patching	2.10	Normal	0	0.025	
	Burpham	12.3	Normal	0	0.025		Burpham	8.20	Normal	0	0.025	
	Findon	9.5	Normal	0	0.025							
S6/4: Uncertainty of climate constrained surface water sources	N/A						N/A					
S8/1 Uncertainty of Climate Change Yield	Groundwater	74.3	Triangular	0	0.022	0.044	Groundwater	57.5	Triangular	0	0.022	0.044
	Surfacewater	0	Triangular	0	0	0	Surfacewater	0	Triangular	0	0	0
S9/1 Uncertainty of New Source Yield	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	1.64				Normal	0	1.37	
D2 Demand forecast variation.			Triangular	-6.04	0	6.92			Triangular	-3.89	0	4.45
D3 Effect of climate change on demand			Triangular	-0.36	0	0.25			Triangular	-0.36	0	0.25
D4 Uncertainty of impact of demand management			Triangular	-1.66	0	1.66			Triangular	-1.06	0	1.06

FWRMP

Item	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	Arundel	0.12	Triangular	0	0.02	0.03	Arundel	0.07	Triangular	0	0.02	0.03
S6/1 Uncertainty for yields constrained by infrastructure	Arundel	4.5	Triangular	-0.01	0.02	0.04	Findon	6.15	Triangular	-0.01	0.02	0.04
	Clapham	3.05	Triangular	-0.01	0.02	0.04						
S6/2 Meter uncertainty for licence critical sources	Angmering	4	Triangular	0	0	0.04	Clapham	3.05	Triangular	0	0	0.04
	Madehurst	4.5	Triangular	0	0	0.04	Madehurst	4.5	Triangular	0	0	0.04
	Northbrook	7	Triangular	0	0	0.04	Stanhope Lodge	7	Triangular	0	0	0.04
	Stanhope Lodge	7	Triangular	0	0	0.04	Warning Camp	4.7	Triangular	0	0	0.04
	Warning Camp	5	Triangular	0	0	0.04	Angmering	3.9	Triangular	0	0	0.04
							Arundel	4.5	Triangular	0	0	0.04
							Northbrook	7.00	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	Broadwater	12.5	Normal	0	0.025		Broadwater	11.00	Normal	0	0.025	
	Patching	2.2	Normal	0	0.025		Patching	2.10	Normal	0	0.025	
	Burpham	12.3	Normal	0	0.025		Burpham	8.20	Normal	0	0.025	
	Findon	8.68	Normal	0	0.025							
S6/4: Uncertainty of climate constrained surface water sources	N/A						N/A					
S8/1 Uncertainty of Climate Change Yield	Groundwater	70.73	Triangular	-1.63%	0.00%	0.98%	Groundwater	62.1	Triangular	-1.39%	0.00%	0.83%
	Surfacewater	0	Triangular	0	0	0	Surfacewater	0	Triangular	0	0	0
S9/1 Uncertainty of New Source Yield	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	1.64				Normal	0	1.37	
D2 Demand forecast variation.			Triangular	-3.72104011	0	3.77784001			Triangular	-2.9165885	0	2.9611462
D3 Effect of climate change on demand			Triangular	-0.48171681	0	0.2408584			Triangular	-0.3026706	0	0.2043858
D4 Uncertainty of impact of demand management			Triangular	-1.53471811	0	4.60415434			Triangular	-1.20761039	0	3.62283118

Table F.9 Sussex Worthing – Headroom Input Data

AMP 4

Item	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 Time Limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 Gradual pollution o	Throwley	7.5	Triangular	0	0.02	0.03	Throwley	7.5	Triangular	0	0.02	0.03
S5/2	Luton	5.1	Triangular	0	0.02	0.03	Luton	5.1	Triangular	0	0.02	0.03
S5/3	Gore	3.1	Triangular	0	0.02	0.03	Gore	3.1	Triangular	0	0.02	0.03
S5/4												
S6/1 Uncertainty for yi	Belmont	11.3	Triangular	0	0	0.04	Belmont	10.95	Triangular	-0.01	0.02	0.04
	Capstone Chalk	3.8	Triangular	0	0	0.04	Capstone Chalk	3.5	Triangular	-0.01	0.02	0.04
	Capstone Greensand	1.4	Triangular	0	0	0.04	Capstone Greensand	1.4	Triangular	-0.01	0.02	0.04
	Cuxton	6.7	Triangular	0	0	0.04	Cuxton	6.7	Triangular	-0.01	0.02	0.04
	Fawkham	7.88	Triangular	0	0	0.04	Gore	3.1	Triangular	-0.01	0.02	0.04
	Gore	3.1	Triangular	0	0	0.04	Hazells	6.28	Triangular	-0.01	0.02	0.04
	Hazells	7.4	Triangular	0	0	0.04	Higham	0.82	Triangular	-0.01	0.02	0.04
	Higham	0.84	Triangular	0	0	0.04	Highstead	9.18	Triangular	-0.01	0.02	0.04
	Highstead	10.2	Triangular	0	0	0.04	Lower Bush	5.3	Triangular	-0.01	0.02	0.04
	Hockley Hole	4.52	Triangular	0	0	0.04	Luddesdown Chalk	3	Triangular	-0.01	0.02	0.04
	Kettle Hill	4.16	Triangular	0	0	0.04	Luddesdown Greensand	1.4	Triangular	-0.01	0.02	0.04
	Lower Bush	5.3	Triangular	0	0	0.04	Matts Hill	15.82	Triangular	-0.01	0.02	0.04
	Luddesdown Chalk	3	Triangular	0	0	0.04	Nashenden	5.2	Triangular	-0.01	0.02	0.04
	Luddesdown Greensand	1.6	Triangular	0	0	0.04	Northfleet chalk	7.5	Triangular	-0.01	0.02	0.04
	Matts Hill	19.15	Triangular	0	0	0.04	Rainham Mark	0.7	Triangular	-0.01	0.02	0.04
	Nashenden	5.2	Triangular	0	0	0.04	Selling	10.2	Triangular	-0.01	0.02	0.04
	Northfleet chalk	7.5	Triangular	0	0	0.04	Throwley	7	Triangular	-0.01	0.02	0.04
S6/2 Meter uncertainty	Danaway	5	Triangular	0	0	0.04	Danaway	3.4	Triangular	0	0	0.04
	Keyco	1.73	Triangular	0	0	0.04	Fawkham	6.83	Triangular	0	0	0.04
							Keyco	1.27	Triangular	0	0	0.04
							Snodhurst	4.82	Triangular	0	0	0.04
							Strood	2.75	Triangular	0	0	0.04
S6/3 Uncertainty for a	Three crutches	0.8	Normal	0	0.03		Three crutches	0.7	Normal	0	0.03	
S6/4: Uncertainty of cl	Medway scheme	51.64	Normal	0	0.03		Medway scheme	51.64	Normal	0	0.03	
S8 Uncertainty of Clim	Burham : Springburn 7.5%		Triangular	0	4.14	6.88	Burham : Springburn		Triangular	0	3.49	5.74
S9/1 Uncertainty of N	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccura			Normal	0	1.42				Normal	0	1.18	
D2 Demand forecast variation.			Triangular	-4.75	0	14.28			Triangular	-4.18	0	12.57
D3 Effect of climate change on demand			Triangular	0	2.77	3.44			Triangular	0	2.3	2.88
D4 Uncertainty of impact of demand management			Normal	0	0.77				Normal	0	0.67	

Water Resource Investigation

Item	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 Time Limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 Gradual pollution o	Throwley and Windmill Hill	10.25	Triangular	0	0.02	0.03	Throwley and Windmill Hill	10.1	Triangular	0	0.02	0.03
S5/2	Luton	5.1	Triangular	0	0.02	0.03	Luton	5.1	Triangular	0	0.02	0.03
S5/3	Gore	3.1	Triangular	0	0.02	0.03	Gore	3.1	Triangular	0	0.02	0.03
S5/4												
S6/1 Uncertainty for yi	Belmont	12.8	Triangular	-0.01	0.02	0.04	Capstone Chalk	3.8	Triangular	-0.01	0.02	0.04
	Capstone Chalk	3.8	Triangular	-0.01	0.02	0.04	Luddesdown Chalk	3	Triangular	-0.01	0.02	0.04
	Luddesdown Chalk	3	Triangular	-0.01	0.02	0.04	Nashenden	5.2	Triangular	-0.01	0.02	0.04
	Luddesdown LGS	1.6	Triangular	-0.01	0.02	0.04						
	Nashenden	5.2	Triangular	-0.01	0.02	0.04						
	Selling	14	Triangular	-0.01	0.02	0.04						
S6/2 Meter uncertainty	Danaway	5	Triangular	0	0	0.04	Belmont	10.95	Triangular	0	0	0.04
							Danaway	3.4	Triangular	0	0	0.04
							Fawkham	6.83	Triangular	0	0	0.04
							Keycol	1.27	Triangular	0	0	0.04
							Luddesdown LGS	1.4	Triangular	0	0	0.04
							Selling	11.59	Triangular	0	0	0.04
							Strood	2.75	Triangular	0	0	0.04
S6/3 Uncertainty for a	Capstone LGS	1.53	Normal	0	0.03		Capstone LGS	1.53	Normal	0	0.03	
	Cuxton	8	Normal	0	0.03		Cuxton	6.5	Normal	0	0.03	
	Fawkham	7.88	Normal	0	0.03		Gore	3.1	Normal	0	0.03	
	Gore	3.1	Normal	0	0.03		Hazells	4.6	Normal	0	0.03	
	Hazells	6.1	Normal	0	0.03		Higham	0.63	Normal	0	0.03	
	Higham	0.8	Normal	0	0.03		Highstead	5.4	Normal	0	0.03	
	Highstead	6.2	Normal	0	0.03		Lower Bush	5.3	Normal	0	0.03	
	Hockley Hole	4.52	Normal	0	0.03		Northfleet Chalk	8.52	Normal	0	0.03	
	Keycol	1.6	Normal	0	0.03		Rainham Mark	0.85	Normal	0	0.03	
	Lower Bush	5.3	Normal	0	0.03		Snodhurst	4.2	Normal	0	0.03	
	Northfleet Chalk	8.74	Normal	0	0.03		Three Crutches	0.6	Normal	0	0.03	
	Rainham Mark	0.85	Normal	0	0.03		Windmill Hill	3	Normal	0	0.03	
	Snodhurst	5	Normal	0	0.03							
	Strood	3.9	Normal	0	0.03							
	Three Crutches	0.8	Normal	0	0.03							
	Trundlewood	3.7	Normal	0	0.03							
	Windmill Hill	3.1	Normal	0	0.03							
S6/4: Uncertainty of cl	Medway scheme	51.64	Normal	0	0.03		Medway scheme	51.64	Normal	0	0.03	
S8 Uncertainty of Clim	N/A						Burham: Springburn		Triangular	0	8.09	10.83
S9/1 Uncertainty of N	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccura			Normal	0	1.42				Normal	0	1.18	
D2 Demand forecast variation.			Triangular	-4.75	0	14.28			Triangular	-4.18	0	12.57
D3 Effect of climate change on demand	Max climate increase of 2.5%		Triangular	0	2.77	3.44			Triangular	0	2.3	2.88
D4 Uncertainty of impact of demand management			Triangular	-1.13	0	2.27			Triangular	-0.89	0	1.78

Severe Drought Investigations

Item	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 Time Limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 Gradual pollution o												
S5/2	Luton	5.1	Triangular	0	0.02	0.03	Luton	5.1	Triangular	0	0.02	0.03
S5/3												
S5/4	Matts Hill	10.4	Triangular	0	0.02	0.03	Matts Hill	10.4	Triangular	0	0.02	0.03
S6/1 Uncertainty for yi	Selling	13.9	Triangular	-0.01	0.02	0.04	Belmont	9	Triangular	-0.01	0.02	0.04
	Belmont	12.3	Triangular	-0.01	0.02	0.04	Gore	3.1	Triangular	-0.01	0.02	0.04
	Hockley Hole	4.52	Triangular	-0.01	0.02	0.04	Rainham Mark	0.84	Triangular	-0.01	0.02	0.04
	Trundle Wood	3.45	Triangular	-0.01	0.02	0.04	Capstone - chalk	3.8	Triangular	-0.01	0.02	0.04
	Keycol	1.6	Triangular	-0.01	0.02	0.04	Luddesdown - Chalk	3	Triangular	-0.01	0.02	0.04
	Gore	3.1	Triangular	-0.01	0.02	0.04	Northfleet - Chalk	8.52	Triangular	-0.01	0.02	0.04
	Rainham Mark	0.8	Triangular	-0.01	0.02	0.04	Hazells	4.5	Triangular	-0.01	0.02	0.04
	Capstone - Chalk	3.8	Triangular	-0.01	0.02	0.04						
	Luddesdown - Chalk	3	Triangular	-0.01	0.02	0.04						
	Northfleet Chalk	8.74	Triangular	-0.01	0.02	0.04						
	Hazells	6	Triangular	-0.01	0.02	0.04						
	Fawkham	7.88	Triangular	-0.01	0.02	0.04						
S6/2 Meter uncertainty	Danaway	5	Triangular	0	0	0.04	Selling	11.59	Triangular	0	0	0.04
							Hockley Hole	0.00	Triangular	0	0	0.04
							Kettle Hill	0.00	Triangular	0	0	0.04
							Trundle Wood	0	Triangular	0	0	0.04
							Keycol	1.27	Triangular	0	0	0.04
							Danaway	3.4	Triangular	0	0	0.04
							Strood	2.75	Triangular	0	0	0.04
							Fawkham	6.83	Triangular	0	0	0.04
S6/3 Uncertainty for a	Snodhurst	2.5	Normal	0	0.03		Snodhurst	1.5	Normal	0	0.03	
	Nashenden	5	Normal	0	0.03		Nashenden	4.9	Normal	0	0.03	
	Strood	3.9	Normal	0	0.03		Three Crutches	0.56	Normal	0	0.03	
	Three Crutches	0.78	Normal	0	0.03		Higham	0.46	Normal	0	0.03	
	Higham	0.7	Normal	0	0.03		Lower Bush	5.3	Normal	0	0.03	
	Lower Bush	5.3	Normal	0	0.03		Cuxton	6.4	Normal	0	0.03	
	Cuxton	7.9	Normal	0	0.03		Highstead	1	Normal	0	0.03	
	Highsted	4.7	Normal	0	0.03							
S6/4: Uncertainty of cl	N/A						N/A					
S8 Uncertainty of Clim	N/A						N/A					
S9/1 Uncertainty of N	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccura	N/A						N/A					
D2 Demand forecast variation.	N/A						N/A					
D3 Effect of climate change on demand	N/A						N/A					
D4 Uncertainty of impact of demand management	N/A						N/A					

PR09 Baseline

Item	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 Time Limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 Gradual pollution o / S5/2 / S5/3 / S5/4	N/A: AMP4 schemes completed.						N/A: AMP4 schemes completed.					
S6/1 Uncertainty for yi	Belmont	12.3	Triangular	-0.01	0.02	0.04	Belmont	9	Triangular	-0.01	0.02	0.04
	Capstone - Chalk	3.8	Triangular	-0.01	0.02	0.04	Capstone - Chalk	3.8	Triangular	-0.01	0.02	0.04
	Fawkham	7.88	Triangular	-0.01	0.02	0.04	Gore	3.1	Triangular	-0.01	0.02	0.04
	Gore	3.1	Triangular	-0.01	0.02	0.04	Lower Bush	5.5	Triangular	-0.01	0.02	0.04
	Hockley Hole	4.52	Triangular	-0.01	0.02	0.04	Luddesdown - Chalk	3	Triangular	-0.01	0.02	0.04
	Keycol	1.6	Triangular	-0.01	0.02	0.04	Northfleet - Chalk	8.52	Triangular	-0.01	0.02	0.04
	Lower Bush	5.5	Triangular	-0.01	0.02	0.04	Rainham Mark	0.84	Triangular	-0.01	0.02	0.04
	Luddesdown - Chalk	3	Triangular	-0.01	0.02	0.04						
	Luddesdown - LGS	1.6	Triangular	-0.01	0.02	0.04						
	Northfleet Chalk	8.74	Triangular	-0.01	0.02	0.04						
	Selling	13.9	Triangular	-0.01	0.02	0.04						
	Rainham Mark	0.8	Triangular	-0.01	0.02	0.04						
	Trundle Wood	3.45	Triangular	-0.01	0.02	0.04						
S6/2 Meter uncertainty	Danaway	5	Triangular	0	0	0.04	Danaway	3.4	Triangular	0	0	0.04
	Kettle Hill	4.90	Triangular	0	0	0.04	Fawkham	6.83	Triangular	0	0	0.04
							Hockley Hole	0.00	Triangular	0	0	0.04
							Trundle Wood	0	Triangular	0	0	0.04
							Kettle Hill	0.00	Triangular	0	0	0.04
							Keycol	1.27	Triangular	0	0	0.04
							Luddesdown - LGS	1.4	Triangular	0	0	0.04
							Selling	11.59	Triangular	0	0	0.04
							Strood	2.75	Triangular	0	0	0.04
S6/3 Uncertainty for a	Cuxton	7.9	Normal	0	0.03		Cuxton	6.4	Normal	0	0.03	
	Higham	0.7	Normal	0	0.03		Higham	0.46	Normal	0	0.03	
	Luton	6.55	Normal	0	0.03		Luton	6.55	Normal	0	0.03	
	Matts Hill	10.4	Normal	0	0.03		Matts Hill	10.4	Normal	0	0.03	
	Snodhurst	2.5	Normal	0	0.03		Snodhurst	1.5	Normal	0	0.03	
	Strood	3.9	Normal	0	0.03		Three Crutches	0.56	Normal	0	0.03	
	Three Crutches	0.78	Normal	0	0.03		Throwley	9.1	Normal	0	0.03	
	Throwley	9.1	Normal	0	0.03		Nashenden	4.9	Normal	0	0.03	
	Nashenden	5	Normal	0	0.03		Windmill Hill	2	Normal	0	0.03	
	Windmill Hill	2	Normal	0	0.03		Capstone - LGS	1.53	Normal	0	0.03	
	Capstone - LGS	1.53	Normal	0	0.03		Hazells	4.5	Normal	0	0.03	
	Hazells	6	Normal	0	0.03		Highstead	1.5	Normal	0	0.03	
	Highstead	5.2	Normal	0	0.03							
S6/4: Uncertainty of cl	River Medway Scheme	34.8	Normal	0	0.03		River Medway Scheme	34.8	Normal	0	0.03	
S8 Uncertainty of Clim	Groundwater	142.2	Triangular	0	2.2	4.4	Groundwater	110.7	Triangular	0	2.2	4.4
	Surface water	34.8	Triangular	-0.136	0	0.14	Surface water	34.8	Triangular	-0.136	0	0.14
S9/1 Uncertainty of N	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccura			Normal	0	1.42				Normal	0	1.18	
D2 Demand forecast variation.			Triangular	-14.34	0	16.41			Triangular	-10.84	0	12.41
D3 Effect of climate change on demand			Triangular	-0.93	0	0.64			Triangular	-0.93	0	0.64
D4 Uncertainty of impact of demand management			Triangular	-4	0	4			Triangular	-3.02	0	3.02

FWRMP

Item	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulnerable groundwater Licences	N/A						N/A					
S3 Time Limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 Gradual pollution o / S5/2 / S5/3 / S5/4	N/A: AMP4 schemes completed.						N/A: AMP4 schemes completed.					
S6/1 Uncertainty for yi	Belmont	11.7	Triangular	-0.01	0.02	0.04	Belmont	11.7	Triangular	-0.01	0.02	0.04
	Capstone - Chalk	3.8	Triangular	-0.01	0.02	0.04	Capstone - Chalk	3.8	Triangular	-0.01	0.02	0.04
	Fawkham	7.1	Triangular	-0.01	0.02	0.04	Gore	4	Triangular	-0.01	0.02	0.04
	Gore	4	Triangular	-0.01	0.02	0.04	Lower Bush	4.65	Triangular	-0.01	0.02	0.04
	Hockley Hole	4.95	Triangular	-0.01	0.02	0.04	Luddesdown - Chalk	2.9	Triangular	-0.01	0.02	0.04
	Keycol	1.53	Triangular	-0.01	0.02	0.04	Northfleet - Chalk	8	Triangular	-0.01	0.02	0.04
	Lower Bush	4.8	Triangular	-0.01	0.02	0.04	Rainham Mark	0	Triangular	-0.01	0.02	0.04
	Luddesdown - Chalk	2.9	Triangular	-0.01	0.02	0.04						
	Luddesdown - LGS	1.6	Triangular	-0.01	0.02	0.04						
	Northfleet Chalk	8.45	Triangular	-0.01	0.02	0.04						
	Selling	14.05	Triangular	-0.01	0.02	0.04						
	Rainham Mark	0	Triangular	-0.01	0.02	0.04						
	Trundle Wood	4.33	Triangular	-0.01	0.02	0.04						
S6/2 Meter uncertainty	Danaway	4.95	Triangular	0	0	0.04	Danaway	3.4	Triangular	0	0	0.04
	Kettle Hill	5.00	Triangular	0	0	0.04	Fawkham	6.83	Triangular	0	0	0.04
							Hockley Hole	0.00	Triangular	0	0	0.04
							Trundle Wood	0	Triangular	0	0	0.04
							Kettle Hill	0.00	Triangular	0	0	0.04
							Keycol	1.3	Triangular	0	0	0.04
							Luddesdown - L	1.6	Triangular	0	0	0.04
							Selling	14.05	Triangular	0	0	0.04
							Strood	2.8	Triangular	0	0	0.04
S6/3 Uncertainty for a	Cuxton	9.3	Normal	0	0.03		Cuxton	4.8	Normal	0	0.03	
	Higham	0.66	Normal	0	0.03		Higham	0.63	Normal	0	0.03	
	Luton	7.3	Normal	0	0.03		Luton	7.3	Normal	0	0.03	
	Matts Hill	12.7	Normal	0	0.03		Matts Hill	12.6	Normal	0	0.03	
	Snodhurst	3	Normal	0	0.03		Snodhurst	2.6	Normal	0	0.03	
	Strood	2.8	Normal	0	0.03		Three Crutches	0.45	Normal	0	0.03	
	Three Crutche	0.7	Normal	0	0.03		Throwley	6.6	Normal	0	0.03	
	Throwley	9.5	Normal	0	0.03		Nashenden	5	Normal	0	0.03	
	Nashenden	5	Normal	0	0.03		Windmill Hill	1.02	Normal	0	0.03	
	Windmill Hill	2.65	Normal	0	0.03		Capstone - LGS	1.4	Normal	0	0.03	
	Capstone - LGS	1.4	Normal	0	0.03		Hazells	5.3	Normal	0	0.03	
	Hazells	5.75	Normal	0	0.03		Highstead	6	Normal	0	0.03	
	Highstead	6	Normal	0	0.03							
S6/4: Uncertainty of cl	River Medway Sch	46.9	Normal	0	0.03		River Medway Sch	34.6	Normal	0	0.03	
S8 Uncertainty of Clim	Groundwater	145.92	Triangular	-1.86%	0.00%	2.20%	Groundwater	118.73	Triangular	-3.28%	0.00%	2.14%
	Surface water	46.9	Triangular	-15.07%	0.00%	14.55%	Surface water	34.6	Triangular	-11.25%	0.00%	13.58%
S9/1 Uncertainty of N	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccura			Normal	0	1.42				Normal	0	1.18	
D2 Demand forecast variation.			Triangular	-10.7372281	0	10.8788344			Triangular	-8.30018065	0	8.40991217
D3 Effect of climate change on demand			Triangular	-1.43691641	0	0.7184582			Triangular	-1.2136492	0	0.6068246
D4 Uncertainty of impact of demand management			Triangular	-4.34021894	0	13.0206568			Triangular	-3.37250654	0	10.1175196

Table F.10 Kent Medway – Headroom Input Data

	AMP 4 – Peak Deployable Output						AMP 4 – Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Lic	N/A						N/A					
S3 Time-limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources	Lord of the Manor	6.5	Triangular	0	0.02	0.03	Lord of the Manor	6	Triangular	0	0.02	0.03
	Minster B	5.5	Triangular	0	0.02	0.03	Minster B	5.5	Triangular	0	0.02	0.03
	Rumfields	5.68	Triangular	0	0.02	0.03	Rumfields	2.27	Triangular	0	0.02	0.03
S6/1 Uncertainty for yields con	Deal	3.4	Triangular	-0.01	0.02	0.04	Deal	3.4	Triangular	-0.01	0.02	0.04
	Minster B	5.5	Triangular	-0.01	0.02	0.04	Minster B	5.5	Triangular	-0.01	0.02	0.04
	Lord of the Manor	6.5	Triangular	-0.01	0.02	0.04	Lord of the Manor	6	Triangular	-0.01	0.02	0.04
	Martin Gorse	5.5	Triangular	-0.01	0.02	0.04	Martin Gorse	5.5	Triangular	-0.01	0.02	0.04
S6/2 Meter uncertainty for licen	Ringwould	4.55	Triangular	0	0	0.04	Ringwould	3.64	Triangular	0	0	0.04
	Plucks Gutter	3.35	Triangular	0	0	0.04	Plucks Gutter	2.94	Triangular	0	0	0.04
	Woodnesborough	2.73	Triangular	0	0	0.04	Woodnesborough	2.49	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer co	Martin Mill	1.1	Normal	0	0.03		Martin Mill	0.7	Normal	0	0.03	
	Sparrow castle	1.95	Normal	0	0.03		Sparrow castle	1.95	Normal	0	0.03	
	Sutton	4.4	Normal	0	0.03		Sutton	4.4	Normal	0	0.03	
	Wingham	20	Normal	0	0.03		Wingham	20	Normal	0	0.03	
	Flemings	8.7	Normal	0	0.03		Flemings	8.7	Normal	0	0.03	
S6/4: Uncertainty of climate co	N/A						N/A					
S8 Uncertainty of Climate Change Yield			Triangular	0	0.22	0.89			Triangular	0	0.21	0.85
S9/1 Uncertainty of New Sourc	Rumfields - Thanet Group source	5.68	Uniform	0	3.88		Rumfields - Thanet Group source	2.27	Uniform	0	0.98	
Demand Side												
D1 Uncertainty of distribution ir	'+-1 approx		Normal	0	0.73		'+-1 approx		Normal	0	0.61	
D2 Demand forecast variation.			Triangular	-3.4	0	8.21			Triangular	-2.45	0	5.74
D3 Effect of climate change on	Max climate increase of 2.5%		Triangular	0	2.77	3.44	Max climate increase of 2.5%		Triangular	0	2.3	2.88
D4 Uncertainty of impact of de	efficieny savings	2.97	Normal	0	0.4		efficieny savings	2.97	Normal	0	0.27	

	Water Resource Investigation – Peak Deployable Output						Water Resource Investigation – Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Lic	N/A						N/A					
S3 Time-limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources	N/A						N/A					
	N/A						N/A					
S6/1 Uncertainty for yields con	Deal	3.4	Triangular	-0.01	0.02	0.04	Deal	3.4	Triangular	-0.01	0.02	0.04
	Minster B	5.5	Triangular	-0.01	0.02	0.04	Minster B	5.5	Triangular	-0.01	0.02	0.04
	Lord of the Manor	6.5	Triangular	-0.01	0.02	0.04	Lord of the Manor	6	Triangular	-0.01	0.02	0.04
	Martin Gorse	5.5	Triangular	-0.01	0.02	0.04	Martin Gorse	5.5	Triangular	-0.01	0.02	0.04
S6/2 Meter uncertainty for licen	Ringwould	4.55	Triangular	0	0	0.04	Ringwould	3.8	Triangular	0	0	0.04
	Plucks Gutter	3.35	Triangular	0	0	0.04	Plucks Gutter	3.2	Triangular	0	0	0.04
	Woodnesborough	2.73	Triangular	0	0	0.04	Woodnesborough	2.73	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer co	Martin Mill	1.1	Normal	0	0.03		Martin Mill	0.6	Normal	0	0.03	
	Sparrow castle	1.95	Normal	0	0.03		Sparrow castle	1.5	Normal	0	0.03	
	Sutton	4.4	Normal	0	0.03		Sutton	4.4	Normal	0	0.03	
	Wingham	20	Normal	0	0.03		Wingham	19	Normal	0	0.03	
	Flemings	8.7	Normal	0	0.03		Flemings	8.5	Normal	0	0.03	
S6/4: Uncertainty of climate co	N/A							3.26	Normal	0	0.03	
S8 Uncertainty of Climate Change Yield			Triangular	0	0.22	0.89			Triangular	0	0.21	0.85
S9/1 Uncertainty of New Sourc	Rumfields - Thanet Group source	5.68	Uniform	0	3.88		Rumfields - Thanet Group source	2.27	Uniform	0	0.98	
Demand Side												
D1 Uncertainty of distribution ir	'+-1 approx		Normal	0	0.73		'+-1 approx		Normal	0	0.61	
D2 Demand forecast variation.			Triangular	-3.4	0	8.21			Triangular	-2.45	0	5.74
D3 Effect of climate change on	Max climate increase of 2.5%		Triangular	0	2.77	3.44	Max climate increase of 2.5%		Triangular	0	2.3	2.88
D4 Uncertainty of impact of de	Efficiency savings	2.97	Normal	-0.41	0		Efficiency savings	2.97	Triangular	-0.45	0	0.85

	Severe Drought Investigations – Peak Deployable Output						Severe Drought Investigations – Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Lic	N/A						N/A					
S3 Time-limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources	Martin Gorse	5.5	Triangular	0	0.02	0.03	Martin Gorse	5.5	Triangular	0	0.02	0.03
S6/1 Uncertainty for yields con	Deal	2.7	Triangular	-0.01	0.02	0.04	Sutton	4.4	Triangular	-0.01	0.02	0.04
	Sutton	4.4	Triangular	-0.01	0.02	0.04						
	Ringwould	3.8	Triangular	-0.01	0.02	0.04						
S6/2 Meter uncertainty for licen	Woodnesborough	2.73	Triangular	0	0	0.04	Ringwould	3.64	Triangular	0	0	0.04
							Woodnesborough	2.49	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer co	Martin Mill	0.3	Normal	0	0.03		Martin Mill	0.48	Normal	0	0.03	
	Wingham	16	Normal	0	0.03							
S6/4: Uncertainty of climate co												
S8 Uncertainty of Climate Change Yield	N/A						N/A					
S9/1 Uncertainty of New Sourc	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution ir	N/A						N/A					
D2 Demand forecast variation.	N/A						N/A					
D3 Effect of climate change on	N/A						N/A					
D4 Uncertainty of impact of de	N/A						N/A					

	PR09 Baseline – Peak Deployable Output						PR09 Baseline – Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Lic	N/A						N/A					
S3 Time-limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources	N/A						N/A					
	N/A						N/A					
S6/1 Uncertainty for yields con	Flemmings	8.5	Triangular	-0.01	0.02	0.04	Flemings	6.9	Triangular	-0.01	0.02	0.04
	Martin Gorse	5.5	Triangular	-0.01	0.02	0.04	Martin Gorse	5.5	Triangular	-0.01	0.02	0.04
	Minster B	6	Triangular	-0.01	0.02	0.04	Minster B	6	Triangular	-0.01	0.02	0.04
	Ringwould	3.8	Triangular	-0.01	0.02	0.04	Sparrow Castle	1.5	Triangular	-0.01	0.02	0.04
	Sparrow Castle	1.5	Triangular	-0.01	0.02	0.04	Sutton	4.4	Triangular	-0.01	0.02	0.04
	Sutton	4.4	Triangular	-0.01	0.02	0.04						
S6/2 Meter uncertainty for licen	Woodnesborough	2.73	Triangular	0	0	0.04	Ringwould	3.64	Triangular	0	0	0.04
							Woodnesborough	2.49	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer co	Deal	3.4	Normal	0	0.03		Deal	3	Normal	0	0.03	
	Lord of the Manor	4.5	Normal	0	0.03		Lord of the Manor	1.7	Normal	0	0.03	
	Martin Mill	0.6	Normal	0	0.03		Martin Mill	0.5	Normal	0	0.03	
	Wingham	16	Normal	0	0.03		Wingham	11	Normal	0	0.03	
S6/4: Uncertainty of climate co	Plucks Gutter	3.26					Plucks Gutter	3.6				
S8 Uncertainty of Climate Change Yield	Groundwater	56.9	Triangular	0	0.022	0.044	Groundwater	46.6	Triangular	0	0.022	0.044
	Surface water	3.3	Triangular	0	0	0	Surface water	3.3	Triangular	0	0	0
S9/1 Uncertainty of New Sourc	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution ir	'+-1 approx		Normal	0	0.73		'+-1 approx		Normal	0	0.61	
D2 Demand forecast variation.			Triangular	-7.27	0	8.32			Triangular	-4.21	0	4.82
D3 Effect of climate change on			Triangular	-0.39	0	0.27			Triangular	-0.39	0	0.27
D4 Uncertainty of impact of de			Triangular	-2.03	0	2.03			Triangular	-1.18	0	1.18

	FWRMP – Peak Deployable Output						FWRMP – Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Lic	N/A						N/A					
S3 Time-limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources	N/A						N/A					
	N/A						N/A					
S6/1 Uncertainty for yields con	Flemmings	8.85	Triangular	-0.01	0.02	0.04	Flemings	8.45	Triangular	-0.01	0.02	0.04
	Martin Gorse	6.82	Triangular	-0.01	0.02	0.04	Martin Gorse	6.82	Triangular	-0.01	0.02	0.04
	Minster B	5.9	Triangular	-0.01	0.02	0.04	Minster B	5.8	Triangular	-0.01	0.02	0.04
	Ringwould	4.3	Triangular	-0.01	0.02	0.04	Sparrow Castle	2	Triangular	-0.01	0.02	0.04
	Sparrow Castle	2.2	Triangular	-0.01	0.02	0.04	Sutton	5	Triangular	-0.01	0.02	0.04
	Sutton	5	Triangular	-0.01	0.02	0.04						
S6/2 Meter uncertainty for licen	Woodnesborough	2.73	Triangular	0	0	0.04	Ringwould	3.64	Triangular	0	0	0.04
							Woodnesborough	2.49	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer co	Deal	4.3	Normal	0	0.03		Deal	4.3	Normal	0	0.03	
	Lord of the Manor	4	Normal	0	0.03		Lord of the Manor	1.75	Normal	0	0.03	
	Martin Mill	1.08	Normal	0	0.03		Martin Mill	1	Normal	0	0.03	
	Wingham	17	Normal	0	0.03		Wingham	13.5	Normal	0	0.03	
S6/4: Uncertainty of climate co	Plucks Gutter	3.5					Plucks Gutter	3.5				
S8 Uncertainty of Climate Change Yield	Groundwater	57.29	Triangular	-11.12%	0.00%	11.78%	Groundwater	50.97	Triangular	-7.42%	0.00%	6.71%
	Surface water	3.5	Triangular	0.00%	0.00%	0.00%	Surface water	3.5	Triangular	0.00%	0.00%	0.00%
S9/1 Uncertainty of New Sourc	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution ir	'+-1 approx		Normal	0	0.73		'+-1 approx		Normal	0	0.61	
D2 Demand forecast variation.			Triangular	-4.4331965	0	4.49545846			Triangular	-3.17122596	0	3.21586537
D3 Effect of climate change on			Triangular	-0.58412905	0	0.29206453			Triangular	-0.46900436	0	0.23450218
D4 Uncertainty of impact of de			Triangular	-1.79336008	0	5.38008025			Triangular	-1.28922265	0	3.86766795

Table F.11 Kent Thanet – Headroom Input Data

	AMP 4 – Peak Deployable Output						AMP 4 – Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by pump capacity	Brede	3.8	Triangular	-0.01	0.02	0.03	Brede	2.27	Triangular	-0.01	0.02	0.04
	Buckshole	0.62	Triangular	-0.01	0.02	0.03	Buckshole	0.52	Triangular	-0.01	0.02	0.04
	Filsham	2	Triangular	-0.01	0.02	0.03						
S6/2 Meter uncertainty for licence critical sources	N/A							19.07	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	N/A						N/A					
S6/4: Uncertainty of climate constrained surface water sources	Darwell	23.29	Normal	0	0.03		Darwell	19.4	Normal	0	0.03	
	Powdermill	10.91	Normal	0	0.03		Powdermill	3.7	Normal	0	0.03	
S8/1 Uncertainty of Climate Change Yield	Darwell		Triangular	0	3	3.39	Powdermill		Triangular	0	2.35	2.63
S9/1 Uncertainty of New Source Yield	Bewl Darwell Transfer	25	Uniform	0	2.69			25	Uniform	0	3.33	
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	0.27				Normal	0	0.33	
D2 Demand forecast variation.			Triangular	-1.2	0	2.69			Triangular	-1.02	0	2.29
D3 Effect of climate change on demand			Triangular	0	0.61	0.77			Triangular	0	0.51	0.64
D4 Uncertainty of impact of demand management			Normal	0	0.48				Normal	0	0.41	

	Water Resource Investigation – Peak Deployable Output						Water Resource Investigation – Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by pump capacity	N/A							0.04	Triangular	-0.01	0.02	0.04
S6/2 Meter uncertainty for licence critical sources	N/A						Brede	2.27	Triangular	0	0	0.04
							Filsham	0.62	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	Brede	3.8	Normal	0	0.03		N/A					
	Filsham	2	Normal	0	0.03							
S6/4: Uncertainty of climate constrained surface water sources	Darwell	23.29	Normal	0	0.03		Darwell	19.4	Normal	0	0.03	
	Powdermill	10.91	Normal	0	0.03		Powdermill	3.7	Normal	0	0.03	
S8/1 Uncertainty of Climate Change Yield	N/A						Powdermill		Triangular	0	4.17	9.71
S9/1 Uncertainty of New Source Yield	Bewl Darwell transfer	25	Uniform	0	0		N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	0.27				Normal	0	0.33	
D2 Demand forecast variation.			Triangular	-1.2	0	2.69			Triangular	-1.02	0	2.29
D3 Effect of climate change on demand			Triangular	0	0.61	0.77			Triangular	0	0.51	0.64
D4 Uncertainty of impact of demand management	N/A								Triangular	-0.31	0	0.61

	PR09 Baseline – Peak Deployable Output						PR09 Baseline – Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by pump capacity												
S6/2 Meter uncertainty for licence critical sources							Brede	2.23	Triangular	0	0	0.04
							Filsham	0.61	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	Brede	3.77	Normal	0	0.03							
	Filsham	1.99	Normal	0	0.03							
S6/4: Uncertainty of climate constrained surface water sources	Darwell	27.4	Normal	0	0.03		Darwell	30.69	Normal	0	0.03	
	Powdermill	10.3	Normal	0	0.03		Powdermill	4.33	Normal	0	0.03	
S8/1 Uncertainty of Climate Change Yield	Groundwater	5.8	Triangular	0	0.022	0.044	Groundwater	2.8	Triangular	0	0.022	0.044
	Surface water	43.5	Triangular	-0.127	0	0.131	Surface water	37.2	Triangular	-0.127	0	0.131
S9/1 Uncertainty of New Source Yield	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	0.27				Normal	0	0.33	
D2 Demand forecast variation.			Triangular	-2.72	0	3.11			Triangular	-1.79	0	2.05
D3 Effect of climate change on demand			Triangular	-0.21	0	0.14			Triangular	-0.21	0	0.14
D4 Uncertainty of impact of demand management			Triangular	-0.9	0	0.9			Triangular	-0.59	0	0.59

	FWRMP – Peak Deployable Output						FWRMP – Minimum Deployable Output					
	Source	PDO	Distribution	Parameter 1	Parameter 2	Parameter 3	Source	MDO	Distribution	Parameter 1	Parameter 2	Parameter 3
Supply Side												
S1 Vulnerable Surface Water Licences	N/A						N/A					
S2 Vulneralbe groundwater Licences	N/A						N/A					
S3 /1 Time -limited Licences	N/A						N/A					
S4 Bulk transfers	N/A						N/A					
S5 gradual pollution of sources in this planning period	N/A						N/A					
S6/1 Uncertainty for yields constrained by pump capacity												
S6/2 Meter uncertainty for licence critical sources							Brede	1.2	Triangular	0	0	0.04
							Filsham	0.62	Triangular	0	0	0.04
S6/3 Uncertainty for aquifer constrained groundwater sources	Brede	1.5	Normal	0	0.03							
	Filsham	2.25	Normal	0	0.03							
S6/4: Uncertainty of climate constrained surface water sources	Darwell	41.73	Normal	0	0.03		Darwell	34.4	Normal	0	0.03	
	Powdermill	4.68	Normal	0	0.03		Powdermill	4.26	Normal	0	0.03	
S8/1 Uncertainty of Climate Change Yield	Groundwater	3.75	Triangular	-9.33%	0.00%	6.67%	Groundwater	1.82	Triangular	-16.48%	0.00%	10.99%
	Surface water	46.41	Triangular	-5.97%	0.00%	4.86%	Surface water	38.66	Triangular	-4.90%	0.00%	4.63%
S9/1 Uncertainty of New Source Yield	N/A						N/A					
Demand Side												
D1 Uncertainty of distribution input arising from meter inaccuracy			Normal	0	0.27				Normal	0	0.33	
D2 Demand forecast variation.			Triangular	-2.11799415	0	2.14358329			Triangular	-1.62423149	0	1.64388351
D3 Effect of climate change on demand			Triangular	-0.29642505	0	0.14821253			Triangular	-0.25096138	0	0.12548069
D4 Uncertainty of impact of demand management			Triangular	-0.87846338		2.63539015			Triangular	-0.67658166		2.02974498

Table F.12 Sussex Hastings – Headroom Input Data

F.1.4 Results and Discussion

Monte Carlo analysis was carried out using the appropriate probability distribution parameters set out in section F.1.2. The analysis calculated headroom uncertainty from 1,000 iterations of the model; results are produced in the form of percentiles. The interpretation of the results is that if in a given year the available headroom equals say the 90th percentile of the headroom uncertainty, then this ensures that there is a 90% likelihood that the supply demand balance will not be in deficit.

In the early years of the planning period, there is a strong argument for using a high percentile of the headroom uncertainty as the value for target headroom value, decreasing to lower percentiles towards the end of the planning period. This is because in the short-term the company will only be prepared to accept a low risk of that it will not be able to maintain security of supply, because there is little lead-time for options to be completed. In addition, short-term uncertainties are often considered to be more realistic as there is better supporting evidence than for long-term uncertainties. Taking values corresponding to high percentiles at the start and low percentiles towards the end of the planning period would therefore lead to decreasing target headroom over time.

Given the severe consequences in the event of potential or actual failure of the security of supplies, and the need to improve the current out-turn Levels of Service, the company is averse to exposing itself to unnecessary risk and is keen to take a prudent approach to setting the value of target headroom. However, it also acknowledges the importance of not over-planning for risks that may not become reality in the more distant future towards the end of the planning period, which would increase the apparent need for additional resource development which in the event might not be required.

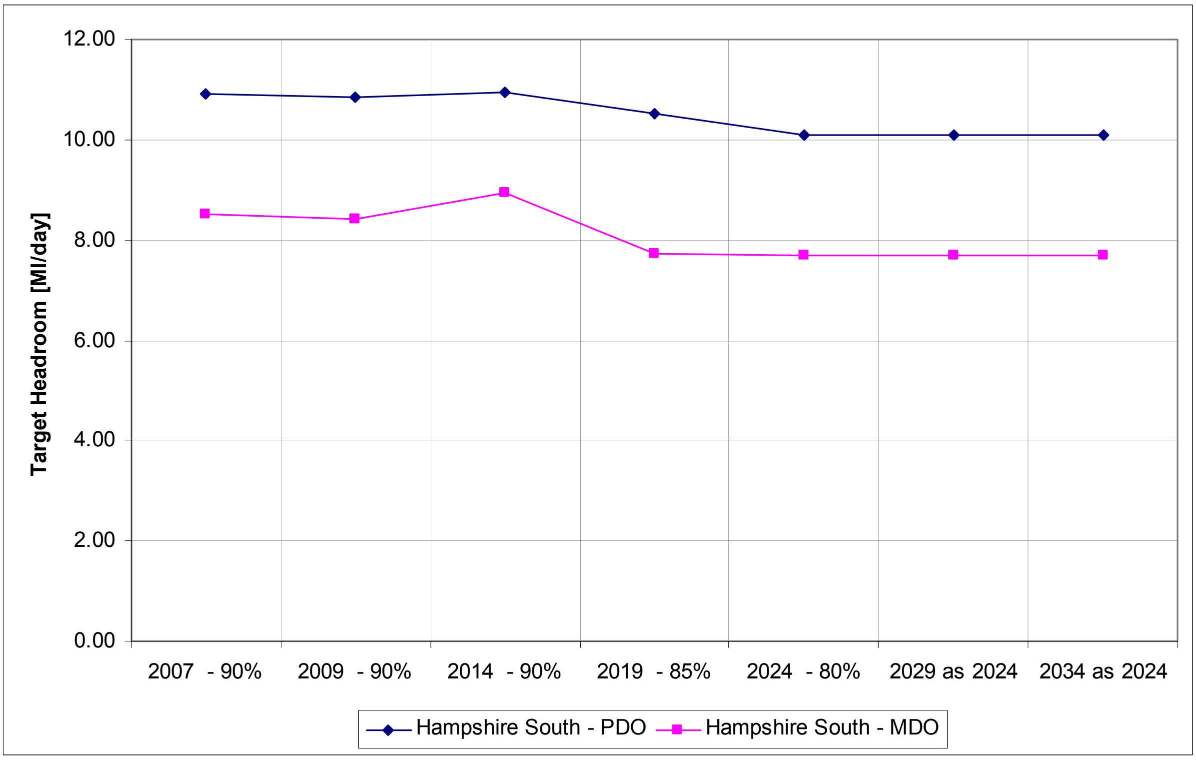
Since the draft WRMP, the company has reviewed the percentile of risk profile over time on which the level of target headroom is based. Following the review and consideration of comments on the draft WRMP, a gradually falling glidepath has been assumed for the first three AMP periods. From then onward, the value of target headroom is kept constant. Values of the proposed target headroom for the WRMP are given in Table F.13 for MDO and Table F.14 for Peak. Plots are shown in Figure F.1 to Figure F.3.

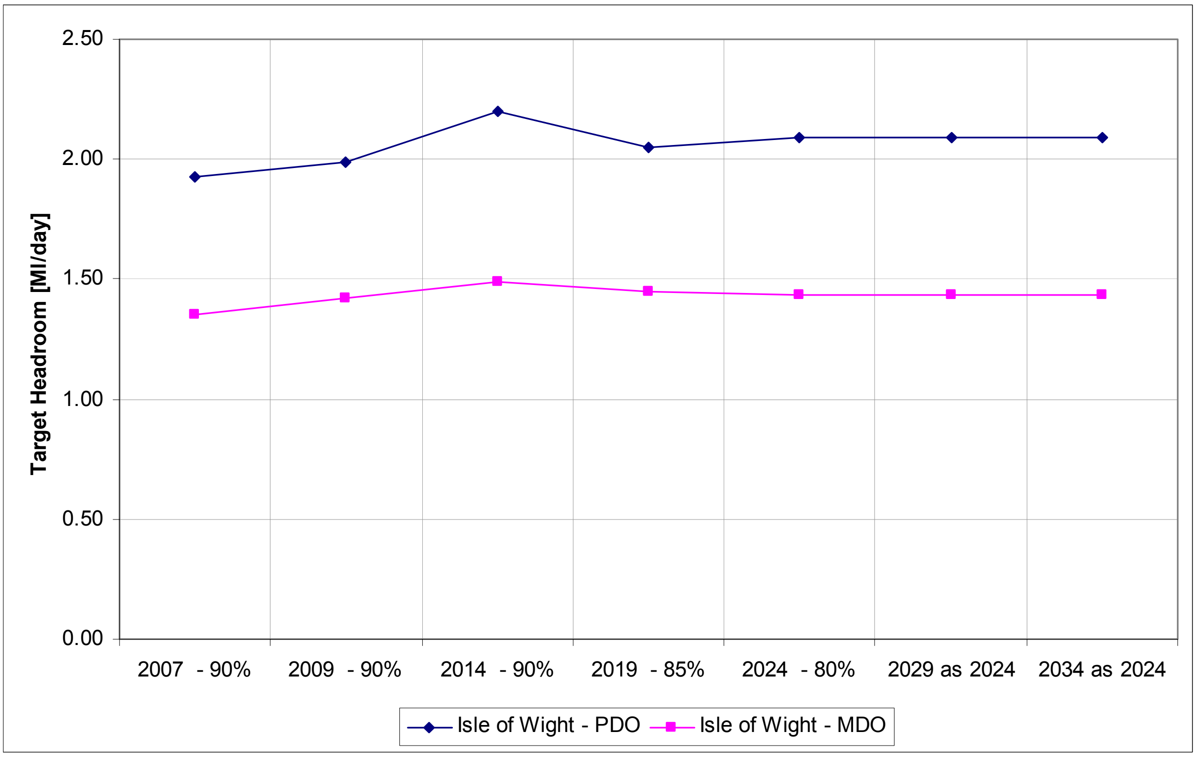
MDO Target Headroom (Ml/d)								
Area	**WRZ**	**2007**	**2009**	**2014**	**2019**	**2024**	**2029**	**2034**
Western	IoW	1.35	1.42	1.49	1.45	1.43	1.43	1.43
	HS	8.52	8.43	8.93	7.73	7.71	7.71	7.71
	HK	0.29	0.29	0.29	0.29	0.27	0.27	0.27
	HA	0.94	0.97	1.00	0.95	0.94	0.94	0.94
Central	SN	2.85	2.92	3.00	2.91	2.84	2.84	2.84
	SW	2.85	2.76	2.95	2.63	2.47	2.47	2.47
	SB	4.41	4.27	4.47	4.06	3.84	3.84	3.84
Eastern	SH	1.57	1.56	1.61	1.37	1.26	1.26	1.26
	KM	5.82	5.83	5.90	5.46	5.47	5.47	5.47
	KT	2.50	2.41	2.53	2.32	2.39	2.39	2.39
Company Total		**31.11**	**30.85**	**32.17**	**29.15**	**28.63**	**28.63**	**28.63**

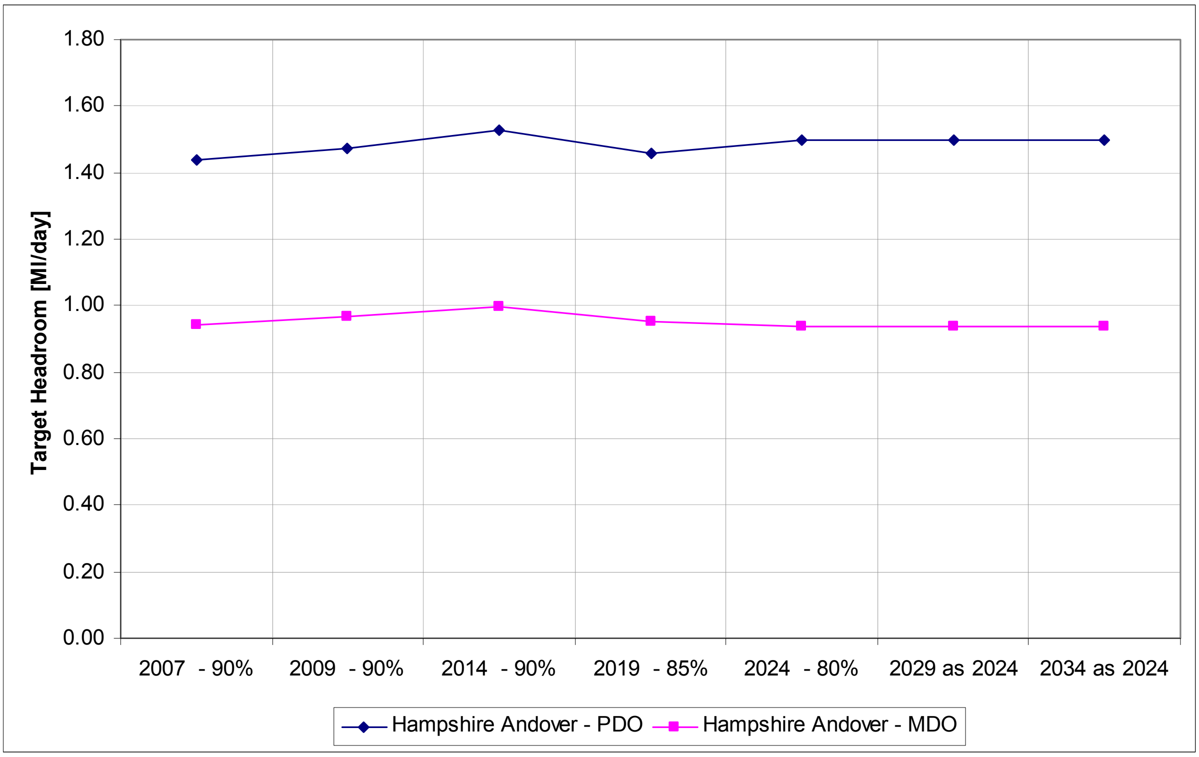
Table F.13 Proposed Target Headroom at MDO (Ml/d)

PDO Target Headroom (Ml/d)								
Area	**WRZ**	**2007**	**2009**	**2014**	**2019**	**2024**	**2029**	**2034**
Western	IoW	1.92	1.99	2.20	2.05	2.09	2.09	2.09
	HS	10.91	10.86	10.93	10.50	10.11	10.11	10.11
	HK	0.42	0.42	0.43	0.40	0.41	0.41	0.41
	HA	1.44	1.47	1.53	1.46	1.50	1.50	1.50
Central	SN	3.96	3.94	4.16	3.86	3.87	3.87	3.87
	SW	3.45	3.35	3.62	3.13	2.89	2.89	2.89
	SB	5.39	5.54	5.59	5.03	4.72	4.72	4.72
Eastern	SH	1.91	1.89	1.92	1.67	1.53	1.53	1.53
	KM	7.76	7.71	7.97	7.24	7.35	7.35	7.35
	KT	3.21	3.22	3.32	3.20	3.29	3.29	3.29
Company Total		**40.38**	**40.39**	**41.67**	**38.55**	**37.75**	**37.75**	**37.75**

Table F.14 Proposed Target Headroom at PDO (Ml/d)


12.00
10.00
8.00
6.00
4.00
2.00
0.00
Target Headroom [Ml/day]
2007 - 90%
2009 - 90%
2014 - 90%
2019 - 85%
2024 - 80%
2029 as 2024
2034 as 2024
Hampshire South - PDO
Hampshire South - MDO


2.50
2.00
1.50
1.00
0.50
0.00
Target Headroom [Ml/day]
2007 - 90%
2009 - 90%
2014 - 90%
2019 - 85%
2024 - 80%
2029 as 2024
2034 as 2024
Isle of Wight - PDO
Isle of Wight - MDO



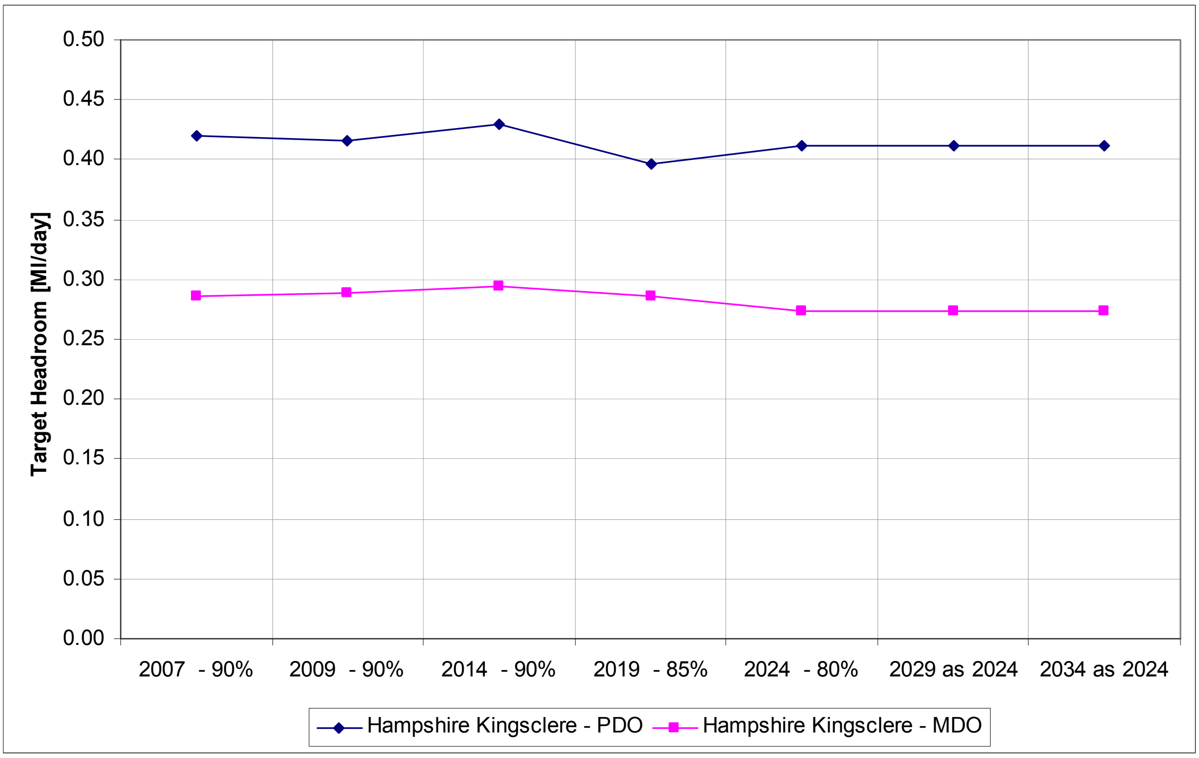
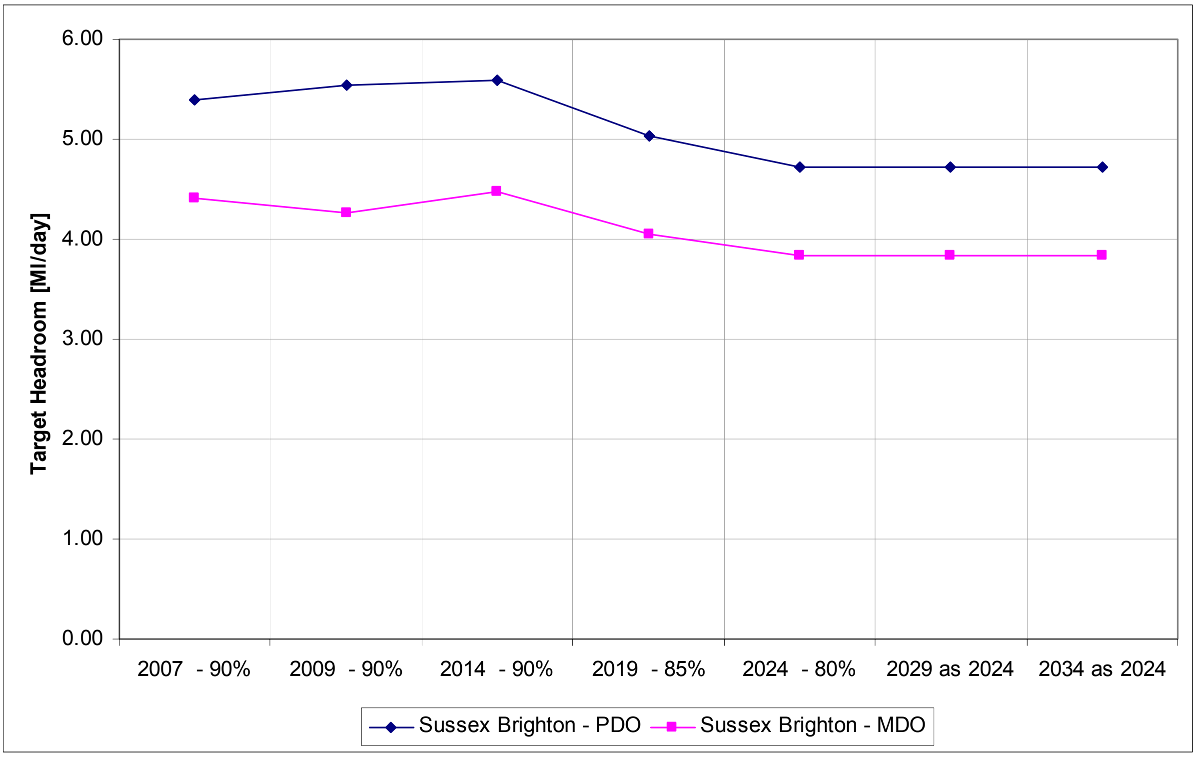
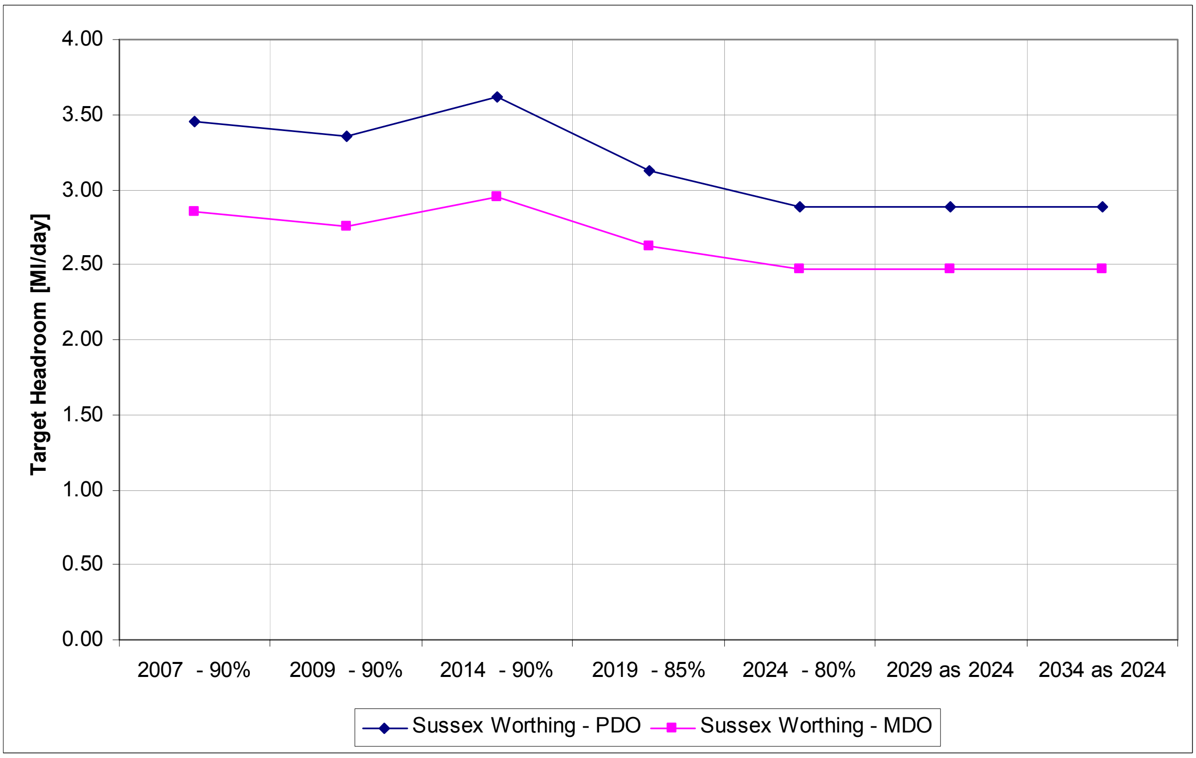


Figure F.1 Western Area – Proposed Target Headroom


6.00
5.00
4.00
3.00
2.00
1.00
0.00
Target Headroom [Ml/day]
2007 - 90%
2009 - 90%
2014 - 90%
2019 - 85%
2024 - 80%
2029 as 2024
2034 as 2024
Sussex Brighton - PDO
Sussex Brighton - MDO


4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Target Headroom [Ml/day]
2007 - 90%
2009 - 90%
2014 - 90%
2019 - 85%
2024 - 80%
2029 as 2024
2034 as 2024
Sussex Worthing - PDO
Sussex Worthing - MDO

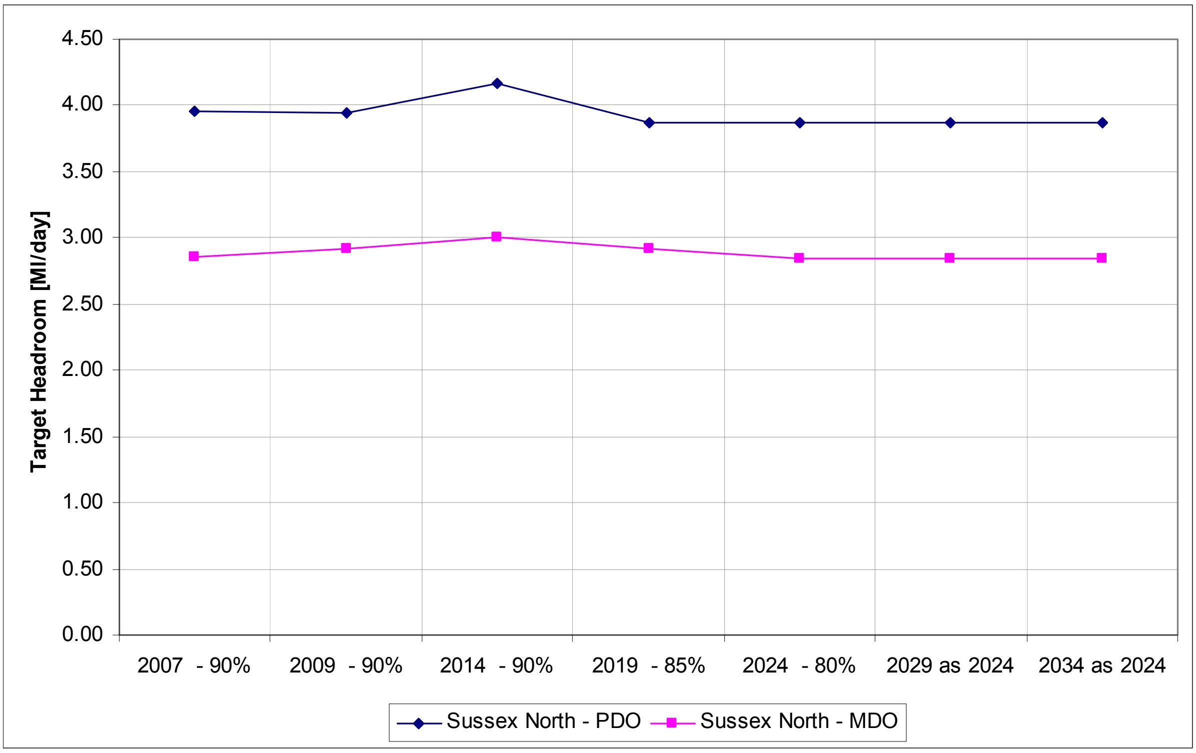
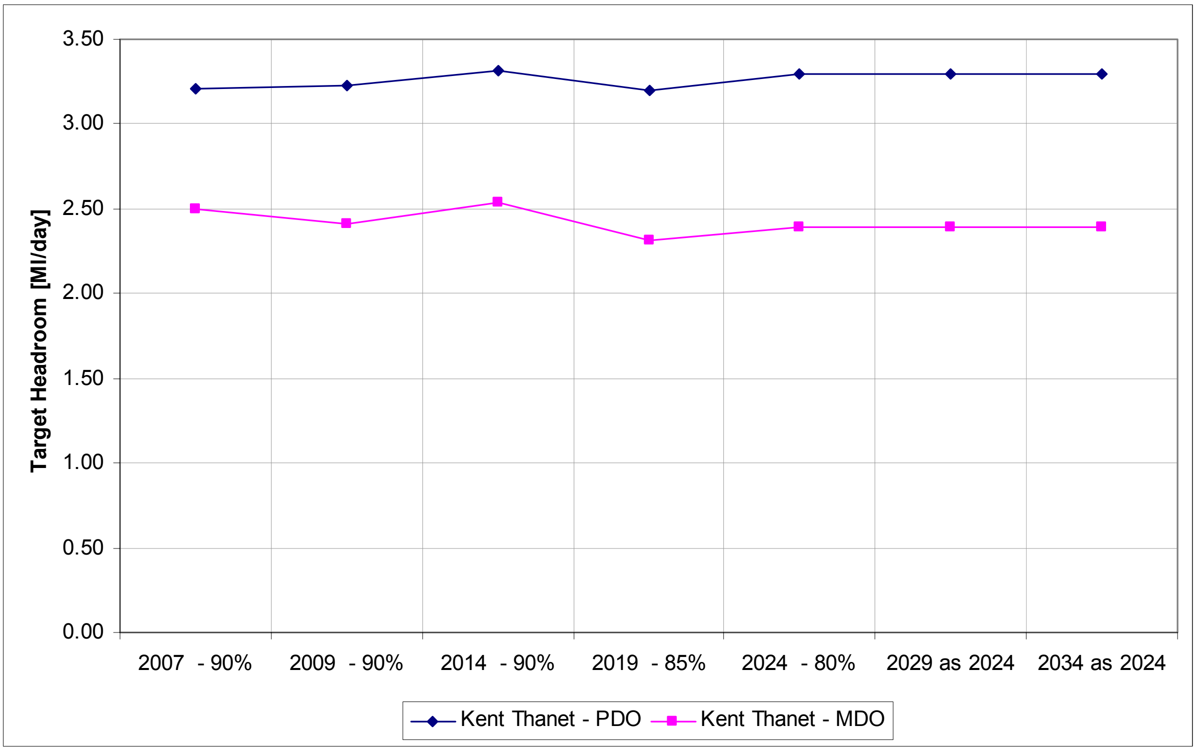
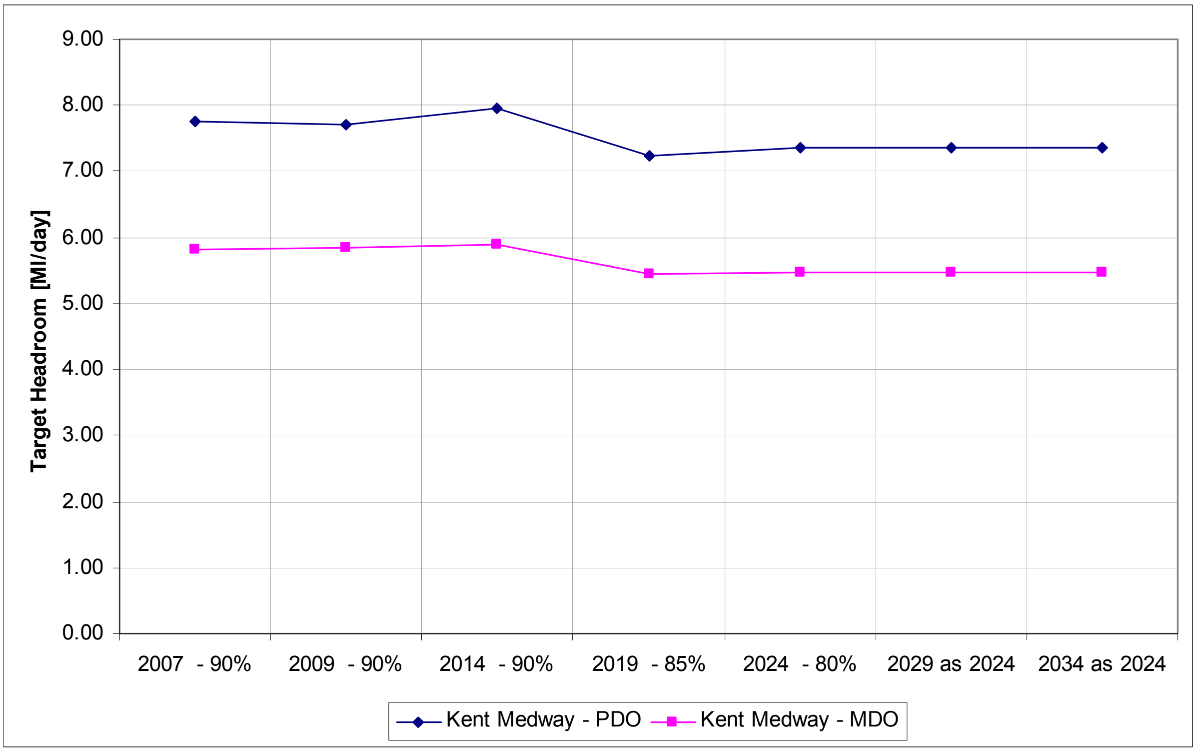


Figure F.2 Central Area – Proposed Target Headroom


Target Headroom [Ml/day]
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2007 - 90%
2009 - 90%
2014 - 90%
2019 - 85%
2024 - 80%
2029 as 2024
2034 as 2024
Kent Thanet - PDO
Kent Thanet - MDO


Target Headroom [Ml/day]
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
2007 - 90%
2009 - 90%
2014 - 90%
2019 - 85%
2024 - 80%
2029 as 2024
2034 as 2024
Kent Medway - PDO
Kent Medway - MDO

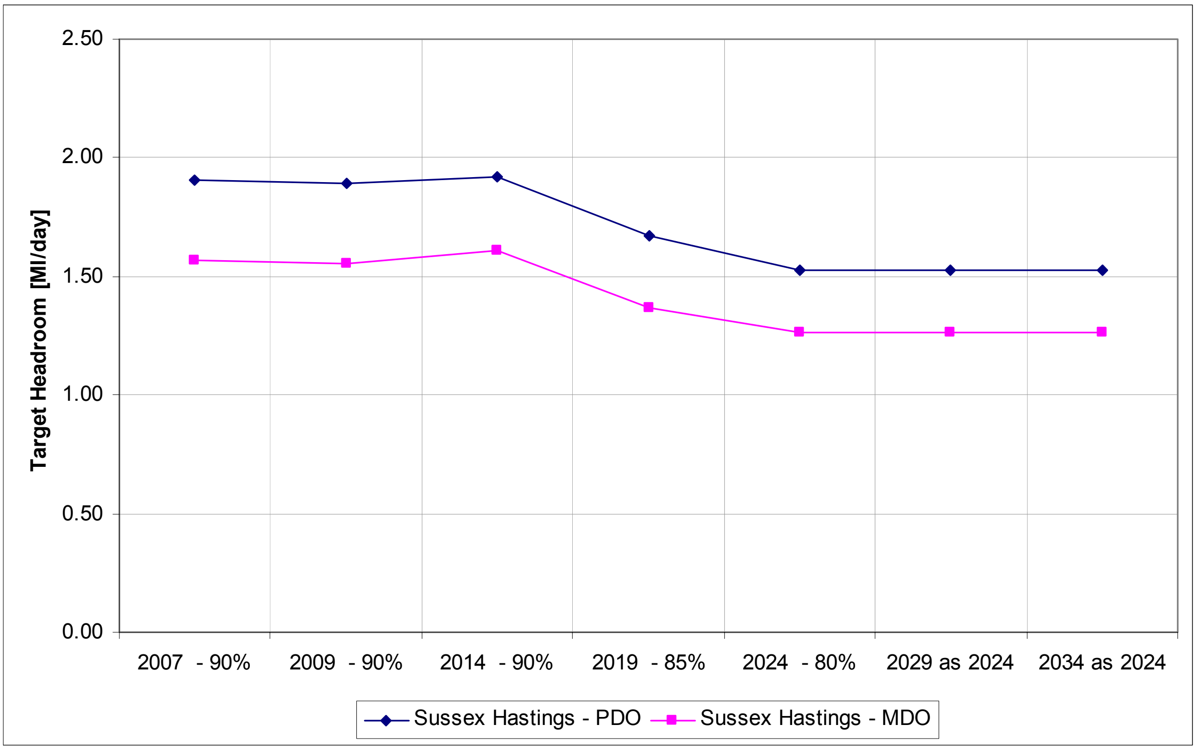


Figure F.3 Eastern Area – Proposed Target Headroom

The output from the Monte Carlo simulation has been reviewed to identify main sources of headroom uncertainty in each of the WRZs. Copies of Tornado Plots are given in Figures F.4 to F.13.

The values of demand side headroom have changed following the change to the demand forecast base year and revised assumptions on metering and the associated demand savings.

In all WRZs with the exception of Sussex Hastings WRZ, and under PDO and MDO conditions, the main source of headroom uncertainty is D2 – Uncertainty in the demand forecast. S8 – supply side uncertainty associated with climate change – begins to appear in Eastern Area from AMP8 onwards.

However as shown in section 10, the magnitude of target headroom is not the dominant driver of the options that make up the company's preferred investment strategy. The value of target headroom can however have an influence the timing of when schemes are required, but the variance should only be a few years.

The company will continue to work to improve the sources of information that it has available for analysis of uncertainties, and will continue to collaborate on industry-wide studies on climate change uncertainties.

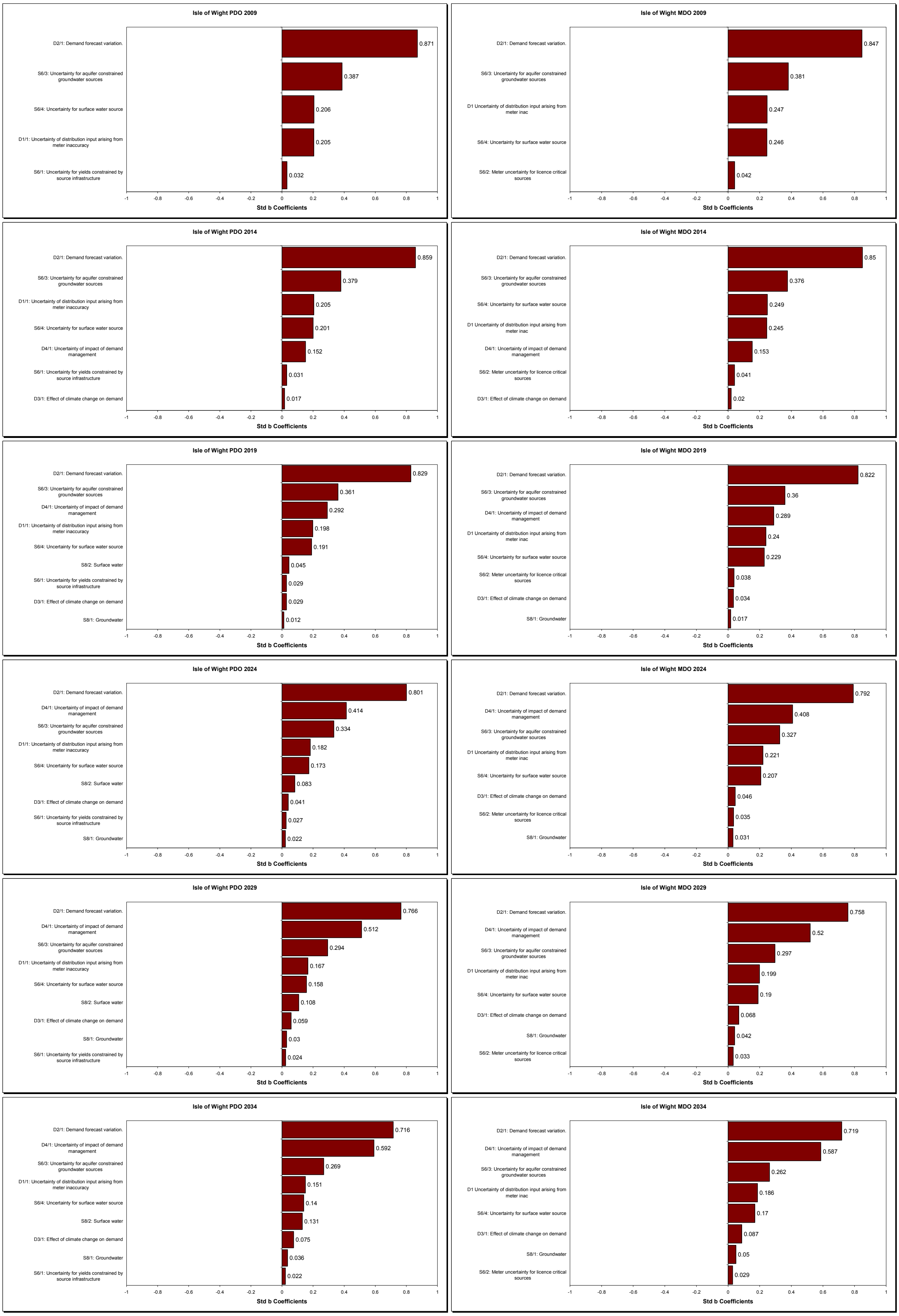


Figure F.4 Western Area – Isle of Wight; Headroom Uncertainty Tornado Plot

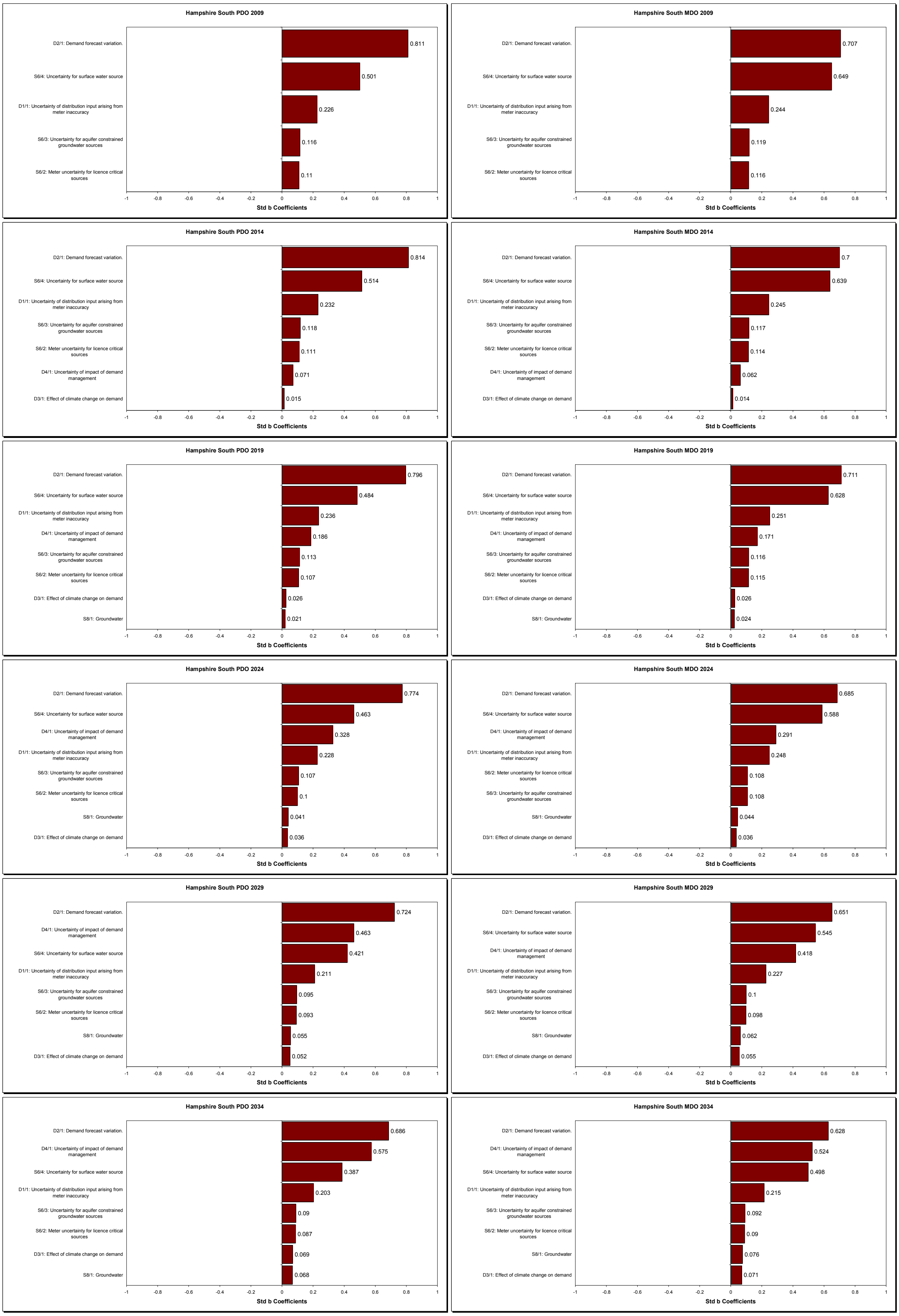


Figure F.5 Western Area – Hampshire South; Headroom Uncertainty Tornado Plot

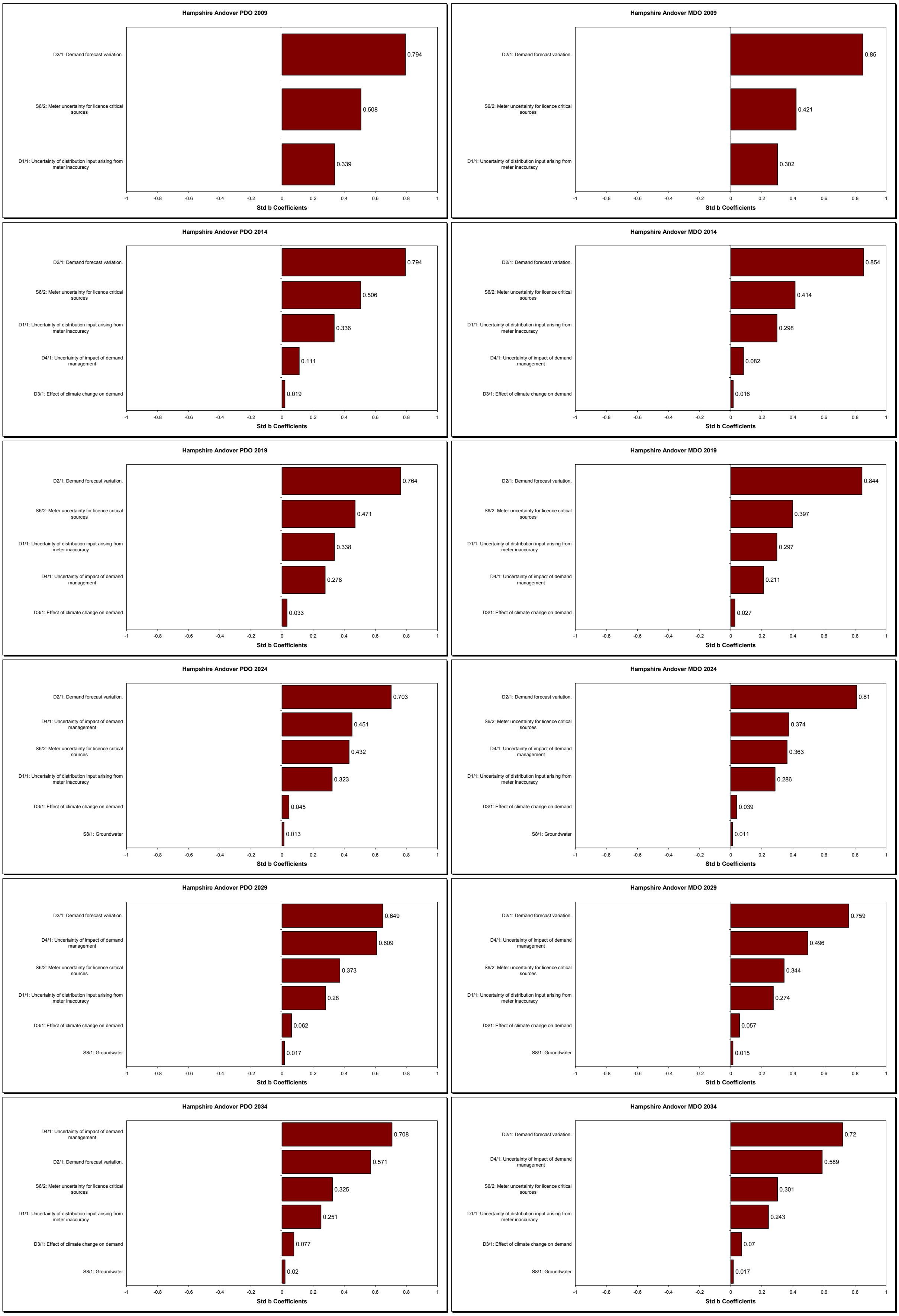


Figure F.6 Western Area – Hampshire Andover; Headroom Uncertainty Tornado Plot

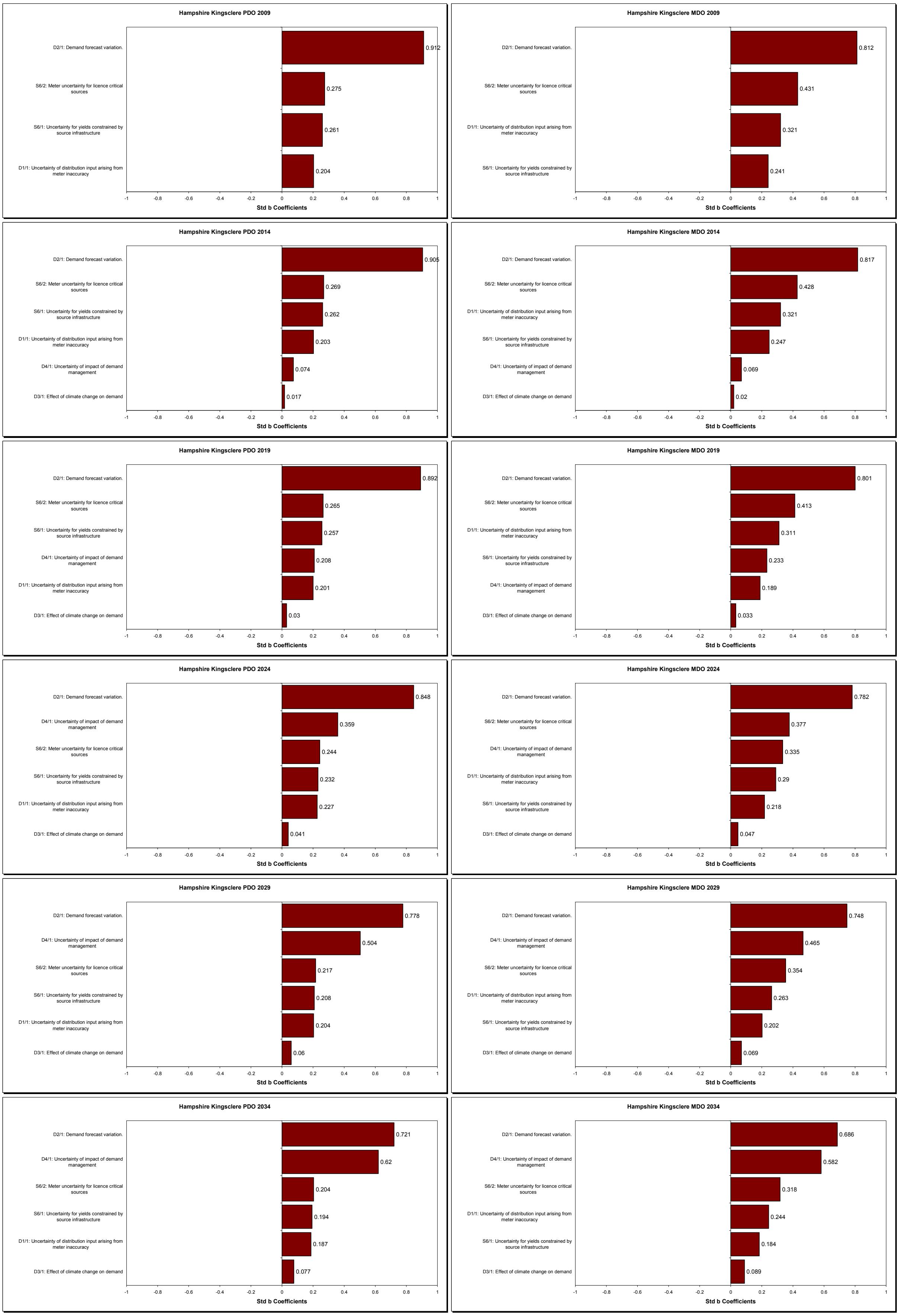


Figure F.7 Western Area – Hampshire Kingsclere; Headroom Uncertainty Tornado Plot

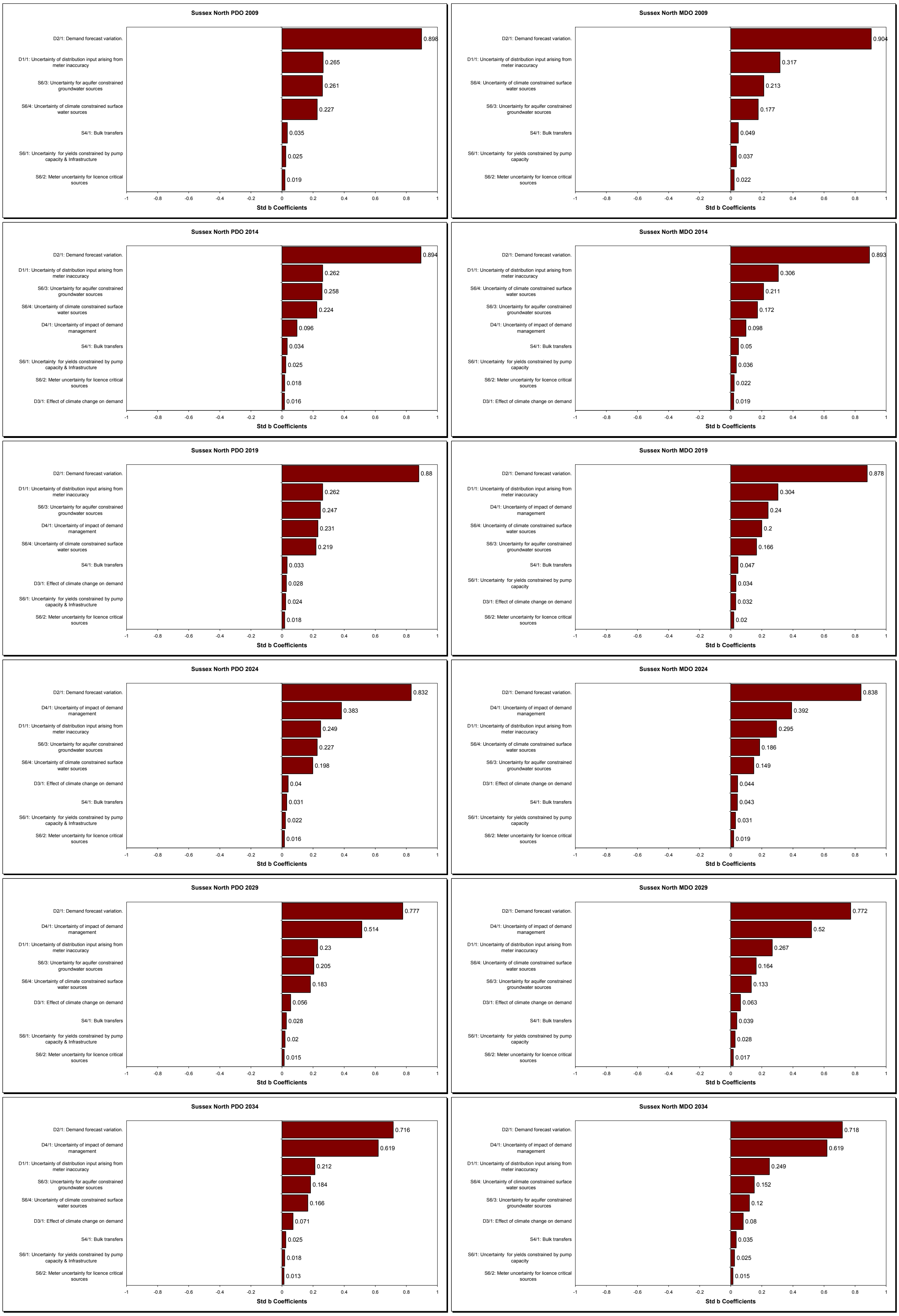


Figure F.8 Central Area – Sussex North; Headroom Uncertainty Tornado Plot

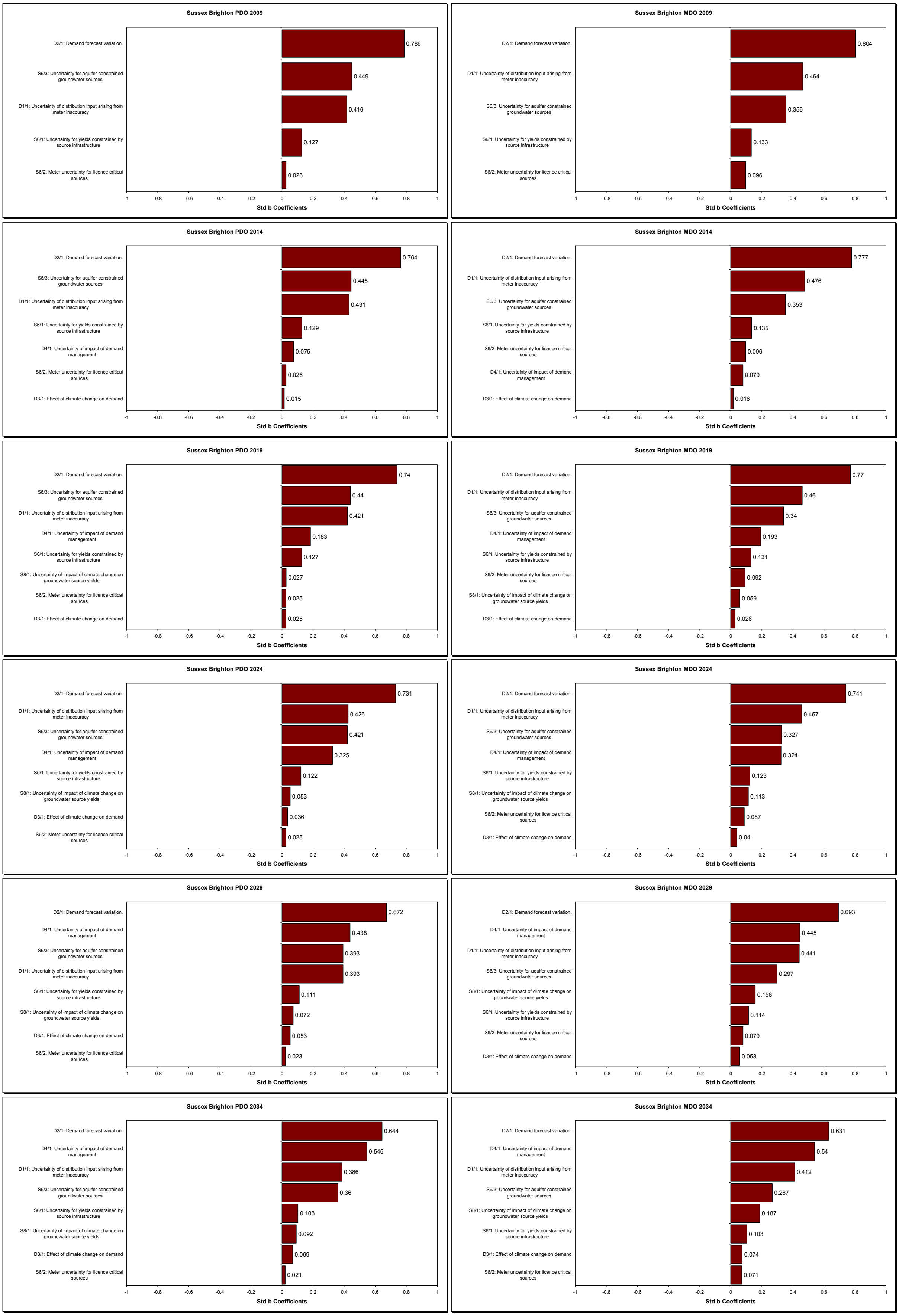


Figure F.9 Central Area – Sussex Brighton; Headroom Uncertainty Tornado Plot

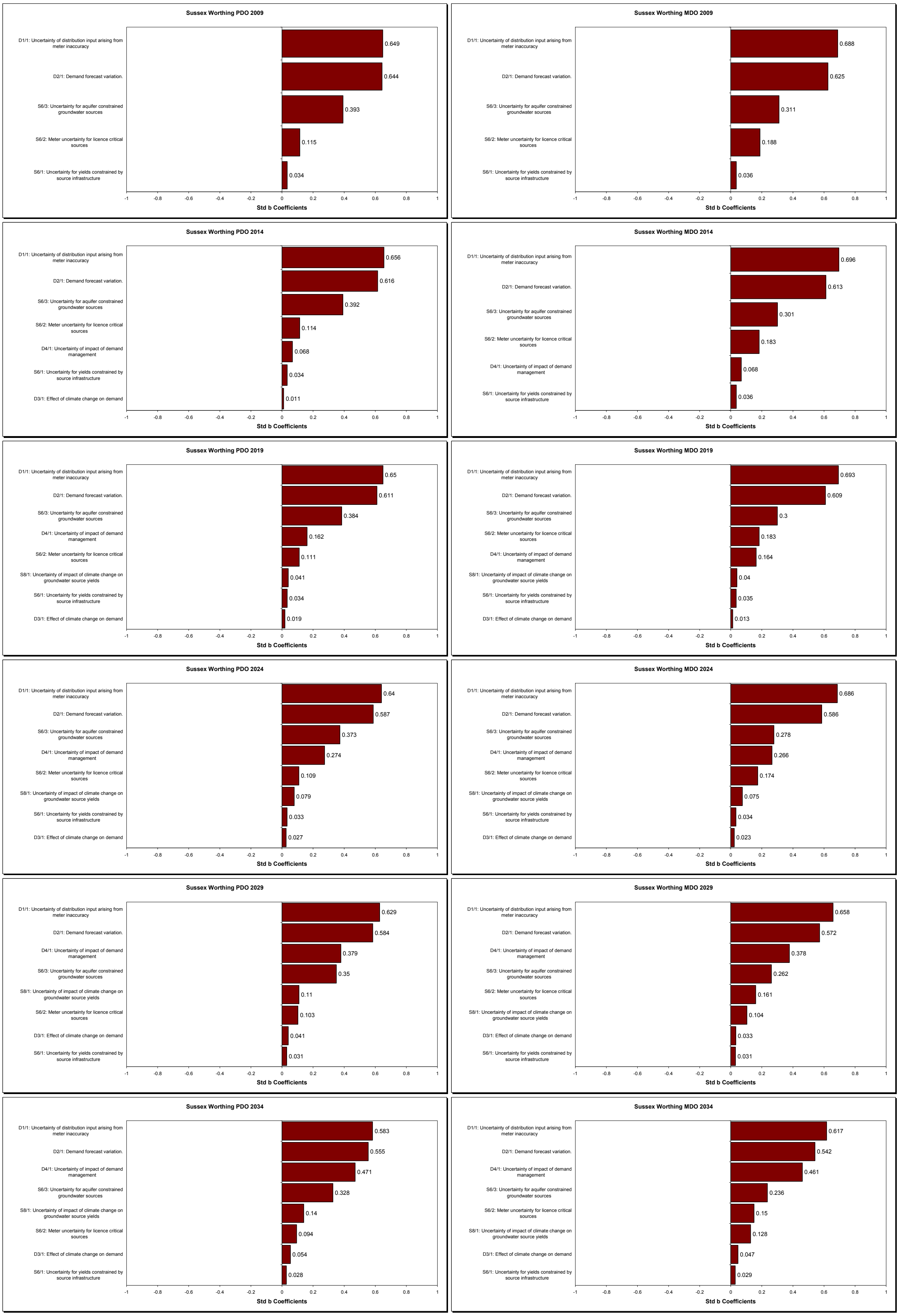


Figure F.10 Central Area – Sussex Worthing; Headroom Uncertainty Tornado Plot

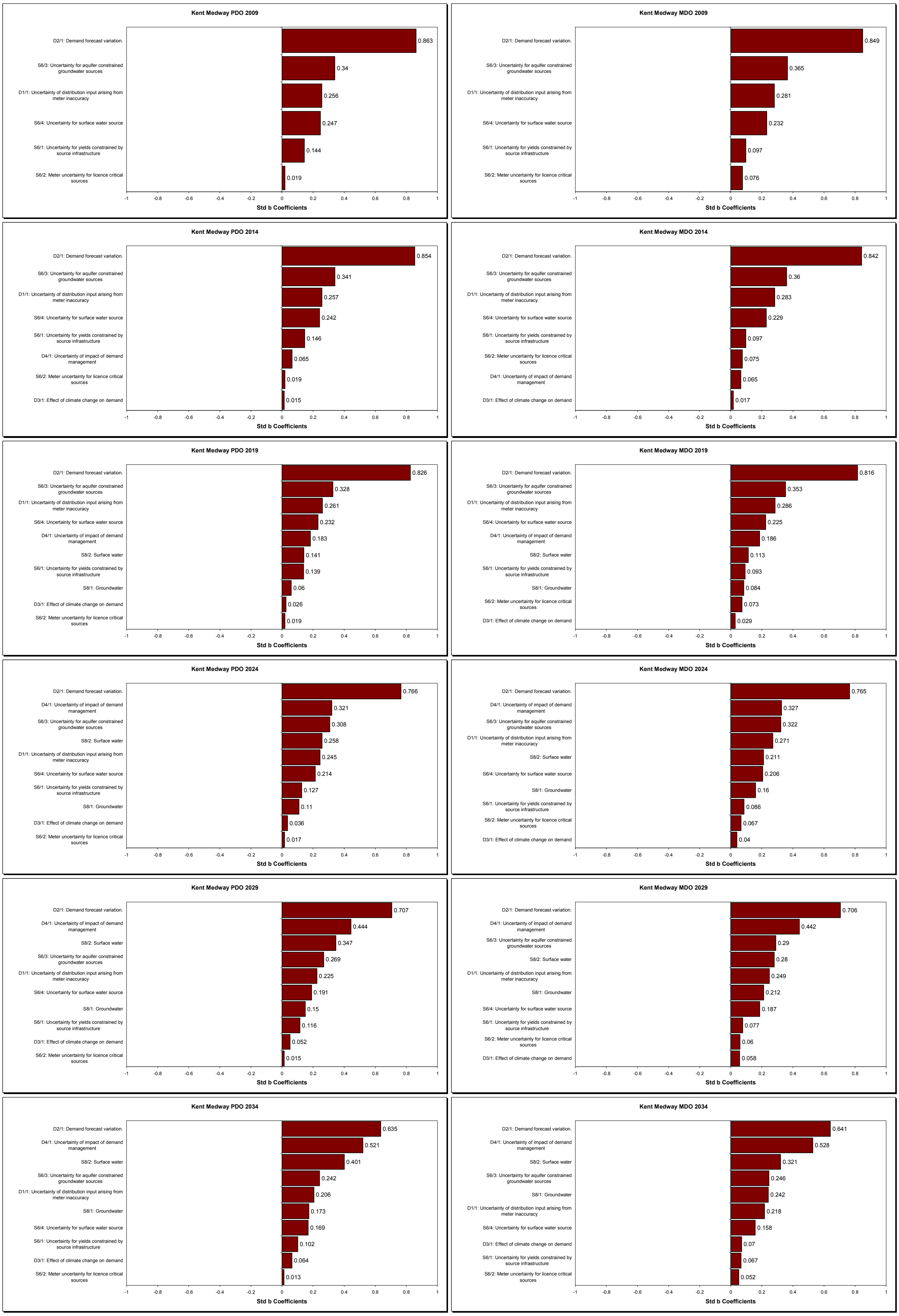


Figure F.11 Eastern Area – Kent Medway; Headroom Uncertainty Tornado Plot

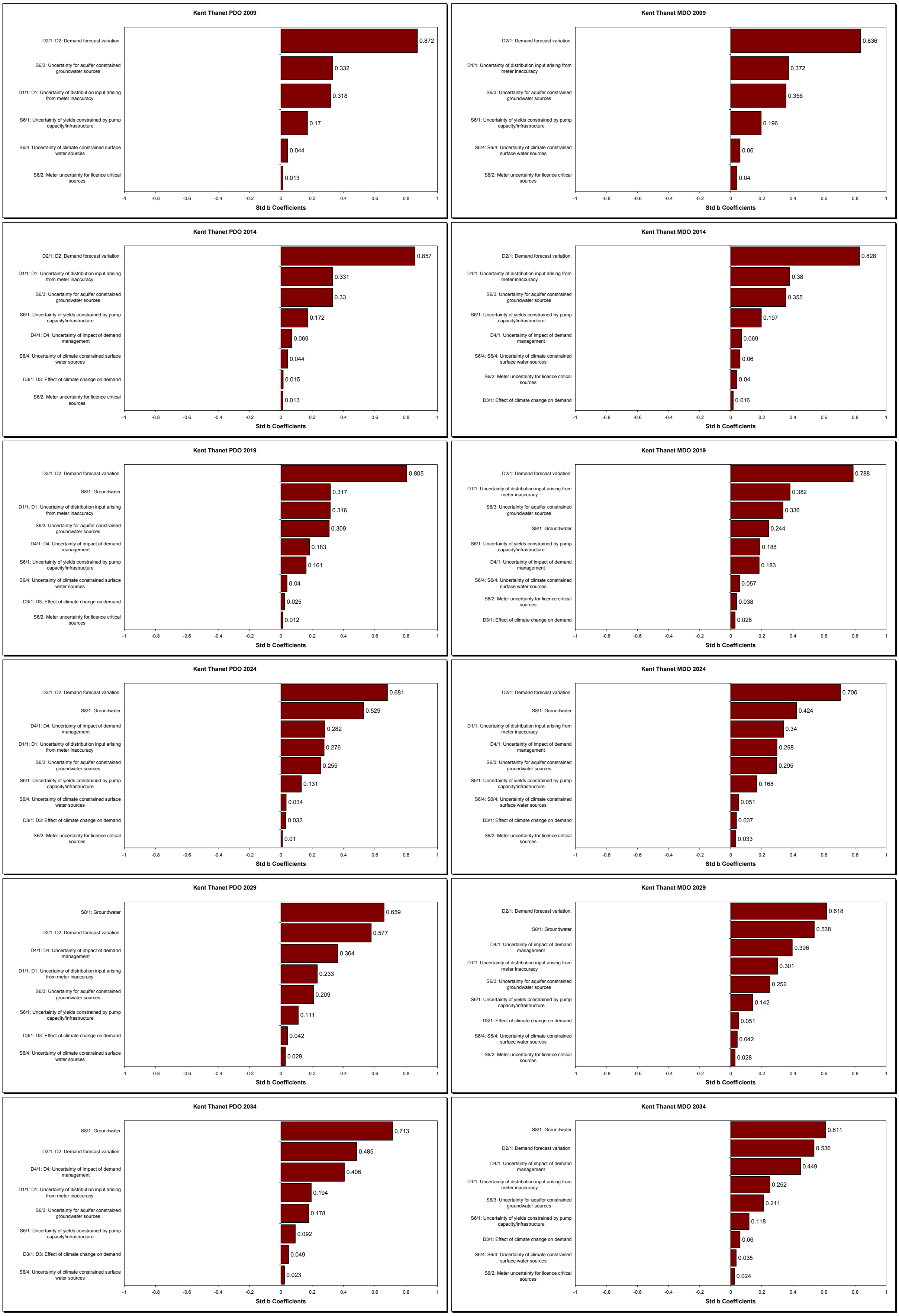


Figure F.12 Eastern Area – Kent Thanet; Headroom Uncertainty Tornado Plot

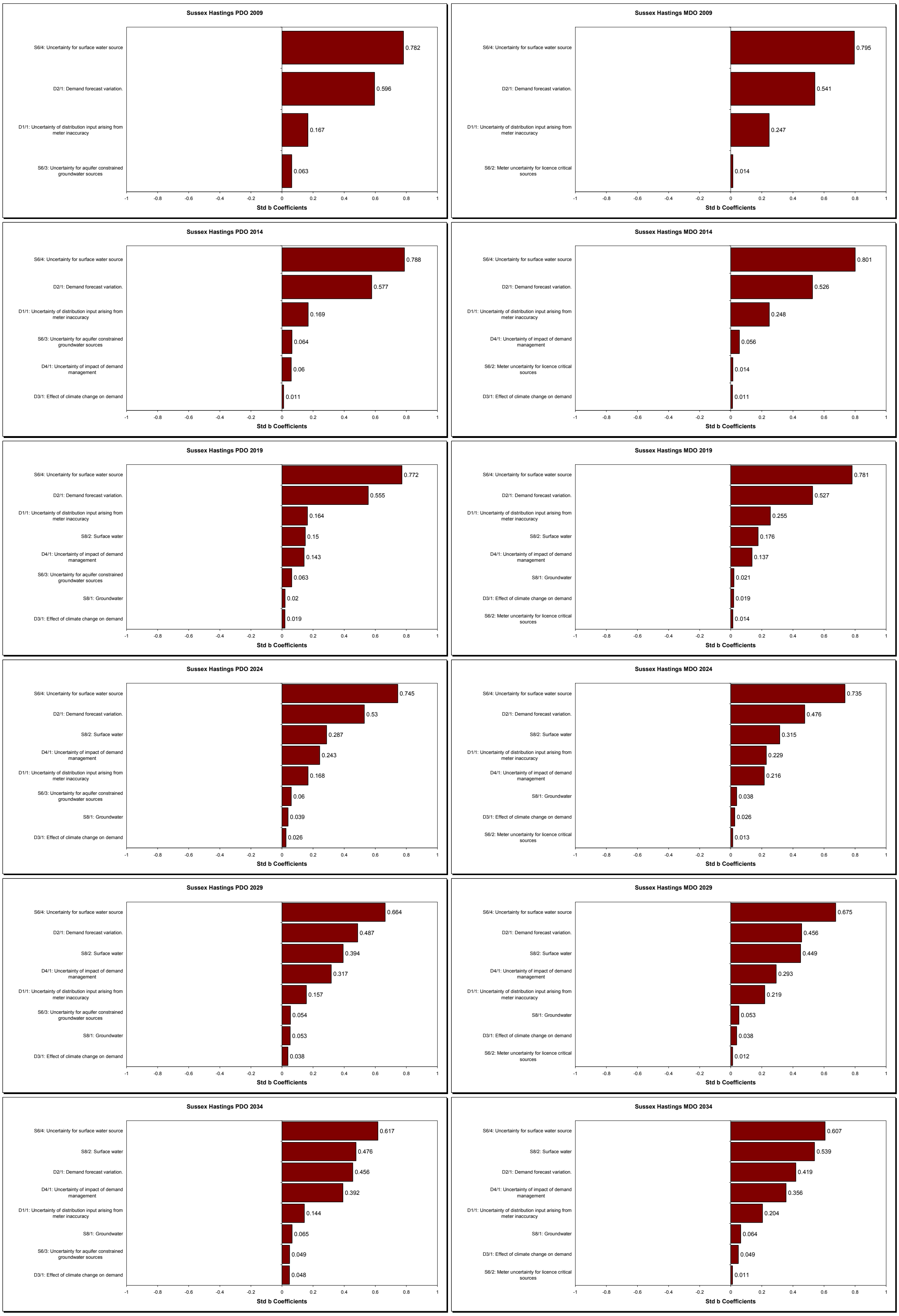


Figure F.13 Eastern Area – Sussex Hastings; Headroom Uncertainty Tornado Plot

F.1.5 References

UKWIR, (2002), *An Improved Methodology for Assessing Headroom. Report 02/WR/13/2*

Appendix G: Options Appraisal

G.1 Introduction

This Appendix describes the options appraisal process that was adopted to determine the “feasible” schemes that were subsequently included for possible selection in the investment model.

The water resources options appraisal process was very much enabled and informed by the work undertaken as part of the AMP4 Water Resources Investigations, which included all the sub-regional areas within Southern Water’s supply area. Demand management options appraisals were based on an assessment of water efficiency options conducted to meet the Base Service Water Efficiency (BSWE) target and to identify options to derive the Sustainable Economic Level of Water Efficiency (SELWE). Leakage control options were developed from a review of the Sustainable Economic Level of Leakage (SELL) in December 2008.

The options appraisal process has followed the Economics of Balancing Supply and Demand (ESBD) approach, which was recommended in the Environment Agency Water Resource Planning Guideline. A full list of the “unconstrained” and “feasible” water resource development options are given in section G.4. Demand management options, comprising water efficiency and leakage control, are discussed further in the section below.

G.2 Demand Management Options

Initially, an unconstrained list of potential demand management options was identified, based on previous work conducted as part of Phase 1 of the AMP4 Water Resources Investigations, and from a full literature review of the current issues, costs and potential benefits associated with possible demand management options. These options were reviewed, and those that were clearly not applicable were disregarded.

Options which were considered relevant were then assessed in greater detail and subjected (where possible) to an economic feasibility appraisal, and an assessment of their potential to reduce any supply/demand deficit.

The investment model has been used to optimise the selection of demand management schemes, where demand management is divided into two categories: additional leakage control and water efficiency measures. Different metering scenarios have been used to derive different supply demand balance lines, but have not been included directly in the investment model. This is discussed in greater detail in Appendix H.

An SEA was also conducted on the draft WRMP, and an Environmental Report was produced, which went out to consultation at the time of the draft WRMP. The SEA report included an appraisal of the demand management options and concluded that the final WRMP proposals, with regard to domestic meter penetration, leakage reduction and water efficiency, constitute best practice and are strongly compatible with the SEA objectives.

G.2.1 Metering Options

Selection of metering policy was included within the investment model. As such, the approach used in this assessment was to develop a number of scenarios involving a range of possible metering options:

- **Optant metering policy** – assumes optants, selectives (high water users), and new properties would be metered throughout the company supply area. Under this scenario the existing policy of change of occupier metering in the Sussex WRZs would cease at the end of AMP4.

Under this policy, it is anticipated that the number of optant households will increase over the period 2010-11 to 2034-35 by 471,000. The number of selective (high water user) is expected to increase by 4,000;

- **Change of occupier metering (universal)** – extends the existing policy of metering on change of occupancy throughout the Sussex WRZs to all other WRZs. This would be in addition to the baseline policy for optant, selective, and new property metering

  Under this policy, it is anticipated that the number of change of occupier households will increase over the period 2010-11 to 2034-35 by 246,000, while the number of optants will increase by 285,000 over the same period, and selectives (high water users) by 2,000; and

- **Universal metering in AMP5** – assumes all properties in all WRZs will be metered in the period 2010-15. All new properties would continue to be metered. It is assumed that this policy would also produce associated benefits due to reduced supply pipe losses.

  Under this policy, it is anticipated that the number of universally metered households will increase over the period 2010-11 to 2034-35 by 523,000, while the number of meters installed under the optants and selective (high water users) meter programme will increase by 33,000 over the same period. Optant and selective metering will only occur ahead of the commencement of the universal metering programme in each WRZ.

The metering scenarios are discussed in depth in Appendix H. Water efficiency and leakage reduction options were made available to satisfy the supply demand balance of these scenarios during the investment modelling phase (see below).

Mott MacDonald were commissioned to investigate the costs and savings associated with the different metering policies. Universal metering costs were based on a policy of installing meters over a 5 year period in AMP5 only. It was assumed that meters would be externally located wherever practicable, which has a number of benefits, the main one of which is that this allows customers to more easily identify whether there is a leak on their supply pipe.

The universal metering scenario also included allowances for the benefits of reduced supply pipe leaks and the costs to the company associated with repairing those leaks. The net present value cost was calculated over a 25 year period, and so included the cost of replacing meters at the end of their life (assumed to be 15 years). It was also assumed under the universal metering scenario that smart meters would be installed, whereas for the other metering scenarios it was assumed that conventional meters would be installed.

The SEA recommended that metering was broadly compatible with the majority of SEA objectives due to the minimal amount of physical intervention required to implement. It was identified that metering has the potential for disturbance to local communities in the short term during their installation, but this negative effect is considered non-significant and outweighed by the overall environmental benefits. The company proposes installing external meters which should minimise disruption to households, and implementing the installation programme simultaneously over a large area will help minimise any disturbance to communities.

G.2.2 Tariff Options

Variable tariffs are widely considered to be a useful mechanism for encouraging more efficient water use, particularly at peak times. However, the success of varying tariff structures is likely to be dependent on the level of meter penetration, so might not be applicable until late in the planning period if the metering policy selected does not reach high meter penetration rates rapidly. However, it may be a feasible option to consider if meter penetration is accelerated due to universal metering.

With the current meter technology, the principle tariff structure that could be used would be a rising block tariff. These are designed to reduce customer's demand by charging relatively more for higher rates of consumption. They tend to have a higher standing charge allowing consumers a "free" block of water. Consumption above this block is then charged at a higher than standard volumetric rate. However, the benefits of a rising block tariff are not clear and may actually be small.

It is likely that a seasonal tariff (i.e. charging customers at higher rates for consumption during June, July and August) would have a greater impact on reducing demand. Such tariff structures can be designed to have a neutral impact on the average customer's bill. However, the use of this tariff structure would require smart meters in all metered properties. Even if it were assumed that smart meters were installed as part of a universal metering programme, the existing meter stock would also need to be converted to smart meters prior to allowing the tariffs to be introduced. It is generally assumed that conventional meters need replacing approximately once every 10-15 years, and so a seasonal tariff structure might not be feasible before 2025.

Current research, based on the findings of an evidence-based analysis undertaken to estimate the additional effect of implementing tariffs on metered household demand, suggested the following, although it should be noted that they involve a high degree of uncertainty:

- Rising block tariffs were found to provide an additional 5% reduction in annual average demand on top of the 10 % reduction that metering alone is assumed to provide; and
- The additional impact of seasonal tariffs in addition to metering is assumed to be 5% at annual average and from 7.5% to 10% at peak period.

On completion of the universal metering programme, the development of appropriate tariffs could lead to further reductions in demand of 5% at annual and 10% at peak, over and above the effect of metering alone[1]. However, because of the significant uncertainties associated with tariff options, Southern Water proposes a trial of different tariff structures during AMP5 to increase confidence in estimating the potential savings from tariff options and their impact on customers.

G.2.3 Water Efficiency

G.2.3.1 Ofwat Targets

Ofwat published their final proposals regarding water efficiency targets in November 2008[2]. These targets aim to build on water companies' existing duty to promote the efficient use of water to their customers and aim to ensure companies play their part in helping to meet the Government's aspirational target of reducing individual water usage to 130 litres per person per day from the current level of around 150 litres[3].

Each company has been set a minimum equivalent base service target in relation to the number of properties it serves, and within this:

- A minimum target for water saved through approved water efficiency activity in megalitres per day;
- A requirement to provide information to consumers on how to use water more wisely; and
- A requirement to take an active part in improving the evidence base for water efficiency.

Ofwat proposes that each company should have an annual base service target saving of one litre of water per billed property per day through approved water efficiency activity. Converted into megalitres per day, Southern Water's company specific target is 1.01 Ml/d.

The target is to be met through both household and non-household activity, and is initially to be in place for five years from 2010-11 to 2014-15[4].

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[1] Herrington (2007), Waste not, want not? Water tariffs for sustainability. Report to WWF-UK.
[2] Ofwat, *Future Water Efficiency Targets,* Nov 2008
[3] Defra, *Future Water: The Government's water strategy for England*, 2008
[4] Ofwat, *Future Water Efficiency Targets,* Nov 2008

The second element of the Ofwat target is the Sustainable Economic Level of Water Efficiency (SELWE), by which companies are expected to propose additional water efficiency activity, above the base service water efficiency (BSWE) target[5]. This is to form part of a sustainable, economic approach to balancing supply and demand over the full planning period.

From the SEA perspective, water efficiency measures were recommended as the preferred demand management measure, as no potential conflicts with the SEA objectives were found.

G.2.3.2 Water Efficiency Options Assessment

A review of potential water efficiency options was carried out to derive an unconstrained list of feasible options from the latest literature available, including that from Ofwat and Waterwise. The options considered are presented below, under household and non-household categories.

Household Options

A range of options, currently available in the market and approved by the industry, were individually assessed for their potential to reduce household demand. The appraisal was based on retrofitting existing properties to encourage water savings in daily domestic use. The following options were considered:

WCs
- Retro-fit dual flush mechanisms;
- Low dual flush toilets (4/2 litre) (subsidy scheme); and
- Cistern displacement devices (CDD).

Domestic Taps
- Low flow taps; and
- Tap inserts.

Showers
- Low flow shower heads; and
- Shower timers.

Other
- Low use washing machines (subsidy scheme);
- Low use dishwasher (subsidy scheme);
- Household water audits (HHA); and
- Household water efficiency kit.

External devices
- Trigger hoses;
- Water butts;
- Grey water reuse; and
- Composters.

Household Water Efficiency Kit

The household water efficiency kit contains a selection of devices from the above list which are grouped together in order to reduce marketing overheads, raise awareness, maximise savings, and potentially link with a metering programme.

Two water efficiency kit schemes were assessed:
- Household water efficiency kit with manned household audit; containing CDDs, tap inserts, low flow shower heads, shower timers, tea towel, booklet containing advice on water efficiency, and involving a manned audit to distribute devices as requested by the customer; and

[5] ibid

- Standard kit for distribution upon customer request; containing CDD, tap insert, shower timer, tea towel and booklet, and involving a basic self audit.

Subsidy Schemes

The proposed schemes for low dual flush valve WCs, washing machines and dishwashers, consist of a subsidy to households to act as an incentive to install water efficient appliances upon replacement. The amount of subsidy was estimated based on the typical difference in cost between a standard appliance and a water efficient one.

Non-Household Options

A number of non-household schemes considered as part of a water efficiency strategy were assessed in terms of potential costs and water savings benefits, in the context of Ofwat good practice consumption recommendations[6]. These included:

- Commercial water audits (CWA);
- Schools and universities (low dual flush WC replacement);
- Promotion of water efficiency in conjunction with hospitals; and
- Promotion of water efficiency in conjunction with public buildings and council-owned leisure centres.

The last two options involved co-ordination of water efficiency promotion activity with public bodies that have an obligation under the Water Act 2003 to promote water efficiency.

Feasibility Assessment

All options were assessed in terms of their estimated costs and water savings, and any practical considerations in their implementation were identified. A number of options were concluded to be unviable for implementation in the context of the company's water efficiency strategy. For instance, grey water recycling was excluded due to its very low cost effectiveness.

In line with current best practice, the deterioration in the effectiveness of each water efficiency measure over time, due to various reasons such as breakdown, lack of maintenance, and removal or replacement, was modelled using a time varying yield curve assumption, based on exponential decay and dependent on the asset life of each measure[7].

The uptake rate was estimated as the proportion of properties that would be expected to implement a water efficiency measure, taking into account suitability of properties for installation and consumer behavioural assumptions.

Costs were based on current retail price, minus an assumed average bulk discount rate of 20%. Administration charges and marketing campaign overheads were also applied as a flat rate to all properties to account for staffed organisation and raising awareness of the scheme among customers. Economies of scale apply to marketing costs as well as to the bulk purchase of devices. The potential for further combination of marketing initiatives on the back of other demand management schemes and between efficiency schemes was also identified.

The total operational benefit from the assumed volume of water saved by a given water efficiency scheme was estimated using the company level cost of water[8]. The environmental benefits associated with reduced demand for water were also estimated and taken into account[9], as well as the carbon benefits from reduced need for heating water in the household[10].

[6] Ofwat (2007), *Water Efficiency Initiatives - Good Practice Register*
[7] Waterwise (2008), *Evidence base for large-scale water efficiency in homes*
[8] WRc (2008), *Economic Level of Leakage Analysis*
[9] Atkins (2004), *Environmental Costs and Benefits for the PR04 Water Resource Plan*
[10] EA (2008), *Greenhouse gas emissions of water supply and demand management options.*

The Average Incremental Social Cost (AISC) was calculated for each of the feasible options by dividing the net present value of scheme's financial, environmental and social costs by its discounted contribution to reducing demand. The discount rate used was 3.5%, in line with Ofwat guidance.

Water Efficiency Options Assessment Results

The schemes were ranked by their AISC to indicate their cost effectiveness. The results are presented in Table G.1. While all options were assessed separately, some would be most effective when considered and implemented as part of a Household Water Efficiency Kit; these options have been shaded grey in the table.

Scheme	AISC (p/m^3)	Water Saving from Device (l/prop/d)	Average Water Saving at Company Level (Ml/d)
Cistern Displacement Device (CDD)	35	12.0	3.5
Water Efficiency Kit [Box]	83	16.8	3.3
Schools - Install Low Flow Dual Flush WC	113	555.0	0.4
Water Efficiency Kit [Manned HHA Audit]	146	40.4	2.0
Install Low Dual Flush (4/2) (subsidy)	159	31.0	0.6
Commercial Water Audit (CWA)	171	60.0	0.4
Tap Inserts (Based on TapMagic)	234	9.3	0.4
Low Flow Taps	297	18.5	0.7
Retro-fit Dual Flush	321	13.1	1.3
Shower Timer	346	4.2	0.3
Low Flow Shower Heads	451	14.1	0.2
Water Butts	531	2.2	0.3
Trigger Hoses	536	1.3	0.4
Low Use Washing Machine (subsidy)	814	7.4	0.2
Household Audit (HHA)	2433	1.0	0.1
Low Use Dishwasher (subsidy)	6763	1.2	0.0

Table G.1 Summary of Water Efficiency Schemes at Company Level, Ranked by AISC

The results of this analysis informed the least cost strategy to achieve Ofwat's baseline water efficiency target. Feasible options not included in the baseline strategy were considered in the investment model alongside other supply and demand side options as part of the 'twin track' approach to determine the least-cost strategy for this WRMP. The investment modelling methodology also allows for options selected in the baseline to be reselected towards the end of the planning period if required under a least-cost strategy.

G.2.3.3 Baseline Water Efficiency Strategy

Based on the AISC ranking of schemes from Table G.1, the baseline water efficiency strategy was derived by prioritising the most economic options until the targets for each year were met. Table G.2. and Figure G.1 show the schemes selected and their relative contributions toward the water efficiency target.

Scheme	AMP5				
	2010	2011	2012	2013	2014
Water Efficiency Kit (Box)	0.65	0.65	0.65	0.65	0.65
Schools – Install Low Flow Dual Flush	0.40	0.00	0.00	0.00	0.00
Commercial Water Audit (CWA)	0.00	0.37	0.00	0.00	0.00
Install Low Flow Dual Flush (4/2) (subsidy)	0.00	0.00	0.60	0.06	0.06
Low Flow Taps	0.00	0.00	0.00	0.36	0.36
Total Water Saving (Ml/d)	**1.05**	**1.02**	**1.25**	**1.07**	**1.07**

Table G.2. Baseline Water Efficiency Strategy Components

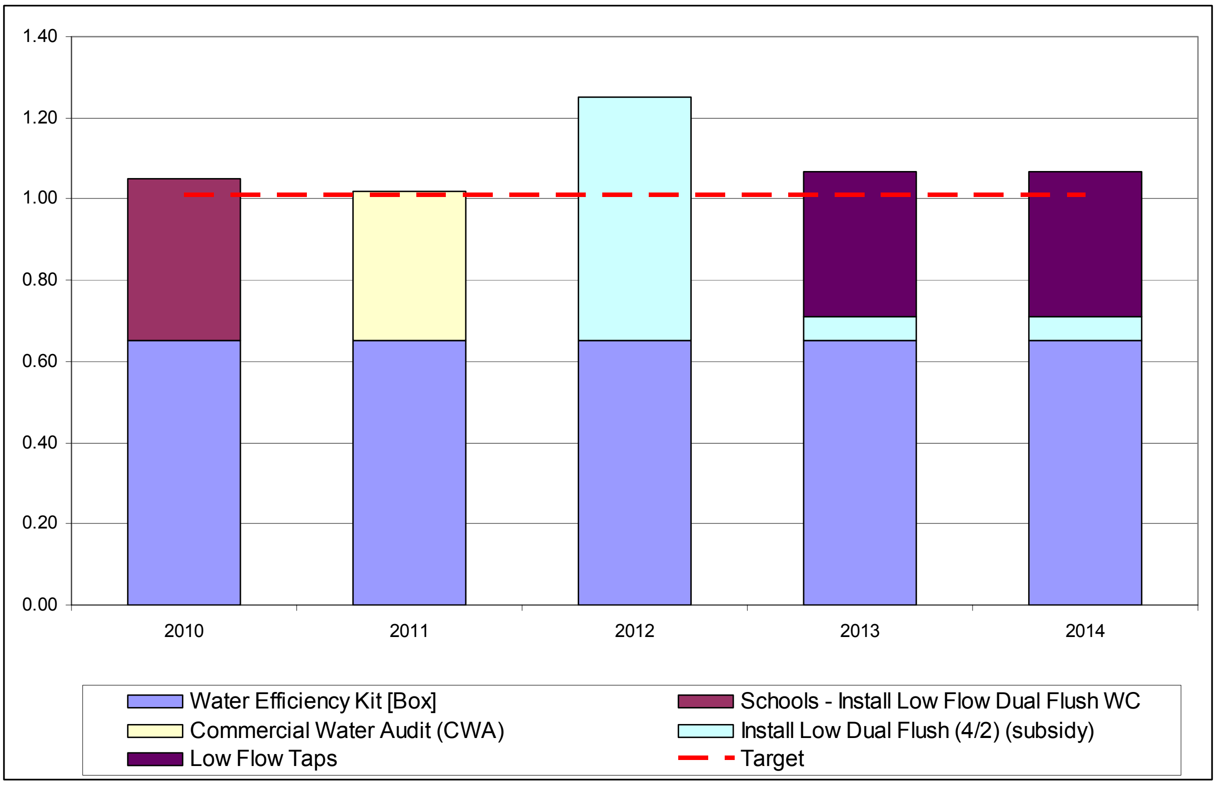

Figure G.1 Baseline Water Efficiency Strategy Components

G.2.3.4 Water Efficiency Options in the Investment Model

In order to ensure that the Sustainable Economic Level of Water Efficiency (SELWE) is taken into account in this WRMP as part of a sustainable, economic approach to balancing supply and demand, water efficiency schemes have been added to the investment model alongside the water resource options and other demand management measures.

Any option not selected in the baseline water efficiency strategy (to meet the Ofwat target) has been made available for selection in the investment model from 2010/11 onwards.

Those options which were included in the baseline water efficiency strategy were not available to be re-selected by the investment model until a period of one and a half scheme asset lives had passed. This was considered to be a reasonable timeframe over which yield will have decayed due to breakdown, lack of maintenance, removal or replacement. Schemes in the baseline that are assumed to be ongoing (e.g. subsidy for dual flush toilets) were not included in the investment model.

In the investment model, it was assumed that a marketing campaign would be required to promote uptake of a scheme. However, if several schemes were selected, the marketing campaign could promote numerous schemes simultaneously, and thereby reduce the total cost of water efficiency efforts. Marketing campaigns were assumed to take place in the first year only of any given AMP cycle to promote the water efficiency scheme(s) selected for that AMP period.

Certain water efficiency schemes cannot be implemented at the same time as other schemes, because they are mutually exclusive. The investment model makes provision for this by disallowing the selection of mutually exclusive schemes.

G.2.4 Leakage Control Options

Leakage levels for Southern Water are already well below their Economic Level of Leakage. This is discussed in greater depth in Appendix E. As a response to the drought of 2004-06, Southern Water reduced leakage below their Ofwat target level. It is proposed that leakage be maintained at this new low level in the baseline supply demand balance. In the base year (2007-08), the level of leakage reported in the June Return was 81.5 Ml/d (post-MLE adjustment), which is below the Ofwat target level of 92 Ml/d, and the recently assessed long-run sustainable economic level of 89.4 Ml/d. Current leakage is also well below the short-term sustainable economic level of around 116.5 Ml/d.

WRc were commissioned to revise their assessment of economic leakage levels over both the short and longer terms. As part of these assessments WRc produced a series of cost curves for each WRZ associated with reducing leakage from current levels toward the policy minimum levels. These cost curves were derived for discrete ‘steps’ of leakage reductions, and therefore allowed an economic assessment of leakage to be developed within the overall strategy in the investment model.

Generally, when developing the overall strategy for this WRMP, the company considered it to be unacceptable to allow leakage levels to rise if they had previously been driven down to low levels, even where there was an economic case to allow them to rise again. In essence additional leakage control was selected when it was relatively beneficial over the remainder of the planning period.

The SEA assessment concluded that leakage reduction had the potential for negative effects to local communities due to disruption, dependent upon the scale of the works involved, but that these effects would be short term. In the long term, leakage reduction was found by the SEA to be compatible with the majority of the SEA objectives as it enables the best use of existing resources.

Under scenarios implementing universal metering during AMP5 additional leakage control options could not be implemented until AMP6 due to the inherent practical difficulties of conducting both a large scale metering programme and a significant leakage reduction programme at the same time. In scenarios when no UCM is used, additional leakage control options were available for selection in the investment model from the beginning of the planning period (2010/11).

G.3 Resource Development Options

The lists of resource development options were derived during the AMP4 Water Resources Investigations, which covered all areas. Scheme descriptions, estimated outputs and costs for feasible options have been taken primarily from the Phase 2 and Phase 3 Water Resources Investigation reports.

G.3.1 Screening Process

The screening process made use of work conducted by Atkins under the AMP4 Water Resources Investigation projects. The objectives of the screening process were:

1. To provide a comprehensive list of 'unconstrained' options that could be considered in order to provide additional water supplies to each of Southern Water's Water Resource Zones. This included all schemes that had been previously considered by Southern Water in the AMP4 Water Resources Plan, as well as additional schemes that were identified by either Southern Water or the Environment Agency as part of the AMP4 Water Resources Investigations evaluation process.
2. To provide a summary technical evaluation of each option, to determine whether it represents a viable water resource development that should be considered in greater detail, or whether there are fundamental reasons why the scheme is unsuitable for further investigation. The following could be justifiable reasons for exclusion of schemes at the initial stages:
    - Technical feasibility. There may be water related environmental constraints (particularly for borehole developments, aquifer recharge or run-of-river abstractions) that mean a scheme cannot achieve any useable deployable output, or there could be physical or chemical constraints (although these are more likely to relate to issues over practicability or deliverability, rather than basic technical feasibility);
    - Practicality, reliability and deliverability. Are there water quality constraints or issues that would lead to unacceptable risks to the customer, or grossly excessive monetary or environmental costs, in comparison to other available options? Would the scheme require significantly disproportionate capital or operational costs compared to the anticipated deployable output, in comparison to other available options? Would the scheme be reliant on technologies that are as yet unproven in the commercial environment, meaning that there are excessive risks surrounding its deliverability, in comparison to other available options?
    - Environmental or social impacts that mean the option is fundamentally unacceptable against the environmental objectives outlined in the technical methodology.

Options that address improving deployable output at existing sources through routine asset maintenance / source improvements were not included within the options appraisal work. These types of options (where feasible and practicable) are already incorporated in water resource modelling as completed options – i.e. the contribution of these options to overall water supply is already taken into consideration when identifying the level of future baseline supply demand balance deficits.

The list of unconstrained options was developed from the AMP4 Water Resources Investigations, which in turn made use of various sources of information including:

- PR04 Water Resources Planning documents produced for Southern Water by Mott Macdonald (2003);
- Options identified by Southern Water Corporate Strategy team and Atkins consultancy team during the scoping phases of the AMP4 Water Resources Investigations; and
- Options suggested by the Environment Agency and detailed in a letter to Meyrick Gough (Southern Water, Water Planning and Strategy Manager) from Nigel Hepworth (Environment Agency, Principal Water Resources Planner, South Supra-regional water resources planning Team) on November 15th 2005.

In addition, since the draft WRMP was produced, further options have been identified for Hampshire South as part of discussions involving EA, Ofwat, SWS, Portsmouth Water and Natural England. The alternative options, on which the current draft *Memorandum of Understanding for the River Itchen sustainability reduction proposals* (Jan 2009) is based, are described in the *Technical Note on Lower Itchen Water Resources Options,* (Atkins 2008).

All studies and options were the subject of review and, where appropriate, further desk based research. The constrained options were each examined in terms of:

- The practicability of the option;
- Its potential benefit in water resource terms;
- The extent of environmental impact, on both aquatic and terrestrial ecology;
- Its potential impact on other factors, such as heritage, noise and air pollution;
- Any constraints on the option in planning terms; and
- Its cost, in terms of both the capital and operational expenditure required, including an allowance for the cost of carbon.

The environmental and social costs / benefits of each option were estimated, where possible, using the Environment Agency's *Assessment of benefits for water quality and water resources schemes in the PR04 Environment Programme* (Environment Agency, 2003); known as the Benefits Assessment Guidance, or BAG. This methodology allows a monetary value to be calculated for a number of cost / benefit impact categories within a range of environmental compartment or waterbody types that are likely to be affected by each option. Expected costs / benefits are first described in qualitative terms and then the process moves into monetary assessment, which is conducted using transfer values and population estimates. Environmental costs / benefits derived using the BAG have been added as a fixed annual cost (i.e. fixed opex) because it was considered that any damage that might occur to the aquatic environment would not disappear as soon as abstraction, water quality impacts etc. disappeared. However, there are inherent uncertainties associated with the calculation of these environmental costs and benefits, and not all transfer costs involved were necessarily adaptable to the wide range of options assessed.

Integrated water resources models were developed during the AMP4 Water Resources Investigations for each of the three areas in Southern Water using the MISER platform. This allowed the benefit of each option to be tested against different design drought scenarios.

The results of the option screening process was to produce a list of feasible options for each of Southern Water's three sub-regional areas, with associated costs that were then used in investment modelling to derive a least-cost plan over the 25-year planning period.

G.3.2 Strategic Environmental Assessment

Those options considered as feasible following the screening process described in section G.3.1 above, were then subject to a Strategic Environmental Assessment (SEA). As part of the draft WRMP, an SEA of the WRMP options and strategy was conducted. This expanded on the assessment of environmental and social impacts in the AMP4 Water Resources Investigations, and identified potential mitigation measures.

A high level compatibility assessment was carried out for each of the generic options described in section G.3.3 against 17 SEA objectives in order to identify any conflicts with the SEA objectives over the short, medium and long term. A summary of the results of this high level compatibility assessment is given for each generic option below.

Overall, a number of potential conflicts between WRMP resource development options and SEA objectives were identified both in the short, medium and long term. The SEA found that the extent of these conflicts was dependent on the nature of implementation and location of the specific options. Therefore each individual supply side option under consideration as part of this WRMP was subject to further in-depth SEA investigation. The results of this assessment were taken into account in this WRMP strategy, and the environmental and social impacts and possible mitigation measures are discussed further in section 10.

G.3.3 Description of Options

A number of supply side options have been investigated for this WRMP. The range of options considered can be sub-divided into a number of categories, each of which is described below:

- Bulk Transfer;
- Wastewater recycling;
- Aquifer Storage and Recovery;
- Desalination; and
- Area Specific Water Resource Developments

G.3.3.1 Bulk Transfers

Bulk transfers are a means of supplying additional water to an area with a supply demand balance deficit from an area with a surplus. The possible transfer options open to Southern Water include:

- Enabling transfers (inter-zonal transfers between Southern Water WRZs);
- Inter-company bulk transfers within the south east region;
- Termination of existing bulk supplies to other water companies; and
- Transfers from outside the south east region.

The transfer of water from areas of surplus to those of deficit has always been a fundamental part of Southern Water's strategy. However, a key consideration is the availability of surplus supplies in potential donor WRZs or other companies. Consideration also needs to be given to other factors such as the magnitude of the surplus available, the timing of availability and the duration for which it is available.

The water supply system within the south east of England is very complex. There are a number of water companies, each sharing boundaries with a number of other companies. It is also the area with the most pressures on it, being not only classified as an area of serious water stress, but also likely to be in the forefront of the effects of climate change. Given the complexity of the situation, there are a number of benefits arising from the development of a regional strategy which is reflected through the harmonisation of the strategies of the individual companies. This can help to progress regional developments that avoid unnecessary developments which could result in the creation of greater environmental impact, a non-least cost solution (for the region as a whole) and customer bills that are higher than they need to be.

The work of the Water Resources in South England (WRSE) Group has focused on sharing resource developments to create the building blocks for a regional solution. It is then the responsibility of the companies to identify, investigate and agree on the potential bulk supply and/or shared resource schemes. This is discussed in greater detail in section 9 of the main report.

The SEA found that bulk transfers were compatible with a number of SEA objectives, but concluded that if bulk transfers require construction of additional pipelines, they may have potential conflicts against a number of SEA objectives; namely terrestrial biodiversity if affecting a designated nature conservation site and disruption to local communities during construction. Other effects on SEA objectives, such as landscape and cultural heritage, were found to be dependent upon the pipeline routing, and unlikely to be significant beyond the construction phase.

G.3.3.2 Wastewater Recycling

The recycling of wastewater, to reduce pressure on existing water abstractions and further resource development options, can be sub-divided into the following categories:

- Direct potable re-use;

- Direct non-potable re-use;
- Indirect potable use: recharge of groundwater aquifers; and
- Indirect potable use: supplementing river flows and surface water storage.

However, there are a number of other issues associated with the recycling of wastewater that need to be considered and overcome if it is to be widely adopted in the future. These relate to environmental impact of wastewater discharge, public health, public perception and cost. The only categories that have been considered as part of this WRMP process are direct non-potable re-use and indirect potable use by augmenting river flows and surface water storage. Direct potable re-use is unacceptable due to the high levels of risk and the recharge of groundwater using wastewater is not permitted under European legislation.

The advantages of wastewater recycling schemes are that they should be resilient to climate change, and offer flexibility in implementation and operation. However, there could be serious concerns raised with regards to the energy usage involved to operate such schemes, bearing in mind the possibility of multiple pumping and treatment required. There are examples of indirect wastewater recycling schemes across the company's supply area, although they may not be perceived as such in view of their size.

The SEA concluded that while compatible with some SEA objectives, wastewater recycling has the potential for negative impacts on biodiversity, local communities and landscape character due to the infrastructure and additional pipelines that may be required, depending on the nature of implementation. Potential negative effects on surface water quality, aquatic biodiversity and fisheries were found to be dependent upon the nature of the treated wastewater and receiving watercourses and regulatory controls. While these water-related negative effects may occur in both the short and long term, the SEA concluded that they may be reduced in the medium/long term through appropriate mitigation measures. These are discussed in detail in section 10 of the main report.

G.3.3.3 Aquifer Storage and Recovery

The principle of Aquifer Storage and Recovery (ASR) is that either potable water, or raw water that could be used for potable purposes, is injected into a confined or semi-confined aquifer to create a 'bubble' of fresh water than can be re-abstracted when required.

The environmental applicability of ASR essentially relates to the impacts such a scheme would have on parts of aquifers that either affect surface water bodies or sources that are currently used for potable water.

The SEA found that ASR is broadly compatible with SEA objectives, and that schemes generally require less infrastructure than other resource development options; however pumping and treatment facilities may be required and energy use was found to be high. Potential effects on groundwater and terrestrial SEA objectives such as biodiversity and landscape were found to be largely dependent upon implementation and can be reduced in the medium/long term through mitigation measures. The SEA concluded that ASR was the preferred resource development option.

G.3.3.4 Desalination

Desalination considers the opportunity of making use of saline groundwater, and coastal and tidal river waters which cannot be exploited by traditional treatment techniques. It has become less expensive in recent years as the cost of membrane technologies used in reverse osmosis processes has reduced. The potential sources of saline water are:

- Coastal Waters;
- Tidal Rivers;
- Offshore Waters;
- Deep Groundwater; and

- Coastal Aquifers.

The first two sources, coastal waters and tidal rivers, are the two most commonly identified sources, and are probably the easiest to design and manage from an operational viewpoint.

A number of environmental factors were taken into account when considering desalination during the AMP4 Water Resources Investigations, among which are:

- Construction and the subsequent abstraction and brine discharge may have adverse environmental impacts on coastal and marine habitats and wildlife;
- Treatment works may have significant visual impacts, especially in residential, tourist and designated areas along the coastline;
- Significant supporting infrastructure (roads, power, pipelines) is required, which may have social and environmental impacts;
- Tidal rivers in the south and south east of England are considered a valuable habitat and many of those within or near the company's supply area are subject to one or more environmental designation;
- Groundwater aquifers, given that they are likely to be non-renewable (i.e. a fossil aquifer), when subject to abstraction may have impacts on adjacent aquifers;
- Extraction from coastal aquifers may result in saline intrusion into fresh groundwater sources; and
- The potential requirements in terms of energy, although these can be reduced if the plant is only used intermittently, and modern design includes the facility for much enhanced energy recycling and the use of green energy source.

Owing to the environmental designations that apply to large part of the southern coastline within the Southern Water area of supply, desalination was only considered in existing industrial areas where there was the possibility of combined abstraction and/or wastewater discharge, so as to minimise the environmental impact.

The exact location of desalination plants was selected within existing or potential industrial developments where the visual and environmental impacts could be minimised.

None of the desalination options were taken forward for EA Benefits Assessment Guidance environmental costing as screening determined there were no mechanisms by which any of the options would have a significant impact on any of the following categories:

- Informal recreation;
- Coastal bathing;
- Water sports;
- Recreational fisheries; and
- Shell fisheries.

These conclusions are based on qualitative assessment questions within the BAG to determine significance of effects, and are a handy reference point for concluding significance of effect. For the 'Coastal bathing' category for example, the test for significance comes down to the following:

> 'Will the scheme improve water quality so the imperative values are met, or will it ensure that water quality is maintained at the mandatory standard values? Or will the scheme result in water quality meeting the guidelines standards?'

For all the desalination options identified, it was concluded that the option would not have any effect on such standards and therefore assessment was not carried out.

The Opex costs of desalination included allowances for carbon costs. Opex costs were based on work that considered typical saltwater reverse osmosis, which includes pressure recovery.

The SEA generic assessment of desalination found that it has the potential for conflicts with a number of SEA objectives relating to terrestrial and aquatic biodiversity, landscape, greenhouse gas emissions and waste production. These potential effects are related to both the construction and operational phases of a desalination plant, its visual impact and effects due to abstraction and discharge. It was found that during operation, the desalination process generates a large amount of brine waste and is highly energy intensive. However, the negative effects were concluded to be dependent upon the nature of implementation of the plant, its location, the nature of the receiving waters and the proportion of time during which it is in active operation. Potential mitigation measures are discussed in section 10 of the main report.

G.3.3.5 Area Specific Water Resource Developments

This section addresses the various area specific options that are not covered by the categories above. They all include the development of new resources in specific locations within each of the areas. The typical options are outlined below, and can vary widely in terms of the volumes of supplies available, from minor local source improvements to the development of major strategic options such as surface water reservoirs:

- New surface storage reservoirs;
- Increases in abstraction from either surface or groundwater;
- Enlarging existing reservoirs;
- Re-commissioning old/existing licences;
- Licence variations; and
- Upgrading Water Supply Works treatment facilities.

The availability of any of these options will vary considerably within each area, and so each option has been considered on its own merits. However, it must be remembered that the development of an option in one WRZ can have an effect on all interconnected WRZs within the area.

From an SEA perspective, it was found that both the construction of new surface storage reservoirs and the enlargement of existing ones have the potential for conflict with a range of SEA objectives, both in the short and long term.

Increases in abstraction from either surface or groundwater have potential conflicts with most water related SEA objectives, in relation to CAMS designations in the south east of England.

The re-commissioning of old/existing licences, licence variations and the upgrading of water supply works treatment facilities were found to be likely to have a range of effects on SEA objectives. The SEA report concluded that the effects strongly depend on the nature of implementation and mitigation measures used, and that the licensing process should determine whether the environmental effects are acceptable.

A summary of SEA findings and discussion of potential mitigations measures for area specific water resource development options included in the strategy is provided in section 10 of the main report.

G.4 Option Summary Tables

G.4.1 Tables of Unconstrained Resource Development Options

This set of tables provides, for each of the three sub-regional areas, a description of all unconstrained resource development options. These are defined as “the complete and exhaustive list of all technically feasible options that could address the planning problem” (EA Water Resource Planning Guidelines). A brief explanation has also been provided where an option was excluded from further analysis.

G.4.1.1 Western Area

Option Ref.	Option Name	Description	Excluded ? (Y/N)	Reason for Exclusion
Local Options				
IWb6	Purchase abstraction licences	Buy all river abstraction licences from the Eastern Yar to protect supplies.	Y	Practicability/ reliability/ availability
IW28	K253 link main	New transfer link from K253 WSW to K253 WSW linking two supply areas.	Y	Already in Capital Programme
IWL1	L536 marginal treatment	L536 is a disused groundwater source located on the east side of the Isle of Wight . The abstraction is sourced from a 2m diameter brick-lined well to a depth of 22.5m; this is connected to a 78m deep well lying 20m west from the main well. In addition there is an 18” diameter borehole 20m north-east of the main well to a depth of 80m. All three sources are linked at depth by an adit system. The option would involve bringing this source back online. This option consists of two schemes, one (Scheme 1) which involves marginal treatment onsite and the other (Scheme 2) is to pump the raw water from L536 borehole through a new dedicated raw water pipe to O355 for treatment.	N	
IWL1	L536 scheme 2	L536 is a disused groundwater source located on the east side of the Isle of Wight . The abstraction is sourced from a 2m diameter brick-lined well to a depth of 22.5m; this is connected to a 78m deep well lying 20m west from the main well. In addition there is an 18” diameter borehole 20m north-east of the main well to a depth of 80m. All three sources are linked at depth by an adit system. The option would involve bringing this source back online. This option consists of two schemes, one (Scheme 1) which involves marginal treatment onsite and the other (Scheme 2) is to pump the raw water from L536 borehole through a new dedicated raw water pipe to O355 for treatment.	Y	Not economically viable
IWL2	H614 Reservoir Brown route	This option involves the construction of an impounding reservoir across the River Medina on the Isle of Wight. Water would be treated at a new water supply works (WSW), which would be constructed just downstream of the proposed site for the dam, and then pumped to a water service reservoir (WSR) to enter distribution.	Y	Very significant environmental impacts

Option Ref.	Option Name	Description	Excluded ? (Y/N)	Reason for Exclusion
IWL2	H614 Reservoir Blue route	This option involves the construction of an impounding reservoir across the River Medina on the Isle of Wight. Water would be treated at a new water supply works (WSW), which would be constructed just downstream of the proposed site for the dam, and then pumped to a water service reservoir (WSR) to enter distribution.	N	
IWL6	K628 WSW	K628 groundwater source has been disused since 1989. The source is located west of the River Medina on the Isle of Wight. The abstraction is sourced from a 220m deep well with a borehole in the base connected via an adit to another borehole. This option would involve bringing this source back online. Groundwater is abstracted from the highly confined Barton Beds, which are only some 20m thick at the base of the deep borehole.	N	
IWL7	Cross Solent Main 20 Ml/d	Two new 300mm diameter cross-Solent mains have been constructed between the Hampshire coast and the IOW to replace the two slightly smaller mains that have reached the end of their design life. This option incorporates the additional assets required to utilise the additional capacity of these mains. • Replacement 20 Ml/d pump for a booster station; • Replacement 20 Ml/d pumps for the IOW booster pumping station; • Pressure management on a 450mm pipeline; and • 10000Ml additional storage reservoir.	N	
IWL3	O335	O355 is an existing groundwater source and water treatment works. The source consists of a Lower Greensand and a Chalk borehole. The waters from the chalk borehole goes through a treatment process of super and de-chlorination as well as phosphoric dosing; as such there are no process losses which could be recovered. The waters from the Lower Greensand however undergo a process of aeration cascading, then 10 minute retention in a redox tank and then following by filtration through 3 rapid gravity filters. The treatment losses for the LGS water amounts to 0.17Ml/d and therefore the volume of water which could be recovered from treatment losses would be somewhat less than 0.17Ml/d. As the DO is source constrained there would be no extra DO available from lowering of pumps or increase of pump capacity.	Y	Insignificant increase in DO through recovery of process losses from limited treated
IWL4	Development of existing dewatering schemes for potable supply	The limited and unreliable yield of the de-watering scheme will not provide addition DO, therefore this option has not been progressed.	Y	Does not provide an increase in DO
IWL5	River Yar augmentation boreholes	On the Isle of Wight there is an existing scheme where the river Eastern Yar is augmented with flows from groundwater sources within the same catchment, as well as ground and surface water from an adjacent catchment. The scheme is operated in order to meet the MRF (minimum residual flow) conditions downstream at the Burnt House gauging station. The groundwaters from within the Eastern Yar catchment are pumped into drainage ditches in the headwaters of the River Yar. The ground and surface waters from the adjoining Blackwater catchment are deposited into a sump and then pumped across the catchment boundary into the river Yar.	Y	Does not provide an increase in DO
HSb4	New groundwater source	Develop new groundwater sources.	Y	Lower Test classified as 'over licensed' and the EA intends to maintain this status

Option Ref.	Option Name	Description	Excluded ? (Y/N)	Reason for Exclusion
HS28	S517	Introduce borehole number three.	Y	Lower Test classified as 'over licensed' and the EA intends to maintain this status
HSb11	Purchase abstraction licences	Buy out other river abstractors to allow SW abstractions to continue.	Y	Practicability / Reliability / Availability
HS31	B513	Increase industrial main capacity to 60Ml/d.	Y	No net benefit & Technical Feasibiltiy
HS36	Reduce industrial supply	Reduce industrial supply.	Y	No net benefit & Technical Feasibiltiy
HSL1	B513 Washwater Recovery	Recovery of 3~4 Ml/d of settled washwater is included in HSL3.	Y	Removed as a standalone option
HSL2	B513 40Ml/d DAF plant	The proposed staged increase in DO of 15 Ml/d to 120 Ml/d has been removed as a standalone option due to the magnitude of the required increases in DO. A two stage approach is now recommended with increases to 136 and 160 Ml/d.	Y	Removed as a standalone option
HSL3	B513 New DAF plant to utilise full licence	This option will increase the treatment capacity to 136 Ml/d, reduce process losses to approximately 0.25 Ml/d. A replacement 120 Ml/d potable high lift pumping will allow full utilisation of the additional treatment capacity to meet daytime demands of up to 90 Ml/d and transfer up to 30 Ml/d through the existing Grove transfers into the Otterbourne zones.	N	
HSL4	B513 Increase capacity to 160Ml/d	This option will increase the treatment capacity to 160 Ml/d to maximise the abstraction rate within 10 Ml/d of the hands off flow and corresponds with the original design capacity of the river abstraction, inlet culvert, low lift pumping station, lakes pumping station and pipework. The increase in DO to 160 Ml/d will provide 20 Ml/d to the IOW, 22.7 Ml/d for industrial customers and 117.3 Ml/d to B513 including a 30 Ml/d transfer to the Winchester area.	Y	Excluded in final WRMP due to high environmental risk and low likelihood licence would be granted
HSL5	New surface water storage site	A new surface water storage reservoir in the Hampshire South region. This reservoir would be a largely pump filled from a new abstraction on the River Itchen although the reservoir does also have a catchment of approximately 28km2. The reservoir would be used as storage to supply additional water for treatment at Y841.	N	
HSL6	Convert a lake into a surface water storage site	The exact volume of the existing lake is unclear but is assumed to be in the region of 500Ml. Much of the useable volume would be required to provide emergency storage as the treatment capacity to the works increases to 136 Ml/d and 160 Ml/d, options HSL3 and HSL4, such that little storage is available as a water resource.	Y	Excluded due to limited water resource benefits coupled with environmental & social impacts
HSL7	Modify the Itchen channel to create greater velocities to allow fish to swim up the river		Y	Whilst modifications to the channel of the River Itchen downstream of the Otterbourne may have environmental benefits, they would not on their own remove the need for the magnitude of Sustainability Reductions proposed by the EA.
HSL8	Relocate Y841 abstraction	This option considers moving the location for the surface water abstraction from its current location to a new location further downstream on the River Itchen.	Y	Excluded for final WRMP as relies on supply from Portsmouth Water Company
HAb2	New groundwater source	Develop new groundwater sources.	Y	Anton WRMU assessed as 'over licensed' and the EA will retain existing policy

Option Ref.	Option Name	Description	Excluded ? (Y/N)	Reason for Exclusion
HBT3	B136 to Y422	This scheme comprises of a 4.1km, 300mm diameter pipeline from B136 to a service reservoir and a new pumping station. The scheme is dependent on additional resources being available at B513 that would supply a re-zoned supply area in southern Hants allowing surplus water to be supplied to the required zone.	Y	The recent construction of a Michelmersh WSR to Broughton has provided a dedicated Horsebridge to Broughton main
HB17	Reservoir link main	This option is a pipeline link forming part of the Hampshire North south link scheme identified by SWS in 1998. This option would comprise of 16.4km of 300mm diameter pipeline and a booster station. This option is not now considered necessary.	Y	The recent construction of a Michelmersh WSR to Broughton has provided a means of transferring water from Crabwood to Broughton using existing infrastructure
HBb2	New groundwater source	Develop new groundwater sources.	Y	Anton WRMU assessed as 'over licensed' and the EA will retain existing policy
HBL1	R176	The source consists of 2 boreholes that are mothballed and have been out of commission since 1994. In the Phase 1 report it was considered that the existing licensed abstraction was likely to be constrained following completion of the HD RoC. The EA has since confirmed that the existing licence was shown to have no adverse affects in Stage 3 of the review of consents and so it is not under threat of modification in Stage 4.	N	
HKb2	New groundwater source	Develop new groundwater sources.	Y	Anton WRMU assessed as 'over licensed' and the EA will retain existing policy
HKL1	J358 route 1	The scheme is located within the Hampshire Kingsclere resource group. The scheme will increase the yield of J358 within the existing licence by removing the present constraint imposed by mains leaving the site. This option will involve the construction of a dedicated pipeline from the WSW to a WSR. Additional high-lift pumping capacity would also be required.	N	
HKL1	J358 route 2		Y	Route 2 is considered to have a greater environmental impact due to the increase construction length within an AONB, as well as greater social and amenity impacts due to the nine road crossing and proximity to housing
Additional Options for final WRMP under Sustainability Reductions				
HWO-56	56 Mld Woodmill abstraction, treatment at Otterbourne	This option involves the replacement of existing 45 Ml/d surface water abstractions from SWS Otterbourne WSW with a 51Ml/d abstraction further downstream at above the saline limit at Woodmill. This scheme will therefore include capacity to mitigate the 11Ml/d Sustainability Reduction which is proposed for Gaters Mill. Treatment at Otterbourne.	N	
HWO-85a	85 Mld Woodmill abstraction, treatment at Otterbourne	Involves mitigation of the entire Sustainability Reductions at Otterbourne (surface water, groundwater and Twyford) by an 81Ml/d abstraction above the saline limit at Woodmill. This will include capacity to mitigate the 11Ml/d Portsmouth Water Sustainability Reductions at Gaters Mill. Treatment at Otterbourne.	N	
HWG-56	56 Mld Woodmill abstraction, treatment at Gaters Mill	As for HWO-56 but treatment at Gaters Mill.	N	

Option Ref.	Option Name	Description	Excluded ? (Y/N)	Reason for Exclusion
HWG-85	85 Mld Woodmill abstraction, treatment at Gaters Mill	As for HWO-85 but treatment at Gaters Mill.	N	
HWO-85b	85 Mld Woodmill abstraction, treatment at Otterbourne; assuming HCA1	As for HWO-85a but assuming HCA1.	N	
HCA1	Candover Alre Augmentation	Use of the Candover and Alre groundwater augmentation scheme boreholes to enhance flows within the River Itchen during periods of low flow and extreme drought. This enable s reduction or mitigation of the MRF restrictions imposed at the Otterbourne sources, allowing yield and DO benefits at these sources while still maintaining the Sustainability Reduction flow requirements downstream.	N	
Enabling transfers within Southern Water supply area				
IWT1	New transfer pipeline - route 1	This option increases the capacity for transfer of water from B513 to the Isle of Wight via a booster pumping station. The existing cross-Solent Main has a capacity of around 11 Ml/d for transfer of water from the booster pumping station to the Isle of Wight but it is currently being replaced by a new cross-Solent Main whose capacity will be 20 Ml/d. At present, there is an existing 'industrial' main from B513 to the booster pumping station. The booster pumping station feeds the cross-Solent transfer. In order that SWS can increase their supply to industrial customers as well as meeting the 20 Ml/d demand for the cross-Solent transfer, a new 35 Ml/d pipeline is required from B513 to the booster pumping station. As well as a new pipeline, this option involves the construction of a new high-lift pumping station at B513 The option is dependant on an additional treatment capacity being provided at B513 (option HSL4).	Y	This scheme is not to be considered for further investigations because it does not provide additional resources for SWS, rather it would provide greater security of supplies to Fawley
IWT1	New transfer pipeline - route 2	See above	Y	This scheme is not to be considered for further investigations because it does not provide additional resources for SW, rather it would provide greater security of supplies to Fawley
IWT2	N472 to a WSR - transfer 2.5 Ml/d		Y	Removed as a standalone option
IWT2	N472 to a WSR - transfer 5 Ml/d		Y	Removed as a standalone option
IWT2	N472 to a WSR – transfer 10 Ml/d		Y	Removed as a standalone option
IWT2	N472 to a WSR - transfer 20 Ml/d		Y	Removed as a standalone option
HAT1	WSR to WSR pipeline	This option involves the construction of a pipeline between two water service reservoirs in Hampshire South and Hampshire Andover WRZs. The scheme includes a short spur off the main pipeline to feed a third WSR., The WSR in the Andover WRZ would also be connected to the WSRs in the area via new pipelines.	Y	Excluded in final WRMP as security of supply issue, not water resources option

Option Ref.	Option Name	Description	Excluded ? (Y/N)	Reason for Exclusion
HKT1	WSR to WSR pipeline	This scheme is dependent upon scheme HAT1: The transfer pipeline for this scheme branches off the pipeline for scheme HAT1. In addition, the scheme includes a further pipeline to V175 WSW for onward distribution to additional WSRs.	Y	Excluded in final WRMP as security of supply issue, not water resources option
Desalination Options				
HTD1	Southampton urban area. 15 Ml/d	A triangular plot of land adjacent to a WWTW and constrained to the north by the railway line and to the south by a local road servicing a container terminal was identified as a suitable location. The Waste Water Sewage and Sewage Sludge Minerals and Waste Local Plan (December 1998), identified under Policy 52, states that some sites are to be kept for development to accommodate sewage sludge treatment. Policy 52 is applicable to this land at Millbrook WWTW, and it is therefore understood that consent for a desalination plant at this site might be granted. The outlet structure of the WWTW could be used to mitigate the impact of brine discharge. This area is located within the Otterbourne Indirect Reservoir Zone in Trunk Main Area (TMA) - PX08. This zone could accept up to 30Ml/d.	N	
HTD1	Southampton urban area, 20 Ml/d	See above	N	
HTD1	Southampton urban area, 25 Ml/d	See above	N	
HTD1	Southampton urban area, 30 Ml/d	See above	N	
HTD2	Marchwood area opposite Southampton on the Test Estuary	Another option would be within the site of Marchwood Industrial Park. The site is approximately 54ha of flat land with an extensive frontage to the River Test, which is not environmentally designated. The site is located within the MA1 and MA2 allocations from the Local Plan. The MA1 policy allocates land for housing and therefore a desalination plant would not be acceptable, however the majority of the site falls within the MA2 allocation which is identified for industrial or business use. There is potential for development of a desalination plant within this allocation as it will be classified as industrial use. It must be noted that the site is adjacent to areas with significant nature conservation value. In order to obtain consent it will have to be demonstrated that the construction and/or operation of the plant will not adversely affect the surrounding international and national designations.	Y	Discounted based on outfall modelling
HTD3	Gosport and Lee-on-the-Solent (outside the company's supply area)	The coastline from Lee-on-the-Solent to Hill Head consists of a shingle beach and does not have any European designations. Residential dwellings and secondary homes cover most of the coast.	Y	Inappropriate location
HTD4	Solent/Southampton Water 25 Ml/d	This area is within the Rownhams Zone in PMA RW35. The area lies within the Hants South WRZ which feeds the local demands and the Isle of Wight. The plant could provide all this demand and therefore no water would be required from B513. Additionally, a connection to other supply zones via mains would be possible, and the capacity of the plant could be increased by 15Ml/d for local supply.	N	
HTD4	Solent/Southampton Water 45 Ml/d	See above	N	

Option Ref.	Option Name	Description	Excluded ? (Y/N)	Reason for Exclusion
HTD4	Solent/Southampton Water 60 Ml/d	See above	N	
HTD5	Coastal desalination, sharing sites	There are a number of main wastewater treatment works (WWTW) on the coast that might give the opportunity to share existing infrastructure with a desalination plant.	Y	Discounted based on outfall modelling
HTD6	Tidal River Itchen	The River Itchen industrial estate north of the Itchen Bridge on the eastern side of the estuary has been identified as a potential area for a desalination plant. The industrial area consists of densely packed large warehouse buildings and there are small pockets of undeveloped land.	Y	Discounted based on outfall modelling
HTD7	Coastal aquifer desalination	Following the Phase 1 assessment, the EA has confirmed that it would not accept any deterioration in aquifer quality. For these reasons option HTD7 is not considered to be feasible and has not been examined further.	Y	Following the Phase 1 assessment, the EA has confirmed that it would not accept any deterioration in aquifer quality. For these reasons option HTD7 is not considered to be feasible and has not been examined further
HTD8	Desalination of deep groundwater	Abstraction of deeply confined aquifers with poor water quality is carried out in conjunction with desalination technology. This practice is deliberately unsustainable as it takes water from an aquifer that is not being replenished (at least not in the short term) by the hydrological cycle.	Y	Given the many unknowns in terms of aquifer properties, the high investigative costs to establish these parameters, the water quality of the Permo-Triassic sandstones at depth, the potential problems and costs associated with constructing and operating very deep boreholes, option HTD8 is not considered feasible and has not been examined further
HTD9	Offshore desalination	Ship-mounted desalination has been discounted as a water resource option on the basis that it is considered to offer no significant advantages over land-based alternatives for producing the required quantities of potable water. It would require a pipeline connection into supply from a suitable berth, power connection, delivery and storage of consumables on land or the ship, and purchase or lease of an appropriate vessel along with mooring fees. In addition, recirculation of brine may become an issue at high production rates unless either the offtake or discharge is located at some distance from the ship. Offshore platform desalination has been discounted for similar reasons.	Y	HTD9 is not considered to be feasible and has not been examined further.
IWD1	Coastal desalination IOW 8.5 Ml/d	The site is situated on the south east side of the island. This site has been allocated for waste water use in the Local Plan. Therefore the Council will seek to ‘safeguard this site for possible future development for the transfer and improvement of wastewater treatment or the handling and treatment of sewage sludge’. The Council will refuse proposals for development which would prevent or prejudice such development. The site is situated about 400m away from the coast. Therefore for this option to be viable a pumping station will need to be located along the seafront.	N	
IWD1 - 20	Coastal desalination IOW 20 Ml/d	As for 8.5Ml/d option, but sized to supply 20Ml/d.	N	

Option Ref.	Option Name	Description	Excluded ? (Y/N)	Reason for Exclusion
IWD2	Tidal River Medina and Eastern Yar Desalination	Out of the three potential options in Cowes the site adjacent to the Cowes power station is preferred as the planning allocation leaves the best opportunity for a desalination plant. The environmental concerns are similar for all three options and will have to be considered in more detail in the next stage.	Y	Discounted based on outfall modelling
South east region transfers				
HAT2	Bulk supply to Hants South from neighbouring Company		Y	No available surplus in neighbouring companies
HKT2	Bulk supply to Hants Kingsclere from neighbouring Company		Y	No available surplus in neighbouring companies
HST2	B513 to Y841	This option transfers up to 45 Ml/d of the additional water produced by B513 following completion of options HSL3 and HSL4, to the areas served by Y841 The option involves a 21.5km 60mmHPPE pipeline and a new high-lift pumping station at B513 The option is dependant on an additional treatment capacity being provided at B513, (HSL3 and HSL4).	N	
HAT3	Termination of bulk supply to Wessex		Y	Insignificant saving
Transfers from outside region				
HGT1	Upper Thames Reservoir to B513 [10 Ml/d]	The option would require advance water treatment located either next to the reservoir, or possibly on the Hampshire border. This would allow potable water transfer into the Hampshire Andover and Kingsclere WRZs and avoid the need for additional treatment at Y841.	Y	Uncertainty of additional water availability and unavailable until 2023 at the earliest
HGT1	Upper Thames Reservoir to B513 [20 Ml/d]	See above	Y	Uncertainty of additional water availability and unavailable until 2023 at the earliest
HGT1	Upper Thames Reservoir to B513 [30 Ml/d]	See above	Y	Uncertainty of additional water availability and unavailable until 2023 at the earliest
HGT1	Upper Thames Reservoir to Testwood WSW [50 Ml/d]	See above	Y	Uncertainty of additional water availability and unavailable until 2023 at the earliest
HGT1	Upper Thames Reservoir to Testwood WSW [80 Ml/d]	See above	Y	Uncertainty of additional water availability and unavailable until 2023 at the earliest
Wastewater Recycling Options				
IWR1	Recycle wastewater to support flows in the upper Eastern Yar catchment, [2.5 Ml/d]	This option proposes the transfer of recycled wastewater to support flows in the Eastern River Yar at Burnt House . Treated water in excess of the local demand will be transferred through a new transfer pipeline to a WSR, near Newport, for supply to much of the island. This option is reliant on the WSR enlargements carried out in Option IWL7.	N	
IWR1	Recycle wastewater to support flows in the upper Eastern Yar catchment [5 Ml/d]	See above	N	

Option Ref.	Option Name	Description	Excluded ? (Y/N)	Reason for Exclusion
IWR1	Recycle wastewater to support flows in the upper Eastern Yar catchment [10 Ml/d]	See above	N	
IWR1	Recycle wastewater to support flows in the upper Eastern Yar catchment [20 Ml/d]	See above	N	
IWR2	Recycle wastewater to support flows Upper Medina catchment	See above	Y	There is an AMP4 scheme The implementation of this scheme will mean that this option (IWR2) will not be possible
HSR1	Recycle wastewater to support flows in the upper Itchen catchment, route 1	This option transfers 30 Ml/d of recycled wastewater to a site downstream of Y841.	Y	Excluded for final WRMP due to water quality issues.
HSR1	Recycle wastewater to support flows in the upper Itchen catchment, route 2	See above	Y	
HSR2	Recycle wastewater to support flows within the River Test, route 1 option 1	This option proposes the use of recycled wastewater support flows in the River Test upstream of B513.	Y	Excluded from Phase 2 Report
HSR2	Recycle wastewater to support flows within the River Test, route 1 option 2	See above	Y	Excluded from Phase 2 Report
HSR2	Recycle wastewater to support flows within the River Test, route 2 option 1	See above	Y	Excluded from Phase 2 Report
HSR2	Recycle wastewater to support flows within the River Test, route 2 option 2	See above	Y	Excluded from Phase 2 Report
ASR Options				
	Hampshire - Bagshot Beds		Y	Technical feasibility
	Hampshire - Chalk		Y	Technical feasibility
	Hampshire - Greensands		Y	Technical feasibility
	Isle of Wight - Bembridge Marls and Limestones		Y	Technical feasibility
	Isle of Wight - Bagshot Beds		Y	Technical feasibility
	Isle of Wight - Chalk		Y	Technical feasibility

Option Ref.	Option Name	Description	Excluded ? (Y/N)	Reason for Exclusion
	Isle of Wight - Upper Greensand		Y	Technical feasibility

Table G.4.1 Unconstrained List of Resource Development Options for Western Area

G.4.1.2 Central Area

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
Local Options				
SN25	Artificial Recharge	Artificial recharge and increased abstraction from the Hardham Basin Folkestone Beds aquifer.	Y	Environmental Impacts - Regulators would almost certainly refuse a scheme that worsens the current situation
SN2b	West Sussex New Groundwater Sources	Develop new groundwater sources in either Sussex North or Sussex Coast areas.	Y	Environmentally Unacceptable - EA policy of no more consumptive abstraction from the unconfied chalk
SN10b	T168 Licence Increase	Increase the licence capacity of the source.	Y	Environmentally unacceptable - There is little or no scope for additional abstraction
SN 50	Raise E282 Reservoir	Raising of impounding reservoir to increase storage and daily output.	Y	Infeasible as a stand alone scheme - Considered in N2 and N4
SN14b	Licence Separation	Separation of the S466 & R648 GW & surface icences to allow greater flexibility (up to 100 Ml/d abstraction) and possible benefits from conjunctive use.	Y	Infeasible as a stand alone scheme - Included in N8
SNXX	Utilising Water from Rock Common Sand Pit	Proposed transfer of water discharged from Rock Common sand pit operation for treatment and conveyance to supply.	Y	Site is now a landfill and no longer viable for a reservoir
SN20b	Wastewater recycling at E282	Discharge recycled wastewater from neighbouring WTWs into the Reservoir.	Y	
SN7b	Western Rother wastewater recycling for river flow augmentation	Import recycled wastewater to augment flows in the Western Rother.	Y	Included in another Option
SN28	Storrington Sand Pits	Develop Storage in Storrington Sand Pits.	Y	This option is now being used as a construction waste landfill site (Angells landfill)
SN12b	Portsmouth Water bulk supply	Increase bulk supply from Portsmouth Water.	Y	Included in another Option
SN13b	PWC Source	Purchase the source providing the bulk supply from Portsmouth Water.	Y	Included in another Option
SN15b	Strategic Trunk Mains	Develop a better strategic trunk main system to allow water to be distributed more easily.	Y	Included in resource modelling (MISER) and costs arising added to options where appropriate
SN21b	Recycled wastewater for river flow augmentation	Augment rivers supporting abstractions with recycled wastewater.	Y	Included in another Option
SNXX	SPA Flow Augmentation	Use of treated water to augment flows in SPA ditches and allow further groundwater abstraction in the Hardham Basin.	Y	Environmentally unacceptable - No real benefit over indirect wastewater re-use
SN1b-B	Build New Reservoir	Construction of new reservoir at Pulborough.	Y	Economically infeasible and evnironmental concerns as sites lie within River Arun flood plain
SN1b-C	Build New Reservoir	Construction of new reservoir at Coneyhurst.	Y	Environmentally unacceptable as the River Adur is a designated trout fishery

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
SN1b-D	Build New Reservoir	Construction of new reservoir at Dunsfold.	Y	Low refill from local source and considerable infrastructure expenditure
SN1b-E	Build New Reservoir	Construction of new reservoir at Horsfold.	Y	Environmentally unacceptable and technical issues surrounding the reservoir footprint
SN1b-F	Build New Reservoir	Construction of new reservoir at Vachery Pond.	Y	Environmental constraints and considerable infrastructure expenditure
SN1b-G	Build New Reservoir	Construction of new reservoir at Small Dole.	Y	Both sites lie within the River Adur flood plain so compensatory storage would be required. Significant material to be excavated and disposed of at considerable cost
SN1b-H	Build New Reservoir	Construction of new reservoir at Goose Green.	Y	Low refill from source, abstracted water quality issues and considerable infrastructure expenditure
SN1b-I	Build New Reservoir	Construction of new reservoir at Cornerhouse.	Y	Environmentally unacceptable as the River Adur is a designated trout fishery
SN1b-J	Build New Reservoir	Construction of new reservoir at Slinfold.	Y	Water quality issues due to shallow depth and limited capacity. Economic reliability
	Build New Reservoir	Construction of new reservoir at Nyewood.	Y	Requires new treatment works within AONB and proposed South Downs National Park
	Build New Reservoir	Construction of new reservoir at Petersfield.	Y	Considerable infrastructure required close to Petersfield and within AONB and proposed National Park
	Build New Reservoir	Construction of new reservoir at Rotherbridge.	Y	Environmentally unacceptable - River Rother is a major trout fishery and site is within AONB
	Build New Reservoir	Construction of new reservoir at Ingrams Green.	Y	Environmentally unacceptable - High impact on trout spawning grounds and white clawed crayfish habitat. Also within AONB and proposed National Park
	Build New Reservoir	Construction of new reservoir at Trotton.	Y	Environmentally unacceptable - River Rother is a major trout fishery and site is within AONB
	Build New Reservoir	Construction of new reservoir at Habin.	Y	Environmentally unacceptable - River Rother is a major trout fishery and site is within AONB
	Build New Reservoir	Construction of new reservoir at Kirdford.	Y	Environmental (trout spawning and within AONB) and water quality issues combined with economic feasibility
	Build New Reservoir	Construction of new reservoir at Kneppmill Pond.	Y	Environmental (woodland and within AONB) and water quality issues combined with economic feasibility

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
	Build New Reservoir	Construction of new reservoir at New Pond.	Y	Environmental (woodland and within AONB) and water quality issues combined with economic feasibility
	Build New Reservoir	Construction of new reservoir at Hammer Pond.	Y	Environmental (woodland and within AONB) and water quality issues combined with economic feasibility
	Build New Reservoir	Construction of new reservoir at Mill Pond.	Y	Environmental (within AONB) and water quality issues combined with economic feasibility
	Build New Reservoir	Construction of new reservoir at Hawkins Pond.	Y	Environmental (woodland and within AONB) and water quality issues combined with economic feasibility
	Build New Reservoir	Construction of new reservoir at Burton Mill Pond.	Y	Environmental (woodland and within AONB) and water quality issues combined with economic feasibility
SC40 and 31	M584 alternative site and treatment capacity	Scheme to improve DO through additional treatment for M584 scheme.	Y	Already assumed in AMP4
SC37	Tolmare Farm Borehole	New Groundwater Source at Tolmare Farm.	Y	Social & Environmental impacts
SC20	I747 treatment improvements	Improve monitoring of Arun/Chalk interaction to allow greater use of the source.	Y	Already in Capital Programme
SC23b	River Ouse Abstraction	New river abstraction on River Ouse.	Y	Social & Environmental impacts
SCXX	A163 Licence Increase	Increase in licence.	Y	Social & Environmental impacts
SCXX	V281Licence Increase	Increase in licence.	Y	Social & Environmental impacts
N1	Western Rother Irrigation Licences	This option investigates the possibility of purchasing existing summer spray irrigation licences on the Western Rother and replacing these with small farm storage reservoirs for the existing license holders. These reservoirs would be filled over the winter using a winter abstraction licence and then discharged over the summer months when the water is required. This would reduce the abstraction stress on the river during low flow periods and hence allow greater abstraction during peak periods when abstraction is constrained by the MRF in the river.	N	
N2	E282 Winter Refill (Medway)	This option refers to the refill of E282 by the abstraction of water downstream in the Medway during dry winters (effectively this significantly increases the catchment size for the reservoir). This option does not involve extension of the capacity of the reservoir or the water treatment works, rather it increases the volume of water held at the start of a drought event based on past hydrological experience. The abstraction will need to be sufficiently far downstream of the reservoir so that its catchment area will be likely to have flows high enough to abstract from, without adversely impacting on the hydrology and ecology of the river.	Y	Excluded in Phase 2. There are significant doubts over resource benefits under certain drought conditions, including the 'design scenario'

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
N3	MRF Seasonal Variation	Work carried out during drought permit applications in the 2005 and 2006 drought permits indicated that the MRF (Minimum River Flow) on the Western Rother could potentially be reduced by 10Ml/d without unacceptable environmental impacts, particularly if this is done outside of the summer critical period when river temperatures are at their highest. Currently the licence is 75Ml/d (combined surface and groundwater), but surface water abstraction is constrained by a requirement that the flow over the Weir should be no less that 63.64 Ml/d (daily average).	N	
N4	E282 Winter Refill (Western Rother/Arun treated water)	This option involves the transfer of water to E282 from sources other than the Medway. Initial considerations have shown that a dedicated raw water pipeline from either the Rother or Arun downstream of Horsham (which would need to be the location of any abstraction to produce an appreciable yield) would require 30km+ of pipelines. Given the potential yields and DOs involved (see Option N2) this would be considered to involve grossly excessive costs. It is considered that the only feasible option for transfer from these sources is a treated water transfer using existing infrastructure. The option would rely on using excess surface water capacity during the winter (which exists in even the most severe droughts) to treat and transfer water.	N	
N5	Build New Reservoir at Blackstone	The option involves the construction of an earth embankment reservoir at Blackstone with a proposed storage capacity of up to 4,600 Ml. The option will allow treated water to enter the distribution network to supply either the Sussex coastal block or the Hardham area. The reservoir will be filled with water pumped from the eastern branch of the river Adur. The abstraction of raw water from the river to the reservoir would have a maximum flow of 30Ml/d.	N	
N6	Surface Storage Reservoir at Hardham	The option involves the construction of a bank side storage reservoir to provide additional resources when the flow in the river Rother is low. Water would be abstracted from the river Rother during periods of high flow and would be used to supplement availability at low flows. Two reservoir sizes and sites have been identified depending on storage volume requirements, a 3500Ml storage reservoir and a 750 -1000Ml storage reservoir. At this stage the larger of the schemes has been considered.	Y	Excluded in Phase 2. A scheme of this size is unlikely to be viable, but a smaller option (ie N6a) in combination with N7 could well be viable
N6a	Surface Storage Reservoir at Hardham - combined Rother / Arun abstraction 10Ml/d		N	
N6a	Surface Storage Reservoir at Hardham - combined Rother / Arun abstraction 20 Ml/d		N	
N7a	Arun abstraction above the tidal limit Scheme 1: 5Ml/d abstraction	The option involves the construction of a river intake for abstraction on the river Arun and treatment at a supply works (using excess capacity in the works when flows in the Rother constrain abstraction to below 75Ml/d). The option would require an intake structure and a	N	

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
N7b	Arun abstraction above the tidal limit Scheme 2: 10Ml/d abstraction & 100Ml storage	pipeline. The river Rother joins the Arun about 6km downstream of the abstraction point.	N	
N7c	Arun abstraction above the tidal limit Scheme 3: 20Ml/d abstraction & 200Ml storage		N	
N8	Sussex North to coast Winter transfer Phase 1	This option considers the potential for excess surface water that may be available within the River Rother during the winter to be used (either within the existing licence, or using an extended winter licence) to supply Sussex Coast. This would allow coastal groundwater sources to be rested, which would help Southern Water's Source Drought Management Strategy (SDMS) and hence increase groundwater capabilities during the summer and autumn of a drought year.	Y	Included in N8 Phase 2 for final WRMP
N8a	Hardham Winter transfer Phase 1&2 (pipeline & pumping station) (assuming N9 is available)	As for N8, assuming N9 is available. Includes a 4Mld transfer from SN to SB.	N	
N8b	Hardham Winter transfer Phase 1&2 (pipeline & pumping station) (assuming N9 is not available)	As for N8, assuming N9 is NOT available. Includes a 4Mld transfer from SN to SB.	N	
N8	Sussex North to Coast Winter transfer Phase 3 (pipeline & further treatment / infra upgrade)	As for N8 above.	Y	Under current circumstances it does not appear that a large scale Coastal upgrade (i.e. phase iii) of Option N8) is appropriate to extend the current levels of transfer that are available
C1	Purchase Groundwater licences: Brighton / Worthing Blocks	During Phase 1 of the Options Appraisal process the EA indicated that new groundwater licences in the Brighton or Worthing Chalk Block would be unlikely to be granted. This option investigates the feasibility of purchasing the use of existing surface water and groundwater licences in Sussex. Investigations included all significant licences that are not currently owned by Southern Water and which are 'live' but have not been extensively used in recent years.	Y	Excluded during Phase 3 prior to sustainability assessment
C2	Worthing Turbidity Treatment	The original justification for this option was that there were a number of disparate sources in the Worthing area that were constrained by turbidity issues. It was considered that DO could be improved if these were treated, perhaps at a central location. However, AMP4 investigation and treatment schemes at several sites limited the potential to only a few remaining sites. The 2005/06 drought then promoted further investigations at these sites. This has resulted in ongoing works at D758 and a realisation that turbidity at X862 is also linked to potential adit stability issues, which means pumping and treating for turbidity would carry a high risk of compromising the structure and hence yield of the source.	Y	Excluded at Phase 2. Unstable sources

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
C3	Build New Reservoir on Coast	The option would involve the construction of an earth embankment reservoir and associated treatment works that would allow up to 10 Ml/d of treated water to enter the distribution mains and supply the Sussex Coastal block. The reservoir would be filled with water pumped from the river Arun at Houghton, which could only realistically be pumped during low tides and may be constrained to periods of relatively low flow during the winter because of turbidity constraints during higher flows. Because of this, the treatment works has been sized at a relatively low capacity (10Ml/d). Approximate reservoir storage would be around 3,500 Ml.	N	
C4	River Adur Abstraction	This option is similar to Option N5, but C4 would involve direct abstraction from the Adur all year round without associated storage. As with N5, it is considered that the eastern branch of the Adur is the only one that is potentially suitable for abstraction due to the very low flow rates in the western branch. This is supported by the Adur and Ouse CAMS document, which indicates that the eastern branch is the only one with water potentially available during the summer. Abstracted water from the River Adur would be treated directly and then supplied up to a rate of up to 5Ml/d. This is considered to be the maximum realistic upper limit, as flows within this branch of the Adur regularly fall as low as 12 Ml/d during low flow years (the majority of which is formed from artificial discharges). The Option has two alternatives, one is to send the water into supply at a WSR, the alternative is to send the water into supply via the Sussex North to coast transfer main.	N	
N9	Arun Abstraction Below Tidal Limit 10Ml/d abstraction & 50Ml storage	The option involves the abstraction of river water from the tidal stretch of the river Arun. The option would require an intake structure and a pipeline to the nearest WSW. Because it would be abstracting from the tidal river, abstraction would only be possible for part of the day. As a result, the option would require abstraction infrastructure capable of supplying up to twice the anticipated yield. It would also require a 'balancing pond' at least large enough to store a full day's abstraction, ideally being located within or adjacent to the nearest treatment works. One abstraction point and pipeline route is proposed on the inside bend of the Arun downstream of the confluence with the Rother and opposite Pulborough brooks SSSI. A second abstraction location and pipeline route is proposed upstream of the Arun – Rother confluence, although at this stage it is not certain whether the hydraulics of the river would allow this as an option. Water would be treated using the spare capacity at the water treatment works that is available when river recession limits the allowable abstraction from the River Rother.	Y	Replaced by preferred N9 option
N9	Arun Abstraction Below Tidal Limit 10Ml/d abstraction & 75Ml storage		N	
N9	Arun abstraction Below Tidal Limit 15Ml/d abstraction & 250Ml storage		Y	Replaced by preferred N9 option
Desalination Options				
CD1a	Coastal Desalination 10 Ml/d	This option proposes installation of a seawater desalination plant which would be capable of producing 10 or 20Ml/d.	N	
CD1b	Coastal Desalination 20 Ml/d		N	
CD2	Tidal River Adur Desalination	Most of the tidal stretch of the river is internationally designated. The Adur runs through the Sussex Downs AONB and is designated as a SSSI on entering Shoreham Harbour. Adur Estuary SSSI site also forms part of an RSPB reserve witch supports a large number of wading birds and saltmarsh plants.	Y	Excluded at Phase 2. Rejected on environmental grounds
CD3a	Tidal River Arun Desalination 10 Ml/d	The River Arun runs through a SSSI, AONB, and RSPB reserve in its upper tidal reaches and is a designated SNCI along much of its length. The area of interest in the lower few	N	

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
CD3b	Tidal River Arun Desalination 20 Ml/d	kilometres below Arundel are relatively free from major designations with the exception of Climping Beach SSSI on the western side of the estuary restricts locating a desalination plant in that area. This option proposes the installation of a desalination plant between Littlehampton and Arundel which would treat the estuarine water from the River Arun to produce 10 or 20Ml/d.	N	
CD4	Tidal River Ouse Desalination	The tidal reach of the river passes through an AONB, a SSSI and a SNCI. Although much of the river stretch is not in the company's supply area, the option was investigated because of the potential for brackish water desalination. The area with most potential has been identified as the industrial and business area located within Newhaven (Denton Island and North Quay Road industrial estate) which is within easy access of the river. These areas are not locally, nationally or internationally designated.	Y	Excluded at phase 2. Plant unable to be located within the company's water supply area
CD5	Coastal Aquifers	Following the Phase 1 assessment, the EA was consulted about the prospect of groundwater abstractions that would deliberately induce saline intrusion into aquifers near the coast for the purpose of desalination. EA water resources officers clearly indicated that this was against licensing policy and that such applications would have a 'presumption against' them. For these reasons option CD5 is not considered to be feasible and has not been examined further.	Y	Excluded at phase 2. EA water resource officers informed plans would be against licensing policy
CD6	Deep Groundwater	Abstraction of deeply confined aquifers with poor water quality is carried out in conjunction with desalination technology. This practice is deliberately unsustainable as it takes water from an aquifer that is not being replenished (at least not in the short term) by the hydrological cycle.	Y	Excluded at phase 2. No suitable aquifers available
CD7	Offshore desalination	Ship-mounted desalination has been discounted as a water resource option on the basis that it is considered to offer no significant advantages over land-based alternatives for producing the required quantities of potable water. It would require a pipeline connection into supply from a suitable berth, power connection, delivery and storage of consumables on land or the ship, and purchase or lease of an appropriate vessel along with mooring fees. In addition, recirculation of brine may become an issue at high production rates unless either the offtake or discharge is located at some distance from the ship. Offshore platform desalination has been discounted for similar reasons.	Y	Excluded at phase 2. No advantages over land based desalination
Transfers Options				
SN31	Hants South to Sussex North transfer	This pipeline option would be operated at critical summer periods and the pipeline would then be drained over the winter when supply from the River Rother was adequate. The proposal was to transfer 20Ml/d (peak and average).	Y	Itchen Habitats Directive found significant environmental impacts would remove excess water availability
SN43	Transfer to Medhurst		Y	Asset optimisation
SN44	Pump / reverse flow from Sussex Worthing to Sussex North		Y	Duplication of option SN22
SNXX	Increased Connectivity – within Sussex North		Y	Asset Enhancement
SC28	Import Water from Sussex North		Y	Duplication of option SN41

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
SC8b	Import Water from the North		Y	Duplication of option SN41
SC15b	Develop new trunk mains in Sussex Worthing		Y	Asset enhancement
SC18b	Develop strategic trunk main in Brighton		Y	Asset enhancement considered in N8
	Folkestone and Dover Water	Folkestone and Dover Water: an extension of a seasonal supply to an all year supply from 2010/11 is possible, depending on the outcome of investigations which will occur during AMP4.	Y	Does not provide additional DO
	South East Water	South East Water: there are no proposals for any increase in bulk transfers, again pending AMP4 investigations. However, there is potential that, in future, Bewl reservoir may provide additional supplies to South East Water.	Y	Does not provide additional DO
	Bulk transfer from Kielder Reservoir		Y	Practicality & technical feasibility
	Bulk transfer from Craig Goch Reservoir		Y	Practicality, technical feasibility & environmental impacts
	Imports from other water companies outside south east region & Thames Water		Y	No areas with sufficient water surplus
	Water Grid and canals		Y	Technical feasibility is uncertain, concerns regarding practicality and reliability of the scheme, potential for significant environmental impacts
SNXX	Wey and Arun Canal transfer		Y	Technical feasibility, practicality and reliability
NT1	Pump / reverse flow from Sussex Coast to Sussex North	Delivered in AMP4.	Y	Scheme is confirmed as being delivered in AMP4
NT2	Transfer from Bewl to Weir Wood	Scheme carried forward to Phase 3.	Y	Requires large scale water resource developments. Not considered for the first stage of water resource development
CT1	Second stage transfer to/from Sussex Coast	Insufficient spare capacity.	Y	Water resource modelling shows there is insufficient spare capacity to justify such a transfer without further resource development
NT3	Increase the connectivity between SEW and SW raw water reservoirs	This option is to increase connectivity between two reservoirs to allow transfer from a SEW raw water to E282 at a capacity of 10 to 20Ml/day. The option to increase the connectivity between the reservoirs does not involve extension of the capacity of either reservoir or the water treatment works. Rather, this option aims to increase the volume of water held at the start of a drought event based on past hydrological experience.	Y	Weir Wood does not provide significant benefit in the baseline design scenario. This option is eventually covered by NT10

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
NT4	Increase the connectivity between SESW and SW raw water reservoirs	This option involves the transfer of water from a Sutton and East Surrey Water reservoir to E282. The transfer would most likely be of raw untreated water but it is also possible that water would first be treated. The latter option would require consideration of any additional capital and operational expenditure in treating the water before pumping, and for the Phase 2 costings it has been assumed that a raw water transfer is possible. The choice of whether to transfer raw or treated water would also need to be made with consideration for any possible water quality impacts or risks of transfer of alien species.	Y	Requires large scale water resource developments. Not considered for the first stage of water resource development
CT6	Sussex North to coast Winter transfer to enable resting of coastal groundwater sources	Now included in option N8.	Y	Covered by N8
CT2	Bulk supply from Darwell	Scheme carried forward to Phase 3.	Y	
CT3	Raw water supply from Darwell	Raw water transfer would be more cost effective from Bewl rather than Darwell.	Y	Any raw water transfer from the Bewl-Darwell system would be more cost effective and reliable coming from Bewl rather than Darwell
CT4	Enhance Bewl-Darwell transfer to 45 Ml/d	Option considered under NT2.	Y	All options involving Bewl-Darwell are covered under option NT2
CT5	Transfer between Sussex Hastings WRZ and Sussex Coast	Unlikely to be any excess capacity.	Y	The ongoing Kent and Sussex Hastings Water Resource Investigation Programme has made it clear that it is highly unlikely there will be any excess capacity
NT5	Increase the existing Portsmouth Water transfer to Sussex North	Scheme carried forward to Phase 3.	Y	Requires large scale water resource developments by PWC. Not considered for the first stage of water resource development
CT9	Large scale coastal transfer	Similar to option CT8.	Y	There is no difference between this option and the various Portsmouth Water transfer options
NT6	Purchase of the Portsmouth Water source which supplies transfer to Sussex North	Scheme carried forward to Phase 3.	Y	Requires large scale water resource developments by PWC. Not considered for the first stage of water resource development
CT7	Bulk import from South East Water	Scheme carried forward to Phase 3.	Y	Covered by NT4
CT8	Portsmouth Water supply to Sussex Coast	Scheme carried forward to Phase 3.	Y	Requires large scale water resource developments by PWC. Not considered for the first stage of water resource development.
NT7	Supply from Portsmouth Water following construction of a Havant Thicket reservoir (by 2020)	Scheme carried forward to Phase 3.	Y	Requires large scale water resource developments by PWC. Not considered for the first stage of water resource development.

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
NT8	Terminate bulk supply to South East Water	Bulk supply terminated as early as possible.	Y	It is assumed that the bulk supply will terminate as early as possible (2020)
NT9	Additional extraction from Bray WTW	Scheme carried forward to Phase 3.	Y	Requires large scale water resource developments. Not considered for the first stage of water resource development
NT10	Additional extraction from the Thames	Option NT4 is a better solution.	Y	Effectively covered by NT4
Wastewater recycling options				
NR1	Recycle wastewater to support flows within the River Rother	A number of separate wastewater recycling options were assessed during the Phase 1 process after which three possibilities were identified. These possibilities were: • The transfer of recycled wastewater from Havant to the river Rother (Option NR1); • Transfer of recycled wastewater from the Littlehampton area to the same point on the Rother(Option NR2); and • The direct re-use for large non-potable users in the Central Area (Option NR3).	Y	Rejected at Phase 2 as more expensive than NR2
NR2	Transfer of recycled wastewater from Littlehampton area to support flows within the River Rother - MBR	This option involves the transfer of up to 20Ml/d of recycled wastewater, currently being discharged to sea at Littlehampton, to the River Rother in order to maintain flows over the weir during drought conditions. 20Ml/d represents the upper end of the reliable flow that could be expected. Because the option requires a long pipeline, smaller schemes (e.g. 10 Ml/d) have not been evaluated at this stage because they would almost certainly be less cost effective than this large option. Membrane treatment.	N	
NR2	Transfer of recycled wastewater from Littlehampton area to support flows within the River Rother - BAFF	As above but with BAFF treatment.	N	
NR3	Direct re-use for large, non-potable users in the Central Area	Supplying recycled wastewater to industrial users for non-potable purposes to replace existing potable supplies is a potentially feasible water resources option to free up existing potable water for delivery to domestic customers and thereby off-setting the need for new water resource development. Such schemes however would involve the construction of new dedicated non-potable water supply infrastructure to the point of use and there is a commercial risk that such infrastructure would become redundant should the water use needs of the end user change in future.	Y	No viable options
ASR Options				
	Sussex North – Tunbridge Wells Sands		Y	Technical feasibility
	Sussex North – Ashdown Beds		Y	Technical feasibility
	Sussex North – Portland Sandstone		Y	Technical feasibility

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
	Sussex Coast – Chalk		Y	Technical feasibility
	Sussex Coast – Upper Greensand		Y	Technical feasibility
	Sussex Coast – Tunbridge Wells Sands		Y	No information available
	Sussex Coast – Ashdown Beds		Y	No information available
NA1	Sussex North – 5 Ml/d (Hythe Beds?)	Because of the uncertainty over the scope for development within the Lower Greensand in a given area, two alternative schemes have been assessed under this option; a 5Ml/d output using two boreholes (scheme A) and a 10Ml/d output using four boreholes (scheme B). The option includes the construction and testing of pilot boreholes followed by the development of full scale boreholes to a depth of around 400m below ground level. The option will take potable mains water and inject it into the aquifer within the Lower Greensands formation during the winter and abstract it over the summer months. The abstracted water is then treated and then sent into supply via a WSR.	Y	Excluded in final WRMP
CA1	Sussex Coast - 10 Ml/d (Lower Greensand?)	Because of the uncertainty over the scope for development within the Lower Greensand in a given area, two alternative schemes have been assessed under this option; a 5Ml/d output using two boreholes (scheme A) and a 10Ml/d output using four boreholes (scheme B). The option includes the construction and testing of pilot boreholes followed by the development of full scale boreholes to a depth of around 400m below ground level. The option will take potable mains water and inject it into the aquifer within the Lower Greensands formation during the winter and abstract it over the summer months. The abstracted water is then treated and then sent into supply via a WSR.	N	

Table G.4.2 Unconstrained List of Resource Development Options for Central Area

G.4.1.3 Eastern Area

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
Local Options				
SH2b	New GW source	Development of a new groundwater abstraction in Sussex Hastings WRZ.	Y	Environmentally unacceptable - EA policy of no more consumptive abstraction from the unconfined chalk
KM2b	New GW source	Development of a new groundwater abstraction in Kent Medway WRZ.	Y	Environmentally unacceptable - EA policy of no more consumptive abstraction from the unconfined chalk
KT2b	New GW sources	Development of a new groundwater abstraction in Kent Thanet WRZ.	Y	Environmentally unacceptable - EA policy of no more consumptive abstraction from the unconfined chalk
KM35	Seasonal optimisation	Optimise the seasonal management of the North Kent chalk aquifer block.	Y	Practicability & reliability - already implemented as far as possible
H1	Enlargement of Darwell Reservoir	This option involves raising the embankment of Darwell Reservoir. The proposal is to raise the embankment by up to 10m to provide increased storage, and therefore increase supplies.	N	
H2	Enlarge Powdermill Reservoir and increase abstraction from the Eastern Rother to refill during winter period	This option involves raising the embankment of Powdermill Reservoir by up to 13m to provide increased storage and subsequently increase supplies to Southern Water. The scheme would consist of the following: • Raising the reservoir embankment by 13m; • Increasing the storage from 856Ml to 7200Ml; and • Improvements to a 5km road section of the A21 in order to improve access to the reservoir site.	Y	Scheme has high impacts with small water resource benefits
H8	New abstraction from the River Brede and transfer to Powdermill Reservoir	This option would require the construction of a river abstraction on the River Brede close to the existing abstraction, from where the water would be pumped through a new transfer main to Powdermill reservoir.	N	
H3&H7	Re-introduction of disused boreholes	This option considers refurbishment or replacement of S556 borehole source. This option includes the drilling of new boreholes, construction of new treatment and provision of a connection to the existing distribution system.	N	
H4	New borehole at L832	There is an existing source at l832. This source is currently used and has a deployable output of 2.26 Ml/d (average) and 3.8 Ml/d (peak). There are at least 3 boreholes at the site, linked by a series of adits. This option aims to increase the deployable output at the site to the licensed value. The current licence is for 2.26 Ml/d (average) and 8.73 Ml/d (peak). Hence it is only possible to increase the peak licence at this source.	Y	The site is at its hydrogeological yield and cannot be increased further
H5	Upgrade treatment capacity at X431	Treatment works can act as strategic constraints within the supply system. They do not provide additional water, but can make water available if constraints within the network are removed. Network constraints and their impact on any schemes to increase DO within Sussex Hastings WRZ will be investigated.	Y	Considered as strategic constraint so not costed

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
H6	Upgrade treatment capacity at O455	Treatment works can act as strategic constraints within the supply system. They do not provide additional water, but can make water available if constraints within the network are removed. The current capacity of the WSW is 25 Ml/d but it is subject to an AMP4 scheme to increase the treatment capacity to 30 Ml/d. . Network constraints and their impact on any schemes to increase DO within Sussex Hastings WRZ will be investigated.	Y	Considered as strategic constraint so not costed
M1& M12	Re-commission existing or old licences	The following sources have been considered for re-commissioning within the Kent Medway WRZ: • C552l; • S171; and • Z468	Y	Baseline option that was included in the water resources model
M2	Purchase under-utilised licences from industry	This option considers the feasibility of purchasing the use of existing large industrial abstraction licences by Southern Water that have not been used either in part, or in their entirety.	Y	No viable options
M3	Develop new 'leakage sources' to capture groundwater flowing into tidal sites	This option reviews the potential for capturing groundwater flow into tidal sites in both the Kent Medway and Thanet WRZs. This is predominantly considered as an operational efficiency measure, in a similar manner to 'spread load' boreholes in that it would permit key groundwater sources to be rested.	Y	Source enhancement
M4	Develop new 'spread load' boreholes to increase DO	This option investigates developing sources in order to spread abstractions across an increased number of boreholes. This will result in making enhancements to a number of boreholes. Work was carried out under the 'Source Optimisation' programme during 2006 to investigate a number of opportunities in this area.	Y	Source enhancement
M5a	Raise Bewl Water 3m	The scheme involves the raising of Bewl Water, by up to 3m to increase storage and yield. The major works for raising Bewl to higher TWL levels will include: • Raise the dam crest and build new wave wall; • Raise overflow and valve chamber shafts; and • Many ancillary works around the perimeter of the reservoir.	N	
M5b	Raise Bewl Water 3m plus licence variation	As for M5a plus Licence Variation M10.	Y	Considered for final WRMP but M5b and M10 are individually included in the investment model
M6	Investigate and develop other new reservoir sites		Y	Raising existing reservoirs is a priority over creating new ones
M7	Increase treatment and mains capacity at P647	Treatment works can act as strategic constraints within the supply system. They do not provide additional water, but can make water available from options if constraints within the network are removed. The effect of constraints within the network on any schemes to increase DO within the Kent Medway WRZ will be investigated.	Y	Considered as strategic constraint so not costed
M8	Use of flood storage reservoirs	The Leigh Barrier is an impounding flood storage reservoir, which is used to attenuate peak flows in the Upper Medway catchment and hence reduce the risk of flooding downstream. The barrier is 6m high and has a storage capacity of approximately 5,500 Ml. Analysis has been carried out to assess how much water may be available at the barrier, for years when Bewl Water fails to fill. Analysis of the flow record shows that there are no dates when the Leigh Barrier would be operated.	Y	Analysis of flow records show this option is not expected to provide additional DO

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
M9	Implement a licence variation combined with an increase in pump capacity in North Kent	This borehole abstraction licence amendment scheme proposes to alter the existing licence which forms part of the Sittingbourne group licence. This will remove the annual licence constraint and hence allow abstraction at the daily rate over the whole year. This option is a proposal to increase the abstraction from the MDO value of 3.4 Ml/d to 5.0 Ml/d through a change in the licence. It is understood that the source is rested during periods of low groundwater in the autumn and winter.	N	
M10	Licence amendment for G457	Within the licence there are two key levers which constrain how these elements of the scheme operate. These are: • The MRF at Teston, which controls when abstraction must cease and when releases should start; and • The release factor, which states that 20% more water should be released from Bewl Water than is required for re-abstraction at V356. A combination of different options is reviewed in order to assess the potential improvement in deployable output as a result of implementing this option.	N	
M11	Blue Water	Blue Water is a former quarry in North Kent which is owned by Blue Circle. It is reported to have flooded during the 1930s while being worked. It is thought that this is due to the quarry intercepting a fissure. There are a number of current abstraction licences around the site. There are a number of constraints that would influence the ability to develop a new source at Blue Lake. The main constraint is that of water quality as this is understood to be poor. It is reported that the site is contaminated by flue dust. There is also the potential for saline intrusion and there is a cemetery close to the lake.	Y	Blue Water would not be suitable for strategic water resource development because of water quality problems and high cost
M13	F364 & H358 refurbishment	This option involves the refurbishment and reintroduction of the F364 & H358 groundwater sources. The existing boreholes are located on the Isle of Sheppey. This option involves the construction of new boreholes, raw water mains and a combined treatment works.	Y	High risk scheme
M14	Construction of bankside storage at A615	This option proposes bankside storage of 250Ml capacity would capture and store water from the River Medway at high flow events. At times of need, this would allow the existing A615-Bewl pipeline, which only abstracts during high flow events, to transfer water over an extended time period i.e. when river levels have fallen below the normal cut off level.	Y	Large construction issues, new abstraction licence required
M15	Increased capacity of the A615 to Bewl Water transfer main	The River Medway is of a 'flashy' nature, with high flows following rainfall events, even during 'dry' conditions. In order to maximise the potential abstraction, Southern Water recently built a pipeline between A615 and Bewl Water with a capacity of 250 Ml/d. The existing pipeline is of 1200mm diameter with a length of 19.9km. This proposed option duplicates the existing pipeline, including the construction of a new pumping station and rising main. This would also require a new abstraction licence from the Environment Agency, which would be expected to be above the existing MRF plus abstraction capacity (i.e. above 500 Ml/d).	Y	Similar benefit achieved by varying existing licence

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
T1	Development of new reservoir at Broadoak, inclusive of new treatment works and mains	The scheme is for a new surface water storage reservoir located to the west of the A291, along the valley of the Sarre Penn stream just to the north of the village of Broad Oak in east Kent. The outline of the scheme is as follows: • Abstraction from the River Stour. • Abstraction works and pumping station. • A new raw water pipeline from the abstraction location to the reservoir and the construction of inlet and off-take towers. • A new impoundment dam across the Sarre Penn valley and all associated works. • A new water supply works to treat water abstracted form the reservoir and all associated underground infrastructure • Various roadworks and landscaping works associated with the reservoir.	N	
T2	New surface water abstraction and bankside storage from the Stour	Southern Water currently operate a surface water abstraction on the River Stour,. Option T5 seeks to increase this abstraction and develop bankside storage. This abstraction is at the tidal limit and is therefore at the most appropriate location within the catchment, i.e. the furthest practical location downstream. This option (T2) for a new surface water abstraction and bankside storage elsewhere within the Stour is therefore excluded, as the present site is a more appropriate option.	Y	Plucks Gutter is a more appropriate option and is covered in T5
T7	Re-introduce all GW sources currently out of action	This option encompasses work at a number of sources which are currently unused. Each source has been considered individually.	Y	Seven borehole sources were reviewed. Due to poor water quality or low yield none appear suitable
T8	K788	This option involves the reintroduction of groundwater from the K788 borehole. This source is located north of Ramsgate. The site contains a 53m deep borehole, a small water treatment works and a covered reservoir. The site is licensed at 5.68 Ml/d (MDO and PDO). The current source is out of action due to a water quality incident at the site. The scheme is to refurbish the current borehole, install all necessary pumping infrastructure and new treatment works.	Y	Rejected because source is too polluted (Phase 2)
T5a	T656 10Ml/d	This section assesses the potential options to increase the water available from the River Great Stour. There are two key sub-options that are proposed for further consideration. These can be summarised as the following: • Build bankside storage in combination with a new WTW (10 Ml/d works). The option includes a licence variation to increase the abstraction from the River Great Stour by 10 Ml/d during the winter period (October to March) in order to fill the proposed bankside storage; and • The construction of bankside storage combined with recycled wastewater (option TR1) and a 25 Ml/d works.	Y	Consolidated into T5b
T5b	T656 25Ml/d	See T5a but for 25Ml/d	N	
T3	Develop the resources of the North and South streams (and associated treatment)	The aim of this option is to develop the water resources in the North and South Streams area. The North and South Streams are two streams that run parallel to each other in the Hacklinge Water Resource Management Unit (WRMU) of the Stour catchment.	Y	Increased abstraction is unlikely due to the current environmentally poor condition, the limited resource and the environmental designations
T4	Mine working storage	This option represents the storage of raw water in disused mine workings. There are a number of significant problems with this option.	Y	Rejected on grounds of practicability and water quality

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
T6	Thanet WRZ licence variation	R168 & A853 are borehole sources which abstract from the chalk aquifer. They are located in close proximity to each other. This option is to aggregate the licence for the sources, in order to allow the overall deployable output to be increased.	Y	The scheme is included in the assessment and the revised DO has been included in the water resources model
H9	Darwell licence variation		N	
	Borehole source at Sittingbourne	Taking over of an existing licence.	Y	
Desalination Options				
HD1	River Rother Desalination, for about 3km from the river mouth up until Houghton Green	The historic town of Rye is situated on the confluence of the Rivers Rother, Brede and Tillingham and is almost entirely encapsulated within the High Weald AONB. Upstream, between Rye and Houghton Green, the area around the Rother consists of residential housing areas and would not be suitable for the proposed development.	Y	Site around Rother consists of residential housing and would not be suitable for the development
HD2	River Brede Desalination, on the approach to Rye where it joins the Rother before entering Rye Harbour	The River Brede is only tidal for a very short distance, approximately 800m, where it joins the Rother before entering Rye. Aerial photos show residential housing and boat yards overlooking the only plot of undeveloped land on the stretch, across a relatively narrow channel.	Y	A more suitable site is located to the south and considered in HD4
HD3	Hastings Desalination	Hastings is largely surrounded by the High Weald AONB, as well as a large swathe of SSSI and SAC (Hastings Cliffs). Hastings is predominantly residential in nature and no appropriate locations for desalination have been identified.	Y	Site around Rother consists of residential housing and would not be suitable for the development
HD4	Hastings WRZ Desalination 5 Ml/d	Although the flat farmland surrounding Camber has some potential for developing a desalination plant, it is designated as a SSSI and is a popular seaside tourist destination. A much better site is an area of land to the south of Rye, which is located adjacent to an industrial area which includes a cement works. The industrial area has no environmental designations and the presence of the cement works indicates that power supplies may be available. This area will be considered for a desalination plant in the feasibility appraisal although the cost of connecting to the service reservoirs near Hastings might make this option economically unfavourable.	N	
HD5	Winchelsea Desalination	Winchealsea town, beach and surrounding area is located within the High Weald AONB and is largely protected by national and international ecological designations. Similarly, further inland Winchealsea village itself is situated within a gap between SSSI and SNCIs. There are no potential locations for a desalination plant here.	Y	There are no potential locations for a desalination plant here
HD6	Coastal aquifer desalination	Following the Phase 1 assessment, the EA was consulted about the prospect of groundwater abstractions that would deliberately induce saline intrusion into aquifers near the coast for the purpose of desalination. EA water resources officers clearly indicated that this was against licensing policy and that such applications would have a 'presumption against them'.	Y	EA indicated that groundwater abstractions that would deliberately induce saline intrusion into aquifers is against licensing policy
HD7	Desalination of deep groundwater	Abstraction of deeply confined aquifers with poor water quality is carried out in conjunction with desalination technology. This practice is deliberately unsustainable as it takes water from an aquifer that is not being replenished (at least not in the short term) by the hydrological cycle.	Y	Groundwater 'mining' for desalination is expected to have an unacceptable impact on potable water aquifers

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
HD8	Offshore desalination options	Ship-mounted desalination has been discounted as a water resource option on the basis that it is considered to offer no significant advantages over land-based alternatives for producing the required quantities of potable water. It would require a pipeline connection into supply from a suitable berth, power connection, delivery and storage of consumables on land or the ship, and purchase or lease of an appropriate vessel along with mooring fees. In addition, recirculation of brine may become an issue at high production rates unless either the offtake or discharge is located at some distance from the ship. Offshore platform desalination has been discounted for similar reasons.	Y	No significant advantage over land-based alternatives for producing the required quantities of potable water
MD1	Isle of Sheppey Desalination 10 Ml/d	Locating a desalination plant on the Isle of Sheppey has a clear advantage: it would meet local demand while significantly reducing the need for transfers along the main from Deans Hill BPT. The site south of Sheerness Docks will be further investigated in the feasibility appraisal. This option would require: • Construction of a reverse osmosis desalination plant and buildings including pre- and post-treatment facilities and delivery and storage facilities for consumables; • Necessary site facilities and service connections (power connection, fencing, car park etc); • Mains connection to supply 5Ml/d to two service reservoirs (total approximately 9km); • Intake facilities from coast to the site; and • A long-sea outfall would be required due to the lack of local WWTW.	N	
MD2a	River Medway Desalination, up as far as Allington Lock 10 Ml/d	This option proposes installation of a desalination plant in the Upper Medway estuary.	N	
MD2b	River Medway Desalination, up as far as Allington Lock 20 Ml/d	As for MD2a but 20 Ml/d.	N	
MD3	River Thames Desalination at Northfleet or Gravesend	This option proposes the development of a desalination plant adjacent to the River Thames which would be capable of producing 10Ml/d, and would discharge through an outfall from a local WWTW.	Y	Excluded due to low PAC value (Phase 2)
TD1	Desalination – East Kent coast	This stretch of coastline has been discounted as a potential site for a desalination plant because the coastline is subject to several designations (e.g. SSSI, Ramsar sites, SAC and SPA, Special Landscape area) and is either undeveloped or residential in nature.	Y	The site is subject to several designations and is either undeveloped or residential in nature
TD2a	River Stour Desalination 10 Ml/d	The Stour Estuary is largely made up of protected areas and is therefore unsuitable for a desalination plant. However, areas of land adjacent to existing WWTWs show some potential. The desalination plant would produce 10Ml/d or 20Ml/d and combine discharge with the WWTW's existing outfall.	Y	Rejected due to environmental impact (Phase 2)
TD2b	River Stour Desalination 20 Ml/d	As for TD2a but 20 Ml/d.	Y	Rejected due to environmental impact (Phase 2)
Transfer Options				
SH18	S348 to X431 Main		Y	Infeasible - trial borehole found no water
	Craig Goch supply	Supply from Craig Goch in Wales and transfer of water via River Severn and transfer to River Thames.	Y	Practicality, technical feasibility & environmental impacts

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
	Imports from other Water Companies outside SE		Y	No areas with sufficient water surplus
	Water Grid and canals		Y	Technical feasibility is uncertain, concerns regarding practicality and reliability of the scheme, potential for significant environmental impacts
HT1	Enhance Bewl-Darwell transfer to 45Ml/d	The Bewl to Darwell transfer scheme option proposes to increase the existing transfer capacity between the Bewl and Darwell Surface Water Reservoirs from 35Ml/d to 45Ml/d with the construction of a new raw water transfer main. The new main would be constructed alongside the existing transfer mains between the two reservoirs.	N	
HT2	Transfer between Sussex Hastings and Sussex Coast		Y	No water available to transfer either currently or in future predictions
HT3	Optimise Medway – Rother transfer	This option is to use the existing Bewl-Darwell transfer main to transfer water from Darwell to Bewl. This would re-use the existing pipeline but would require a new pumping station, together with by-pass valves on the existing main and potentially additional air valves or other infrastructure along the pipeline route.	Y	The PAC of the scheme is very low (less than 2 Ml/d) and is not considered as a strategic water resource development
HT4	Connect Powdermill and Darwell	Construct a transfer pipeline between Darwell and Powdermill Reservoirs to allow water to be transferred between these sources. The pipeline is designed with a maximum capacity of 10 Ml/d.	Y	Provides very little DO
TT1	Duplicate transfer along existing Kent Medway to Kent Thanet main	The Kent Medway to Kent Thanet transfer scheme option proposes to increase the existing transfer capacity by 11 Ml/d from the current 22.5 Ml/d to 33.5 Ml/d. This would be achieved by duplicating the existing transfer main, which would require the construction of: • New Pumping main ; • Booster pumping station; • Break pressure tank • Gravity main ; • Modification of borehole pumps ; and • Additional treatment including disinfection and phosphate dosing.	N	
MT4	Wastewater recycling transfer Sevenoaks	Wastewater within the Sevenoaks area is collected by Thames Water and transported to one of their treatment works This represents water 'lost' from the Medway catchment. This option relates to the use of any increased discharge as a result of expansion in the Sevenoaks area, by a transfer to the headwaters of the River Medway.	Y	Given the complexities associated with this option and the small potential increase in DO, this is discounted as it is not a strategic option
HT5	Clay Hill reservoir transfer	The status of Clay Hill Reservoir is unknown. South East Water are conducting a review of their strategic options available. At PR04, the development of a new reservoir at Clay Hill was the preferred scheme. There are considerable uncertainties associated with this option for SW. Firstly, there is no control of either the timing or the scale of the development proposals. Secondly, the water available to SW is unknown. Given the complexities associated with this option and the small potential increase in deployable output, this is discounted as it is not a strategic option.	Y	As there is uncertainty about this reservoir and the potential for any transfer of water from it

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
HT6	Waller's Haven transfer from SEW	This option represents a transfer of water from SEW's Waller's Haven abstraction to Darwell Reservoir. No information about whether any water would be available for transfer has been made available.	Y	SEW confirmed that there is no water available for transfer from this source
TT2	Termination of Deal bulk supply to FDWS	SW currently has an agreement to supply Folkestone & Dover Water (F&DW) with a supply of potable water. The agreement is for a transfer of approximately 3 Ml/d during the period of September to December (inclusive). The current contract ends on 31st December 2012. Non renewal of this bulk supply at a time other than this contractual date is not considered viable.	Y	As the volumes of water associated with this scheme are small it is not considered strategic
HT7	Termination of Darwell reservoir supply to SEW	SW currently have an agreement to supply South East Water with raw water from Darwell Reservoir. The agreement is for an average supply of 8 Ml/d, up to a maximum of 12 Ml/d. The current contract states that there is an option for a break in the contract on 31st December 2013 and the contract ends on 31st December 2023. Non renewal of this bulk supply at a time other than these contractual dates is not considered viable.	Y	As this only represents a reduction in the bulk supply of 2.7 Ml/d, this is not considered as a strategic
MT1	Termination of Belmont scheme to MKW	SW currently has an agreement to supply South East Water with water from the Belmont area. The agreement is for a transfer of approximately 22% of the yield of three sources. The current contract ends on 31st March 2023. Non renewal of this bulk supply at a time other than this contractual date is not considered viable.	Y	Contracted until 2023, not a viable scheme for this appraisal
MT2	Thames abstraction and transfer to SESW, then to SWS	This option assesses the feasibility of transferring resource from Thames Water (TWUL) to SW, via the Sutton and East Surrey Water (SESW) system. SESW currently have no water available for transfer to Southern Water. However, they share boundaries with both TWUL and SW. Their one surface water reservoir, currently pumps treated water to support peak demand in their Sutton WRZ. A secondary option would be to build a pipeline to transfer treated water from this reservoir to P647. This would provide slightly increased output, as there would not be an environmental loss associated with the scheme. However, this is a significant distance, with various motorway and railway crossings. Hence this pipeline transfer option is not considered, as a 'free' transfer using the river is clearly preferable to the costs (both capital and pumping / maintenance costs) and environmental impact associated with the construction of a pipeline.	Y	Reliant on surplus from Thames Water which is unrealistic - depends on their resource development strategy. Removed for final WRMP
MT3a	Bulk supply from Thames Water reservoir (London Water Ring Main) 10 Ml/d	This option involves the transfer of up to 40Ml/d of treated water from a Thames Water in Lewisham to P647 , through a new bulk transfer pipeline. There is the potential that this option may be developed jointly with South East Water. The works will include: • A new pumping station at Thames Water's reservoir; • A new pipeline 48km long ; • A booster pumping station; • A new service reservoir and pumping station at P647 and • New distribution mains from P647.	Y	Excluded from final WRMP as not reliable option
MT3b	Bulk supply from Thames Water reservoir (London Water Ring Main) 20 Ml/d	See above	Y	Excluded from final WRMP as not reliable option

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
MT3c	Bulk supply from Thames Water reservoir (London Water Ring Main) 30 Ml/d	See above	Y	Not economically viable, no guarantee water is available
MT3d	Bulk supply from Thames Water reservoir (London Water Ring Main) 40 Ml/d	See above	Y	Not economically viable, no guarantee water is available
Wastewater recycling Options				
MR1	Review of potential large commercial users with sites close to SWS WWTWs to determine options for non-potable re-use	Supplying recycled wastewater to large industrial users for non-potable purposes is a potentially feasible option to free up existing potable water for delivery to domestic customers and thereby off-setting the need for new water resource development. Such schemes however would involve the construction of new dedicated non-potable water supply infrastructure to the point of use and there is a commercial risk that such infrastructure would become redundant should the water needs of the user change over time.	Y	Kent International Airport's water demands have reduced markedly, hence this is not considered a strategic option
HR1a	Transfer of recycled wastewater from Bexhill and Hastings to augment storage within Darwell reservoir	This option proposes the transfer of 10-20 Ml/d of recycled wastewater from Bexhill & Hastings, currently being discharged to sea, to augment storage in either Darwell or Powdermill reservoirs.	N	
HR1b	Transfer of recycled wastewater from Bexhill and Hastings to augment storage within Powdermill reservoir	See above	N	
TR1	Transfer of recycled wastewater from the North Kent coast to support flows within the Stour	This option proposes the transfer 18 Ml/d of recycled wastewater from a WWTW in North Kent to the Stour upstream of T656. There is an existing scheme in operation where wastewater is discharged into the Stour and the abstraction licence for T656 is linked to this discharge. The implementation of this option will involve the following: • Additional tertiary treatment and continuous upflow sand filters followed by additional GAC and UV treatment; • A new pumping station at the WWTW, • A New pipeline from the WWTW to a new discharge location on the Stour; and • An outlet at the new discharge point.	Y	Included in option T5b
MR2a	Transfer of recycled wastewater to support flows within the Medway upstream of Maidstone	To support the flows in the River Medway upstream of V356, this option proposes the transfer of 20 Ml/d of recycled wastewater currently being discharged to sea, to one of two tributaries of the River Medway. Option MR 2a: Discharge to Medway tributary approximately 5km upstream of V356;	Y	Option MR2a / MR2b is replaced with option MR3, Medway wastewater recycling scheme (Phase 3)
MR2b	Transfer of recycled wastewater to support flows within the Medway upstream of Maidstone	To support the flows in the River Medway upstream of Maidstone, this option proposes the transfer of 20 Ml/d of recycled wastewater currently being discharged to sea, to one of two tributaries of the River Medway. Option MR 2b: Discharge to Medway tributary approximately 9km upstream of V356;	Y	Option MR2a / MR2b is replaced with option MR3, Medway wastewater recycling scheme (Phase 3)

Option Ref.	Option Name	Description	Excluded? (Y/N)	Reason for Exclusion
MR3	Medway wastewater recycling scheme	This option involves the transfer of up to 20 Ml/d of recycled wastewater to the River Medway, upstream of V356 which would be used to supplement flows within the Medway during low flow periods, thus reducing the releases from Bewl Water and conserving storage. The following would be required to implement the scheme: • Additional treatment at the WWTW; • Pipeline incorporating river, rail and motorway crossings and various other road crossings; and • A discharge structure on the River Medway.	N	
ASR Options				
	Kent Medway - Thanet Sands		Y	Technical feasibility
	Kent Medway Chalk		Y	Technical feasibility
	Kent Thanet - Thanet Sands		Y	Technical feasibility
	Kent Thanet - Chalk		Y	Technical feasibility
	Kent Thanet - Lower Greensand		Y	Technical feasibility
	Kent Thanet - Jurassic Limestones		Y	Technical feasibility
	Kent Thanet - Upper Coal Measures Sandstone Division		Y	Technical feasibility
	Sussex Hastings - Tunbridge Wells Sands		Y	Technical feasibility
	Sussex Hastings - Ashdown Beds		Y	Technical feasibility
	Sussex Hastings - Portland Sandstone		Y	Technical feasibility
MA1	Medway Greensands		Y	

Table G.4.3 Unconstrained List of Resource Development Options for Eastern Area

G.4.2 Tables of Feasible Options

Feasible options are defined as “options that satisfy the screening criteria and are further analysed for capability to address the planning problem” (EA Water Resource Planning Guidelines). This set of tables provides, for each of the three supply areas, lists all the feasible options and provides a breakdown of costs and estimated scheme outputs associated with each option. The feasible options were used in the investment modelling process to derive the final planning solution to balance supply and demand.

Note that carbon costs for resource development options are incorporated into the variable opex costs.

G.4.2.1 Western Area

Option Ref.	Option Name	Option Type	Raw Capital Cost	Fixed Opex	Variable Opex	Carbon (inc var Opex)	Enviro - Social-Costs	Earliest Start Date	Scheme Output (Ml/d)		
			£m	£m/a	£/m3	£/m3	£m/a	Year	Peak	MDO	ADO
IWL1	L536 marginal treatment	Resource mgt	£0.50	£0.06	£0.04	£0.00	£0.00	2010	0.5	0.3	0.3
IWL2	H614 Blue route	Resource mgt	£21.28	£0.25	£0.09	£0.01	£0.93	2015	5.6	4.3	4.3
IWL6	K628	Resource mgt	£1.24	£0.08	£0.08	£0.01	£0.00	2011	0.4	0.2	0.2
IWL7	Cross Solent Main 20 Ml/d	Distribution-side mgt	£3.60	£0.04	£0.10	£0.01	£0.00	2012	6.0	6.0	6.0
HSL3	B513 New DAF plant to utilise full licence	Production-side mgt	£15.73	£0.19	£0.06	£0.01	£0.08	2012	31.0	31.0	31.0
HSL5	New surface water storage site at Colden Common	Resource mgt	£13.10	£0.07	£0.07	£0.01	£0.29	2015	2.0	1.4	1.4
HBL1	R176	Resource mgt	£1.21	£0.03	£0.07	£0.01	£0.00	2012	0.5	0.3	0.3
HKL1	J358 route 1	Production-side mgt	£6.13	£0.03	£0.05	£0.00	£0.00	2011	1.5	1.0	1.0
HTD1	Southampton Desalination Plant 15 Ml/d	Resource mgt	£41.98	£0.52	£0.43	£0.05	£0.00	2012	15.0	7.5	7.5
HTD1	Southampton Desalination Plant 20 Ml/d	Resource mgt	£49.33	£0.60	£0.43	£0.05	£0.00	2012	20.0	10.0	10.0
HTD1	Southampton Desalination Plant 25 Ml/d	Resource mgt	£56.62	£0.67	£0.43	£0.05	£0.00	2012	25.0	12.5	12.5
HTD1	Southampton Desalination Plant 30 Ml/d	Resource mgt	£63.52	£0.74	£0.43	£0.05	£0.00	2012	30.0	15.0	15.0
HTD4	Solent/Southampton Water 25 Ml/d	Resource mgt	£52.03	£0.75	£0.43	£0.05	£0.00	2013	25.0	12.5	12.5
HTD4	Solent/Southampton Water 45 Ml/d	Resource mgt	£77.76	£1.00	£0.43	£0.05	£0.00	2013	45.0	22.5	22.5

Option Ref.	Option Name	Option Type	Raw Capital Cost	Fixed Opex	Variable Opex	Carbon (inc var Opex)	Enviro - Social-Costs	Earliest Start Date	Scheme Output (Ml/d)		
			£m	£m/a	£/m3	£/m3	£m/a	Year	Peak	MDO	ADO
HTD4	Solent/Southampton Water 60 Ml/d	Resource mgt	£95.68	£1.16	£0.43	£0.05	£0.00	2013	60.0	30.0	30.0
IWD1	IOW Coast Desalination 8.5 Ml/d	Resource mgt	£31.22	£0.35	£0.44	£0.05	£0.00	2012	8.5	4.3	4.3
IWD1-20	IOW Coast Desalination 20 Ml/d	Resource mgt	£66.21	£0.61	£0.44	£0.05	£0.00	2012	20.0	10.0	10.0
HST2	B513 to Y841	Resource mgt	£16.41	£0.10	£0.05	£0.01	£0.00	2012	0.0	0.0	0.0
IWR1	Wastewater recycling 2.5 Ml/d	Resource mgt	£23.55	£0.17	£0.13	£0.01	£0.01	2012	2.5	1.3	1.3
IWR1	Wastewater recycling 5 Ml/d	Resource mgt	£26.61	£0.25	£0.12	£0.01	£0.01	2012	5.0	2.5	2.5
IWR1	Wastewater recycling 10 Ml/d	Resource mgt	£32.12	£0.30	£0.12	£0.01	£0.01	2012	10.0	5.0	5.0
IWR1	Wastewater recycling 20 Ml/d	Resource mgt	£43.98	£0.41	£0.11	£0.01	£0.01	2012	20.0	10.0	10.0
HWO-56	56 Ml/d Woodmill abstraction, treatment at Otterbourne	Resource mgt	£32.87	£0.26	£0.12	£0.02	£0.00	2020	45.0	45.0	45.0
HWO-85a	85 Ml/d Woodmill abstraction, treatment at Otterbourne	Resource mgt	£46.24	£0.32	£0.10	£0.01	£0.00	2020	74.0	74.0	74.0
HWG-56	56 Ml/d Woodmill abstraction, treatment at Gaters Mill	Resource mgt	£49.57	£0.50	£0.12	£0.02	£0.00	2020	45.0	45.0	45.0
HWG-85	85 Ml/d Woodmill abstraction, treatment at Gaters Mill	Resource mgt	£66.09	£0.67	£0.10	£0.01	£0.00	2020	74.0	74.0	74.0
HWO-85b	85 Ml/d Woodmill abstraction, treatment at Otterbourne; assuming HCA1	Resource mgt	£46.24	£0.32	£0.10	£0.01	£0.00	2020	59.1	74.0	74.0
HCA1	Candover Alre Augmentation	Resource mgt	£2.77	£0.08	£0.07	£0.01	£0.00	2011	26.9	17.3	17.3

Table G.4.4 Feasible Resource Development Options and Costs, Western Area

WRZ	Water Efficiency Option	Devices per Property	Device Cost per Property	Scheme Device/ Admin Cost	Scheme Installation Cost	Scheme Capex	Carbon Cost (+tive)	Earliest Year	Ave Yield per Device	Max Water Saving	Equiv Annual Saving
			£/prop	£k	£k	£k	£/m3		l/prop/d	Ml/d	Ml
Hampshire Andover	Water Efficiency Kit (Box)	1	£ 7.10	£ 42.47	£ -	£ 42.47	-£ 0.079	2023	13.3	0.06	22.65
Hampshire Andover	Schools - Install Low Flow Dual Flush WC	1	£1,296.00	£ 64.90	£ 27.00	£ 91.90		2038	555	0.03	10.13
Hampshire Andover	Commercial Water Audit	1	£ -	£ 0.31	£ 28.26	£ 28.57	-£ 0.029	2027	60	0.01	3.44
Hampshire Andover	Install Low Dual Flush (4/2l) (subsidy)	1.6	£ 160.00	£ 86.90	£ -	£ 86.90		2038	31	0.02	6.07
Hampshire Andover	Low Flow Taps	1.6	£ 83.20	£ 91.40	£ 57.93	£ 149.33	-£ 0.079	2038	18.5	0.02	7.24
Hampshire Andover	Low Flow Shower Heads	1.6	£ 19.20	£ 5.69	£ -	£ 5.69	-£ 0.158	2010	14.1	0.00	1.38
Hampshire Andover	Water Butts	1	£ 24.00	£ 83.68	£ -	£ 83.68		2010	2.2	0.01	2.58
Hampshire Andover	Trigger Hoses	1	£ 3.60	£ 45.06	£ -	£ 45.06		2010	1.3	0.01	3.82
Hampshire Andover	Low Use Washing Machine (subsidy)	1	£ 100.00	£ 82.07	£ -	£ 82.07	-£ 0.158	2010	7.37	0.01	2.16
Hampshire Andover	Low Use Dishwasher (subsidy)	1	£ 140.00	£ 114.25	£ -	£ 114.25	-£ 0.158	2010	1.16	0.00	0.34
Hampshire Kingsclere	Water Efficiency Kit (Box)	1	£ 7.10	£ 9.17	£ -	£ 9.17	-£ 0.079	2023	13.3	0.01	4.89
Hampshire Kingsclere	Schools - Install Low Flow Dual Flush WC	1	£1,296.00	£ 14.28	£ 5.94	£ 20.22		2038	555	0.01	2.23
Hampshire Kingsclere	Commercial Water Audit	1	£ -	£ 0.07	£ 6.12	£ 6.19	-£ 0.029	2027	60	0.00	0.74
Hampshire Kingsclere	Install Low Dual Flush (4/2l) (subsidy)	1.6	£ 160.00	£ 18.76	£ -	£ 18.76		2038	31	0.00	1.31
Hampshire Kingsclere	Low Flow Taps	1.6	£ 83.20	£ 19.73	£ 12.51	£ 32.24	-£ 0.079	2038	18.5	0.00	1.56

WRZ	Water Efficiency Option	Devices per Property	Device Cost per Property	Scheme Device/ Admin Cost	Scheme Installation Cost	Scheme Capex	Carbon Cost (+tive)	Earliest Year	Ave Yield per Device	Max Water Saving	Equiv Annual Saving
			£/prop	£k	£k	£k	£/m3		l/prop/d	Ml/d	Ml
	Low Flow Shower Heads	1.6	£ 19.20	£ 1.23	£ -	£ 1.23	-£ 0.158	2010	14.1	0.00	0.30
	Water Butts	1	£ 24.00	£ 18.06	£ -	£ 18.06		2010	2.2	0.00	0.56
	Trigger Hoses	1	£ 3.60	£ 9.73	£ -	£ 9.73		2010	1.3	0.00	0.82
	Low Use Washing Machine (subsidy)	1	£ 100.00	£ 17.72	£ -	£ 17.72	-£ 0.158	2010	7.37	0.00	0.47
	Low Use Dishwasher (subsidy)	1	£ 140.00	£ 24.67	£ -	£ 24.67	-£ 0.158	2010	1.16	0.00	0.07
Hampshire South	Water Efficiency Kit (Box)	1	£ 7.10	£ 382.44	£ -	£ 382.44	-£ 0.079	2023	13.3	0.56	204.02
Hampshire South	Schools - Install Low Flow Dual Flush WC	1	£1,296.00	£ 582.80	£ 242.46	£ 825.26		2038	555	0.25	90.96
Hampshire South	Commercial Water Audit	1	£ -	£ 2.96	£ 266.58	£ 269.54	-£ 0.029	2027	60	0.09	32.43
Hampshire South	Install Low Dual Flush (4/2l) (subsidy)	1.6	£ 160.00	£ 782.56	£ -	£ 782.56		2038	31	0.15	54.66
Hampshire South	Low Flow Taps	1.6	£ 83.20	£ 823.13	£ 521.70	£ 1,344.84	-£ 0.079	2038	18.5	0.18	65.24
Hampshire South	Low Flow Shower Heads	1.6	£ 19.20	£ 51.20	£ -	£ 51.20	-£ 0.158	2010	14.1	0.03	12.43
Hampshire South	Water Butts	1	£ 24.00	£ 753.57	£ -	£ 753.57		2010	2.2	0.06	23.27
Hampshire South	Trigger Hoses	1	£ 3.60	£ 405.77	£ -	£ 405.77		2010	1.3	0.09	34.38
Hampshire South	Low Use Washing Machine (subsidy)	1	£ 100.00	£ 739.08	£ -	£ 739.08	-£ 0.158	2010	7.37	0.05	19.49
Hampshire South	Low Use Dishwasher (subsidy)	1	£ 140.00	£ 1,028.92	£ -	£ 1,028.92	-£ 0.158	2010	1.16	0.01	3.07
Isle of Wight	Water Efficiency Kit (Box)	1	£ 7.10	£ 97.35	£ -	£ 97.35	-£ 0.079	2023	13.3	0.14	51.93
Isle of Wight	Schools - Install Low Flow Dual Flush WC	1	£1,296.00	£ 147.97	£ 61.56	£ 209.53		2038	555	0.06	23.09

WRZ	Water Efficiency Option	Devices per Property	Device Cost per Property	Scheme Device/ Admin Cost	Scheme Installation Cost	Scheme Capex	Carbon Cost (+tive)	Earliest Year	Ave Yield per Device	Max Water Saving	Equiv Annual Saving
			£/prop	£k	£k	£k	£/m3		l/prop/d	Ml/d	Ml
	Commercial Water Audit	1	£ -	£ 1.02	£ 91.80	£ 92.82	-£ 0.029	2027	60	0.03	11.17
	Install Low Dual Flush (4/2l) (subsidy)	1.6	£ 160.00	£ 199.20	£ -	£ 199.20		2038	31	0.04	13.91
	Low Flow Taps	1.6	£ 83.20	£ 209.52	£ 132.80	£ 342.32	-£ 0.079	2038	18.5	0.05	16.61
	Low Flow Shower Heads	1.6	£ 19.20	£ 13.03	£ -	£ 13.03	-£ 0.158	2010	14.1	0.01	3.16
	Water Butts	1	£ 24.00	£ 191.82	£ -	£ 191.82		2010	2.2	0.02	5.92
	Trigger Hoses	1	£ 3.60	£ 103.29	£ -	£ 103.29		2010	1.3	0.02	8.75
	Low Use Washing Machine (subsidy)	1	£ 100.00	£ 188.13	£ -	£ 188.13	-£ 0.158	2010	7.37	0.01	4.96
	Low Use Dishwasher (subsidy)	1	£ 140.00	£ 261.90	£ -	£ 261.90	-£ 0.158	2010	1.16	0.00	0.78

Table G.4.5 Feasible Water Efficiency Options and Costs, Western Area

WRZ	Reduction from target to min policy level (Ml/d)	Transition Costs (excl SE) £m	Transition Social impacts £m	Transition Carbon emissions £m	Opex Costs £m/a	Opex Social Costs £m/a	Opex Carbon Costs £m/a	Earliest Year	Peak Water Saving Ml/d	Average Water Saving Ml/d
Isle of Wight	Current	-	0.00000	0.00000	-	0.000	0.000	2015	0	0
	0-0.1	0.007	0.00251	0.00010	0.009	0.000	0.000	2015	0.1	0.1
	0.1-0.2	0.008	0.00251	0.00010	0.010	0.000	0.000	2015	0.1	0.1
	0.2-0.3	0.008	0.00251	0.00010	0.011	0.000	0.000	2015	0.1	0.1
	0.3-0.4	0.008	0.00251	0.00010	0.012	0.000	0.000	2015	0.1	0.1
	0.4-0.5	0.008	0.00251	0.00010	0.013	0.000	0.000	2015	0.1	0.1
	0.5-0.6	0.009	0.00251	0.00010	0.015	0.000	0.000	2015	0.1	0.1
	0.6-0.7	0.009	0.00251	0.00010	0.016	0.000	0.000	2015	0.1	0.1
	0.7-0.8	0.009	0.00251	0.00010	0.018	0.000	0.000	2015	0.1	0.1
	0.8-0.9	0.009	0.00251	0.00010	0.021	0.000	0.000	2015	0.1	0.1
	0.9-1	0.010	0.00251	0.00010	0.023	0.000	0.000	2015	0.1	0.1
	1-1.1	0.010	0.00251	0.00010	0.027	0.000	0.000	2015	0.1	0.1
	1.1-1.2	0.011	0.00251	0.00010	0.031	0.000	0.000	2015	0.1	0.1
	1.2-1.3	0.011	0.00251	0.00010	0.036	0.000	0.000	2015	0.1	0.1
	1.3-1.4	0.012	0.00251	0.00010	0.043	0.000	0.000	2015	0.1	0.1
	1.4-1.5	0.013	0.00251	0.00010	0.052	0.000	0.000	2015	0.1	0.1
Hampshire South	Current	-	0.00000	0.00000	-	0.000	0.000	2015	0	0
	0-0.6	0.040	0.01579	0.00058	0.038	0.000	0.000	2015	0.6	0.6
	0.6-1.2	0.041	0.01579	0.00058	0.042	0.000	0.000	2015	0.6	0.6
	1.2-1.8	0.042	0.01579	0.00058	0.046	0.000	0.000	2015	0.6	0.6
	1.8-2.4	0.043	0.01579	0.00058	0.051	0.000	0.000	2015	0.6	0.6
	2.4-3	0.045	0.01579	0.00058	0.057	0.000	0.000	2015	0.6	0.6
	3-3.6	0.046	0.01579	0.00058	0.064	0.000	0.000	2015	0.6	0.6
	3.6-4.2	0.048	0.01579	0.00058	0.072	0.000	0.000	2015	0.6	0.6
	4.2-4.8	0.050	0.01579	0.00058	0.082	0.000	0.000	2015	0.6	0.6
	4.8-5.4	0.052	0.01579	0.00058	0.095	0.000	0.000	2015	0.6	0.6
	5.4-6	0.054	0.01579	0.00058	0.110	0.000	0.000	2015	0.6	0.6
	6-6.6	0.057	0.01579	0.00058	0.130	0.000	0.000	2015	0.6	0.6
	6.6-7.2	0.060	0.01579	0.00058	0.155	0.000	0.000	2015	0.6	0.6

WRZ	Reduction from target to min policy level (Ml/d)	Transition Costs (excl SE) £m	Transition Social impacts £m	Transition Carbon emissions £m	Opex Costs £m/a	Opex Social Costs £m/a	Opex Carbon Costs £m/a	Earliest Year	Peak Water Saving Ml/d	Average Water Saving Ml/d
	7.2-7.8	0.064	0.01579	0.00058	0.188	0.000	0.000	2015	0.6	0.6
	7.8-8.4	0.070	0.01579	0.00058	0.233	0.000	0.000	2015	0.6	0.6
	8.4-9	0.076	0.01579	0.00058	0.297	0.000	0.000	2015	0.6	0.6
Hampshire Andover	Current	-	0.00000	0.00000	-	0.000	0.000	2015	0	0
	0-0.1	0.009	0.00272	0.00010	0.010	0.000	0.000	2015	0.1	0.1
	0.1-0.2	0.009	0.00272	0.00010	0.012	0.000	0.000	2015	0.1	0.1
	0.2-0.3	0.009	0.00272	0.00010	0.013	0.000	0.000	2015	0.1	0.1
	0.3-0.4	0.010	0.00272	0.00010	0.015	0.000	0.000	2015	0.1	0.1
	0.4-0.5	0.010	0.00272	0.00010	0.018	0.000	0.000	2015	0.1	0.1
	0.5-0.6	0.011	0.00272	0.00010	0.021	0.000	0.000	2015	0.1	0.1
	0.6-0.7	0.012	0.00272	0.00010	0.026	0.000	0.000	2015	0.1	0.1
	0.7-0.8	0.013	0.00272	0.00010	0.032	0.000	0.000	2015	0.1	0.1
	0.8-0.9	0.014	0.00272	0.00010	0.040	0.000	0.000	2015	0.1	0.1
	0.9-1	0.015	0.00272	0.00010	0.052	0.000	0.000	2015	0.1	0.1
	1-1.1	0.017	0.00272	0.00010	0.070	0.000	0.000	2015	0.1	0.1
	1.1-1.2	0.020	0.00272	0.00010	0.099	0.000	0.000	2015	0.1	0.1
	1.2-1.3	0.024	0.00272	0.00010	0.152	0.000	0.000	2015	0.1	0.1
	1.3-1.4	0.032	0.00272	0.00010	0.264	0.000	0.000	2015	0.1	0.1
	1.4-1.5	0.048	0.00272	0.00010	0.568	0.000	0.000	2015	0.1	0.1
Hampshire Kingsclere	Current	-	0.00000	0.00000	-	0.000	0.000	2015	0	0
	0-0.1	0.010	0.00242	0.00010	0.012	0.000	0.000	2015	0.1	0.1
	0.1-0.2	0.011	0.00242	0.00010	0.018	0.000	0.000	2015	0.1	0.1
	0.2-0.3	0.014	0.00242	0.00010	0.031	0.000	0.000	2015	0.1	0.1
	0.3-0.4	0.019	0.00242	0.00010	0.068	0.000	0.000	2015	0.1	0.1
	0.4-0.5	0.041	0.00242	0.00010	0.257	0.000	0.000	2015	0.1	0.1

Table G.4.6 Feasible Leakage Control Options and Costs, Western Area

G.4.2.2 Central Area

Option Ref.	Option Name	Option Type	Raw Capital Cost	Fixed Opex	Variable Opex	Carbon (inc var Opex)	Enviro - Social- Costs	Earliest Start Date	Scheme Output (Ml/d)		
			£m	£m/a	£/m3	£/m3	£m/a	Year	Peak	MDO	ADO
N1	Western Rother Irrigation Licences	Resource mgt	£19.99	£0.05	£0.07	£0.01	£0.00	2013	3.5	0.5	0.5
N3	MRF Seasonal Variation	Resource mgt	£1.06	£0.00	£0.07	£0.01	£0.00	2012	0.0	5.0	3.0
N4	E282 Winter Refill (Western Rother/Arun treated water)	Resource mgt	£3.18	£0.02	£0.14	£0.01	£0.00	2012	0.0	3.0	3.0
N5	Build New Reservoir at Blackstone	Resource mgt	£52.39	£0.26	£0.12	£0.01	£0.45	2017	15.0	12.0	12.0
N6a	Surface Storage Reservoir in Sussex North-Rother/Arun abstraction 10 Ml/d	Resource mgt	£46.33	£0.20	£0.10	£0.01	£0.78	2020	30.0	21.0	17.5
N6b	Surface Storage Reservoir in Sussex North - Rother/Arun abstraction 20 Ml/d	Resource mgt	£47.81	£0.21	£0.10	£0.01	£0.73	2020	30.0	26.0	21.0
N7a	Arun abstraction above the tidal limit Scheme 1: 5Ml/d abstraction	Resource mgt	£8.29	£0.06	£0.10	£0.01	£0.16	2012	5.0	5.0	4.0
N7b	Arun abstraction above tidal limit Scheme 2: 10Ml/d abstraction & 100 Ml storage	Resource mgt	£14.09	£0.07	£0.11	£0.01	£0.21	2012	15.0	9.5	7.5
N7c	Arun abstraction above tidal limit Scheme 3: 20Ml/d abstraction & 200Ml storage	Resource mgt	£16.55	£0.09	£0.11	£0.01	£0.25	2013	20.0	11.5	9.5
N8a	Sussex North to Coast Winter transfer Phase 1&2 (assuming N9 available)	Resource mgt	£17.06	£0.12	£0.27	£0.03	£0.00	2015	2.5	2.5	2.5
N8b	Sussex North to Coast Winter transfer Phase 1&2 (assuming N9 not available)	Resource mgt	£18.12	£0.12	£0.27	£0.03	£0.00	2015	4.0	4.0	4.0
C3	Build New Reservoir on Coast	Resource mgt	£47.07	£0.24	£0.13	£0.01	£0.16	2014	10.0	10.0	10.0
C4	River Adur Abstraction	Resource mgt	£11.21	£0.07	£0.13	£0.01	£0.19	2013	5.0	5.0	4.0
N9	Arun Abstraction Below Tidal Limit 10Ml/d abstraction & 75Ml storage	Resource mgt	£10.13	£0.07	£0.09	£0.01	£0.14	2012	15.0	11.5	10.0

Option Ref.	Option Name	Option Type	Raw Capital Cost	Fixed Opex	Variable Opex	Carbon (inc var Opex)	Enviro - Social-Costs	Earliest Start Date	Scheme Output (Ml/d)		
			£m	£m/a	£/m3	£/m3	£m/a	Year	Peak	MDO	ADO
CD1a	Coastal Desalination 10 Ml/d	Resource mgt	£28.37	£0.23	£0.46	£0.07	£0.00	2013	10.0	10.0	10.0
CD1b	Coastal Desalination 20 Ml/d	Resource mgt	£43.62	£0.28	£0.46	£0.07	£0.00	2013	20.0	20.0	20.0
CD3a	Tidal River Arun Desalination 10 Ml/d	Resource mgt	£23.96	£0.27	£0.33	£0.04	£0.65	2013	10.0	10.0	10.0
CD3b	Tidal River Arun Desalination 20 Ml/d	Resource mgt	£34.55	£0.34	£0.32	£0.04	£0.65	2013	20.0	20.0	20.0
NR2	Transfer of recycled wastewater to support flows within the River Rother, MBR	Resource mgt	£35.57	£0.31	£0.14	£0.01	£0.00	2016	20.0	19.0	15.0
NR2	Transfer of recycled wastewater to support flows within the River Rother, BAFF	Resource mgt	£36.65	£0.16	£0.11	£0.01	£0.88	2016	20.0	19.0	15.0
CA1	Sussex Coast ASR - 10 Ml/d (Lower Greensand)	Resource mgt	£10.78	£0.06	£0.17	£0.02	£0.00	2015	10.0	5.0	3.0

Table G.4.7 Feasible Resource Development Options and Costs, Central Area

WRZ	Water Efficiency Option	Devices per Property	Device Cost per Property	Scheme Device/ Admin Cost	Scheme Installation Cost	Scheme Capex	Carbon Cost (+tive)	Earliest Year	Ave Yield per Device	Max Water Saving	Equiv Annual Saving
			£/prop	£k	£k	£k	£/m3		l/prop/d	Ml/d	Ml
Sussex Brighton	Water Efficiency Kit (Box)	1	£ 7.10	£ 225.44	£ -	£ 225.44	-£ 0.079	2023	13.3	0.33	120.27
	Schools - Install Low Flow Dual Flush WC	1	£1,296.00	£ 343.97	£ 143.10	£ 487.07		2038	555	0.15	53.68
	Commercial Water Audit	1	£ -	£ 1.83	£ 164.34	£ 166.17	-£ 0.029	2027	60	0.05	19.99
	Install Low Dual Flush (4/2l) (subsidy)	1.6	£ 160.00	£ 461.31	£ -	£ 461.31		2038	31	0.09	32.22
	Low Flow Taps	1.6	£ 83.20	£ 485.23	£ 307.54	£ 792.77	-£ 0.079	2038	18.5	0.11	38.46
	Low Flow Shower Heads	1.6	£ 19.20	£ 30.18	£ -	£ 30.18	-£ 0.158	2010	14.1	0.02	7.33
	Water Butts	1	£ 24.00	£ 444.23	£ -	£ 444.23		2010	2.2	0.04	13.72
	Trigger Hoses	1	£ 3.60	£ 239.20	£ -	£ 239.20		2010	1.3	0.06	20.27
	Low Use Washing Machine (subsidy)	1	£ 100.00	£ 435.68	£ -	£ 435.68	-£ 0.158	2010	7.37	0.03	11.49
	Low Use Dishwasher (subsidy)	1	£ 140.00	£ 606.54	£ -	£ 606.54	-£ 0.158	2010	1.16	0.00	1.81
Sussex Worthing	Water Efficiency Kit (Box)	1	£ 7.10	£ 130.54	£ -	£ 130.54	-£ 0.079	2023	13.3	0.19	69.64
	Schools - Install Low Flow Dual Flush WC	1	£1,296.00	£ 198.59	£ 82.62	£ 281.21		2038	555	0.08	30.99
	Commercial Water Audit	1	£ -	£ 0.89	£ 79.74	£ 80.63	-£ 0.029	2027	60	0.03	9.70
	Install Low Dual Flush (4/2l) (subsidy)	1.6	£ 160.00	£ 267.11	£ -	£ 267.11		2038	31	0.05	18.66
	Low Flow Taps	1.6	£ 83.20	£ 280.96	£ 178.07	£ 459.03	-£ 0.079	2038	18.5	0.06	22.27

WRZ	Water Efficiency Option	Devices per Property	Device Cost per Property	Scheme Device/ Admin Cost	Scheme Installation Cost	Scheme Capex	Carbon Cost (+tive)	Earliest Year	Ave Yield per Device	Max Water Saving	Equiv Annual Saving
			£/prop	£k	£k	£k	£/m3		l/prop/d	Ml/d	Ml
	Low Flow Shower Heads	1.6	£ 19.20	£ 17.48	£ -	£ 17.48	-£ 0.158	2010	14.1	0.01	4.24
	Water Butts	1	£ 24.00	£ 257.21	£ -	£ 257.21		2010	2.2	0.02	7.94
	Trigger Hoses	1	£ 3.60	£ 138.50	£ -	£ 138.50		2010	1.3	0.03	11.74
	Low Use Washing Machine (subsidy)	1	£ 100.00	£ 252.27	£ -	£ 252.27	-£ 0.158	2010	7.37	0.02	6.65
	Low Use Dishwasher (subsidy)	1	£ 140.00	£ 351.19	£ -	£ 351.19	-£ 0.158	2010	1.16	0.00	1.05
Sussex North	Water Efficiency Kit (Box)	1	£ 7.10	£ 155.35	£ -	£ 155.35	-£ 0.079	2023	13.3	0.23	82.87
	Schools - Install Low Flow Dual Flush WC	1	£1,296.00	£ 237.53	£ 98.82	£ 336.35		2038	555	0.10	37.07
	Commercial Water Audit	1	£ -	£ 1.71	£ 154.08	£ 155.79	-£ 0.029	2027	60	0.05	18.75
	Install Low Dual Flush (4/2l) (subsidy)	1.6	£ 160.00	£ 317.88	£ -	£ 317.88		2038	31	0.06	22.20
	Low Flow Taps	1.6	£ 83.20	£ 334.36	£ 211.92	£ 546.28	-£ 0.079	2038	18.5	0.07	26.50
	Low Flow Shower Heads	1.6	£ 19.20	£ 20.80	£ -	£ 20.80	-£ 0.158	2010	14.1	0.01	5.05
	Water Butts	1	£ 24.00	£ 306.10	£ -	£ 306.10		2010	2.2	0.03	9.45
	Trigger Hoses	1	£ 3.60	£ 164.82	£ -	£ 164.82		2010	1.3	0.04	13.97
	Low Use Washing Machine (subsidy)	1	£ 100.00	£ 300.22	£ -	£ 300.22	-£ 0.158	2010	7.37	0.02	7.92
	Low Use Dishwasher (subsidy)	1	£ 140.00	£ 417.95	£ -	£ 417.95	-£ 0.158	2010	1.16	0.00	1.25

Table G.4.8 Feasible Water Efficiency Options and Costs, Central Area

WRZ	Reduction from target to min policy level (Ml/d)	Transition Costs (excl SE) £m	Transition Social impacts £m	Transition Carbon emissions £m	Opex Costs £m/a	Opex Social Costs £m/a	Opex Carbon Costs £m/a	Earliest Year	Peak Water Saving Ml/d	Average Water Saving Ml/d
Sussex North	Current	-	0.00000	0.00000	-	0.0000	0.0000	2015	0	0
	0-0.2	0.01849	0.00493	0.00020	0.01623	0.0000	0.0000	2015	0.2	0.2
	0.2-0.4	0.01889	0.00493	0.00020	0.01742	0.0000	0.0000	2015	0.2	0.2
	0.4-0.6	0.01933	0.00493	0.00020	0.01874	0.0000	0.0000	2015	0.2	0.2
	0.6-0.8	0.01980	0.00493	0.00020	0.02022	0.0000	0.0000	2015	0.2	0.2
	0.8-1	0.02031	0.00493	0.00020	0.02188	0.0000	0.0000	2015	0.2	0.2
	1-1.2	0.02086	0.00493	0.00020	0.02375	0.0000	0.0000	2015	0.2	0.2
	1.2-1.4	0.02146	0.00493	0.00020	0.02588	0.0000	0.0000	2015	0.2	0.2
	1.4-1.6	0.02212	0.00493	0.00020	0.02830	0.0000	0.0000	2015	0.2	0.2
	1.6-1.8	0.02284	0.00493	0.00020	0.03108	0.0000	0.0000	2015	0.2	0.2
	1.8-2	0.02364	0.00493	0.00020	0.03430	0.0000	0.0000	2015	0.2	0.2
	2-2.2	0.02452	0.00493	0.00020	0.03804	0.0000	0.0000	2015	0.2	0.2
	2.2-2.4	0.02551	0.00493	0.00020	0.04242	0.0000	0.0000	2015	0.2	0.2
	2.4-2.6	0.02661	0.00493	0.00020	0.04761	0.0000	0.0000	2015	0.2	0.2
	2.6-2.8	0.02786	0.00493	0.00020	0.05382	0.0000	0.0000	2015	0.2	0.2
	2.8-3	0.02929	0.00493	0.00020	0.06132	0.0000	0.0000	2015	0.2	0.2
Sussex Worthing	Current	-	0.00000	0.00000	-	0.0000	0.00000	2015	0	0
	0-0.2	0.01716	0.00778	0.00021	0.01742	0.00000	0.00000	2015	0.2	0.2
	0.2-0.4	0.01773	0.00778	0.00021	0.01967	0.00000	0.00000	2015	0.2	0.2
	0.4-0.6	0.01839	0.00778	0.00021	0.02240	0.00000	0.00000	2015	0.2	0.2
	0.6-0.8	0.01914	0.00778	0.00021	0.02573	0.00000	0.00000	2015	0.2	0.2
	0.8-1	0.02002	0.00778	0.00021	0.02987	0.00000	0.00000	2015	0.2	0.2
	1-1.2	0.02105	0.00778	0.00021	0.03510	0.00000	0.00000	2015	0.2	0.2
	1.2-1.4	0.02227	0.00778	0.00021	0.04183	0.00000	0.00000	2015	0.2	0.2
	1.4-1.6	0.02376	0.00778	0.00021	0.05070	0.00000	0.00000	2015	0.2	0.2
	1.6-1.8	0.02560	0.00778	0.00021	0.06272	0.00000	0.00000	2015	0.2	0.2
	1.8-2	0.02793	0.00778	0.00021	0.07959	0.00000	0.00000	2015	0.2	0.2
	2-2.2	0.03099	0.00778	0.00021	0.10434	0.00000	0.00000	2015	0.2	0.2
	2.2-2.4	0.03518	0.00778	0.00021	0.14274	0.00000	0.00000	2015	0.2	0.2

WRZ	Reduction from target to min policy level (Ml/d)	Transition Costs (excl SE) £m	Transition Social impacts £m	Transition Carbon emissions £m	Opex Costs £m/a	Opex Social Costs £m/a	Opex Carbon Costs £m/a	Earliest Year	Peak Water Saving Ml/d	Average Water Saving Ml/d
	2.4-2.6	0.04125	0.00778	0.00021	0.20713	0.00000	0.00000	2015	0.2	0.2
	2.6-2.8	0.05086	0.00778	0.00021	0.32778	0.00000	0.00000	2015	0.2	0.2
	2.8-3	0.06836	0.00778	0.00021	0.59716	0.00000	0.00000	2015	0.2	0.2
Sussex Brighton	Current	-	0.00000	0.00000	-	0.0000	0.0000	2015	0	0
	0-0.4	0.02733	0.01148	0.00039	0.03717	0.00000	0.00000	2015	0.4	0.4
	0.4-0.8	0.02862	0.01148	0.00039	0.04434	0.00000	0.00000	2015	0.4	0.4
	0.8-1.2	0.03018	0.01148	0.00039	0.05380	0.00000	0.00000	2015	0.4	0.4
	1.2-1.6	0.03212	0.01148	0.00039	0.06665	0.00000	0.00000	2015	0.4	0.4
	1.6-2	0.03458	0.01148	0.00039	0.08474	0.00000	0.00000	2015	0.4	0.4
	2-2.4	0.03781	0.01148	0.00039	0.11133	0.00000	0.00000	2015	0.4	0.4
	2.4-2.8	0.04225	0.01148	0.00039	0.15277	0.00000	0.00000	2015	0.4	0.4
	2.8-3.2	0.04871	0.01148	0.00039	0.22265	0.00000	0.00000	2015	0.4	0.4
	3.2-3.6	0.05901	0.01148	0.00039	0.35469	0.00000	0.00000	2015	0.4	0.4
	3.6-4	0.07800	0.01148	0.00039	0.65369	0.00000	0.00000	2015	0.4	0.4
	4-4.4	0.12464	0.01148	0.00039	1.60621	0.00000	0.00000	2015	0.4	0.4
	4.4-4.8	0.42171	0.01148	0.00039	10.22946	0.00000	0.00000	2015	0.4	0.4

Table G.4.9 Feasible Leakage Control Options and Costs, Central Area

G.4.2.3 Eastern Area

Option Ref.	Option Name	Option Type	Raw Capital Cost	Fixed Opex	Variable Opex	Carbon (inc var Opex)	Enviro - Social-Costs	Earliest Start Date	Scheme DO (Ml/d)		
			£m	£/a	£/m3	£/m3	£/a	Year	Peak	MDO	ADO
H1	Enlargement of Darwell Reservoir	Resource mgt	£60.34	£0.18	£0.09	£0.01	£5.82	2018	2.5	2.5	2.5
H8	New abstraction from the River Brede and transfer to Powdermill Reservoir	Resource mgt	£1.94	£0.01	£0.09	£0.01	£0.66	2015	0.9	0.9	0.9
H3 + H7	Re-introduction of disused boreholes	Resource mgt	£0.64	£0.01	£0.06	£0.01	£0.04	2012	0.9	0.9	0.9
M5a	Raise Bewl Water 3m	Resource mgt	£28.83	£0.10	£0.12	£0.01	£0.77	2022	16.0	14.2	14.2
M9	Implement licence variation combined with an increase in pump capacity in North Kent	Resource mgt	£0.61	£0.00	£0.09	£0.01	£0.00	2013	0.0	1.6	1.6
M10	Licence amendment for G457	Resource mgt	£0.67	£0.02	£0.12	£0.01	£0.33	2013	2.8	2.5	2.5
T1	Development of new reservoir at Broadoak, inclusive of new treatment works and mains	Resource mgt	£29.84	£0.33	£0.05	-	£0.00	2023	1.1	1.0	1.0
T5b	T656 25Ml/d	Production-side mgt	£89.80	£0.30	£0.08	£0.01	£0.39	2017	19.3	17.1	16.4
H9	Darwell licence variation	Resource mgt	£0.53	£0.00	£0.09	£0.01	£0.00	2013	1.1	1.0	1.0
HD4	Hastings WRZ Desalination 5 Ml/d	Resource mgt	£27.08	£0.23	£0.53	£0.08	£0.00	2017	5.0	5.0	5.0
MD1	Isle of Sheppey Desalination 10 Ml/d	Resource mgt	£36.23	£0.36	£0.48	£0.07	£0.00	2017	13.8	12.3	10.0
MD2a	River Medway Desalination, up as far as Allington Lock 10 Ml/d	Resource mgt	£28.17	£0.29	£0.33	£0.04	£0.00	2017	17.1	15.2	10.0
MD2b	River Medway Desalination, up as far as Allington Lock 20 Ml/d	Resource mgt	£38.01	£0.39	£0.33	£0.04	£0.00	2017	29.9	26.4	20.0
HT1	Enhance Bewl-Darwell transfer to 45Ml/d	Resource mgt	£11.53	£0.03	£0.10	£0.01	£0.06	2014	10.0	10.0	10.0

Option Ref.	Option Name	Option Type	Raw Capital Cost	Fixed Opex	Variable Opex	Carbon (inc var Opex)	Enviro - Social-Costs	Earliest Start Date	Scheme DO (Ml/d)		
			£m	£/a	£/m3	£/m3	£/a	Year	Peak	MDO	ADO
TT1	Duplicate transfer along existing Kent Medway to Kent Thanet main	Resource mgt	£26.52	£0.08	£0.09	£0.01	£0.13	2018	10.0	10.0	10.0
HR1a	Transfer of recycled wastewater from Bexhill & Hastings to augment storage within Darwell reservoir	Resource mgt	£46.75	£0.27	£0.32	£0.04	£0.00	2015	4.6	4.6	4.6
HR1b	Transfer of recycled wastewater from Bexhill & Hastings to augment storage within Powdermill reservoir	Resource mgt	£31.52	£0.22	£0.31	£0.04	£0.00	2015	2.5	2.5	2.5
MR3	Medway wastewater recycling scheme	Resource mgt	£36.79	£0.31	£0.30	£0.04	£0.00	2018	27.6	24.4	24.4

Table G.4.10 Feasible Resource Development Options and Costs, Eastern Area

WRZ	Water Efficiency Option	Devices per Property	Device Cost per Property	Scheme Device/ Admin Cost	Scheme Installation Cost	Scheme Capex	Carbon Cost (+tive)	Earliest Year	Ave Yield per Device	Max Water Saving	Equiv Annual Saving
			£/prop	£k	Ml/d	£k	£/m3		l/prop/d	Ml/d	Ml
Kent Medway	Water Efficiency Kit (Box)	1	£ 7.10	£ 286.64	£ -	£ 286.64	-£ 0.079	2023	13.3	0.42	152.91
	Schools - Install Low Flow Dual Flush WC	1	£1,296.00	£ 437.43	£ 181.98	£ 619.41		2038	555	0.19	68.27
	Commercial Water Audit	1	£ -	£ 1.75	£ 157.14	£ 158.89	-£ 0.029	2027	60	0.05	19.12
	Install Low Dual Flush (4/2l) (subsidy)	1.6	£ 160.00	£ 586.54	£ -	£ 586.54		2038	31	0.11	40.97
	Low Flow Taps	1.6	£ 83.20	£ 616.95	£ 391.02	£ 1,007.98	-£ 0.079	2038	18.5	0.13	48.90
	Low Flow Shower Heads	1.6	£ 19.20	£ 38.38	£ -	£ 38.38	-£ 0.158	2010	14.1	0.03	9.32
	Water Butts	1	£ 24.00	£ 564.81	£ -	£ 564.81		2010	2.2	0.05	17.44
	Trigger Hoses	1	£ 3.60	£ 304.13	£ -	£ 304.13		2010	1.3	0.07	25.77
	Low Use Washing Machine (subsidy)	1	£ 100.00	£ 553.95	£ -	£ 553.95	-£ 0.158	2010	7.37	0.04	14.61
	Low Use Dishwasher (subsidy)	1	£ 140.00	£ 771.19	£ -	£ 771.19	-£ 0.158	2010	1.16	0.01	2.30
Kent Thanet	Water Efficiency Kit (Box)	1	£ 7.10	£ 128.94	£ -	£ 128.94	-£ 0.079	2023	13.3	0.19	68.78
	Schools - Install Low Flow Dual Flush WC	1	£1,296.00	£ 196.00	£ 81.54	£ 277.54		2038	555	0.08	30.59
	Commercial Water Audit	1	£ -	£ 1.11	£ 99.72	£ 100.83	-£ 0.029	2027	60	0.03	12.13
	Install Low Dual Flush (4/2l) (subsidy)	1.6	£ 160.00	£ 263.83	£ -	£ 263.83		2038	31	0.05	18.43
	Low Flow Taps	1.6	£ 83.20	£ 277.51	£ 175.89	£ 453.40	-£ 0.079	2038	18.5	0.06	21.99

WRZ	Water Efficiency Option	Devices per Property	Device Cost per Property	Scheme Device/ Admin Cost	Scheme Installation Cost	Scheme Capex	Carbon Cost (+tive)	Earliest Year	Ave Yield per Device	Max Water Saving	Equiv Annual Saving
			£/prop	£k	Ml/d	£k	£/m3		l/prop/d	Ml/d	Ml
	Low Flow Shower Heads	1.6	£ 19.20	£ 17.26	£ -	£ 17.26	-£ 0.158	2010	14.1	0.01	4.19
	Water Butts	1	£ 24.00	£ 254.06	£ -	£ 254.06		2010	2.2	0.02	7.85
	Trigger Hoses	1	£ 3.60	£ 136.80	£ -	£ 136.80		2010	1.3	0.03	11.59
	Low Use Washing Machine (subsidy)	1	£ 100.00	£ 249.18	£ -	£ 249.18	-£ 0.158	2010	7.37	0.02	6.57
	Low Use Dishwasher (subsidy)	1	£ 140.00	£ 346.89	£ -	£ 346.89	-£ 0.158	2010	1.16	0.00	1.03
Sussex Hastings	Water Efficiency Kit (Box)	1	£ 7.10	£ 73.61	£ -	£ 73.61	-£ 0.079	2023	13.3	0.11	39.27
	Schools - Install Low Flow Dual Flush WC	1	£1,296.00	£ 111.63	£ 46.44	£ 158.07		2038	555	0.05	17.42
	Commercial Water Audit	1	£ -	£ 0.61	£ 54.72	£ 55.33	-£ 0.029	2027	60	0.02	6.66
	Install Low Dual Flush (4/2l) (subsidy)	1.6	£ 160.00	£ 150.63	£ -	£ 150.63		2038	31	0.03	10.52
	Low Flow Taps	1.6	£ 83.20	£ 158.44	£ 100.42	£ 258.86	-£ 0.079	2038	18.5	0.03	12.56
	Low Flow Shower Heads	1.6	£ 19.20	£ 9.86	£ -	£ 9.86	-£ 0.158	2010	14.1	0.01	2.39
	Water Butts	1	£ 24.00	£ 145.05	£ -	£ 145.05		2010	2.2	0.01	4.48
	Trigger Hoses	1	£ 3.60	£ 78.10	£ -	£ 78.10		2010	1.3	0.02	6.62
	Low Use Washing Machine (subsidy)	1	£ 100.00	£ 142.26	£ -	£ 142.26	-£ 0.158	2010	7.37	0.01	3.75
	Low Use Dishwasher (subsidy)	1	£ 140.00	£ 198.05	£ -	£ 198.05	-£ 0.158	2010	1.16	0.00	0.59

Table G.4.11 Feasible Water Efficiency Options and Costs, Eastern Area

WRZ	Reduction from target to min policy level (Ml/d)	Transition Costs (excl SE) £m	Transition Social impacts £m	Transition Carbon emissions £m	Opex Costs £m/a	Opex Social Costs £m/a	Opex Carbon Costs £m/a	Earliest Year	Peak Water Saving Ml/d	Average Water Saving Ml/d
Kent Medway	Current	-	0.00000	0.00000	-	0.0000	0.00000	2015	0	0
	0-0.5	0.04711	0.01600	0.00049	0.03860	0.00000	0.00000	2015	0.5	0.5
	0.5-1	0.04820	0.01600	0.00049	0.04237	0.00000	0.00000	2015	0.5	0.5
	1-1.5	0.04941	0.01600	0.00049	0.04673	0.00000	0.00000	2015	0.5	0.5
	1.5-2	0.05074	0.01600	0.00049	0.05179	0.00000	0.00000	2015	0.5	0.5
	2-2.5	0.05223	0.01600	0.00049	0.05772	0.00000	0.00000	2015	0.5	0.5
	2.5-3	0.05389	0.01600	0.00049	0.06473	0.00000	0.00000	2015	0.5	0.5
	3-3.5	0.05578	0.01600	0.00049	0.07311	0.00000	0.00000	2015	0.5	0.5
	3.5-4	0.05792	0.01600	0.00049	0.08322	0.00000	0.00000	2015	0.5	0.5
	4-4.5	0.06038	0.01600	0.00049	0.09559	0.00000	0.00000	2015	0.5	0.5
	4.5-5	0.06324	0.01600	0.00049	0.11093	0.00000	0.00000	2015	0.5	0.5
	5-5.5	0.06659	0.01600	0.00049	0.13029	0.00000	0.00000	2015	0.5	0.5
	5.5-6	0.07059	0.01600	0.00049	0.15521	0.00000	0.00000	2015	0.5	0.5
	6-6.5	0.07543	0.01600	0.00049	0.18802	0.00000	0.00000	2015	0.5	0.5
	6.5-7	0.08141	0.01600	0.00049	0.23247	0.00000	0.00000	2015	0.5	0.5
	7-7.5	0.08900	0.01600	0.00049	0.29480	0.00000	0.00000	2015	0.5	0.5
Kent Thanet	Current	-	0.00000	0.00000	-	0.000	0.000	2015	0	0
	0-0.1	0.01077	0.00297	0.00010	0.01802	0.00000	0.00000	2015	0.1	0.1
	0.1-0.2	0.01098	0.00297	0.00010	0.01930	0.00000	0.00000	2015	0.1	0.1
	0.2-0.3	0.01119	0.00297	0.00010	0.02072	0.00000	0.00000	2015	0.1	0.1
	0.3-0.4	0.01142	0.00297	0.00010	0.02231	0.00000	0.00000	2015	0.1	0.1
	0.4-0.5	0.01168	0.00297	0.00010	0.02408	0.00000	0.00000	2015	0.1	0.1
	0.5-0.6	0.01195	0.00297	0.00010	0.02608	0.00000	0.00000	2015	0.1	0.1
	0.6-0.7	0.01224	0.00297	0.00010	0.02833	0.00000	0.00000	2015	0.1	0.1
	0.7-0.8	0.01257	0.00297	0.00010	0.03089	0.00000	0.00000	2015	0.1	0.1
	0.8-0.9	0.01292	0.00297	0.00010	0.03381	0.00000	0.00000	2015	0.1	0.1
	0.9-1	0.01331	0.00297	0.00010	0.03717	0.00000	0.00000	2015	0.1	0.1
	1-1.1	0.01373	0.00297	0.00010	0.04106	0.00000	0.00000	2015	0.1	0.1
	1.1-1.2	0.01421	0.00297	0.00010	0.04558	0.00000	0.00000	2015	0.1	0.1

WRZ	Reduction from target to min policy level (Ml/d)	Transition Costs (excl SE)	Transition Social impacts	Transition Carbon emissions	Opex Costs	Opex Social Costs	Opex Carbon Costs	Earliest Year	Peak Water Saving	Average Water Saving
		£m	£m	£m	£m/a	£m/a	£m/a		Ml/d	Ml/d
	1.2-1.3	0.01474	0.00297	0.00010	0.05090	0.00000	0.00000	2015	0.1	0.1
	1.3-1.4	0.01534	0.00297	0.00010	0.05721	0.00000	0.00000	2015	0.1	0.1
	1.4-1.5	0.01601	0.00297	0.00010	0.06476	0.00000	0.00000	2015	0.1	0.1
Sussex Hastings	Current	-	0.00000	0.00000	-	0.0000	0.00000	2015	0	0
	0-0.1	0.00846	0.00258	0.00010	0.01585	0.00000	0.00000	2015	0.1	0.1
	0.1-0.2	0.00886	0.00258	0.00010	0.01847	0.00000	0.00000	2015	0.1	0.1
	0.2-0.3	0.00933	0.00258	0.00010	0.02179	0.00000	0.00000	2015	0.1	0.1
	0.3-0.4	0.00990	0.00258	0.00010	0.02610	0.00000	0.00000	2015	0.1	0.1
	0.4-0.5	0.01060	0.00258	0.00010	0.03183	0.00000	0.00000	2015	0.1	0.1
	0.5-0.6	0.01146	0.00258	0.00010	0.03967	0.00000	0.00000	2015	0.1	0.1
	0.6-0.7	0.01257	0.00258	0.00010	0.05083	0.00000	0.00000	2015	0.1	0.1
	0.7-0.8	0.01404	0.00258	0.00010	0.06746	0.00000	0.00000	2015	0.1	0.1
	0.8-0.9	0.01608	0.00258	0.00010	0.09385	0.00000	0.00000	2015	0.1	0.1
	0.9-1	0.01912	0.00258	0.00010	0.13950	0.00000	0.00000	2015	0.1	0.1
	1-1.1	0.02412	0.00258	0.00010	0.22914	0.00000	0.00000	2015	0.1	0.1
	1.1-1.2	0.03384	0.00258	0.00010	0.44610	0.00000	0.00000	2015	0.1	0.1
	1.2-1.3	0.06103	0.00258	0.00010	1.24822	0.00000	0.00000	2015	0.1	0.1
	1.3-1.4	0.57255	0.00258	0.00010	23.4761	0.00000	0.00000	2015	0.1	0.1

Table G.4.12 Feasible Leakage Control Options and Costs, Eastern Area

G.5 References

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Appendix H: INVESTMENT MODEL

H.1 Investment Modelling Process

An investment model was developed to derive a least-cost water resources strategy, over the planning horizon and for each critical period, which solved the forecast supply demand balance, to ensure there were no deficits for each of the Water Resource Zones in the three sub-regional areas within Southern Water.

The model is a form of mixed integer linear programme (MILP) which is commonly used for allocation problems such as least-cost resource planning, and is recommended by the EBSD when complexity in the planning process increases. Due to the large number of options and Water Resource Zones, and the interdependencies between them, Southern Water's planning problem is sufficiently complex to warrant an approach such as MILP.

The model has been developed using the software *What'sBest!* (version 9), which consists of a simple toolbar within Microsoft Excel designed specifically to enable the end-user to build large scale optimisation models.

The model encompasses all ten of Southern Water's Water Resource Zones. However, as explained in the text, many of these WRZs are interconnected, and thus it is possible to group various WRZs together, to form three sub-regional areas. The model derives the strategy for each WRZ and the area simultaneously, through the use of inter-zonal transfers where available and required. The areas defined in the model are as follows:

- **Eastern** – Kent Medway WRZ, Kent Thanet WRZ, and Sussex Hastings WRZ;
- **Central** – Sussex Worthing WRZ, Sussex Brighton WRZ, and Sussex North WRZ; and
- **Western** – Hampshire South WRZ, Hampshire Andover WRZ, Hampshire Kingsclere WRZ, and the Isle of Wight WRZ.

In order to calculate the supply demand balance for each WRZ, a calculator tool was developed in Excel. This requires several input datasets:

- Deployable output;
- Sustainability Reductions;
- Outage;
- Process losses;
- Climate change;
- Demand forecast (for peak, average and MDO design scenarios);
- Target headroom allowances; and
- Raw and potable transfers (both inter-zonal and inter-company bulk supplies).

This is used to estimate the baseline supply demand balance for each WRZ for each year, and for each critical period, of the planning horizon. These baseline supply demand balances are then transposed into the investment model, which then derives a least cost solution in the event of any supply demand balance deficit.

For modelling purposes, existing inter-company bulk supplies are included within the calculations of the supply demand balance. Inter-zonal transfers are optimised in the investment model to ensure that the model is able to select them, or not, at the correct level and time, to derive a least-cost solution.

New transfers are also included as options within the investment model. Transfer assumptions are discussed further in section H.2.2. Transfer options allow the model to select an optimal solution for all the WRZs in an area at the same time.

Deployable outputs and costs for all the feasible resource options are fed into the investment models for possible selection in the least-cost solution to meet any forecast deficits. Relationships between the options can be made to specify mutual exclusivity or dependence on other options.

In addition to new resource and transfer options, the model can optimise for new demand management options. In the investment model demand management options have been divided into two categories: additional leakage control and water efficiency measures. Again, relationships between particular demand management options may be specified to model mutual exclusivity or dependence.

Metering options have not been included directly in the investment model. Instead, different metering scenarios have been used to derive different supply demand balance lines. These are then fed into different versions of the investment model – i.e. an investment model is run to develop a solution for each set of metering scenario supply demand balance deficits. This is discussed in greater detail in section H.4.

H.2 Model Input

The investment model is divided into four main sections:

- Water Resource Zones – This section of the model controls the input of the WRZ names and deficits. The initial supply demand balance is input, and the final supply demand balance is then computed here by comparing the current deficit with any new resources or demand management measures that the model may have selected. Constraints in this section ensure that the model must satisfy the deficits in all zones in all years of the planning period, and for each critical period;
- Resources – Water resource options are added in this sheet, and new or existing transfers can be defined to enable the model to move supply between two WRZs. This section provides constraints on the selection of options based on the earliest available year, mutual exclusivity, dependency, and deliverable output. The costs of selected schemes are fed into the total NPV cost and optimised deployable output is provided to satisfy deficits as required. A sample sheet is included in section H.2.1;
- Leakage Control – Individual zones have additional leakage reduction options specified. The model is designed to approximate a cost of leakage control in discrete steps. Steady state and transition costs are entered against individual steps, and typically these will increase as more leakage control is introduced. Constraints on individual steps ensure that leakage cannot rise once it has been lowered to a particular step, and also that no more than three incremental steps can be transitioned in any one year in a given zone. A sample sheet is included in section H.2.1; and
- Water Efficiency Measures – Additional water efficiency measures, beyond those used to meet the baseline water efficiency target, can be entered into the model. These incorporate decay curves and return periods, as described in the water efficiency section of Appendix G, and allow for several options to share the marketing overheads for a given AMP period. A sample sheet is included in section H.2.1.

Each of these last three sections provides a cost (or benefit) to the total NPV of the strategy. The objective function of the programme is the minimisation of total NPV, to derive the least-cost strategy.

H.2.1 Sample data sheets from investment model

Resources input sheet

3		Scheme Name	Code	VRZ										Total Capex	Annuitised cost	Fixed Opex	Carbon opex	Variable opex (w/o Carbon)	Peak Use Factor	Average Use Factor	Annual env costs	Earliest DO Year	Earliest Construction Year	Scheme Life	Peak Scheme output	Average Scheme output
1	Water Resource Schemes																									
2																										
4				1	2	3	4	5	6	7	8	9	10	£m	£m/a	£m/a	£/m3	£/m3			£m/a					
5				SB	SW	SN	KM	KT	SH	HA	HK	HS	IoW													
6	1																	0	0	0.00	0.000		0			
7	2	Coastal Desalination – Shoreham Harbour - 10 Ml/d	CD1-10	1										28.37204	1.943647266	0.22991	0.07	0.39233616	0.415	1.00	0.000	2013	2011	33.083	10.00	10.00
8	3	Sussex Worthing to Sussex Brighton Transfer (IN)		1										0	0	0.01		0.05	0.415	1.00	0.000	2008	2008	60	7.00	7.00
9	4	Coastal Desalination – Shoreham Harbour - 20 Ml/d	CD1-20	1										43.62467	3.006718786	0.28123	0.07	0.39233616	0.415	1.00	0.000	2013	2011	33	20.00	20.00
10	5	N8 Hardham Winter Transfer: Stages1&2 [w/ N9]	N8a	1										17.06288	1.256918274	0.12248	0.028498	0.24295399	0.415	1.00	0.000	2015	2014	94.24898	2.50	2.50
11	6	N8 Hardham Winter Transfer: Stages1&2 [w/ N9] (IN)	N8a	1										0	0	0	0	0	0.415	1.00	0.000	2015	2014	94.24898	4.00	4.00
12	7	Build New Reservoir on Coast - abstraction from the River Arun	C3		1									47.06719	2.548209691	0.23799	0.013984	0.11982108	0.415	1.00	0.161	2014	2012	127.0268	10.00	10.00
13	8	Tidal River Arun Desalination - 10Ml/d	CD3a		1									23.95688	1.548565696	0.27124	0.04	0.28733616	0.415	1.00	0.649	2013	2011	44.24	10.00	10.00
14	9	Tidal River Arun Desalination - 20Ml/d	CD3b		1									34.54663	2.27058708	0.3364	0.04	0.282	0.415	1.00	0.649	2013	2011	41.89	20.00	20.00
15	10	River Adur Abstraction	C4		1									11.20813	0.624694755	0.0749	0.013261	0.11529005	0.415	1.00	0.190	2013	2011	86.32925	5.00	5.00
16	11	Sussex Coast ASR - storage and recovery from Lower Greensand aqu	CA1		1									10.77719	0.624882273	0.05583	0.017714	0.15387071	0.415	1.00	0.000	2015	2014	56.81	10.00	5.00
17	12																	0	0	0.00	0.000		0			
18	13																	0	0	0.00	0.000		0			
19	14	Western Rother Irrigation Licences	N1			1								19.99001	1.125141592	0.05352	0.0085	0.061	0.415	1.00	0.000	2013	2012	60	3.50	0.50
20	15	N3Hardham MRF Reduction	N3			1								1.060215	0.059674401	0	0.0085	0.061	0.415	1.00	0.000	2012	2011	60	0.00	5.00
21	16	Build New Reservoir at Blackstone - Abstraction from E Branch of Ad	N5			1								52.39313	2.845428078	0.25843	0.011734	0.10572629	0.415	1.00	0.450	2017	2014	147.22	15.00	12.00
22	17	N6a Surface Storage Reservoir at Hardham - Combined Rother/Arun	N6a-20			1								47.81378	2.56001475	0.20537	0.0108	0.08461325	0.415	1.00	0.734	2020	2018	155	30.00	26.00
23	18	N6a Surface Storage Reservoir at Hardham - Combined Rother/Arun	N6a-10			1								46.32659	2.475787792	0.19965	0.011	0.08441325	0.415	1.00	0.776	2020	2018	158	30.00	21.00
24	19	N7a Arun Abstraction Above Tidal Limit Scheme 1: 5Ml/d Abstraction	N7a			1								8.286736	0.499944146	0.06415	0.0098	0.09360975	0.415	1.00	0.164	2012	2011	64.23	5.00	5.00
25	20	N7b Arun Abstraction Above Tidal Limit Scheme 2: 10Ml/d Abstractio	N7b			1								14.08727	0.748464563	0.07333	0.011114	0.10183735	0.415	1.00	0.207	2012	2011	87.75	15.00	9.50
26	21	N7c Arun Abstraction Above Tidal Limit Scheme 3: 20Ml/d Abstractic	N7c			1								16.54563	0.880339434	0.08998	0.011182	0.10226628	0.415	1.00	0.248	2013	2012	93.70	20.00	11.50
27	22	NR2 Ford Effluent Reuse Scheme 1: MBR Treatment	NR2			1								35.56752	2.264949722	0.31205	0.012556	0.12846574	0.415	1.00	0.000	2016	2015	52.48	20.00	19.00
28	23	NR2 Ford Effluent Reuse Scheme 1: BAFF Treatment	NR2			1								36.64569	2.215787855	0.15921	0.008887	0.10548567	0.415	1.00	0.884	2016	2015	54.95	20.00	19.00
29	24																	0	0	0.00	0.000		0			
30	25	Sussex Worthing to Sussex North Transfer (IN)				1								0	0	0.01		0.05	0.415	1.00	0.000	2008	2008	60	15.00	15.00
31	26																	0	0	0.00	0.000		0			
32	27	N4 Weir Wood Refill via Treated Transfer Offset from Hardham	N4			1								3.180645	0.172632433	0.01562	0.014498	0.12303673	0.415	1.00	0.000	2012	2011	100	0.00	3.00
33	28																	0	0	0.00	0.000		0			
34	29	N9 Arun Abstraction Below Tidal Limit 10Ml/d abstraction & 50Ml Stor	N9-10			1								10.1344	0.601877081	0.07033	0.007769	0.08088493	0.415	1.00	0.138	2012	2011	97.97	15.00	11.50
35	30	Sussex North to Sussex Worthing Transfer (IN)			1									0	0	0.01		0.05	0.415	1.00	0.000	2008	2008	60	15.00	15.00
36	31	N8 Hardham Winter Transfer: Stages1&2 [w/o N9]	N8b	1										18.1231	1.256918274	0.12248	0.028498	0.24295399	0.415	1.00	0.000	2015	2014	94.24898	4.00	4.00
37	32	N8 Hardham Winter Transfer: Stages1&2 [w/o N9] (IN)	N8b	1										0	0	0	0	0	0.415	1.00	0.000	2015	2014	94.24898	4.00	4.00
38	33	Raise Bewl	M5				1							28.82534	1.658849891	0.10432	0.010931	0.10512009	0.415	1.00	0.768	2022	2019	107.0205	16.00	14.20
39	34																	0	0	0.00	0.000		0			
40	35																	0	0	0.00	0.000		0			
41	36																	0	0	0.00	0.000		0			
42	37																	0	0	0.00	0.000		0			
43	38																	0	0	0.00	0.000		0			
44	39																	0	0	0.00	0.000		0			
45	40																	0	0	0.00	0.000		0			
46	41	Effluent reuse - Aylseford WWTW	MR3				1							36.78974	2.264162478	0.30755	0.040613	0.26130818	0.415	1.00	0.000	2018	2015	65	27.60	24.40
47	42	Sheppey Desalination (10MLD)	MD1				1							36.23073	2.29880348	0.35565	0.069649	0.4085571	0.415	1.00	0.000	2017	2014	46.35	13.8	12.3
48	43	Medway Desalination (10MLD)	MD2a				1							28.16514	1.787987863	0.29229	0.044149	0.28814173	0.415	1.00	0.000	2017	2014	49.4	17.1	15.2
49	44	Medway Desalination (20MLD)	MD2b				1							38.01043	2.477957897	0.39481	0.044149	0.28814173	0.415	1.00	0.000	2017	2014	49.4	29.9	26.4
50	45																	0	0	0.00	0.000		0			
51	46	Licence variation at Danaway	M9				1							0.609624	0.034935745	0	0.011923	0.07836396	0.415	1.00	0.000	2013	2012	60	0	1.6
52	47	Licence variation for R. Medway scheme	M10				1							0.670586	0.03842932	0.02083	0.010931	0.10512009	0.415	1.00	0.334	2013	2011	60	2.8	2.5

Leakage Control input sheet

	A	B	C	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	AC	AD	AE	AF	AG	AH
3			Leakage Name	VRZ												Transition Cost	Transition S&E	Transition Carbon	Opex	Social & Env Costs	Carbon Costs	Earliest Year	Peak Water Saving	Average Water Saving						
4				1	2	3	4	5	6	7	8	9	10	11	12	£m	£m	£m	£m/a	£m/a	£m/a		Ml/day	Ml/day						
5				SB	SW	SN	KM	KT	SH	HA	HK	HS	IoW	0	0											2007	2008	2009	2010	2011
6		1																								0	0	0	0	0
7		2	Isle of Wight - 0-0.1 lvl - Current Policy										1			0.007	0.003	0.000	0.009	0	0	2015	0.1	0.1		0	0	0	0	0
8		3	Isle of Wight - 0.1-0.2 lvl - Current Policy										1			0.008	0.003	0.000	0.010	0	0	2015	0.1	0.1		0	0	0	0	0
9		4	Isle of Wight - 0.2-0.3 lvl - Current Policy										1			0.008	0.003	0.000	0.011	0	0	2015	0.1	0.1		0	0	0	0	0
10		5	Isle of Wight - 0.3-0.4 lvl - Current Policy										1			0.008	0.003	0.000	0.012	0	0	2015	0.1	0.1		0	0	0	0	0
11		6	Isle of Wight - 0.4-0.5 lvl - Current Policy										1			0.01	0.00	0.00	0.01329	0	0	2015	0.1	0.1		0	0	0	0	0
12		7	Isle of Wight - 0.5-0.6 lvl - Current Policy										1			0.01	0.00	0.00	0.0147	0	0	2015	0.1	0.1		0	0	0	0	0
13		8	Isle of Wight - 0.6-0.7 lvl - Current Policy										1			0.009	0.003	0.000	0.016	0	0	2015	0.1	0.1		0	0	0	0	0
14		9	Isle of Wight - 0.7-0.8 lvl - Current Policy										1			0.009	0.003	0.000	0.018	0	0	2015	0.1	0.1		0	0	0	0	0
15		10	Isle of Wight - 0.8-0.9 lvl - Current Policy										1			0.009	0.003	0.000	0.021	0	0	2015	0.1	0.1		0	0	0	0	0
16		11	Isle of Wight - 0.9-1 lvl - Current Policy										1			0.010	0.003	0.000	0.023	0	0	2015	0.1	0.1		0	0	0	0	0
17		12	Isle of Wight - 1-1.1 lvl - Current Policy										1			0.010	0.003	0.000	0.027	0	0	2015	0.1	0.1		0	0	0	0	0
18		13	Isle of Wight - 1.1-1.2 lvl - Current Policy										1			0.01	0.00	0.00	0.031	0	0	2015	0.1	0.1		0	0	0	0	0
19		14	Isle of Wight - 1.2-1.3 lvl - Current Policy										1			0.01	0.00	0.00	0.03626	0	0	2015	0.1	0.1		0	0	0	0	0
20		15	Isle of Wight - 1.3-1.4 lvl - Current Policy										1			0.012	0.003	0.000	0.043	0	0	2015	0.1	0.1		0	0	0	0	0
21		16	Isle of Wight - 1.4-1.5 lvl - Current Policy										1			0.013	0.003	0.000	0.052	0	0	2015	0.1	0.1		0	0	0	0	0
22		17																								0	0	0	0	0
23		18	Hampshire South - 0-0.6 lvl - Current Policy									1				0.040	0.016	0.001	0.038	0	0	2015	0.6	0.6		0	0	0	0	0
24		19	Hampshire South - 0.6-1.2 lvl - Current Policy									1				0.041	0.016	0.001	0.042	0	0	2015	0.6	0.6		0	0	0	0	0
25		20	Hampshire South - 1.2-1.8 lvl - Current Policy									1				0.04	0.02	0.00	0.04603	0	0	2015	0.6	0.6		0	0	0	0	0
26		21	Hampshire South - 1.8-2.4 lvl - Current Policy									1				0.04	0.02	0.00	0.05106	0	0	2015	0.6	0.6		0	0	0	0	0
27		22	Hampshire South - 2.4-3 lvl - Current Policy									1				0.04	0.02	0.00	0.05695	0	0	2015	0.6	0.6		0	0	0	0	0
28		23	Hampshire South - 3-3.6 lvl - Current Policy									1				0.05	0.02	0.00	0.06393	0	0	2015	0.6	0.6		0	0	0	0	0
29		24	Hampshire South - 3.6-4.2 lvl - Current Policy									1				0.05	0.02	0.00	0.07228	0	0	2015	0.6	0.6		0	0	0	0	0
30		25	Hampshire South - 4.2-4.8 lvl - Current Policy									1				0.05	0.02	0.00	0.08237	0	0	2015	0.6	0.6		0	0	0	0	0
31		26	Hampshire South - 4.8-5.4 lvl - Current Policy									1				0.05	0.02	0.00	0.09474	0	0	2015	0.6	0.6		0	0	0	0	0
32		27	Hampshire South - 5.4-6 lvl - Current Policy									1				0.05	0.02	0.00	0.11012	0	0	2015	0.6	0.6		0	0	0	0	0
33		28	Hampshire South - 6-6.6 lvl - Current Policy									1				0.06	0.02	0.00	0.12958	0	0	2015	0.6	0.6		0	0	0	0	0
34		29	Hampshire South - 6.6-7.2 lvl - Current Policy									1				0.06	0.02	0.00	0.15469	0	0	2015	0.6	0.6		0	0	0	0	0
35		30	Hampshire South - 7.2-7.8 lvl - Current Policy									1				0.064	0.016	0.001	0.188	0	0	2015	0.6	0.6		0	0	0	0	0
36		31	Hampshire South - 7.8-8.4 lvl - Current Policy									1				0.070	0.016	0.001	0.233	0	0	2015	0.6	0.6		0	0	0	0	0
37		32	Hampshire South - 8.4-9 lvl - Current Policy									1				0.076	0.016	0.001	0.297	0	0	2015	0.6	0.6		0	0	0	0	0
38		33																								0	0	0	0	0
39		34	Hampshire Andover - 0-0.1 lvl - Current Policy							1						0.009	0.003	0.000	0.010	0	0	2015	0.1	0.1		0	0	0	0	0
40		35	Hampshire Andover - 0.1-0.2 lvl - Current Policy							1						0.01	0.00	0.00	0.01162	0	0	2015	0.1	0.1		0	0	0	0	0
41		36	Hampshire Andover - 0.2-0.3 lvl - Current Policy							1						0.01	0.00	0.00	0.01331	0	0	2015	0.1	0.1		0	0	0	0	0
42		37	Hampshire Andover - 0.3-0.4 lvl - Current Policy							1						0.010	0.003	0.000	0.015	0	0	2015	0.1	0.1		0	0	0	0	0
43		38	Hampshire Andover - 0.4-0.5 lvl - Current Policy							1						0.010	0.003	0.000	0.018	0	0	2015	0.1	0.1		0	0	0	0	0
44		39	Hampshire Andover - 0.5-0.6 lvl - Current Policy							1						0.011	0.003	0.000	0.021	0	0	2015	0.1	0.1		0	0	0	0	0
45		40	Hampshire Andover - 0.6-0.7 lvl - Current Policy							1						0.012	0.003	0.000	0.026	0	0	2015	0.1	0.1		0	0	0	0	0
46		41	Hampshire Andover - 0.7-0.8 lvl - Current Policy							1						0.013	0.003	0.000	0.032	0	0	2015	0.1	0.1		0	0	0	0	0
47		42	Hampshire Andover - 0.8-0.9 lvl - Current Policy							1						0.01	0.00	0.00	0.03988	0	0	2015	0.1	0.1		0	0	0	0	0
48		43	Hampshire Andover - 0.9-1 lvl - Current Policy							1						0.02	0.00	0.00	0.05172	0	0	2015	0.1	0.1		0	0	0	0	0
49		44	Hampshire Andover - 1-1.1 lvl - Current Policy							1						0.02	0.00	0.00	0.06977	0	0	2015	0.1	0.1		0	0	0	0	0
50		45	Hampshire Andover - 1.1-1.2 lvl - Current Policy							1						0.02	0.00	0.00	0.09924	0	0	2015	0.1	0.1		0	0	0	0	0
51		46	Hampshire Andover - 1.2-1.3 lvl - Current Policy							1						0.02	0.00	0.00	0.15241	0	0	2015	0.1	0.1		0	0	0	0	0
52		47	Hampshire Andover - 1.3-1.4 lvl - Current Policy							1						0.03	0.00	0.00	0.26394	0	0	2015	0.1	0.1		0	0	0	0	0
53		48	Hampshire Andover - 1.4-1.5 lvl - Current Policy							1						0.05	0.00	0.00	0.56849	0	0	2015	0.1	0.1		0	0	0	0	0
54		49																								0	0	0	0	0
55		50	Hampshire Kingsclere - 0-0.1 lvl - Current Policy								1					0.01	0.00	0.00	0.01167	0	0	2015	0.1	0.1		0	0	0	0	0

Water efficiency measures input sheet

Water Efficiency Measures

Row	No.	Option	WRZ 1 SB	2 SW	3 SN	4 KM	5 KT	6 SH	7 HA	8 HK	9 HS	10 IoW	Uptake	HH	Non HH	Max Properties	Start Year	Devices per property	Installation Cost £/prop	Base Yield - Peak l/prop/day	Base Yield - Average l/prop/day	Device cost per Property £/prop	Admin cost per Property £/prop	Carbon Cost £/m3	Half-Life	Max Water Saving - Peak Ml/day	Max Water Saving - Average Ml/day	Max Sche Devic Adm Cost £k
6	1	Water Efficiency Kit [Box]	1										17%	1		24774	2023	1	£ -	13.3	13.3	£ 7.1	£ 2.00	-£ 0.079	2.5	0.3295	0.3295	£ 2
7	2	Schools - Install Low Flow Dual Flush WC	1										40%		1	265	2038	1	£ 540.00	555	555	£ 1,296.0	£ 2.00		7.5	0.1471	0.1471	£ 3
8	3	Commercial Water Audit (CWA)	1										10%		1	913	2027	1	£ 180.00	60	60	£ -	£ 2.00	-£ 0.029	4	0.0548	0.0548	£
9	4	Install Low Dual Flush (4/2) (subsidy)	1										2%	1		2848	2038	1.6	£ -	31	31	£ 160.0	£ 2.00		7.5	0.0883	0.0883	£ 4
10	5	Low Flow Taps	1										4%	1		5695	2038	1.6	£ 54.00	18.5	18.5	£ 83.2	£ 2.00	-£ 0.079	7.5	0.1054	0.1054	£ 4
11	6	Low Flow Shower Heads	1										1%	1		1424	2010	1.6	£ -	14.1	14.1	£ 19.2	£ 2.00	-£ 0.158	2.5	0.0201	0.0201	£
12	7	Water Butts	1										12%	1		17086	2010	1	£ -	2.2	2.2	£ 24.0	£ 2.00		7.5	0.0376	0.0376	£ 4
13	8	Trigger Hoses	1										30%	1		42714	2010	1	£ -	1.3	1.3	£ 3.6	£ 2.00		2.5	0.0555	0.0555	£ 2
14	9	Low Use Washing Machine (Subsidy)	1										3%	1		4271	2010	1	£ -	7.37	7.37	£ 100.0	£ 2.00	-£ 0.158	5	0.0315	0.0315	£ 4
15	10	Low Use Dishwasher (subsidy)	1										3%	1		4271	2010	1	£ -	1.16	1.16	£ 140.0	£ 2.00	-£ 0.158	5	0.0050	0.0050	£ 6
16	11	Water Efficiency Kit [Box]		1									17%	1		14345	2023	1	£ -	13.3	13.3	£ 7.1	£ 2.00	-£ 0.079	2.5	0.1908	0.1908	£ 1
17	12	Schools - Install Low Flow Dual Flush WC		1									40%		1	153	2038	1	£ 540.00	555	555	£ 1,296.0	£ 2.00		7.5	0.0849	0.0849	£ 1
18	13	Commercial Water Audit (CWA)		1									10%		1	443	2027	1	£ 180.00	60	60	£ -	£ 2.00	-£ 0.029	4	0.0266	0.0266	£
19	14	Install Low Dual Flush (4/2) (subsidy)		1									2%	1		1649	2038	1.6	£ -	31	31	£ 160.0	£ 2.00		7.5	0.0511	0.0511	£ 2
20	15	Low Flow Taps		1									4%	1		3298	2038	1.6	£ 54.00	18.5	18.5	£ 83.2	£ 2.00	-£ 0.079	7.5	0.0610	0.0610	£ 2
21	16	Low Flow Shower Heads		1									1%	1		824	2010	1.6	£ -	14.1	14.1	£ 19.2	£ 2.00	-£ 0.158	2.5	0.0116	0.0116	£
22	17	Water Butts		1									12%	1		9893	2010	1	£ -	2.2	2.2	£ 24.0	£ 2.00		7.5	0.0218	0.0218	£ 2
23	18	Trigger Hoses		1									30%	1		24732	2010	1	£ -	1.3	1.3	£ 3.6	£ 2.00		2.5	0.0322	0.0322	£ 1
24	19	Low Use Washing Machine (Subsidy)		1									3%	1		2473	2010	1	£ -	7.37	7.37	£ 100.0	£ 2.00	-£ 0.158	5	0.0182	0.0182	£ 2
25	20	Low Use Dishwasher (subsidy)		1									3%	1		2473	2010	1	£ -	1.16	1.16	£ 140.0	£ 2.00	-£ 0.158	5	0.0029	0.0029	£ 3
26	21	Water Efficiency Kit [Box]			1								17%	1		17071	2023	1	£ -	13.3	13.3	£ 7.1	£ 2.00	-£ 0.079	2.5	0.2270	0.2270	£ 1
27	22	Schools - Install Low Flow Dual Flush WC			1								40%		1	183	2038	1	£ 540.00	555	555	£ 1,296.0	£ 2.00		7.5	0.1016	0.1016	£ 2
28	23	Commercial Water Audit (CWA)			1								10%		1	856	2027	1	£ 180.00	60	60	£ -	£ 2.00	-£ 0.029	4	0.0514	0.0514	£
29	24	Install Low Dual Flush (4/2) (subsidy)			1								2%	1		1962	2038	1.6	£ -	31	31	£ 160.0	£ 2.00		7.5	0.0608	0.0608	£ 3
30	25	Low Flow Taps			1								4%	1		3924	2038	1.6	£ 54.00	18.5	18.5	£ 83.2	£ 2.00	-£ 0.079	7.5	0.0726	0.0726	£ 3
31	26	Low Flow Shower Heads			1								1%	1		981	2010	1.6	£ -	14.1	14.1	£ 19.2	£ 2.00	-£ 0.158	2.5	0.0138	0.0138	£
32	27	Water Butts			1								12%	1		11773	2010	1	£ -	2.2	2.2	£ 24.0	£ 2.00		7.5	0.0259	0.0259	£ 3
33	28	Trigger Hoses			1								30%	1		29433	2010	1	£ -	1.3	1.3	£ 3.6	£ 2.00		2.5	0.0383	0.0383	£ 1
34	29	Low Use Washing Machine (Subsidy)			1								3%	1		2943	2010	1	£ -	7.37	7.37	£ 100.0	£ 2.00	-£ 0.158	5	0.0217	0.0217	£ 3
35	30	Low Use Dishwasher (subsidy)			1								3%	1		2943	2010	1	£ -	1.16	1.16	£ 140.0	£ 2.00	-£ 0.158	5	0.0034	0.0034	£ 4
36	31	Water Efficiency Kit [Box]				1							17%	1		31499	2023	1	£ -	13.3	13.3	£ 7.1	£ 2.00	-£ 0.079	2.5	0.4189	0.4189	£ 2
37	32	Schools - Install Low Flow Dual Flush WC				1							40%		1	337	2038	1	£ 540.00	555	555	£ 1,296.0	£ 2.00		7.5	0.1870	0.1870	£ 4
38	33	Commercial Water Audit (CWA)				1							10%		1	873	2027	1	£ 180.00	60	60	£ -	£ 2.00	-£ 0.029	4	0.0524	0.0524	£
39	34	Install Low Dual Flush (4/2) (subsidy)				1							2%	1		3621	2038	1.6	£ -	31	31	£ 160.0	£ 2.00		7.5	0.1122	0.1122	£ 5
40	35	Low Flow Taps				1							4%	1		7241	2038	1.6	£ 54.00	18.5	18.5	£ 83.2	£ 2.00	-£ 0.079	7.5	0.1340	0.1340	£ 6
41	36	Low Flow Shower Heads				1							1%	1		1810	2010	1.6	£ -	14.1	14.1	£ 19.2	£ 2.00	-£ 0.158	2.5	0.0255	0.0255	£
42	37	Water Butts				1							12%	1		21724	2010	1	£ -	2.2	2.2	£ 24.0	£ 2.00		7.5	0.0478	0.0478	£ 5
43	38	Trigger Hoses				1							30%	1		54309	2010	1	£ -	1.3	1.3	£ 3.6	£ 2.00		2.5	0.0706	0.0706	£ 3

H.2.2 Transfers

Transfers of water, both inter-zonal within the company supply area and external as inter-company bulk supplies to and from Southern Water, add to the complexity of the modelling process and have been incorporated into the models as follows:

- Inter-company bulk imports and exports – These have been considered as fixed baseline transfers, which are assumed to continue until the end of the planning period; and
- Inter-zonal transfers – These transfers between Southern Water's WRZs have been modelled within the investment model itself. As such, all inter-zonal transfers have been set at zero from the start of AMP5. This allows the model to select a transfer within the optimisation process to derive a least-cost solution. This, in turn, allows the model to select the least-cost strategy for transfers, resource development and demand management options to derive the least-cost solution.

H.2.3 Options in the investment model

The investment model incorporates resource development, leakage reduction and water efficiency options. These are all available to solve any given supply demand balance deficit at least-cost.

The derivation of options for inclusion within the investment model, along with their cost, output, earliest start date, etc. has been derived and is discussed in detail in Appendix G.

H.2.4 Discount rates

In the investment model, all costs and benefits were discounted using the Social Time Preference Rate (STPR) of 3.5%. However, raw capex costs for resource development options were annuitised using a rate of 5.5% to represent the cost of capital. This approach is consistent with recent guidance from Ofwat, (19 December 2007), *Further Ofwat Guidance on the Use of Cost Benefit Analysis for PR09*.

The EA Water Resource Planning Guideline suggests using 4.5%; however, we have followed Ofwat's methodology outlined in their Business Plan Guidelines.

H.3 Model Output

The model comprises several reporting spreadsheets to filter, sort and present both the input data and results. Following each model run, the scheme outputs have been examined to make sure they look sensible and practical, thereby providing a sense-check of results based on expert judgement.

The model presents a least-cost solution for meeting the supply demand balance in each WRZ, taking into account inter-zonal transfers, by selecting resource development, leakage reduction, and water efficiency options. The total cost generated in the investment model is then combined with the cost of the metering programme used to generate the demand side of the supply demand balance, which was calculated separately. This gives the least-cost solution for a given metering programme, and can be used to select the preferred strategy for the company over the planning period.

Example model output screenshots are presented below. These show the least-cost for the chosen strategy, and also the options selected and their timing for each WRZ.

	C	D	E	F	G	H	I	J	K	L	M	N	Q	R	S
92															
93	4	KM	Kent Medway										PEAK Breakdown		
94				AMP4	AMP5	AMP6	AMP7	AMP8	AMP9	AMP10	Total	PP Total	AMP4	AMP5	AMP6
95	Water Resources	Capex		0.00	0.00	0.00	0.04	0.14	0.16	0.06	0.39	0.34	0.00	0.00	0.00
96		Opex	Fixed	0.00	0.00	0.00	0.00	0.01	0.04	0.02	0.07	0.05	0.00	0.00	0.00
97			Variable	0.00	0.00	0.00	0.00	0.09	0.22	0.08	0.39	0.32	0.00	0.00	0.00
98			Total	0.00	0.00	0.00	0.00	0.10	0.26	0.10	0.46	0.37	0.00	0.00	0.00
99		S&E	Env.	0.00	0.00	0.00	0.00	0.16	0.71	0.25	1.11	0.86	0.00	0.00	0.00
100			Carbon	0.00	0.00	0.00	0.00	0.02	0.04	0.02	0.08	0.06	0.00	0.00	0.00
101		Total		0.00	0.00	0.00	0.04	0.42	1.17	0.42	2.05	1.64	0.00	0.00	0.00
102	Water Efficiency	Capex		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103		Opex	Carbon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
104		Total		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
105	Leakage	ALC	Transition	0.00	0.00	0.00	0.00	0.15	0.19	0.00	0.34	0.34	0.00	0.00	0.00
106			Steady State	0.00	0.00	0.00	0.00	0.42	1.35	0.85	2.62	1.77	0.00	0.00	0.00
107		S&E	Env.	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.09	0.09	0.00	0.00	0.00
108			Carbon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
109		Total		0.00	0.00	0.00	0.00	0.62	1.58	0.85	3.06	2.20	0.00	0.00	0.00
110	Water Savings	Operational		0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.02	-0.02	0.00	0.00	0.00
111		S&E	Env.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
112			Carbon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00
113		Total		0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.03	-0.02	0.00	0.00	0.00
114	Total	Capex		0.00	0.00	0.00	0.04	0.14	0.16	0.06	0.39	0.34	0.00	0.00	0.00
115		Opex		0.00	0.00	0.00	0.00	0.67	1.78	0.94	3.40	2.46	0.00	0.00	0.00
116		S&E	Env.	0.00	0.00	0.00	0.00	0.20	0.75	0.25	1.21	0.96	0.00	0.00	0.00
117			Carbon	0.00	0.00	0.00	0.00	0.02	0.04	0.02	0.08	0.06	0.00	0.00	0.00
118	Total			0.00	0.00	0.00	0.04	1.04	2.74	1.26	5.08	3.82	0.00	0.00	0.00
119	Estimated Cost to Customer			0.00	0.00	0.00	0.01	0.91	2.60	1.22	4.73	3.51	0.00	0.00	0.00
120															
121															
122	5	KT	Kent Thanet										PEAK Breakdown		
123				AMP4	AMP5	AMP6	AMP7	AMP8	AMP9	AMP10	Total	PP Total	AMP4	AMP5	AMP6
124	Water Resources	Capex		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
125		Opex	Fixed	0.00	0.04	0.04	0.03	0.03	0.02	0.01	0.16	0.15	0.00	0.01	0.01
126			Variable	0.00	0.02	0.01	0.02	0.02	0.02	0.01	0.10	0.09	0.00	0.02	0.01
127			Total	0.00	0.06	0.04	0.05	0.05	0.05	0.02	0.26	0.24	0.00	0.03	0.02
128		S&E	Env.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
129			Carbon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
130		Total		0.00	0.06	0.04	0.05	0.05	0.05	0.02	0.26	0.24	0.00	0.03	0.02
131		Capex		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Row	C	D	E	F	G	H	I	J	K
313									
314		4	KM		Kent Medway		AMP5	AMP6	AMP7
315							2010	2015	2020
316	Accepted SDB Deficit						Peak	MDO	
317						2010	0.00	7.40	
318						2011	0.00	6.83	
319						2012	0.00	0.85	
320						2013	0.00	0.00	
321						2014	0.00	0.00	
322						2015	0.00	0.00	
323									
324	Water Resource Schemes		ids		Scheme Name	No. of Years		Year Selected	
325		1	4_1	46	Licence variation at Danaway	13		2024	
326		2	4_2	47	Licence variation for R. Medway scheme	8		2029	
327		3	4_3	43	Medway Desalination (10MLD)	0			
328		4	4_4	33	Raise Bewl	0			
329		5	4_5	42	Sheppey Desalination (10MLD)	0			
330		6	4_6	41	Effluent reuse - Aylesford WWTW	0			
331		7	4_7	44	Medway Desalination (20MLD)	0			
332		8	4_8	-1					
355									
356	Transfers out of Zone		ids		Scheme Name	Selected No. of Years		Year Selected	
357		1	4_1	53	Duplicate Selling-Fleete main (IN)	0			
358		2	4_2	56	KM to KT Transfer (IN)	27		2010	
359		3	4_3	61	Increase capacity of Bewl-Darwell transfer (IN)	0			
360		4	4_4	-1					
361		5	4_5	-1					
362		6	4_6	-1					
363		7	4_7	-1					
367									
368	Transfers in to Zone		ids		Scheme Name	No. of Years		Year Selected	
369		1	4_1	49	Reverse flow in Selling-Fleete main (IN)	0			
370		2	4_2	-1					
371		3	4_3	-1					
372		4	4_4	-1					
373		5	4_5	-1					
374		6	4_6	-1					
375		7	4_7	-1					
379									
380	Water Efficiency Schemes		ids		Option		1st	2nd	3rd
381		1	4_1	35	Low Flow Taps				
382		2	4_2	40	Low Use Dishwasher (subsidy)				
383		3	4_3	32	Schools - Install Low Flow Dual Flush WC				
384		4	4_4	34	Install Low Dual Flush (4/2) (subsidy)				
385		5	4_5	37	Water Butts				
386		6	4_6	39	Low Use Washing Machine (Subsidy)				
387		7	4_7	38	Trigger Hoses				
388		8	4_8	31	Water Efficiency Kit [Box]				
389		9	4_9	33	Commercial Water Audit (CWA)				
390		10	4_10	36	Low Flow Shower Heads				
391		11	4_11	-1					
396									
397	Leakage Control Options		ids		Leakage Name	No. of Years		Year Selected	
398		1	4_1	101	Kent Medway - 0-0.5 Ml - Current Policy	11		2026	
399		2	4_2	102	Kent Medway - 0.5-1 Ml - Current Policy	11		2026	
400		3	4_3	103	Kent Medway - 1-1.5 Ml - Current Policy	10		2027	
401		4	4_4	104	Kent Medway - 1.5-2 Ml - Current Policy	10		2027	
402		5	4_5	105	Kent Medway - 2-2.5 Ml - Current Policy	9		2028	
403		6	4_6	106	Kent Medway - 2.5-3 Ml - Current Policy	9		2028	
404		7	4_7	107	Kent Medway - 3-3.5 Ml - Current Policy	6		2031	
405		8	4_8	108	Kent Medway - 3.5-4 Ml - Current Policy	6		2031	
406		9	4_9	109	Kent Medway - 4-4.5 Ml - Current Policy	5		2032	
407		10	4_10	110	Kent Medway - 4.5-5 Ml - Current Policy	4		2033	
408		11	4_11	111	Kent Medway - 5-5.5 Ml - Current Policy	4		2033	
409		12	4_12	112	Kent Medway - 5.5-6 Ml - Current Policy	3		2034	
410		13	4_13	113	Kent Medway - 6-6.5 Ml - Current Policy	3		2034	
411		14	4_14	114	Kent Medway - 6.5-7 Ml - Current Policy	0			
412		15	4_15	115	Kent Medway - 7-7.5 Ml - Current Policy	0			
413									

H.4 Scenarios Modelled

The direct selection of metering policy was not included within the investment model. As such, supply demand balance scenarios were generated to directly incorporate the effects of different metering policies. An investment model was created and run for each scenario, to understand how the impacts of differing metering policies would affect the selection of resource development, leakage reduction and water efficiency options, and to determine the relative costs of these strategies. The cost was combined with the cost of each of the metering scenarios to generate an overall strategy cost for each scenario and thus determine which was least-cost.

The draft WRMP demonstrated that a programme of universal metering was less expensive than change of occupier metering, which would have been the logical extension to the existing policy of metering on change of occupier throughout Sussex. However, Ofwat raised a concern in its consultation response to the draft WRMP that the company had not compared the costs and benefits of metering programmes with the costs and benefits of other options to maintain and restore the supply demand balance. Ofwat stated specifically that '*the company must demonstrate that it [i.e. the* *metering programme] is part of an economic solution, taking account of financial, environmental, social and carbon costs as well as customers*'.

To address the shortcomings of the draft WRMP assessment and to satisfy consultation responses received from Ofwat and others, the company has developed as "optant" metering scenario (effectively a "baseline"), which assumes that optants, selectives (high water users), and new properties would be metered throughout the company, but that change of occupier metering would continue in the Sussex WRZs until the end of AMP4 only (change of occupier metering is current policy in the Sussex WRZs). This scenario has then been compared to the change of occupier metering and universal metering scenarios to assess which of these leads to the lowest economic case overall, when taking into account all options required to maintain, and restore, the supply demand balance.

Ofwat notes, in *Water Supply and Demand Policy*, PR09/20 (November 2008), that '*we will include selective or planned metering proposals in our baseline assumptions for PR09 as long as each company can show that the benefits of this approach are likely to outweigh the costs. We accept that the quantified costs might exceed the quantified benefits, but we will make allowance for selective metering as long as there is a reasonable prospect that unquantified net benefits can bridge that gap.'*

The metering scenarios that have been modelled are presented in Table H.1 below, and effectively represent two metering options (change of occupier metering and universal metering) to compare to optant metering. A calculation of the supply demand balance deficit was undertaken under each scenario, and thus each scenario provides a different set of supply demand balance deficit figures to feed into the investment model.

Scenario name		Basis of scenario	Resource options		Meter policy			Leakage options			Climate change assumed
			Company selected	WRSE selected	Optants & selectives	Change of occupier	Universal	JR08 – 82Ml/d	SPL reductions	Ofwat Target	
1	Optant	Optant & selective meters only	✓	×	✓	×	×	✓	×	×	✓
2	Change of occupier	All WRZs from AMP5 (Sussex WRZs from AMP4)	✓	×	✓	✓	×	✓	×	×	✓
3	Universal metering	Universal metering in all WRZs	✓	×	AMP 4	×	✓ (100%)	AMP 4	✓	×	✓
Other scenarios modelled:											
4	Regional strategy	As Scenario 3a, but with WRSE resource developments and bulk supplies forced in	×	✓	AMP 4	×	✓ (100%)	AMP 4	✓	×	✓
8	Leakage rise to Ofwat target	Based on Scenario 3a, but with leakage rising to target level in each WRZ	✓	×	AMP 4	×	✓ (100%)	×	×	✓	✓
11	Universal metering no climate change	Based on Scenario 3a but with no climate change impacts on supply or demand	✓	×	AMP 4	×	✓ (100%)	AMP 4	✓	×	×

Table H.1 Metering Scenarios for Which Investment Modelling was Undertaken

There are limitations to including metering options directly in the investment model for a number of reasons. Firstly, the models already include all resource development, leakage reduction and water efficiency options. They are thus complex and can require significant time to complete a model run. Adding further complexity to the investment model by inserting additional metering options would likely make the model impractical.

Allowing the model to choose not only the preferred metering approach (change of occupier metering, universal metering, etc.) but also the level of metering required would add even more complexity to the model, as this would require it to select meter numbers and effectively calculate the savings in each year of the planning period. This would result in excessive run times.

The costs of each of the metering policy scenarios were developed by Mott MacDonald and nera. This is discussed in greater detail in Appendix G. A consequence of using different scenarios is that the NPV from the investment model cannot be directly compared to other scenario results without consideration of the costs of the metering policy included in a particular supply demand balance.

H.5 Sensitivity Analysis

A sensitivity analysis was undertaken to determine the robustness of the company-only least-cost strategy. It comprised determining the impact on this strategy from changes in the values of the input data, given the same basic assumptions.

A number of potential sensitivities in input data were identified on both the Supply Forecast and the Demand Forecast. In view of the potentially complex interaction of all these potential sensitivities, at varying magnitudes, occurring at the same time, it was decided to develop two basic sensitivity "envelopes". These comprised a "possible worst-case", and "possible best-case" sensitivity. Through the use of these envelope sensitivities, all potential combinations in the variation of the individual input data could be accommodated.

H.6 References

Atkins (October 2005), *WB! LRMC Optimisation Tool User Manual*, 5013951/060/DG1

UKWIR / Environment Agency (2002), *The economics of balancing supply and demand*

Appendix I: WATER RESOURCES STRATEGY - SUPPORTING DATA

I.1 Water Resources Strategy - Supporting Data for the Western Area

This Appendix sets out the detailed data used in the formulation of the Water Resources Strategy. It includes, for each Area and Water Resources Zone, the following data:

- Table of build-up of baseline supply forecast, for both the MDO and PDO condition, including;
    - Deployable output;
    - AMP5 deployable output improvements;
    - Treatment losses and operational use;
    - Outage;
    - Climate change effects on supply; and
    - Inter-company and inter-zonal transfers; to give
    - Total resources.
- Figures showing movements in deployable output;
- Table of build-up of demand forecast, including:
    - Breakdown of populations and properties;
    - Normal Year Annual Average demand;
    - Dry Year Annual Average demand;
    - Dry Year Critical Period PDO demand; and
    - Dry Year MDO demand.
- Table of target headroom for the MDO and PDO condition;
- Table showing baseline supply demand balances;
- Table showing results of scenario analysis; and
- Table showing results of sensitivity analysis.

I.1.1 Supply Forecast for the Western Area

I.1.1.1 Isle of Wight WRZ

The supply forecast over the planning period is shown as Table I.1 at MDO and Table I.2 at PDO. The assessed changes and improvements in deployable output as a result of the application of the Unified Methodology and source improvements are presented as Figure I.1 for MDO and Figure I.2 for PDO.

There are no planned schemes to increase deployable output during the rest of the AMP4 period. However, potential AMP5 source improvements have been identified.

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	28.12	28.12	30.72	30.72	30.72	30.72	30.72	30.72
AMP5 DO improvements	0.00	0.00	0.00	1.05	1.05	1.05	1.05	1.05
Losses and operational use	-0.49	-0.49	-0.49	-0.49	-0.49	-0.49	-0.49	-0.49
Outage	-1.93	-1.93	-1.93	-1.93	-1.93	-1.93	-1.93	-1.93
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	-0.02	-0.04	-0.06	-0.08
Transfers:								
Import from Hampshire South	14.00	14.00	14.00	14.00	0.00	0.00	0.00	0.00
Total resources	**39.70**	**39.70**	**42.30**	**43.35**	**29.33**	**29.31**	**29.29**	**29.27**

Table I.1 Baseline Supply Forecast – Isle of Wight WRZ – MDO Critical Period (Ml/d)

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	34.23	34.23	37.49	37.49	37.49	37.49	37.49	37.49
AMP5 DO improvements	0.00	0.00	0.00	1.55	1.55	1.55	1.55	1.55
Losses and operational use	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50
Outage	-2.34	-2.34	-2.34	-2.34	-2.34	-2.34	-2.34	-2.34
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	-0.55	-1.09	-1.64	-2.18
Transfers:								
Import from Hampshire South	14.00	14.00	14.00	14.00	0.00	0.00	0.00	0.00
Total resources	**45.39**	**45.39**	**48.65**	**50.20**	**35.66**	**35.11**	**34.57**	**34.02**

Table I.2 Baseline Supply Forecast – Isle of Wight WRZ – PDO Critical Period (Ml/d)

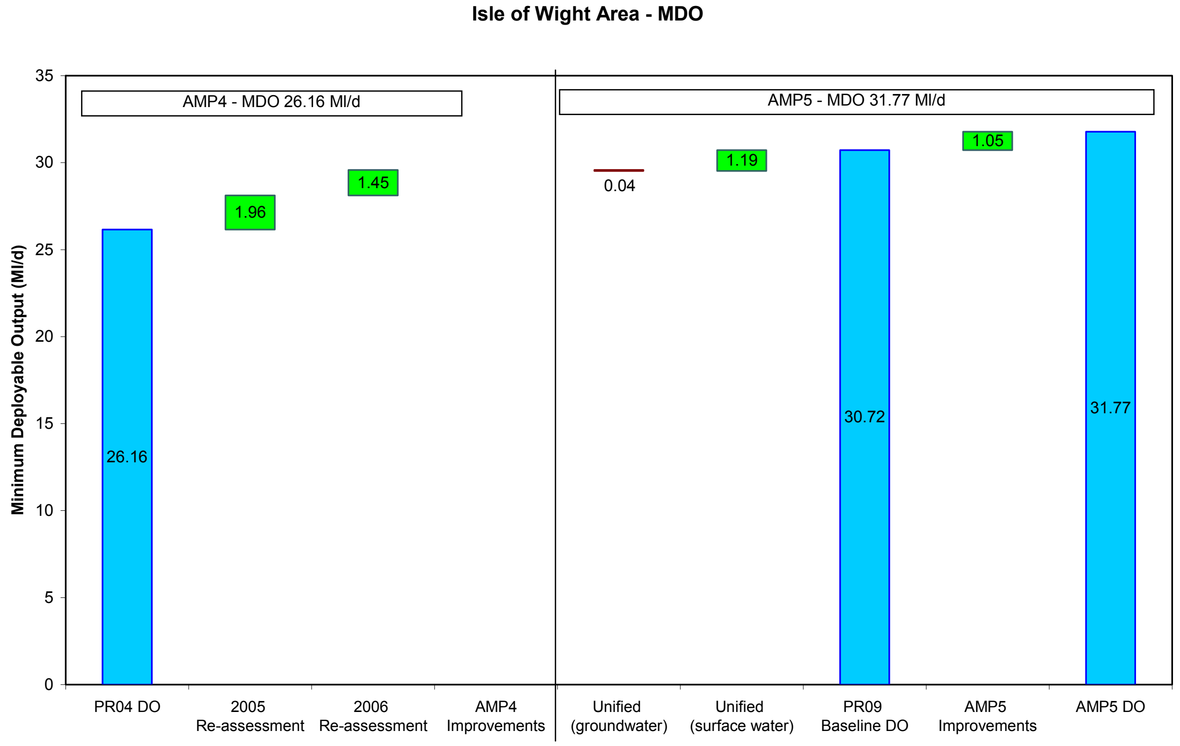

Figure I.1 Movements in Deployable Output – Isle of Wight WRZ – MDO Critical Period (Ml/d)

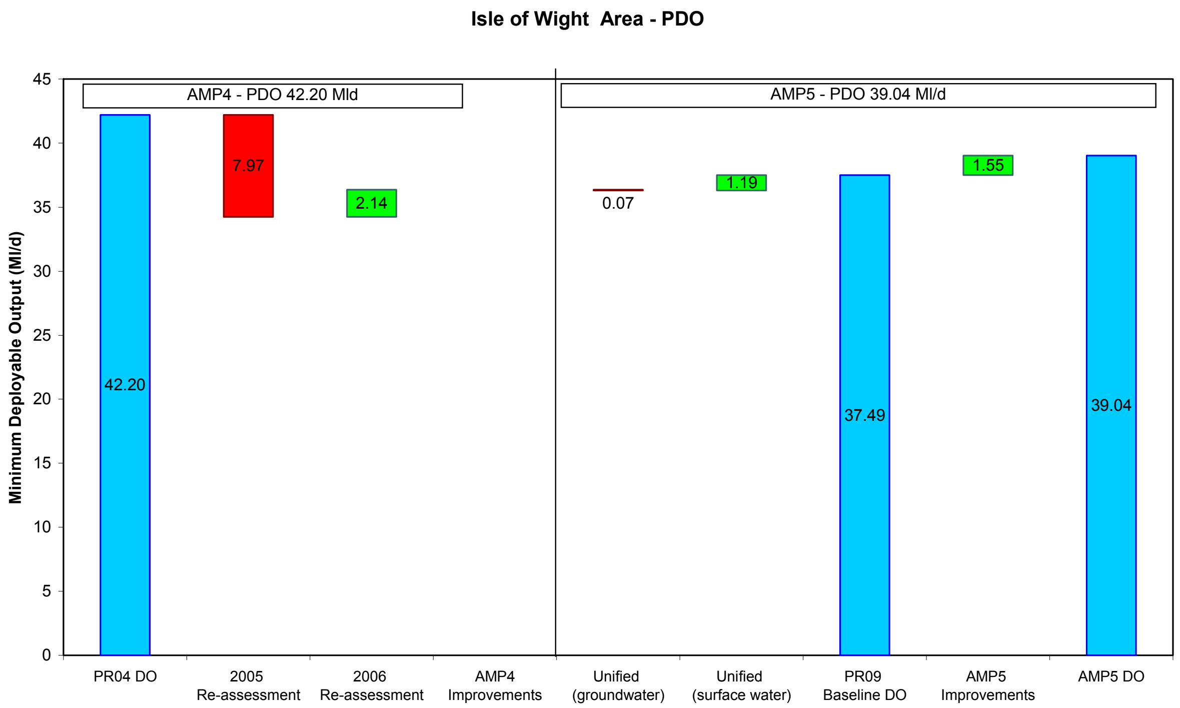

Figure I.2 Movements in Deployable Output – Isle of Wight WRZ – PDO Critical Period (Ml/d)

I.1.1.2 Hampshire South WRZ

The supply forecast over the planning period is shown as Table I.3 at MDO and Table I.4 at PDO. The assessed changes and improvements in deployable output as a result of the application of the Unified Methodology and source improvements are presented as Figure I.3 for MDO and Figure I.4 for PDO.

There are no planned schemes to increase deployable output during the rest of the AMP4 period. However, a number of potential AMP5 source improvements have been identified.

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	252.94	252.94	245.79	245.79	245.79	245.79	245.79	245.79
AMP5 DO improvements	0.00	0.00	0.00	8.00	8.00	8.00	8.00	8.00
Losses and operational use	-1.18	-1.18	-1.18	-1.18	-1.18	-1.18	-1.18	-1.18
Outage	-4.59	-4.59	-4.59	-4.59	-4.59	-4.59	-4.59	-4.59
Sustainability Reductions	0.00	0.00	0.00	0.00	-107.00	-107.00	-107.00	-107.00
Climate change effects on supply	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transfers:								
Export to Isle of Wight	-14.00	-14.00	-14.00	-14.00	0.00	0.00	0.00	0.00
Non potable Export	-23.00	-23.00	-23.00	-23.00	-23.00	-23.00	-23.00	-23.00
Total resources	**210.17**	**210.17**	**203.02**	**211.02**	**118.02**	**118.02**	**118.02**	**118.02**

Table I.3 Baseline Supply Forecast – Hampshire South WRZ – MDO Critical Period (Ml/d)

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	284.70	284.70	264.23	264.23	264.23	264.23	264.23	264.23
AMP5 DO improvements	0.00	0.00	0.00	12.00	12.00	12.00	12.00	12.00
Losses and operational use	-1.18	-1.18	-1.18	-1.18	-1.18	-1.18	-1.18	-1.18
Outage	-6.54	-6.54	-6.54	-6.54	-6.54	-6.54	-6.54	-6.54
Sustainability Reductions	0.00	0.00	0.00	0.00	-86.00	-86.00	-86.00	-86.00
Climate change effects on supply	0.00	0.00	0.00	0.00	-0.01	-0.03	-0.04	-0.05
Transfers:								
Export to Isle of Wight	-14.00	-14.00	-14.00	-14.00	0.00	0.00	0.00	0.00
Non potable export	-23.00	-23.00	-23.00	-23.00	-23.00	-23.00	-23.00	-23.00
Total resources	**239.98**	**239.98**	**219.51**	**231.51**	**159.50**	**159.49**	**159.47**	**159.46**

Table I.4 Baseline Supply Forecast – Hampshire South WRZ – PDO Critical Period (Ml/d)

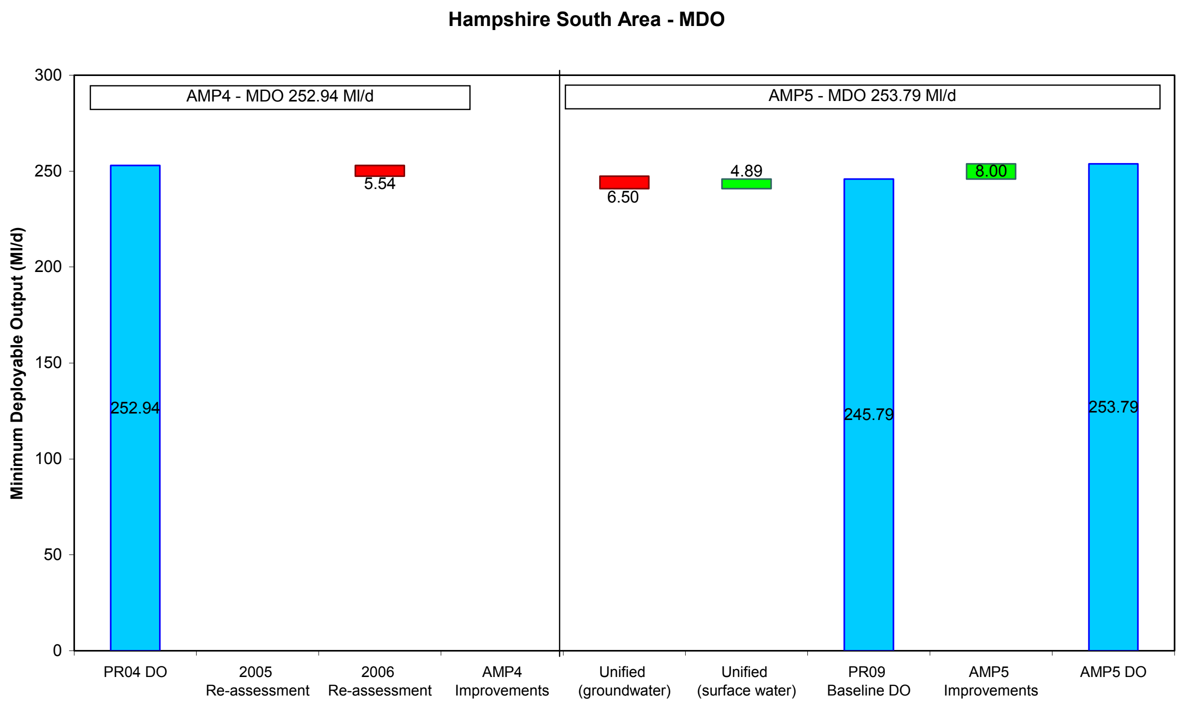

Figure I.3 Movements in Deployable Output – Hampshire South WRZ – MDO Critical Period (Ml/d)

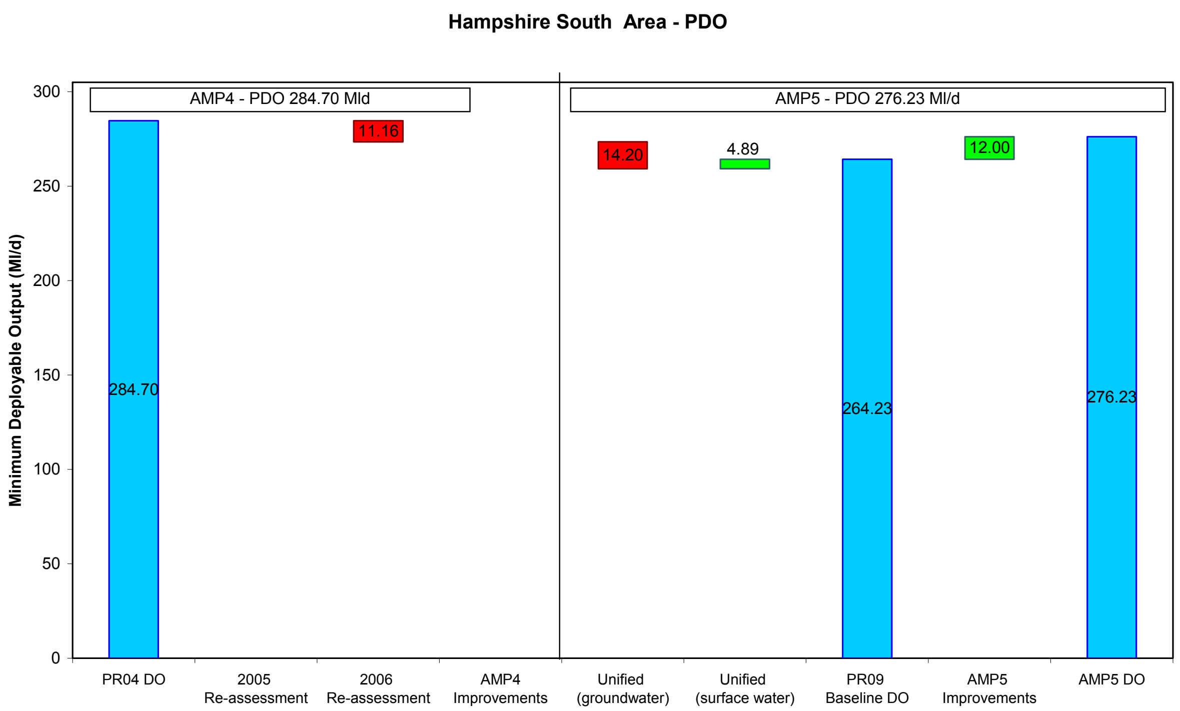

Figure I.4 Movements in Deployable Output – Hampshire South WRZ – PDO Critical Period (Ml/d)

I.1.1.3 Hampshire Andover WRZ

The supply forecast over the planning period is shown as Table I.5 at MDO and Table I.6 at PDO. The assessed changes and improvements in deployable output as a result of the application of the Unified Methodology and source improvements are presented as Figure I.5 for MDO and Figure I.6 for PDO.

There are no planned schemes to increase deployable output during the rest of the AMP4 period. However, potential AMP5 source improvements have been identified.

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	22.86	22.86	22.47	22.47	22.47	22.47	22.47	22.47
AMP5 DO improvements	0.00	0.00	0.00	0.20	0.20	0.20	0.20	0.20
Losses and operational use	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13
Outage	-1.52	-1.52	-1.52	-1.52	-1.52	-1.52	-1.52	-1.52
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	0.00	+0.01	+0.01	+0.01
Transfers:								
Export to Wessex	-0.31	-0.31	-0.31	-0.31	-0.31	-0.31	-0.31	-0.31
Total resources	**20.90**	**20.90**	**20.51**	**20.71**	**20.70**	**20.71**	**20.71**	**20.72**

Table I.5 Baseline Supply Forecast – Hampshire Andover WRZ – MDO Critical Period (Ml/d)

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	28.36	28.36	28.20	28.20	28.20	28.20	28.20	28.20
AMP5 DO improvements	0.00	0.00	0.00	0.20	0.20	0.20	0.20	0.20
Losses and operational use	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13
Outage	-2.44	-2.44	-2.44	-2.44	-2.44	-2.44	-2.44	-2.44
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transfers:								
Export to Wessex	-0.41	-0.41	-0.41	-0.41	-0.41	-0.41	-0.41	-0.41
Total resources	**25.38**	**25.38**	**25.22**	**25.42**	**25.42**	**25.42**	**25.42**	**25.42**

Table I.6 Baseline Supply Forecast – Hampshire Andover WRZ – PDO Critical Period (Ml/d)

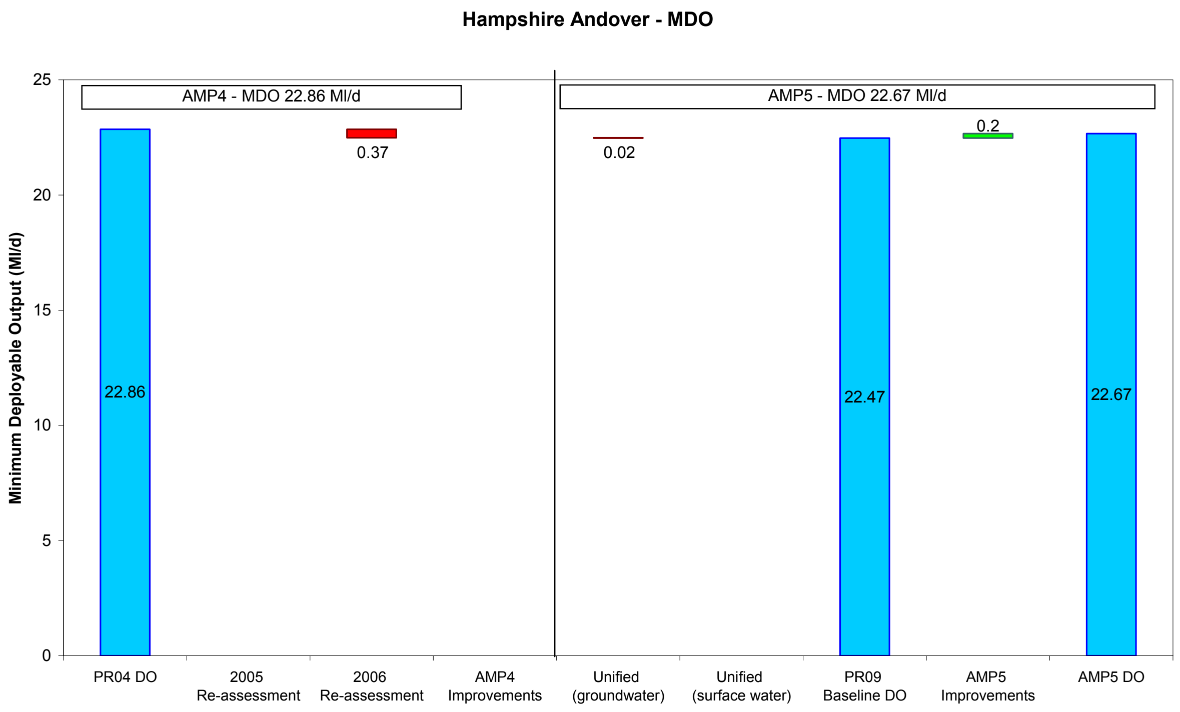

Figure I.5 Movements in Deployable Output – Hampshire Andover WRZ – MDO Critical Period (Ml/d)

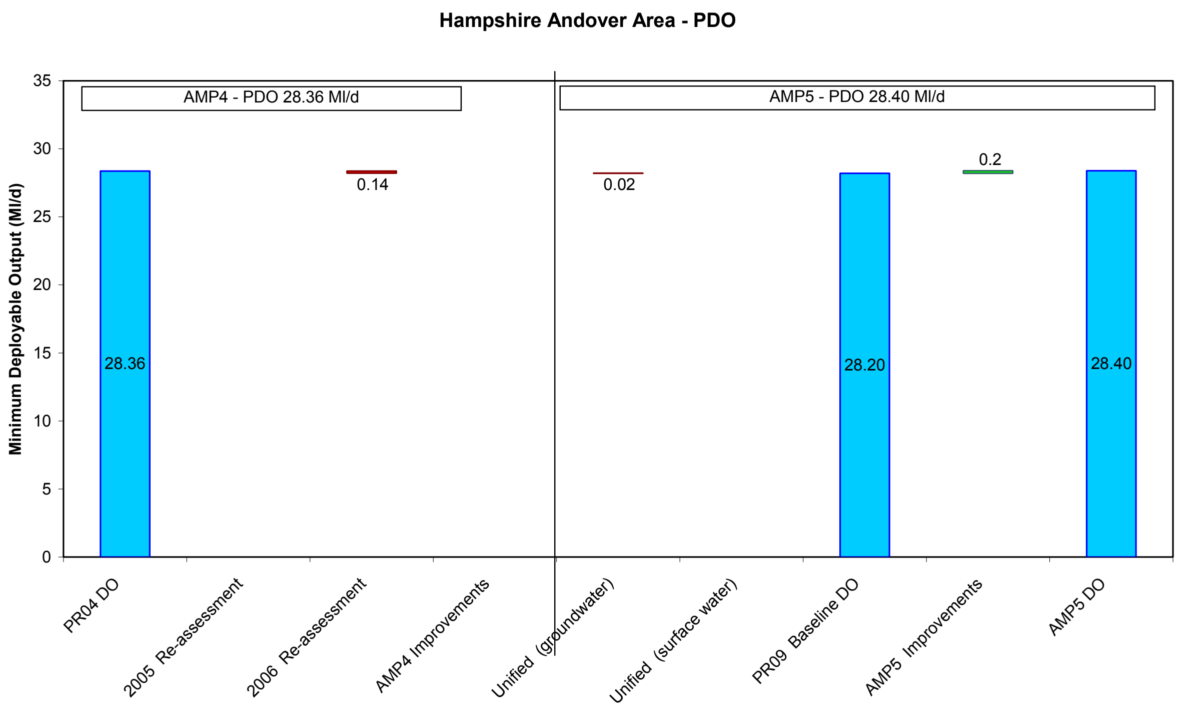

Figure I.6 Movements in Deployable Output – Hampshire Andover WRZ – PDO Critical Period (Ml/d)

I.1.1.4 Hampshire Kingsclere WRZ

The supply forecast over the planning period is shown as Table I.7 at MDO and Table I.8 at PDO. The assessed changes and improvements in deployable output as a result of the application of the Unified Methodology and source improvements are presented as Figure I.7 for MDO and Figure I.8 for PDO.

There are no planned schemes to increase deployable output during the rest of the AMP4 period. However, potential AMP5 source improvements have been identified.

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	8.68	8.68	8.68	8.68	8.68	8.68	8.68	8.68
AMP5 DO improvements	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Losses and operational use	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
Outage	-0.77	-0.77	-0.77	-0.77	-0.77	-0.77	-0.77	-0.77
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transfers:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total resources	**7.87**	**7.87**	**7.87**	**7.87**	**7.87**	**7.87**	**7.87**	**7.87**

Table I.7 Baseline Supply Forecast – Hampshire Kingsclere WRZ – MDO Critical Period (Ml/d)

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	9.18	9.18	9.48	9.48	9.48	9.48	9.48	9.48
AMP5 DO improvements	0.00	0.00	0.00	1.20	1.20	1.20	1.20	1.20
Losses and operational use	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
Outage	-1.49	-1.49	-1.49	-1.49	-1.49	-1.49	-1.49	-1.49
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transfers:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total resources	**7.65**	**7.65**	**7.95**	**9.15**	**9.15**	**9.15**	**9.15**	**9.15**

Table I.8 Baseline Supply Forecast – Hampshire Kingsclere WRZ – PDO Critical Period (Ml/d)

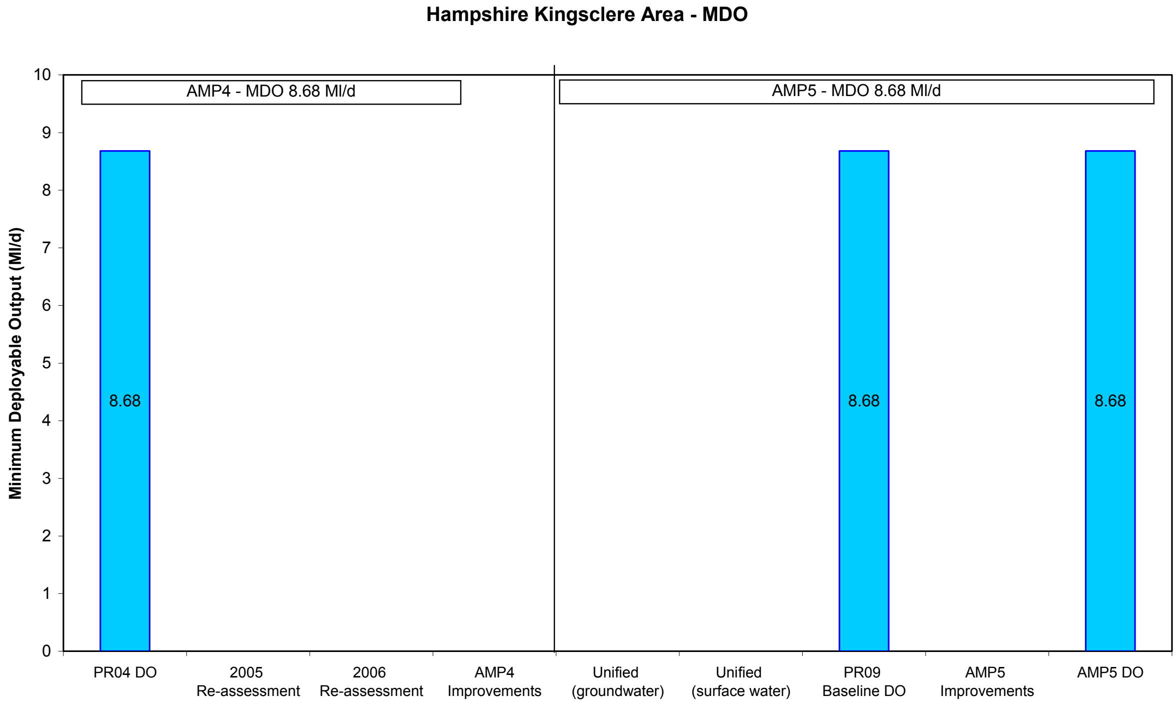

Figure I.7 Movements in Deployable Output – Hampshire Kingsclere WRZ – MDO Critical Period (Ml/d)

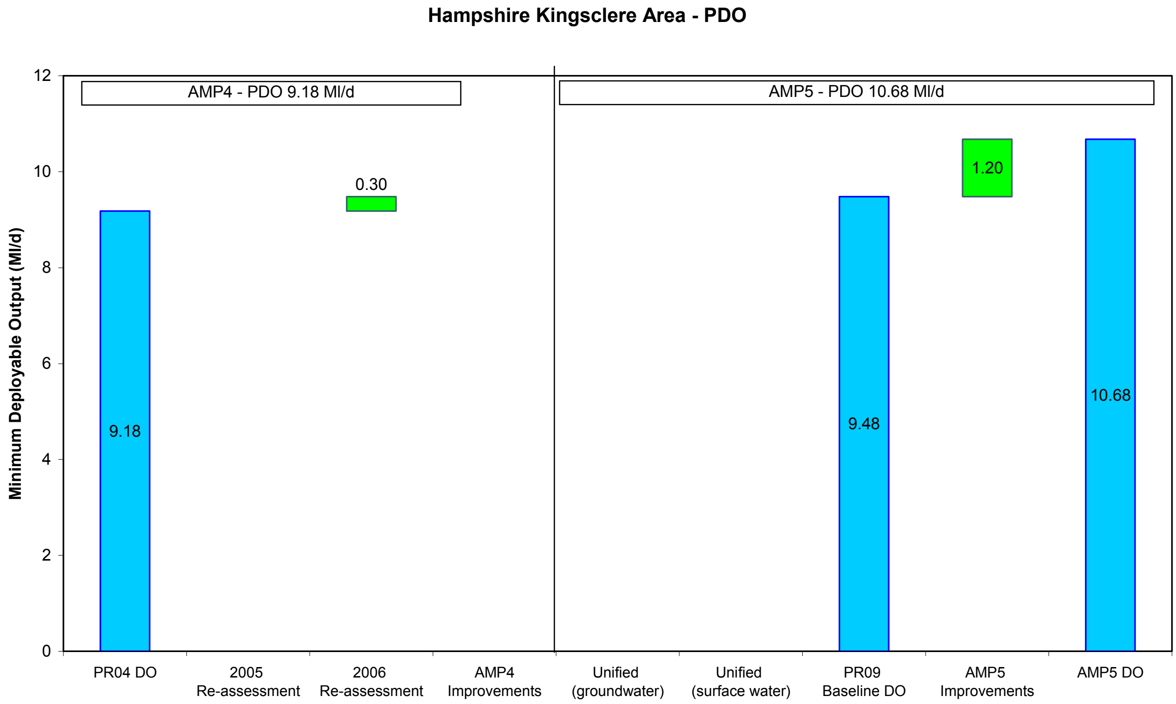

Figure I.8 Movements in Deployable Output – Hampshire Kingsclere WRZ – PDO Critical Period (Ml/d)

I.1.2 Demand Forecast for the Western Area

It is assumed that universal metering powers will be achieved, and metering in all WRZs will reach 100% by 2014-15. The tables below show, for each WRZ in the Western Area, the forecast of population and properties under the company preferred scenario, and the demand forecast under each of the planning scenarios.

Criteria		Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Unmeasured households (000's)	Properties	4.05	4.05	4.05	0.00	0.00	0.00	0.00	0.00
	Population	13.06	13.05	13.05	0.00	0.00	0.00	0.00	0.00
Measured households (000's)	Properties	55.87	56.69	57.10	63.64	67.94	72.03	76.49	80.52
	Population	116.78	119.00	120.11	137.83	143.68	149.31	155.61	161.72
Measured non-h'holds (000's)	Properties	4.90	4.90	4.90	4.90	4.90	4.90	4.90	4.90
	Population	5.11	5.11	5.11	5.11	5.11	5.11	5.11	5.11
Unmeasured non-h'holds (000's)	Properties	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
	Population	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Normal Year Annual Average (Ml/d)		30.31	30.60	30.50	29.91	30.04	30.49	31.05	31.62
Dry Year Annual Average (ADO) (Ml/d)		34.96	35.39	35.30	34.68	34.89	35.45	36.16	36.88
Dry Year Critical Period (PDO) (Ml/d)		44.36	45.08	45.00	44.13	44.51	45.30	46.30	47.32
Dry Year Minimum Deployable Output (MDO) (Ml/d)		33.70	34.09	33.99	33.38	33.57	34.10	34.77	35.45

Table I.9 Demand Forecast Build-Up – Isle of Wight WRZ

Criteria		Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Unmeasured households (000's)	Properties	163.65	153.95	148.36	0.00	0.00	0.00	0.00	0.00
	Population	432.49	406.43	391.66	0.00	0.00	0.00	0.00	0.00
Measured households (000's)	Properties	71.35	84.57	92.27	251.36	268.85	284.79	300.35	314.18
	Population	142.55	179.22	199.72	612.96	639.65	665.02	690.39	714.30
Measured non-h'holds (000's)	Properties	13.44	13.44	13.44	13.44	13.44	13.44	13.44	13.44
	Population	12.97	12.97	12.97	12.97	12.97	12.97	12.97	12.97
Unmeasured non-h'holds (000's)	Properties	1.34	1.34	1.34	1.34	1.34	1.34	1.34	1.34
	Population	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Normal Year Annual Average (Ml/d)		144.42	143.68	143.30	134.66	136.15	138.54	141.09	143.57
Dry Year Annual Average (ADO) (Ml/d)		157.83	157.11	156.75	147.26	149.07	151.79	154.70	157.54
Dry Year Critical Period (PDO) (Ml/d)		206.41	205.39	204.88	187.55	190.35	194.14	198.20	202.17
Dry Year Minimum Deployable Output (MDO) (Ml/d)		152.33	151.60	151.23	142.09	143.77	146.36	149.12	151.81

Table I.10 Demand Forecast Build-Up – Hampshire South WRZ

Criteria		Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Unmeasured households (000's)	Properties	17.10	16.08	0.00	0.00	0.00	0.00	0.00	0.00
	Population	41.56	39.08	0.00	0.00	0.00	0.00	0.00	0.00
Measured households (000's)	Properties	8.87	10.34	26.66	27.88	29.69	31.41	33.12	34.71
	Population	18.27	22.38	62.17	64.75	67.67	70.50	72.94	75.47
Measured non-h'holds (000's)	Properties	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43
	Population	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94
Unmeasured non-h'holds (000's)	Properties	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	Population	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Normal Year Annual Average (Ml/d)		15.28	15.26	14.58	14.42	14.63	14.91	15.15	15.41
Dry Year Annual Average (ADO) (Ml/d)		16.62	16.61	15.85	15.70	15.94	16.26	16.53	16.83
Dry Year Critical Period (PDO) (Ml/d)		21.30	21.27	19.75	19.64	19.99	20.41	20.78	21.19
Dry Year Minimum Deployable Output (MDO) (Ml/d)		17.51	17.50	16.68	16.55	16.81	17.15	17.44	17.77

Table I.11 Demand Forecast Build-Up – Hampshire Andover WRZ

Criteria		Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Unmeasured households (000's)	Properties	4.22	3.97	0.00	0.00	0.00	0.00	0.00	0.00
	Population	11.68	11.00	0.00	0.00	0.00	0.00	0.00	0.00
Measured households (000's)	Properties	1.52	1.79	5.79	5.97	6.34	6.69	6.95	7.14
	Population	3.04	3.80	14.84	15.23	15.76	16.28	16.68	16.97
Measured non-h'holds (000's)	Properties	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
	Population	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Unmeasured non-h'holds (000's)	Properties	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Population	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Normal Year Annual Average (Ml/d)		5.06	5.01	4.94	4.88	4.90	4.95	5.00	5.03
Dry Year Annual Average (ADO) (Ml/d)		5.24	5.18	5.11	5.05	5.07	5.13	5.18	5.21
Dry Year Critical Period (PDO) (Ml/d)		7.13	7.04	6.78	6.73	6.78	6.88	6.95	7.00
Dry Year Minimum Deployable Output (MDO) (Ml/d)		4.95	4.90	4.83	4.77	4.79	4.85	4.89	4.92

Table I.12 Demand Forecast Build-Up – Hampshire Kingsclere WRZ

I.1.3 Target Headroom for the Western Area

The values of target headroom uncertainty in the supply demand balance are presented in the tables below for each WRZ in the Western Area.

Target Headroom (Ml/d)	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
MDO	1.35	1.42	1.43	1.49	1.45	1.43	1.43	1.43
PDO	1.92	1.99	2.03	2.20	2.05	2.09	2.09	2.09

Table I.13 Target Headroom for MDO and PDO Conditions – Isle of Wight WRZ (Ml/d)

Target Headroom (Ml/d)	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
MDO	8.52	8.43	8.53	8.93	7.73	7.71	7.71	7.71
PDO	10.91	10.86	10.87	10.93	10.50	10.11	10.11	10.11

Table I.14 Target Headroom for MDO and PDO Conditions – Hampshire South WRZ (Ml/d)

Target Headroom (Ml/d)	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
MDO	0.94	0.97	0.97	1.00	0.95	0.94	0.94	0.94
PDO	1.44	1.47	1.48	1.53	1.46	1.50	1.50	1.50

Table I.15 Target Headroom for MDO and PDO Conditions – Hampshire Andover WRZ (Ml/d)

Target Headroom (Ml/d)	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
MDO	0.29	0.29	0.29	0.29	0.29	0.27	0.27	0.27
PDO	0.42	0.42	0.42	0.43	0.40	0.41	0.41	0.41

Table I.16 Target Headroom for MDO and PDO Conditions – Hampshire Kingsclere WRZ (Ml/d)

I.1.4 Baseline Supply Demand Balances for the Western Area

The supply demand balances for each WRZ in the Western Area are presented in Table I.17.

Supply Demand Balance	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
MDO								
Isle of Wight	4.65	4.19	6.87	8.24	-6.02	-6.56	-7.26	-7.96
Hampshire South	49.32	50.14	43.26	52.85	-39.26	-40.45	-42.19	-44.17
Hampshire Andover	2.45	2.43	2.04	2.35	2.28	2.13	1.96	1.73
Hampshire Kingsclere	2.63	2.68	2.70	2.74	2.73	2.70	2.66	2.63
Western Area MDO	**59.05**	**59.45**	**54.88**	**66.18**	**-40.26**	**-42.18**	**-44.83**	**-47.77**
PDO								
Isle of Wight	-0.90	-1.67	1.62	3.34	-11.57	-12.94	-14.50	-16.07
Hampshire South	22.66	23.73	3.76	18.82	-52.26	-52.54	-54.36	-56.80
Hampshire Andover	2.63	2.63	2.48	2.85	2.89	2.74	2.59	2.733
Hampshire Kingsclere	0.10	0.19	0.52	1.79	1.80	1.73	1.69	1.66
Western Area PDO	**24.50**	**24.89**	**8.38**	**26.80**	**-59.14**	**-61.01**	**-64.59**	**-68.88**

Table I.17 Baseline Supply Demand Balances for the Western Area

I.1.5 Scenario Analysis for the Western Area

I.1.5.1 Scenario Analysis (Assuming Sustainability Reductions)

The final planning solution under each of the scenarios, in terms of the earliest year in which each option is required, is presented in Table I.18.

WRZ	Scenario	Company preferred Regional strategy	Company only Universal metering	Company only Change of occupier	Company only Optant	Company only Universal metering with no climate change	Company only Leakage rise to Ofwat target
	Number	4	3	2	1	11	8
	Metering policy	Universal	Universal	Change of occupier	Optant and selective	Universal	Universal
	Leakage policy	JR08, then SPL saving	JR08, then SPL saving	JR08	JR08	JR08, then SPL saving	Ofwat, then SPL saving
	WRSE preferred options & bulk supplies	Yes	No	No	No	No	No
WRZ	**Scheme**	**Earliest year required**					
Hampshire South	Testwood new DAF plant to utilise full licence & enabling transfer pipeline to Otterbourne	2015	2015	2015	2015	2015	2015
Hampshire South	Candover Alre Augmentation	2019	2019	2019	2019	2019	2019
Hampshire South	West Tytherley borehole rehabilitation	2033	2033	2031	2027	-	-
Hampshire South	Woodmill abstraction (56 Ml/d) and treatment at Otterbourne	-	-	-	-	-	2028
Hampshire South	New surface water storage at Colden Common Reservoir	-	-	2033	-	-	-
Hampshire South	Leakage reduction	2025 reduction by 7.8 Ml/d	2025 reduction by 7.8 Ml/d	2019 reduction by 8.4 Ml/d	2017 reduction by 8.4 Ml/d	2028 reduction by 4.8 Ml/d	2010 reduction by 6.6 Ml/d
Hampshire South	Water efficiency kit (box)	-	-	2030	2030	-	2025
Hampshire South	Water efficiency low flow shower heads	-	-	-	2030	-	-
Isle of Wight	L536 borehole rehabilitation	2032	2032	2027	2019	-	2026
Isle of Wight	K628 borehole rehabilitation	2034	2034	2034	2028	-	2027
Isle of Wight	Sandown wastewater recycling (5Ml/d)	-	-	-	2031	-	-
Isle of Wight	Cross-Solent main increase (to 20 Ml/d)	-	-	-	-	-	2033
Isle of Wight	Leakage reduction	2026 reduction by 1.1 Ml/d	2026 reduction by 1.1 Ml/d	2019 reduction by 1.2 Ml/d	2017 reduction by 1.3 Ml/d	2032 reduction by 0.7 Ml/d	2020 reduction by 1.2 Ml/d
Isle of Wight	Water efficiency kit (box)	2030	2030	2030	2030	-	2025
Isle of Wight	Water efficiency low flow shower heads	-	-	2030	-	-	-
Isle of Wight	Water efficiency trigger hoses	-	-	-	-	-	2025
Hants. Andover	*No supply side, water efficiency, or leakage reduction schemes*	-	-	-	-	-	-

	Scenario	Company preferred Regional strategy	Company only Universal metering	Company only Change of occupier	Company only Optant	Company only Universal metering with no climate change	Company only Leakage rise to Ofwat target
	Number	**4**	**3**	**2**	**1**	**11**	**8**
Hants. Kings.	*No supply side, water efficiency, or leakage reduction schemes*	-	-	-	-	-	-
	Costs (£m)						
	Total metering cost (£m)	52.70	52.70	56.81	48.17	52.70	52.70
	Total resource, leakage reduction and water efficiency activity cost (£m)	42.65	42.65	48.28	55.48	40.30	56.26
	Total cost of Strategy (£m)	**95.35**	**95.35**	**105.09**	**103.65**	**93.00**	**108.96**

Table I.18 Results of Scenario Analysis for the Western Area, Assuming Sustainability Reductions

I.1.6 Sensitivity Analysis for the Western Area

I.1.6.1 Sensitivity Analysis (Assuming Sustainability Reductions)

Sensitivity analysis was conducted on the company only scenario to assess how key assumptions may influence the timing of the final planning solutions. The results of this analysis are presented in Table I.19.

	Scenario Number	Company preferred Regional strategy 4	Company only Universal metering 3	Increase in demand of 5% by end of planning period "Worst case"	Decrease in demand of 5% by end of planning period "Best case"
	Metering policy	Universal	Universal	Universal	Universal
	Leakage policy	JR08, then SPL saving	JR08, then SPL saving	JR08, then SPL saving	JR08, then SPL saving
	WRSE preferred options & bulk supplies	Yes	No	No	No
WRZ	**Scheme**	**Earliest year required**			
Hampshire South	Testwood new DAF plant to utilise full licence & enabling transfer pipeline to Otterbourne	2015	2015	2015	2015
Hampshire South	Candover Alre Augmentation	2019	2019	2019	2019
Hampshire South	R176 borehole rehabilitation	2033	2033	-	-
Hampshire South	Woodmill abstraction (56 Ml/d) and treatment at Otterbourne	-	-	2026	-
Hampshire South	Leakage reduction	2025 reduction by 7.8 Ml/d	2025 reduction by 7.8 Ml/d	2020 reduction by 5.4 Ml/d	-
Hampshire South	Water efficiency kit (box)	-	-	2025	-
Hampshire South	Water efficiency low flow shower heads	-	-	2025	-
Isle of Wight	L536 borehole rehabilitation	2032	2032	2025	-
Isle of Wight	K628 borehole rehabilitation	2034	2034	-	-
Isle of Wight	Cross-Solent main increase (to 20 Ml/d)	-	-	2030	-
Isle of Wight	Leakage reduction	2026 reduction by 1.1 Ml/d	2026 reduction by 1.1 Ml/d	2021 reduction by 1.2 Ml/d	-
Isle of Wight	Water efficiency kit (box)	2030	2030	2025	-
Hants. Andover	*No supply side, water efficiency, or leakage reduction schemes*	-	-	-	-
Hants. Kings.	*No supply side, water efficiency, or leakage reduction schemes*	-	-	-	-
	Costs (£m)				
	Total metering cost (£m)	52.70	52.70	52.70	52.70
	Total resource, leakage reduction and water efficiency activity cost (£m)	42.65	42.65	56.47	38.49
	Total cost of Strategy (£m)	**95.35**	**95.35**	**109.17**	**91.19**

Table I.19 Results of Sensitivity Analysis of Company-only Strategy for Western Area, Assuming Sustainability Reductions

I.1.7 Strategic Environmental Assessment for the Western Area

All options were assessed against 17 SEA objectives, and assigned an overall environmental risk (high, medium or low), based on the significance of potential long term effects.

The table below sets out the environmental risk of each resource development option, with a summary of the most important effects likely to arise from each scheme, and potential mitigation measures.

Option	Environmental risk score	Comments
Development of Testwood WSW up to the current licence limit	Medium	This option has a medium environmental risk. There is a likely effect on the Solent Maritime SAC and the Solent and Southampton Water SPA/Ramsar as such this option is likely to require Appropriate Assessment. There are likely medium to long term moderately negative effects on aquatic biodiversity, fisheries, surface water, transitional water and greenhouse gas emissions. These effects may be mitigated through a gradual increase in abstraction rates which allows the river to adapt to changes in the flow regime, and, where possible, through sensitive timing of abstraction with regards to when species are least vulnerable. A slight positive effect on soils is likely following remediation of contaminated ground.
Augmentation with the Alre and Candover Schemes	Medium	This option has a medium environmental risk. Without more detailed groundwater studies and model runs, the significance of the effect of this scheme on groundwater, and the extent to which it can be mitigated cannot be fully assessed. However, there are likely moderately negative medium to long term effects on groundwater and greenhouse gas emissions. As a result of increased flows in the River Itchen, positive effects on aquatic biodiversity, fisheries and surface flows are likely.
R176 borehole rehabilitation	Medium	This option has a medium environmental risk. There are likely moderate medium to long term negative effects on greenhouse gas emissions, which can be reduced by operating the scheme for shorter periods of time. Additionally, slightly negative effects are likely on landscape character, safeguarding soil quality and quantity, the generation of waste and archaeology in both the short and the long term.
Refurbishment of L536 Borehole	Medium	This option has a medium environmental risk. Moderate medium to long term negative effects on landscape character are likely as pipeline routes are located within an AONB. However, with mitigation such as screening, habitat creation and replanting of trees, the extent of this effect is likely to be reduced in the long term. Moderate medium to long term effects are likely on soil quality and quantity, archaeology and greenhouse gas emissions, which may be mitigated to some extent through sensitive construction techniques.
Refurbishment of K628 borehole	Medium	This option has a medium environmental risk. There are likely moderate medium to long term negative effects on greenhouse gas emissions, which can be reduced by operating the scheme for shorter periods of time. Additionally, there are likely slightly negative effects on the generation of waste and archaeology in the long term. A slight positive effect on soils is likely following remediation of contaminated ground.
Other options required as part of the scenario and sensitivity analysis were:		
Woodmill abstraction (56 Ml/d) and treatment at Otterbourne	Medium	This option has a medium environmental risk. There are likely moderately negative medium to long term effects on greenhouse gas emissions and archaeology. These negative effects can be reduced through the implementation of mitigation measures such as sensitive construction techniques, habitat creation, replanting schemes and directional drilling where the pipeline crosses valuable habitats. However, as a result of increased flows in the River Itchen, positive effects on aquatic biodiversity, fisheries and surface flows are likely. A slight positive effect on soils is likely following remediation of contaminated ground.

Option	Environmental risk score	Comments
Colden Common Reservoir	High	This option has a high environmental risk. An Appropriate Assessment of this option is likely to be required given the likely effects of the scheme on the River Itchen SSSI/SAC. Despite the implementation of mitigation measures such as replanting schemes, screening, and sensitive routing and construction of pipelines, strong medium to long term negative effects on landscape character and moderate medium to long term negative effects on terrestrial biodiversity and archaeology are likely following the flooding of an area of land, some of which is designated as SNCI. Moderate medium to long term effects are also likely on aquatic biodiversity and freshwater fisheries due to lower flows in the River Itchen, downstream of the reservoir.
Cross Solent Increase	Medium	This option has a medium environmental risk. There are likely moderately negative medium to long term effects on greenhouse gas emissions, which can be reduced by operating the scheme for shorter periods of time. Slight medium to long term effects are likely on the preservation of the landscape character, safeguarding soil quality, the generation of waste and archaeology, which can be reduced through sensitive construction techniques.
Sandown wastewater recycling (5Ml/d)	Medium	This option has a medium environmental risk. Moderate medium to long term negative effects on landscape character and soil quality and quantity are likely through the location of the option in an AONB and the potential of soil contamination from water from the waste water treatment works. However, with mitigation such as screening and replanting of trees, the extent of this effect is likely to be reduced in the long term. The energy required for recycling processes means that this option is also likely to have moderate medium to long term negative effects on greenhouse gas emissions. Additionally, this option is likely to have a positive effect on surface water flows through the augmentation of flows in the River Yar.

Table I.1.1 Environmental Risks of Resource Development Options Selected in the Western Area Strategy

I.2 Water Resources Strategy - Supporting Data for the Central Area

This section sets out the detailed data used in the formulation of the Water Resources Strategy. It includes, for the Water Resources Zones in the Central Area, the following data:

- Table of build-up of baseline supply forecast, for both the MDO and PDO condition, including;
  - Deployable output;
  - AMP5 deployable output improvements;
  - Treatment losses and operational use;
  - Outage;
  - Climate change effects on supply; and
  - Inter-company and inter-zonal transfers; to give
  - Total resources.
- Figures showing movements in deployable output;
- Table of build-up of demand forecast, including:
  - Breakdown of populations and properties;
  - Normal Year Annual Average demand;
  - Dry Year Annual Average demand;
  - Dry Year Critical Period PDO demand; and
  - Dry Year MDO demand.
- Table of target headroom for the MDO and PDO condition;
- Table showing baseline supply demand balances;
- Table showing results of scenario analysis; and
- Table showing results of sensitivity analysis.

I.2.1 Supply Forecast for the Central Area

I.2.1.1 Sussex North WRZ

The supply forecast over the planning period is shown as Table I.20 at MDO and Table I.21 at PDO. The assessed changes and improvements in deployable output as a result of the application of the Unified Methodology and source improvements are presented as Figure I.9 for MDO and Figure I.10 for PDO.

There are planned schemes to increase deployable output during the AMP4 period and a number of potential AMP5 source improvements have also been identified.

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	60.94	60.94	40.05	40.05	40.05	40.05	40.05	40.05
AMP5 DO improvements	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10
Losses and operational use	-0.44	-0.44	-0.44	-0.44	-0.44	-0.44	-0.44	-0.44
Outage	-2.34	-2.34	-2.34	-2.34	-2.34	-2.34	-2.34	-2.34
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.02	-0.03
Transfers:								
Import from PWC	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Import from SESW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Import from TWUL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Export to SEW	-5.40	-5.40	-5.40	-5.40	-5.40	-5.40	-5.40	-5.40
Import from SW	1.01	0.84	10.54	16.63	16.05	16.03	15.50	14.90
Total resources	**68.77**	**68.61**	**57.41**	**62.60**	**63.02**	**62.99**	**62.46**	**61.85**

Table I.20 Baseline Supply Forecast – Sussex North WRZ – MDO Critical Period (Ml/d)

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	83.81	83.81	63.79	63.79	63.79	63.79	63.79	63.79
AMP5 DO improvements	0.00	0.00	0.00	0.30	0.30	0.30	0.30	0.30
Losses and operational use	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39
Outage	-2.30	-2.30	-2.30	-2.30	-2.30	-2.30	-2.30	-2.30
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.02	-0.03
Transfers:								
Import from PWC	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Import from SESW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Import from TWUL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Export to SEW	-5.40	-5.40	-5.40	-5.40	-5.40	-5.40	-5.40	-5.40
Import from SW	0.00	0.00	10.66	13.67	14.56	14.75	14.15	13.42
Total resources	**90.72**	**90.72**	**81.35**	**84.67**	**85.55**	**85.74**	**85.13**	**84.40**

Table I.21 Baseline Supply Forecast – Sussex North WRZ – PDO Critical Period (Ml/d)

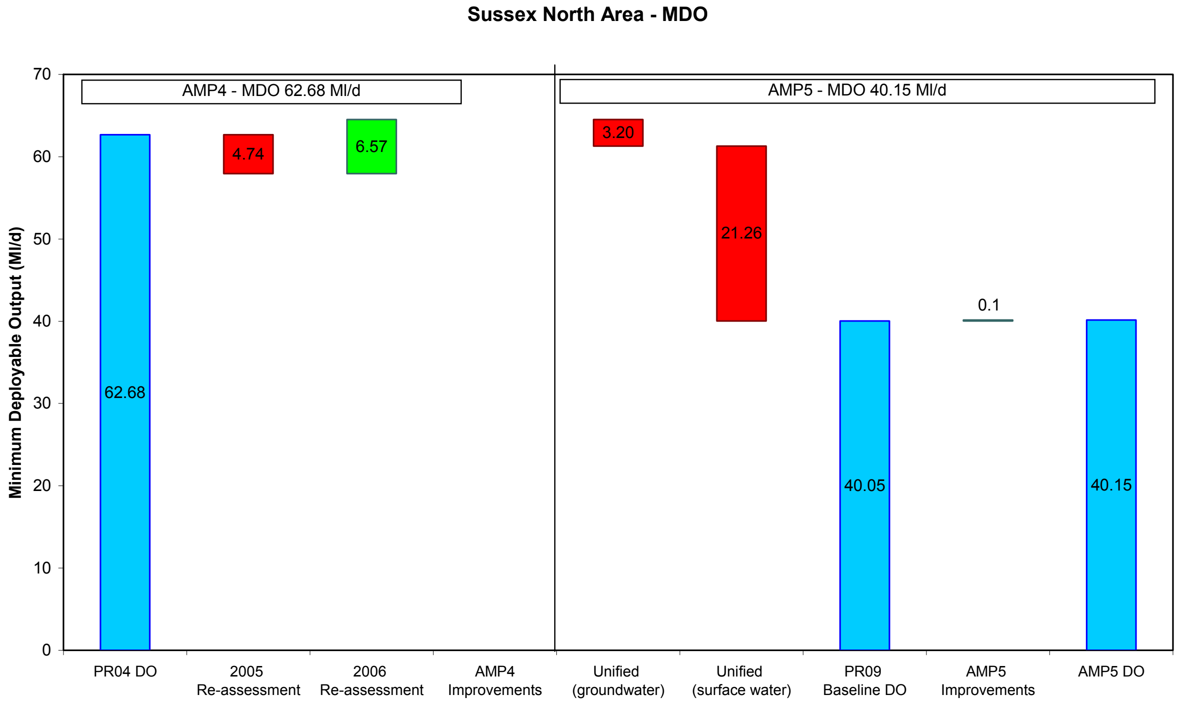

Figure I.9 Movements in Deployable Output – Sussex North WRZ – MDO Critical Period (Ml/d)

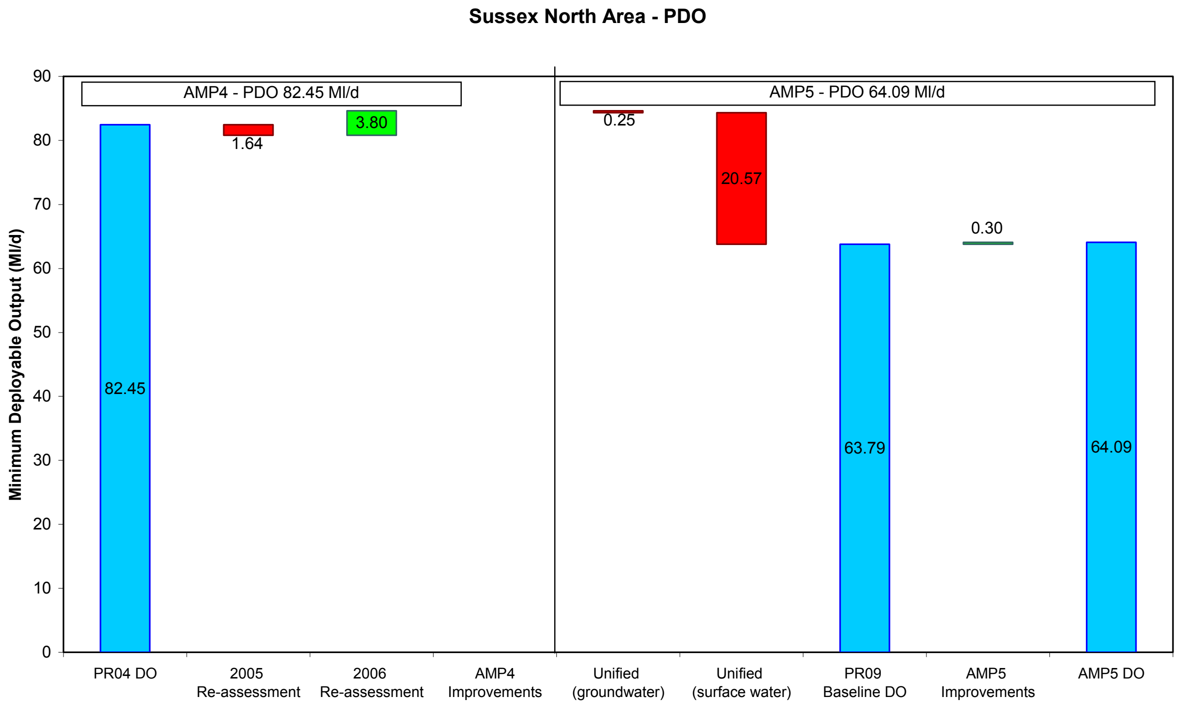

Figure I.10 Movements in Deployable Output – Sussex North WRZ – PDO Critical Period (Ml/d)

I.2.1.2 Sussex Worthing WRZ

The supply forecast over the planning period is shown as Table I.22 at MDO and Table I.23 at PDO. The assessed changes and improvements in deployable output as a result of the application of the Unified Methodology and source improvements are presented as Figure I.11 for MDO and Figure I.12 for PDO.

There are planned schemes to increase deployable output during the AMP4 period and a number of potential AMP5 source improvements have also been identified.

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	62.34	62.34	57.85	57.85	57.85	57.85	57.85	57.85
AMP5 DO improvements	0.00	0.00	0.00	4.25	4.25	4.25	4.25	4.25
Losses and operational use	-0.60	-0.60	-0.60	-0.60	-0.60	-0.60	-0.60	-0.60
Outage	-3.07	-3.07	-3.07	-3.07	-3.07	-3.07	-3.07	-3.07
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	-0.04	-0.09	-0.13	-0.18
Transfers:								
Export to Sussex North	1.01	0.84	10.54	16.63	16.05	16.03	15.50	14.90
Export to Sussex Brighton	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total resources	**57.66**	**57.83**	**43.64**	**42.80**	**42.34**	**42.31**	**42.80**	**43.35**

Table I.22 Baseline Supply Forecast – Sussex Worthing WRZ – MDO Critical Period (Ml/d)

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	78.68	78.68	68.98	68.98	68.98	68.98	68.98	68.98
AMP5 DO improvements	0.00	0.00	0.00	1.75	1.75	1.75	1.75	1.75
Losses and operational use	-0.60	-0.60	-0.60	-0.60	-0.60	-0.60	-0.60	-0.60
Outage	-4.39	-4.39	-4.39	-4.39	-4.39	-4.39	-4.39	-4.39
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	-0.06	-0.12	-0.17	-0.23
Transfers:								
Export to Sussex North	0.00	0.00	10.66	13.67	14.56	14.75	14.15	13.42
Export to Sussex Brighton	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total resources	**73.69**	**73.69**	**53.33**	**52.07**	**51.13**	**50.87**	**51.42**	**52.09**

Table I.23 Baseline Supply Forecast – Sussex Worthing WRZ – PDO Critical Period (Ml/d)

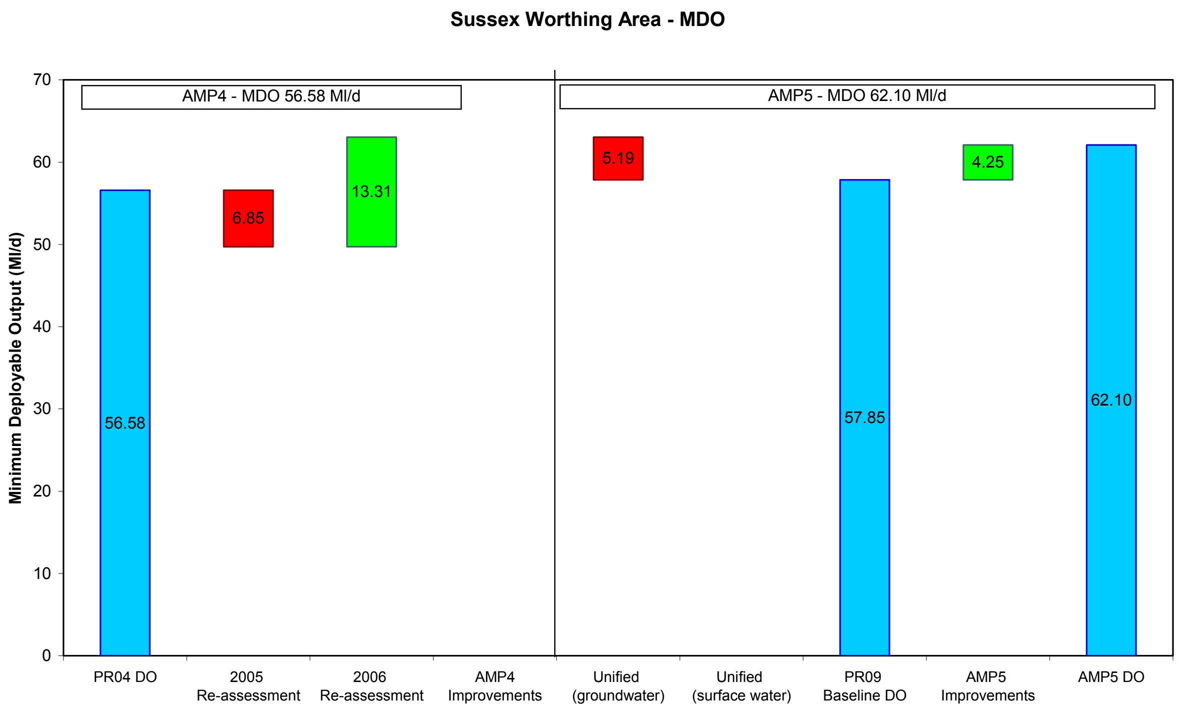

Figure I.11 Movements in Deployable Output – Sussex Worthing WRZ – MDO Critical Period (Ml/d)

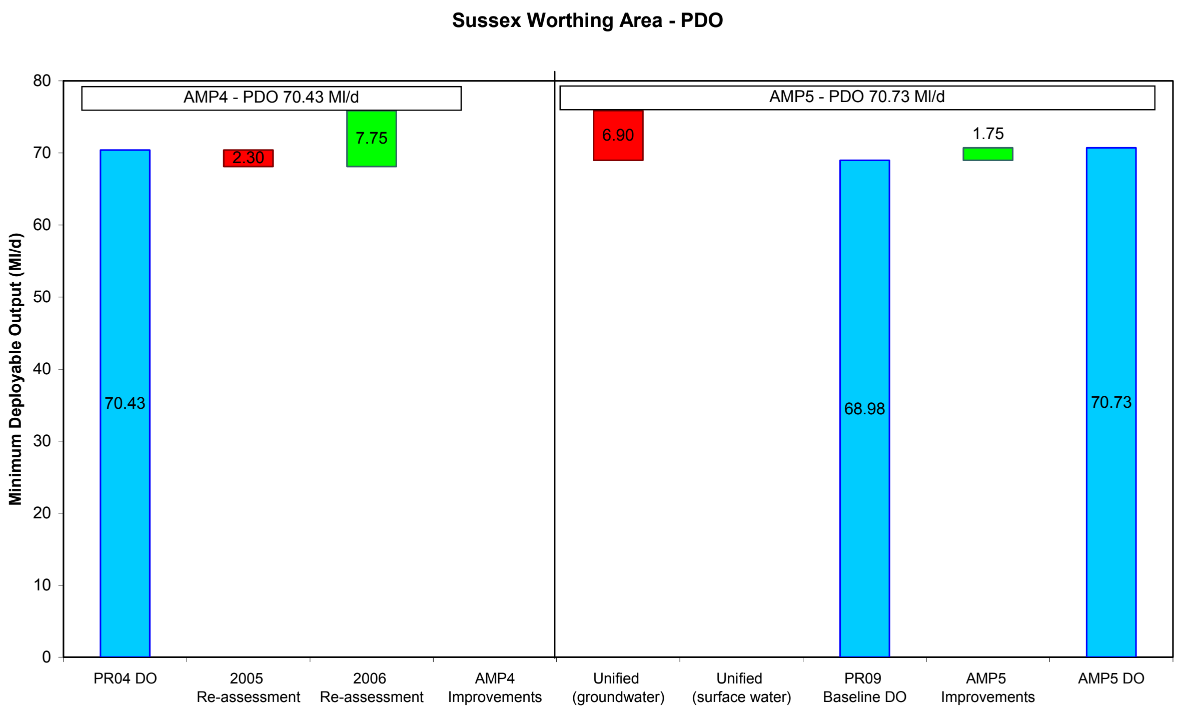

Figure I.12 Movements in Deployable Output – Sussex Worthing WRZ – PDO Critical Period (Ml/d)

I.2.1.3 Sussex Brighton WRZ

The supply forecast over the planning period is shown as Table I.24 at MDO and Table I.25 at PDO. The assessed changes and improvements in deployable output as a result of the application of the Unified Methodology and source improvements are presented as Figure I.13 for MDO and Figure I.14 for PDO.

There are planned schemes to increase deployable output during the AMP4 period and a number of potential AMP5 source improvements have also been identified.

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	95.62	95.62	89.30	89.30	89.30	89.30	89.30	89.30
AMP5 DO improvements	0.00	0.00	0.00	7.25	7.25	7.25	7.25	7.25
Losses and operational use	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50
Outage	-3.63	-3.63	-3.63	-3.63	-3.63	-3.63	-3.63	-3.63
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	-0.10	-0.19	-0.29	-0.39
Transfers:								
Import from Sussex Worthing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total resources	**91.49**	**91.49**	**85.17**	**92.42**	**92.32**	**92.23**	**92.13**	**92.03**

Table I.24 Baseline Supply Forecast – Sussex Brighton WRZ – MDO Critical Period (Ml/d)

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	116.24	116.24	108.52	108.52	108.52	108.52	108.52	108.52
AMP5 DO improvements	0.00	0.00	0.00	7.25	7.25	7.25	7.25	7.25
Losses and operational use	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50
Outage	-5.18	-5.18	-5.18	-5.18	-5.18	-5.18	-5.18	-5.18
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	-0.06	-0.12	-0.18	-0.24
Transfers:								
Import from Sussex Worthing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total resources	**110.56**	**110.56**	**102.84**	**110.09**	**110.03**	**109.97**	**109.91**	**109.85**

Table I.25 Baseline Supply Forecast – Sussex Brighton WRZ – PDO Critical Period (Ml/d)

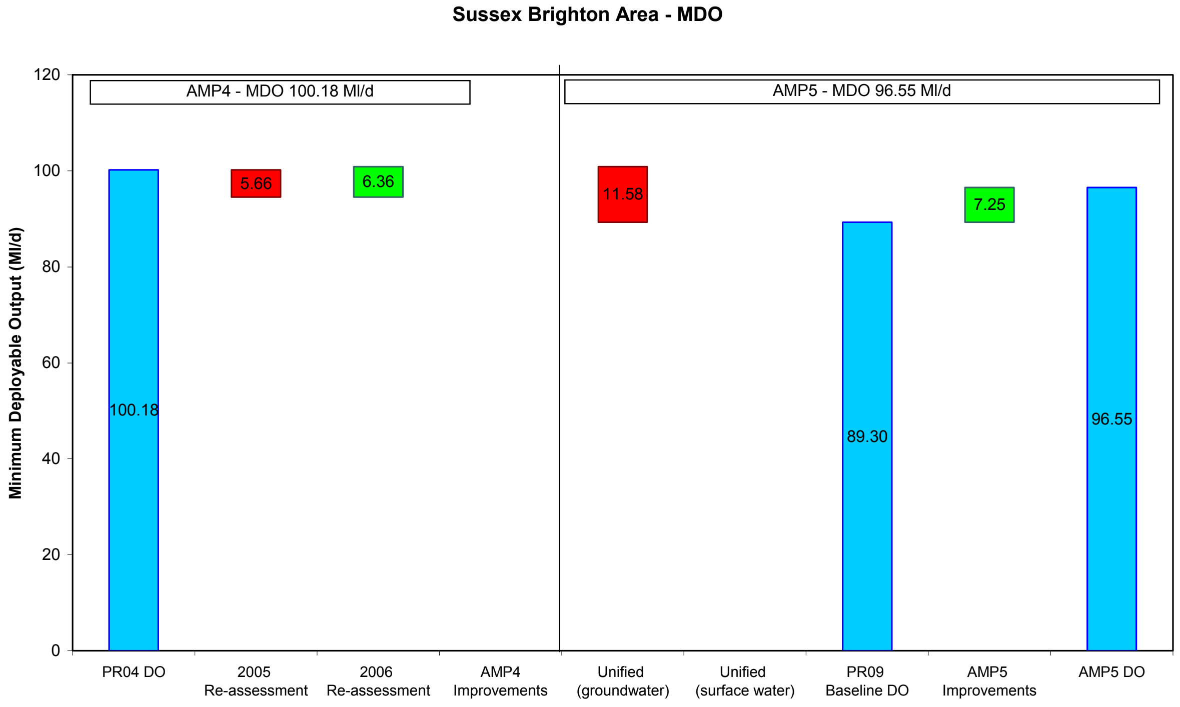

Figure I.13 Movements in Deployable Output – Sussex Brighton WRZ – MDO Critical Period (Ml/d)

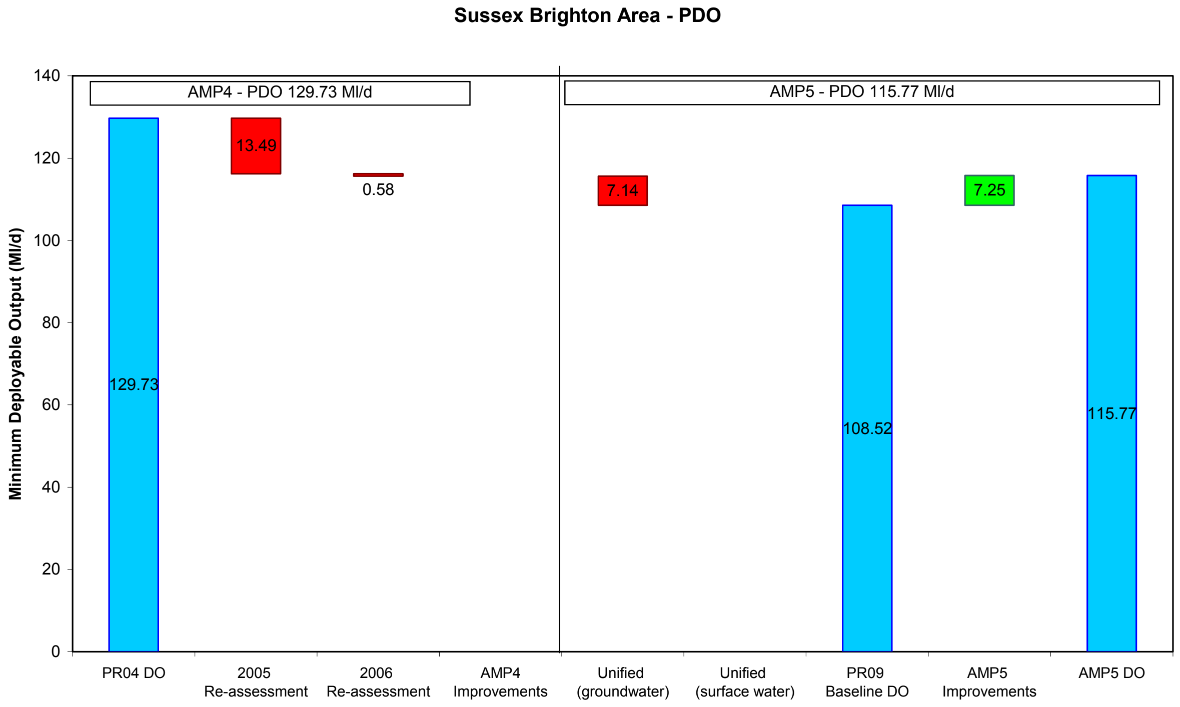

Figure I.14 Movements in Deployable Output – Sussex Brighton WRZ – PDO Critical Period (Ml/d)

I.2.2 Demand Forecast for the Central Area

It is assumed that universal metering powers will be achieved, and metering in all WRZs will reach 100% by 2014-15. The tables below show, for each WRZ in the Central Area, the forecast of population and properties under the company preferred scenario, and the demand forecast under each of the planning scenarios.

Criteria		Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Unmeasured households (000's)	Properties	61.41	52.55	0.00	0.00	0.00	0.00	0.00	0.00
	Population	164.70	140.83	0.00	0.00	0.00	0.00	0.00	0.00
Measured households (000's)	Properties	34.25	44.45	97.75	101.71	108.26	114.40	119.71	124.85
	Population	73.46	101.70	244.66	252.70	262.55	271.62	279.73	287.36
Measured non-h'holds (000's)	Properties	7.19	7.19	7.19	7.19	7.19	7.19	7.19	7.19
	Population	4.19	4.19	4.19	4.19	4.19	4.19	4.19	4.19
Unmeasured non-h'holds (000's)	Properties	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
	Population	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
Normal Year Annual Average (Ml/d)		62.37	62.13	60.94	60.32	60.86	61.76	62.57	63.37
Dry Year Annual Average (ADO) (Ml/d)		67.57	67.34	66.05	65.48	66.13	67.14	68.06	68.96
Dry Year Critical Period (PDO) (Ml/d)		85.20	84.71	81.35	80.94	81.91	83.25	84.49	85.71
Dry Year Minimum Deployable Output (MDO) (Ml/d)		65.92	65.69	64.43	63.85	64.46	65.43	66.32	67.19

Table I.26 Demand Forecast Build-Up – Sussex North WRZ

Criteria		Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Unmeasured households (000's)	Properties	48.84	41.80	40.28	0.00	0.00	0.00	0.00	0.00
	Population	102.85	88.19	84.99	0.00	0.00	0.00	0.00	0.00
Measured households (000's)	Properties	32.22	40.02	41.92	84.53	88.79	92.90	97.55	101.45
	Population	59.40	76.13	80.80	170.39	176.46	181.71	188.24	194.24
Measured non-h'holds (000's)	Properties	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
	Population	5.69	5.69	5.69	5.69	5.69	5.69	5.69	5.69
Unmeasured non-h'holds (000's)	Properties	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
	Population	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44
Normal Year Annual Average (Ml/d)		41.53	40.65	40.50	38.49	38.24	38.70	39.36	39.99
Dry Year Annual Average (ADO) (Ml/d)		42.95	42.04	41.89	39.80	39.55	40.03	40.72	41.39
Dry Year Critical Period (PDO) (Ml/d)		51.57	50.25	50.07	46.61	46.36	46.96	47.83	48.66
Dry Year Minimum Deployable Output (MDO) (Ml/d)		41.94	41.06	40.91	38.87	38.62	39.09	39.75	40.40

Table I.27 Demand Forecast Build-Up – Sussex Worthing WRZ

Criteria		Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Unmeasured households (000's)	Properties	93.56	80.06	77.15	0.00	0.00	0.00	0.00	0.00
	Population	223.60	191.35	184.40	0.00	0.00	0.00	0.00	0.00
Measured households (000's)	Properties	45.87	60.98	64.61	146.27	153.98	161.55	168.87	173.73
	Population	84.57	121.25	130.68	323.83	334.46	344.67	354.34	362.20
Measured non-h'holds (000's)	Properties	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75
	Population	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75
Unmeasured non-h'holds (000's)	Properties	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
	Population	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Normal Year Annual Average (Ml/d)		83.60	81.62	81.20	74.88	75.28	76.14	77.03	77.75
Dry Year Annual Average (ADO) (Ml/d)		86.47	84.40	83.97	77.38	77.82	78.72	79.66	80.42
Dry Year Critical Period (PDO) (Ml/d)		103.80	100.80	100.25	90.16	90.78	91.90	93.06	94.00
Dry Year Minimum Deployable Output (MDO) (Ml/d)		84.39	82.38	81.97	75.57	75.98	76.86	77.75	78.49

Table I.28 Demand Forecast Build-Up – Sussex Brighton WRZ

I.2.3 Target Headroom for the Central Area

The values of target headroom uncertainty in the supply demand balance are presented in the tables below for each WRZ in the Central Area.

Target Headroom (Ml/d)	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
MDO	2.85	2.92	2.94	3.00	2.91	2.84	2.84	2.84
PDO	3.96	3.94	3.99	4.16	3.86	3.87	3.87	3.87

Table I.29 Target Headroom for MDO and PDO Conditions – Sussex North WRZ (Ml/d)

Target Headroom (Ml/d)	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
MDO	2.85	2.76	2.80	2.95	2.63	2.47	2.47	2.47
PDO	3.45	3.35	3.40	3.62	3.13	2.89	2.89	2.89

Table I.30 Target Headroom for MDO and PDO Conditions – Sussex Worthing WRZ (Ml/d)

Target Headroom (Ml/d)	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
MDO	4.41	4.27	4.31	4.47	4.06	3.84	3.84	3.84
PDO	5.39	5.54	5.55	5.59	5.03	4.72	4.72	4.72

Table I.31 Target Headroom for MDO and PDO Conditions – Sussex Brighton WRZ (Ml/d)

I.2.4 Baseline Supply Demand Balances for the Central Area

The supply demand balances for each WRZ in the Central Area are presented in Table I.32.

Supply Demand Balance	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
MDO								
Sussex North	0.00	0.00	-11.07	-5.28	-5.21	-5.99	-7.33	-8.77
Sussex Worthing	12.87	14.01	0.00	0.00	0.00	0.00	0.00	0.00
Sussex Brighton	2.69	4.84	-0.96	8.49	9.75	9.85	9.32	8.72
Central Area MDO	**15.56**	**18.85**	**-12.03**	**3.21**	**4.54**	**3.86**	**1.99**	**-0.05**
PDO								
Sussex North	1.55	2.07	-7.07	-2.72	-1.78	-2.43	-4.02	-5.84
Sussex Worthing	18.67	20.09	0.00	0.00	0.00	0.00	0.00	0.00
Sussex Brighton	1.37	4.22	-2.65	8.11	10.39	11.03	10.61	10.01
Central Area PDO	**21.59**	**26.38**	**-9.72**	**5.39**	**8.61**	**8.59**	**6.59**	**4.17**

Table I.32 Baseline Supply Demand Balances for the Central Area

I.2.5 Scenario Analysis for the Central Area

The final planning solution under each of the scenarios, in terms of the earliest year in which each option is required, is presented in Table I.33.

	Scenario	Company preferred Regional strategy	Company only Universal metering	Company only Change of occupier	Company only Optant	Company only Universal metering with no climate change	Company only Leakage rise to Ofwat target
	Number	4	3	2	1	11	8
	Metering policy	Universal	Universal	Change of occupier	Optant and selective	Universal	Universal
	Leakage policy	JR08, then SPL saving	JR08, then SPL saving	JR08	JR08	JR08, then SPL saving	Ofwat, then SPL saving
	WRSE preferred options & bulk supplies	Yes	No	No	No	No	No
WRZ	**Scheme**	**Earliest year required**					
Sussex North	River Arun abstraction below tidal limit (10 Ml/d)	2012	2012	2012	2012	2012	2012
Sussex North	Leakage reduction	-	-	-	-	-	2010 reduction by 0.6 Ml/d
Sussex North	Water efficiency trigger hoses	-	-	-	-	-	2010
Sussex North	Water efficiency low flow shower heads	-	-	-	-	-	2010
Sussex Brighton	*No supply side, water efficiency, or leakage reduction schemes*	-	-	-	-	-	-
Sussex Worthing	Leakage reduction	-	-	-	-	-	2010 reduction by 0.4 Ml/d
	Costs (£m)						
	Total metering cost (£m)	56.82	56.82	61.25	51.94	56.82	56.82
	Total resource, leakage reduction and water efficiency activity cost (£m)	18.42	18.42	18.62	18.81	18.35	20.22
	Total cost of Strategy (£m)	**75.24**	**75.24**	**79.87**	**70.75**	**75.17**	**77.04**

Table I.33 Results of Scenario Analysis for the Central Area

I.2.6 Sensitivity Analysis for the Central Area

Sensitivity analysis was conducted on the company only scenario to assess how key assumptions may influence the timing of the final planning solutions. The results of this analysis are presented in Table I.34.

	Scenario	Company preferred WRSE Regional	Company only Universal metering	Increase in demand of 5% by end of planning period	Decrease in demand of 5% by end of planning period
	Number	4	3	"Worst case"	"Best case"
	Metering policy	Universal	Universal	Universal	Universal
	Leakage policy	JR08, then SPL saving	JR08, then SPL saving	JR08, then SPL saving	JR08, then SPL saving
	WRSE preferred options & bulk supplies	Yes	No	No	No
WRZ	**Scheme**	**Earliest year required**			
Sussex North	River Arun abstraction below tidal limit (10 Ml/d)	2012	2012	2012	2012
Sussex North	Leakage reduction	-	-	2032 reduction by 1.2 Ml/d	-
Sussex Brighton	*No supply side, water efficiency, or leakage reduction schemes*	-	-	-	-
Sussex Worthing	Leakage reduction	-	-	2033 reduction by 0.4 Ml/d	-
	Costs (£m)				
	Total metering cost (£m)	56.82	56.82	56.82	56.82
	Total resource, leakage reduction and water efficiency activity cost (£m)	18.42	18.42	18.96	18.05
	Total cost of Strategy (£m)	**75.24**	**75.24**	**75.78**	**74.87**

Table I.34 Results of Sensitivity Analysis of Company only Strategy for Central Area

I.2.7 Strategic Environmental Assessment for the Central Area

All options were assessed against 17 SEA objectives, and assigned an overall environmental risk (high, medium or low), based on the significance of potential long term effects.

The table below sets out the environmental risk of each resource development option, with a summary of the most important effects likely to arise from each scheme, and potential mitigation measures.

Option	Environmental risk score	Comments
N9-10 - Arun Abstraction Below Tidal Limit	Low	This option has a low environmental risk. An Appropriate Assessment of this option may be required given its close proximity to a number of sites designated for their internationally valuable nature conservation. However, mitigation such as planting would reduce the effects on landscape. The negative effects on fisheries through reduction in water quality and quantity are largely mitigated naturally by tidal influx of water and the high volumetric flow rates that occur within that tidal flux.

Table I.2.1 Environmental Risks of Resource Development Options Selected in the Central Area Strategy

I.3 Water Resources Strategy - Supporting Data for the Eastern Area

This section sets out the detailed data used in the formulation of the water resources strategy. It includes, for the Water Resources Zones in the Eastern Area, the following data:

- Table of build-up of baseline Supply Forecast, for both the MDO and PDO condition, including;
  - Deployable output;
  - AMP5 deployable output improvements;
  - Treatment losses and operational use;
  - Outage;
  - Climate change effects on supply; and
  - Inter-company and inter-zonal transfers; to give
  - Total resources.
- Figures showing movements in deployable output;
- Table of build-up of demand forecast, including:
  - Breakdown of populations and properties;
  - Normal Year Annual Average demand;
  - Dry Year Annual Average demand;
  - Dry Year Critical Period PDO demand; and
  - Dry Year MDO demand.
- Table of target headroom for the MDO and PDO condition;
- Table showing baseline supply demand balances;
- Table showing results of scenario analysis; and
- Table showing results of sensitivity analysis.

I.3.1 Supply Forecast for the Eastern Area

I.3.1.1 Kent Medway WRZ

The supply forecast over the planning period is shown as Table I.35 at MDO and Table I.36 at PDO. The assessed changes and improvements in deployable output as a result of the application of the Unified Methodology and source improvements are presented as Figure I.15 for MDO and Figure I.16 for PDO.

There are planned schemes to increase deployable output during the AMP4 period and a number of potential AMP5 source improvements have also been identified.

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	166.90	166.90	144.58	144.58	144.58	144.58	144.58	144.58
AMP5 DO improvements	0.00	0.00	0.00	8.75	8.75	8.75	8.75	8.75
Losses and operational use	-1.20	-1.20	-1.20	-1.20	-1.20	-1.20	-1.20	-1.20
Outage	-4.06	-4.06	-4.06	-4.06	-4.06	-4.06	-4.06	-4.06
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	-3.09	-6.18	-9.26	-12.35
Transfers:								
Export to SEW (1)	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30
Export to SEW (2)	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10
Export to SEW RMS at Bewl Water	N/A	N/A	-4.83	-4.83	-4.83	-4.83	-4.83	-4.83
Export to SEW RMS at P647	N/A	N/A	-6.3	-6.3	-6.3	-6.3	-6.3	-6.3
Export to SEW (3)	-6.55	-6.59	-6.59	-6.59	-6.59	-6.59	-6.59	-6.59
Transfer to Darwell Reservoir	-16.0	-16.0	N/A	N/A	N/A	N/A	N/A	N/A
Bewl-Darwell adjustment	0.20	0.56	1.82	2.31	1.93	1.25	0.42	0.00
Export to Kent Thanet	-4.41	-3.76	0.00	0.00	0.00	0.00	-0.36	0.00
Total resources	**134.49**	**135.46**	**123.03**	**132.27**	**128.79**	**125.03**	**120.75**	**117.60**

Note: Transfer to Darwell Reservoir is included in the Deployable Output from AMP5 onwards and SEW's share of the RMS is not included in the RMS Deployable Output during AMP4 but is included from AMP5 onwards.

Table I.35 Baseline Supply Forecast – Kent Medway WRZ – MDO Critical Period (Ml/d)

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	194.58	194.58	182.57	182.57	182.57	182.57	182.57	182.57
AMP5 DO improvements	0.00	0.00	0.00	10.25	10.25	10.25	10.25	10.25
Losses and operational use	-1.20	-1.20	-1.20	-1.20	-1.20	-1.20	-1.20	-1.20
Outage	-5.90	-5.90	-5.90	-5.90	-5.90	-5.90	-5.90	-5.90
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	-5.10	-10.20	-15.29	-20.39
Transfers:								
Export to SEW (1)	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30
Export to SEW (2)	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50
Export to SEW RMS at Bewl Water	N/A	N/A	-4.83	-4.83	-4.83	-4.83	-4.83	-4.83
Export to SEW RMS at P647	N/A	N/A	-6.3	-6.3	-6.3	-6.3	-6.3	-6.3
Export to SEW (3)	-7.78	-7.89	-7.39	-7.39	-7.39	-7.39	-7.39	-7.39
Transfer to Darwell Reservoir	-10.0	-10.0	N/A	N/A	N/A	N/A	N/A	N/A
Bewl-Darwell adjustment	0.00	0.04	0.40	1.28	0.97	0.29	0.00	0.00
Export to Kent Thanet	-4.98	-4.12	-2.23	-4.92	-5.09	-5.91	-0.38	0.00
Total resources	**163.92**	**165.22**	**154.33**	**162.77**	**157.18**	**150.59**	**150.74**	**146.01**

Note: Transfer to Darwell Reservoir is included in the Deployable Output from AMP5 onwards and SEW's share of the RMS is not included in the RMS Deployable Output during AMP4 but is included from AMP5 onwards.

Table I.36 Baseline Supply Forecast – Kent Medway WRZ – PDO Critical Period (Ml/d)

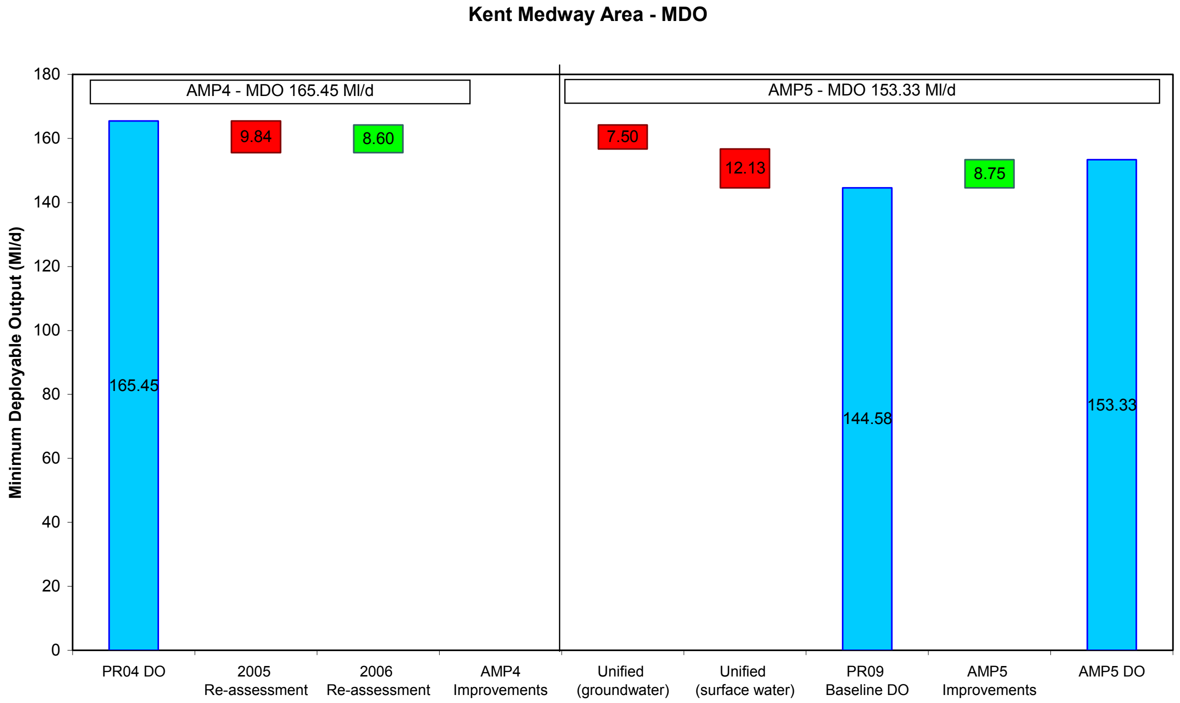

Figure I.15 Movements in Deployable Output – Kent Medway WRZ – MDO Critical Period (Ml/d)

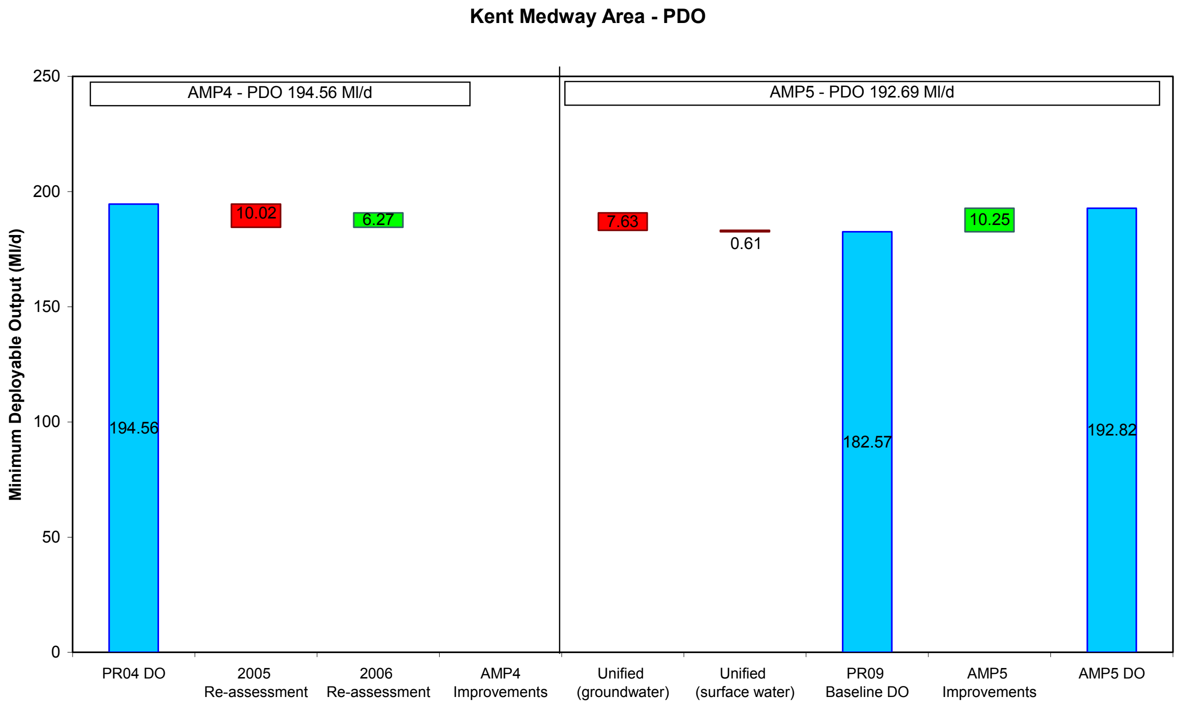

Figure I.16 Movements in Deployable Output – Kent Medway WRZ – PDO Critical Period (Ml/d)

I.3.1.2 Kent Thanet WRZ

The supply forecast over the planning period is shown as Table I.37 at MDO and Table I.38 at PDO. The assessed changes and improvements in deployable output as a result of the application of the Unified Methodology and source improvements are presented as Figure I.17 for MDO and Figure I.18 for PDO.

There are no planned schemes to increase deployable output during the rest of the AMP4 period. However, a number of potential AMP5 source improvements have been identified.

Element	**Base Year 2007-08**	**2009-10**	**Start of Planning Period 2010-11**	**2014-15**	**2019-20**	**2024-25**	**2029-30**	**2034-35**
Deployable Output	49.89	49.89	54.47	54.47	54.47	54.47	54.47	54.47
AMP5 DO improvements	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Losses and operational use	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61
Outage	-3.62	-3.62	-3.62	-3.62	-3.62	-3.62	-3.62	-3.62
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	-0.65	-1.29	-1.94	-2.58
Transfers:								
Import from FDWS	0.10	0.10	0. 10	0.10	0.10	0.10	0.10	0. 10
Export to FDWS	-4.00	-4.00	-4.00	-4.00	-4.00	-4.00	-4.00	-4.00
Transfer from Kent Medway	4.41	3.76	0.00	0.00	0.00	0.00	0.36	0.00
Total resources	**46.17**	**45.52**	**46.34**	**46.34**	**45.69**	**45.05**	**44.76**	**43.76**

Table I.37 Baseline Supply Forecast – Kent Thanet WRZ – MDO Critical Period (Ml/d)

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	63.19	63.19	60.79	60.79	60.79	60.79	60.79	60.79
AMP5 DO improvements	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Losses and operational use	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61
Outage	-4.64	-4.64	-4.64	-4.64	-4.64	-4.64	-4.64	-4.64
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	-0.82	-1.64	-2.46	-3.28
Transfers:								
Import from FDWS	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Export to FDWS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transfer from Kent Medway	4.98	4.12	2.23	4.92	5.09	5.91	0.38	0.00
Total resources	**63.02**	**62.16**	**57.87**	**60.55**	**59.91**	**59.91**	**53.55**	**52.36**

Table I.38 Baseline Supply Forecast – Kent Thanet WRZ – PDO Critical Period (Ml/d)

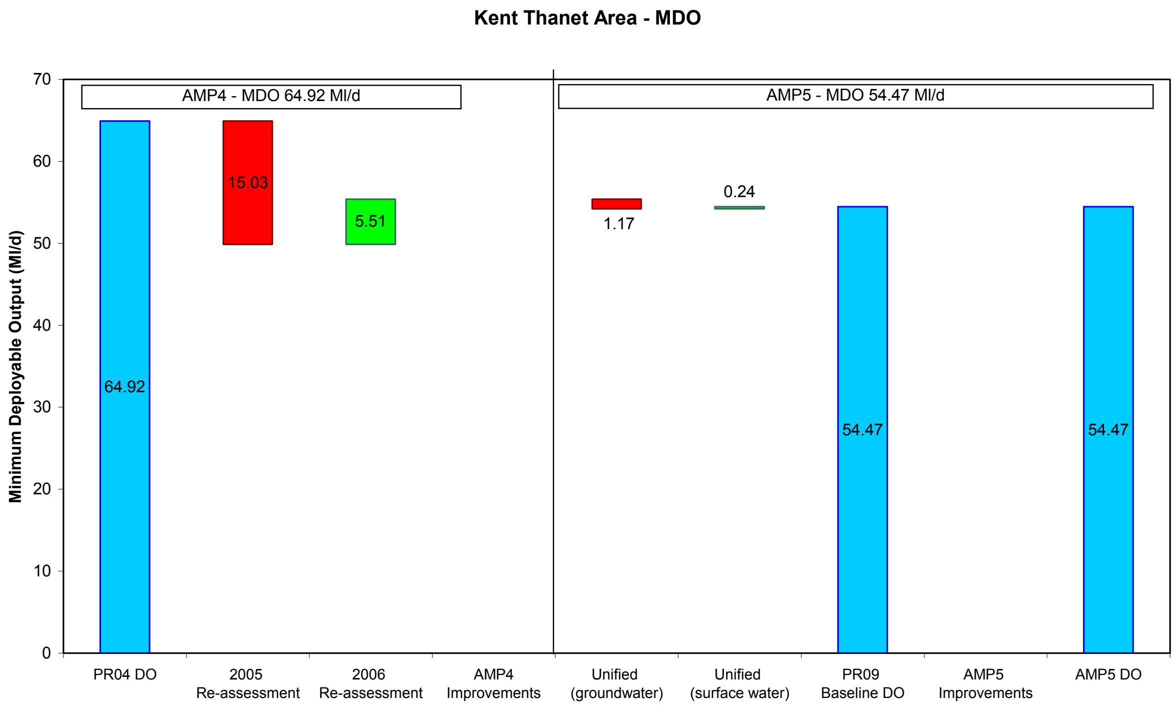

Figure I.17 Movements in Deployable Output – Kent Thanet WRZ – MDO Critical Period (Ml/d)

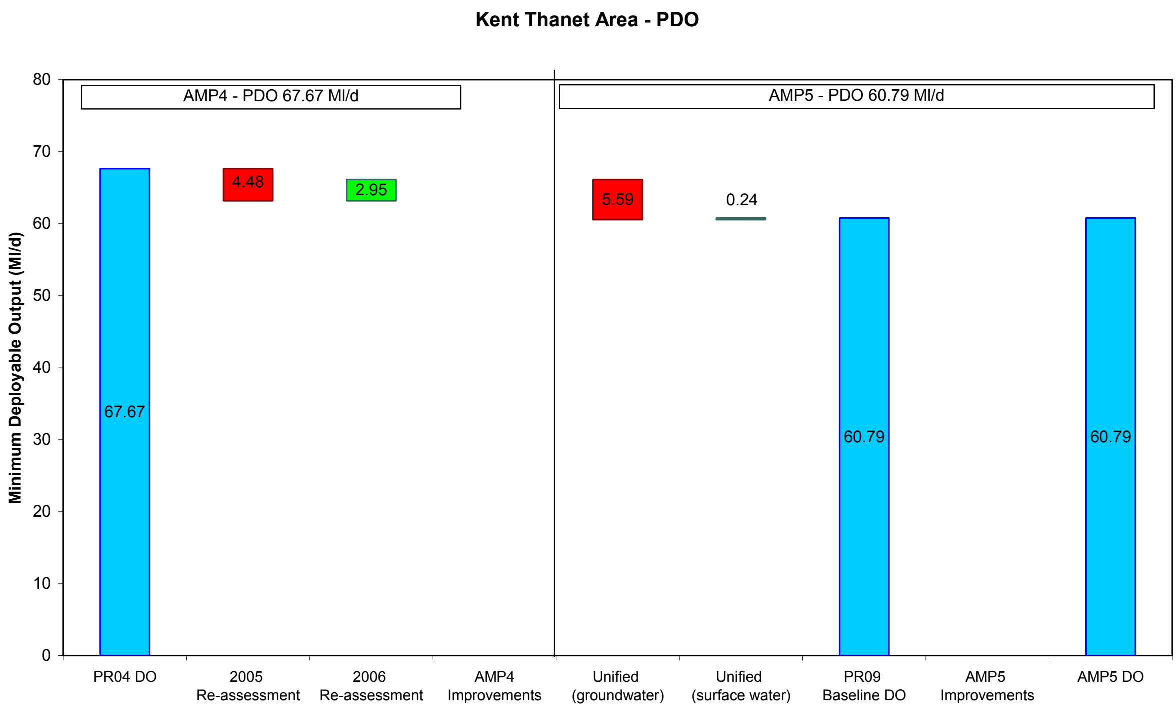

Figure I.18 Movements in Deployable Output – Kent Thanet WRZ – PDO Critical Period (Ml/d)

I.3.1.3 Sussex Hastings WRZ

The supply forecast over the planning period is shown as Table I.39 at MDO and *Table I.40* at PDO. The assessed changes and improvements in deployable output as a result of the application of the Unified Methodology and source improvements are presented as Figure I.19 for MDO and Figure I.20 for PDO.

There are no planned schemes to increase deployable output during the rest of the AMP4 period, nor are there any identified AMP5 source improvements.

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	22.77	22.77	40.48	40.48	40.48	40.48	40.48	40.48
AMP5 DO improvements	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Losses and operational use	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34
Outage	-1.62	-1.62	-1.62	-1.62	-1.62	-1.62	-1.62	-1.62
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	-1.31	-2.61	-3.92	-5.22
Transfers:								
Export to SEW	-8.00	-8.00	-8.00	-8.00	-8.00	-8.00	-8.00	-8.00
Transfer from Bewl	15.80	15.80	0.00	0.00	0.00	0.00	0.00	0.00
Bewl-Darwell adjustment	-0.35	-0.96	-3.11	-3.95	-3.28	-2.13	-0.72	0.00
Total resources	**28.26**	**27.65**	**27.41**	**26.57**	**25.93**	**25.78**	**25.89**	**25.30**

Table I.39 Baseline Supply Forecast – Sussex Hastings WRZ – MDO Critical Period (Ml/d)

Element	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Deployable Output	39.69	39.69	46.35	46.35	46.35	46.35	46.35	46.35
AMP5 DO improvements	0.00	0.00	0.00	0.25	0.25	0.25	0.25	0.25
Losses and operational use	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38
Outage	-3.94	-3.94	-3.94	-3.94	-3.94	-3.94	-3.94	-3.94
Sustainability Reductions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change effects on supply	0.00	0.00	0.00	0.00	-1.48	-2.97	-4.45	-5.93
Transfers:								
Export to SEW	-8.00	-8.00	-8.00	-8.00	-8.00	-8.00	-8.00	-8.00
Transfer from Bewl	6.40	6.40	0.00	0.00	0.00	0.00	0.00	0.00
Bewl-Darwell adjustment	0.00	-0.08	-0.69	-2.29	-1.65	-0.49	0.00	0.00
Total resources	**33.77**	**33.70**	**33.34**	**32.09**	**31.15**	**30.83**	**29.84**	**28.35**

Table I.40 Baseline Supply Forecast – Sussex Hastings WRZ – PDO Critical Period (Ml/d)

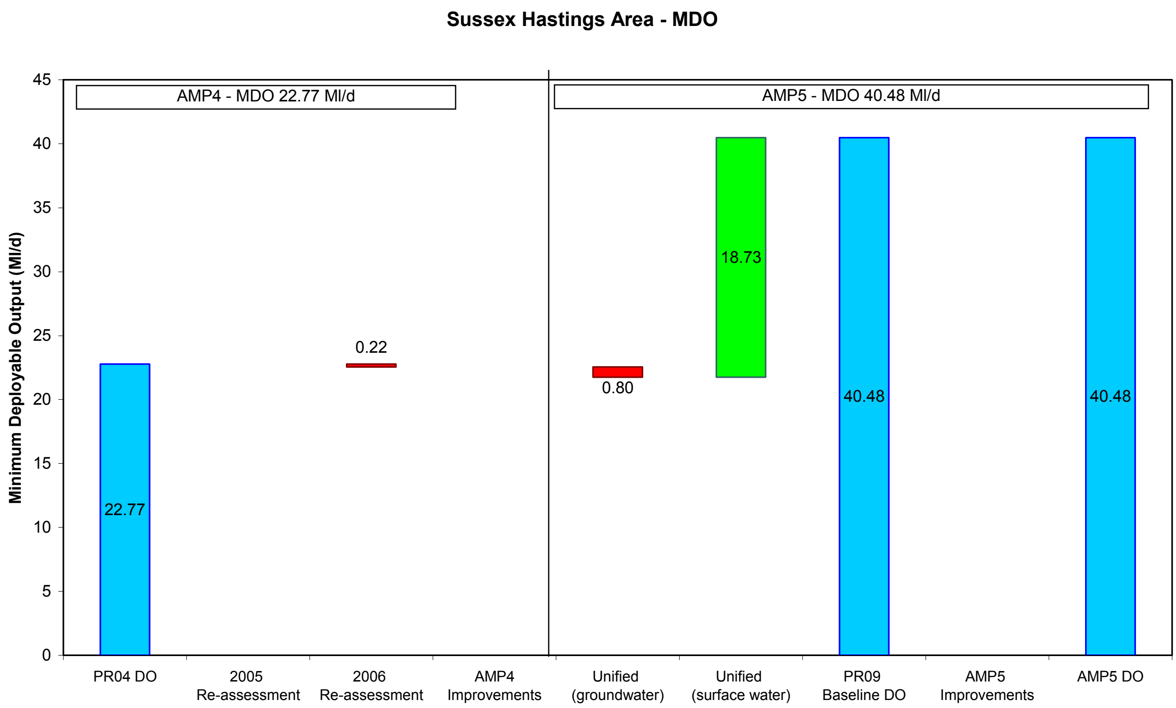

Figure I.19 Movements in Deployable Output – Sussex Hastings WRZ – MDO Critical Period (Ml/d)

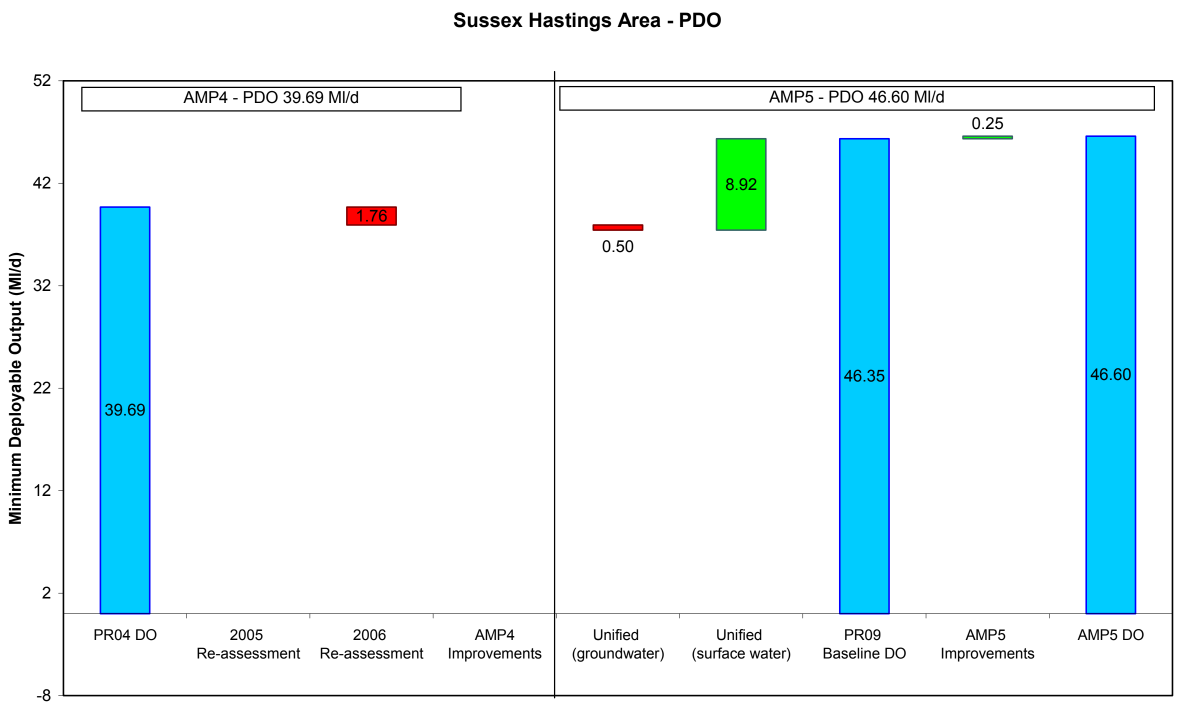

Figure I.20 Movements in Deployable Output – Sussex Hastings WRZ – PDO Critical Period (Ml/d)

I.3.2 Demand Forecast for the Eastern Area

It is assumed that universal metering powers will be achieved, and metering in all WRZs will reach 100% by 2014/15. The tables below show, for each WRZ in the Eastern Area, the forecast of population and properties under the company preferred scenario, and the demand forecast under each of the planning scenarios.

Criteria		**Base Year 2007-08**	**2009-10**	**Start of Planning Period 2010-11**	**2014-15**	**2019-20**	**2024-25**	**2029-30**	**2034-35**
Unmeasured households (000's)	Properties	133.72	125.80	121.23	0.00	0.00	0.00	0.00	0.00
	Population	354.26	333.36	321.25	0.00	0.00	0.00	0.00	0.00
Measured households (000's)	Properties	42.96	53.23	58.94	187.09	198.49	208.85	218.51	226.18
	Population	77.55	103.66	118.66	451.66	467.35	482.07	496.00	507.22
Measured non-h'holds (000's)	Properties	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73
	Population	8.85	8.85	8.85	8.85	8.85	8.85	8.85	8.85
Unmeasured non-h'holds (000's)	Properties	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
	Population	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Normal Year Annual Average (Ml/d)		111.97	110.84	110.43	104.25	104.85	106.18	107.51	108.60
Dry Year Annual Average (ADO) (Ml/d)		122.33	121.08	120.67	113.88	114.65	116.16	117.67	118.90
Dry Year Critical Period (PDO) (Ml/d)		148.95	147.16	146.57	134.61	135.74	137.63	139.53	141.07
Dry Year Minimum Deployable Output (MDO) (Ml/d)		116.47	115.30	114.89	108.44	109.11	110.52	111.93	113.08

Table I.41 Demand Forecast Build-Up – Kent Medway WRZ

Criteria		Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Unmeasured households (000's)	Properties	55.85	52.54	50.63	0.00	0.00	0.00	0.00	0.00
	Population	133.85	126.10	121.51	0.00	0.00	0.00	0.00	0.00
Measured households (000's)	Properties	24.21	28.29	30.75	84.14	88.81	93.24	98.05	101.92
	Population	40.41	49.98	55.51	181.09	186.91	193.01	199.40	204.70
Measured non-h'holds (000's)	Properties	4.67	4.67	4.67	4.67	4.67	4.67	4.67	4.67
	Population	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52
Unmeasured non-h'holds (000's)	Properties	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
	Population	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
Normal Year Annual Average (Ml/d)		43.43	42.87	42.65	39.67	39.91	40.45	41.08	41.61
Dry Year Annual Average (ADO) (Ml/d)		46.39	45.80	45.57	42.38	42.65	43.24	43.94	44.52
Dry Year Critical Period (PDO) (Ml/d)		59.81	58.93	58.62	53.05	53.47	54.27	55.21	55.99
Dry Year Minimum Deployable Output (MDO) (Ml/d)		43.67	43.11	42.89	39.90	40.13	40.68	41.32	41.85

Table I.42 Demand Forecast Build-Up – Kent Thanet WRZ

Criteria		Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
Unmeasured households (000's)	Properties	28.61	24.49	23.60	0.00	0.00	0.00	0.00	0.00
	Population	63.21	54.11	52.15	0.00	0.00	0.00	0.00	0.00
Measured households (000's)	Properties	16.92	21.54	22.63	47.76	50.14	52.44	54.85	56.90
	Population	33.65	43.57	45.81	99.76	102.18	104.93	107.64	110.41
Measured non-h'holds (000's)	Properties	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44
	Population	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76
Unmeasured non-h'holds (000's)	Properties	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
	Population	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Normal Year Annual Average (Ml/d)		25.63	25.07	24.88	22.83	22.85	23.07	23.31	23.57
Dry Year Annual Average (ADO) (Ml/d)		26.95	26.34	26.14	23.97	23.99	24.22	24.48	24.77
Dry Year Critical Period (PDO) (Ml/d)		32.69	31.81	31.55	28.25	28.30	28.59	28.91	29.27
Dry Year Minimum Deployable Output (MDO) (Ml/d)		26.69	26.09	25.89	23.75	23.77	24.00	24.25	24.53

Table I.43 Demand Forecast Build-Up – Sussex Hastings WRZ

I.3.3 Target Headroom for the Eastern Area

The values of target headroom uncertainty in the supply demand balance are presented in the tables below for each WRZ in the Eastern Area.

Target Headroom (Ml/d)	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
MDO	5.82	5.83	5.85	5.90	5.46	5.47	5.47	5.47
PDO	7.76	7.71	7.76	7.97	7.24	7.35	7.35	7.35

Table I.44 Target Headroom for MDO and PDO Conditions – Kent Medway WRZ (Ml/d)

Target Headroom (Ml/d)	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
MDO	2.50	2.41	2.43	2.53	2.32	2.39	2.39	2.39
PDO	3.21	3.22	3.24	3.32	3.20	3.29	3.29	3.29

Table I.45 Target Headroom for MDO and PDO Conditions – Kent Thanet WRZ (Ml/d)

Target Headroom (Ml/d)	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
MDO	1.57	1.56	1.57	1.61	1.37	1.26	1.26	1.26
PDO	1.91	1.89	1.90	1.92	1.67	1.53	1.53	1.53

Table I.46 Target Headroom for MDO and PDO Conditions – Sussex Hastings WRZ (Ml/d)

I.3.4 Baseline Supply Demand Balances for the Eastern Area

The supply demand balances for each WRZ in the Eastern Area are presented in Table I.47.

Supply Demand Balance	Base Year 2007-08	2009-10	Start of Planning Period 2010-11	2014-15	2019-20	2024-25	2029-30	2034-35
ADO								
Sussex Hastings	0.00	0.00	0.00	0.00	0.00	0.00	-0.02	-1.54
Kent Medway	19.15	20.80	-7.37	3.68	0.63	-3.74	-8.47	-12.30
Kent Thanet	10.56	11.25	7.40	8.23	7.95	7.06	6.04	5.04
Eastern Area ADO	**29.71**	**32.05**	**0.03**	**11.91**	**8.58**	**3.32**	**-2.46**	**-8.80**
PDO								
Sussex Hastings	-0.82	0.00	0.00	0.00	0.00	0.00	-1.06	-2.79
Kent Medway	7.21	10.36	0.00	11.02	6.96	0.33	0.00	-5.26
Kent Thanet	0.00	0.00	-4.00	0.00	0.00	0.00	-6.64	-8.17
Eastern Area PDO	**6.39**	**10.36**	**-4.00**	**11.02**	**6.96**	**0.33**	**-7.71**	**-16.21**

Table I.47 Baseline Supply Demand Balances for the Eastern Area

I.3.5 Scenario Analysis for the Eastern Area

The final planning solution under each of the scenarios, in terms of the earliest year in which each option is required, is presented in Table I.48.

WRZ	Scenario	Company preferred Regional strategy	Company only Universal metering	Company only Change of occupier	Company only Optant	Company only Universal metering with no climate change	Company only Leakage rise to Ofwat target
	Number	4	3	2	1	11	8
	Metering policy	Universal	Universal	Change of occupier	Optant and selective	Universal	Universal
	Leakage policy	JR08, then SPL saving	JR08, then SPL saving	JR08	JR08	JR08, then SPL saving	Ofwat, then SPL saving
	WRSE preferred options & bulk supplies	Yes	No	No	No	No	No
WRZ	**Scheme**	**Earliest year required**					
Kent Medway	Licence variation at S271	2024	2024	2022	2020	-	2027
Kent Medway	Licence variation for River Medway Scheme	2029	2029	2028	2027	-	2030
Kent Medway	Medway desalination (10Ml/d)	-	-	-	2033		-
Kent Medway	Wastewater recycling at Aylesford	2018	-	-	-	-	-
Kent Medway	Raise Bewl reservoir	2022	-	-	-	-	-
Kent Medway	Leakage reduction	2026 reduction by 6.5 Ml/d	2026 reduction by 6.5 Ml/d	2023 reduction by 7.5 Ml/d	2013 reduction by 7.0 Ml/d	-	2010 reduction by 7.5 Ml/d
Kent Medway	Water efficiency kit (box)	-	-	2030	2030	-	2030
Kent Medway	Water efficiency low flow shower heads	-	-	2030	-	-	2010
Kent Medway	Water efficiency low use dishwasher subsidy	-	-	-	-	-	2010
Kent Medway	Water efficiency water butts	-	-	-	-	-	2010
Kent Medway	Water efficiency low use washing machine subsidy	-	-	-	-	-	2010
Kent Medway	Water efficiency trigger hoses	-	-	-	-	-	2010
Kent Thanet	Broadoak reservoir	-	-	-	-	-	2034
Kent Thanet	Leakage reduction	2034 reduction by 0.1 Ml/d	2034 reduction by 0.1 Ml/d	2031 reduction by 1.3 Ml/d	2031 reduction by 0.6 Ml/d	-	2010 reduction by 1.5 Ml/d
Kent Thanet	Water efficiency kit (box)	-	-	-	2030	-	2030
Kent Thanet	Commercial water audit	-	-	2030	-	-	2030
Kent Thanet	Water efficiency low use dishwasher subsidy	-	-	-	-	-	2010
Kent Thanet	Water efficiency water butts	-	-	-	-	-	2010
Kent Thanet	Water efficiency low use washing machine subsidy	-	-	-	-	-	2010
Kent Thanet	Water efficiency trigger hoses	-	-	-	-	-	2010
Kent Thanet	Water efficiency low flow shower heads	-	-	-	-	-	2010 (and 2030)

	Scenario Number	Company preferred Regional strategy 4	Company only Universal metering 3	Company only Change of occupier 2	Company only Optant 1	Company only Universal metering with no climate change 11	Company only Leakage rise to Ofwat target 8
Sussex Hastings	Darwell licence variation	2028	2028	2026	2024	-	2026
	Re-introduce S556 borehole source	2031	2031	2030	2029	-	2030
	Leakage reduction	2033 reduction by 0.5 Ml/d	2033 reduction by 0.5 Ml/d	2032 reduction by 0.8 Ml/d	2028 reduction by 1.1 Ml/d	-	2029 reduction by 1.0 Ml/d
	Water efficiency commercial water audit	-	-	-	-	-	2030
Costs (£m)							
Total metering cost (£m)		60.83	60.83	65.57	55.60	60.83	60.83
Total resource, leakage reduction and water efficiency activity cost (£m)		51.95	4.52	7.12	13.01	0.21	19.35
Total cost of Strategy (£m)		**112.78**	**65.35**	**72.69**	**68.61**	**61.04**	**80.18**

Table I.48 Results of Scenario Analysis for the Eastern Area

I.3.6 Sensitivity Analysis for the Eastern Area

Sensitivity analysis was conducted on the company only scenario to assess how key assumptions may influence the timing of the final planning solutions. The results of this analysis are presented in Table I.49.

	Scenario / Number	Company preferred WRSE Regional 4	Company only Universal metering 3	Increase in demand of 5% by end of planning period "Worst case"	Decrease in demand of 5% by end of planning period "Best case"
	Metering policy	Universal	Universal	Universal	Universal
	Leakage policy	JR08, then SPL saving	JR08, then SPL saving	JR08, then SPL saving	JR08, then SPL saving
	WRSE preferred options & bulk supplies	Yes	No	No	No
WRZ	**Scheme**	**Earliest year required**			
Kent Medway	Licence variation at S271	2024	2024	2022	2029
Kent Medway	Licence variation for River Medway Scheme	2029	2029	2026	-
Kent Medway	Medway desalination (10Ml/d)	-	-	2030	-
Kent Medway	Wastewater recycling at Aylesford	2018	-	-	-
Kent Medway	Raise Bewl reservoir	2022	-	-	-
Kent Medway	Leakage reduction	2026 reduction by 6.5 Ml/d	2026 reduction by 6.5 Ml/d	2023 reduction by 6.5 Ml/d	2031 reduction by 3.0 Ml/d
Kent Thanet	Leakage reduction	2034 reduction by 0.1 Ml/d	2034 reduction by 0.1 Ml/d	-	-
Sussex Hastings	Darwell licence variation	2028	2028	2025	2031
Sussex Hastings	Re-introduce S556 borehole source	2031	2031	2028	-
Sussex Hastings	Increase capacity of Bewl-Darwell transfer	-	-	2032	-
Sussex Hastings	Leakage reduction	2033 reduction by 0.5 Ml/d	2033 reduction by 0.5 Ml/d	2030 reduction by 0.6 Ml/d	-
Sussex Hastings	Water efficiency kit (Box)	-	-	2030	-
Sussex Hastings	Water efficiency low flow shower heads	-	-	2030	-
	Costs (£m)				
	Total metering cost (£m)	60.83	60.83	60.83	60.83
	Total resource, leakage reduction and water efficiency activity cost (£m)	51.95	4.52	17.54	0.93
	Total cost of Strategy (£m)	**112.78**	**65.35**	**78.37**	**61.76**

Table I.49 Results of Sensitivity Analysis of Company only Strategy for Eastern Area

I.3.7 Strategic Environmental Assessment for the Eastern Area

All options were assessed against 17 SEA objectives, and assigned an overall environmental risk (high, medium or low), based on the significance of potential long term effects.

The table below sets out the environmental risk of each resource development option, with a summary of the most important effects likely to arise from each scheme, and potential mitigation measures.

Option	Environmental risk score	Comments
Licence variation at S271	Medium	This option has a medium environmental risk as medium to long term moderate negative effects are likely on greenhouse gas emissions. There is uncertainty regarding the effects on the SPA. A pumping test is required to show if freshwater flow could affect the SPA. If it cannot be demonstrated that the freshwater flow to the SPA will not be affected then the environmental risk of this scheme will become high and an Appropriate Assessment may be required.
Licence variation for River Medway Scheme	Medium	This option has a medium environmental risk. The key issue for this option is energy consumption and the likely medium and long term moderate negative effects on greenhouse gas emissions. There is some uncertainty of the aquatic environmental effects associated with the possible reduction in flow within the River Teise and River Medway. These potential effects would need to be examined and quantified as part of the application process for a new licence.
Raise Bewl	High	This option has a high environmental risk. It is likely to result in strong medium to long term negative effects on landscape character due to the extensive permanent loss of woodland around the reservoir and (if required) borrow pits if they are not located in areas to be inundated. This effect could be reduced with planting and restoration of borrow pit areas, however, the potential for mitigation may be limited due to a lack of space. Additional moderate medium to long term effects are likely on terrestrial biodiversity due to the loss of land surrounding the reservoir, and on greenhouse gas emissions.
Wastewater recycling at Aylesford WWTW	High	This option has a high environmental risk. The key issue for this option is energy consumption and the associated likely medium and long term strong negative effects on greenhouse gas emissions. All other medium to long term effects are slight negative.
Darwell Licence Variation	Low	This option has a low environmental risk. All medium to long term effects are considered likely to be slightly negative.
Re-introduce S556 borehole source	Medium	This option has a medium environmental risk, assuming that the current licence is acceptable in environmental terms. Given the close proximity of the scheme to sites designated for their international importance for nature conservation, if taken forward, this option may require Appropriate Assessment. Localised effects on biodiversity and geology from drilling new borehole are likely but these can, to some extent, be mitigated.
Other options required as part of the scenario and sensitivity analysis were:		
Medway Desalination (10 Ml/d)	High	This option has a high environmental risk due to likely medium to long term strong negative effects on terrestrial biodiversity and greenhouse gas emissions. If this option goes forward, its use could be restricted to a few months every few years. This could reduce the effect on greenhouse gases. Negative effects on the Holborough to Burham Marshes SSSI could be avoided by using directional drilling rather than trenching. The pipeline could avoid the Peters Pit SAC but great crested newts surveys are likely to be required followed by subsequent mitigation during pipeline construction. Given the close proximity of the scheme to sites designated for their international importance for

Option	Environmental risk score	Comments
		nature conservation, if taken forward, this option may require Appropriate Assessment.
Increase Capacity of Bewl-Darwell Transfer	Medium	This option has a medium environmental risk as it is assessed as having likely medium to long term negative effects on greenhouse gas emissions and the preservation of features of archaeological importance. Archaeological investigation and mitigation would be required as there are Scheduled Monuments in the vicinity.

Table I.50 Environmental Risks of Resource Development Options Selected in the Eastern Area Strategy

Appendix J: WATER RESOURCES STRATEGY – CHANGES IN KEY SUPPORTING DATA

J.1 Water Resources Strategy – Changes in Key Supporting Data Western Area

J.1.1 Isle of Wight WRZ

PDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Western Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Isle of Wight WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	34.23	34.23	35.42	37.49	35.24	35.24	39.04	39.04
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.46	0.00	3.24	3.24	2.18	2.18
Outage Allowances	Ml/d	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34
Process Losses/Operational Use	Ml/d	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Water Available For Use (own sources)	Ml/d	31.39	31.89	32.12	35.15	29.94	29.94	35.15	35.15
Potable Water Imported	Ml/d	11.85	11.85	14.00	14.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Water Available For Use	Ml/d	43.24	45.39	46.12	48.65	29.94	29.94	34.02	34.02
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	141.47	135.20	146.69	138.52	173.46	173.46	167.08	167.08
Total Properties	000's	66.56	67.23	69.86	68.50	89.54	89.54	88.42	88.42
Distribution Input	Ml/d	43.70	44.36	44.73	45.00	50.62	50.62	47.32	47.32
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	43.24	45.39	46.12	48.65	29.94	56.02	34.02	54.02
Available Headroom	Ml/d	-0.46	1.03	1.39	3.65	-20.68	5.40	-13.30	6.70
Target Headroom	Ml/d	0.89	1.92	1.08	2.03	2.38	2.38	2.09	2.09
Supply Demand Balance	Ml/d	-1.35	-0.90	0.32	1.62	-23.06	3.02	-15.39	4.61

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

MDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Western Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Isle of Wight WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	28.12	28.12	29.31	30.72	29.91	29.91	31.77	31.77
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.48	0.00	3.39	3.39	1.05	1.05
Outage Allowances	Ml/d	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93
Process Losses/Operational Use	Ml/d	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
Water Available For Use (own sources)	Ml/d	25.70	26.19	26.41	28.79	24.10	24.10	28.79	28.79
Potable Water Imported	Ml/d	11.85	14.00	14.00	14.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Water Available For Use	Ml/d	37.55	39.70	40.41	42.30	24.10	24.10	29.27	29.27
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	141.47	135.20	146.69	138.52	173.46	173.46	167.08	167.08
Total Properties	000's	66.56	67.23	69.86	68.50	89.54	89.54	88.42	88.42
Distribution Input	Ml/d	32.70	44.36	33.39	45.00	37.61	37.61	47.32	47.32
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	37.55	39.70	40.41	42.30	24.10	44.45	29.27	39.27
Available Headroom	Ml/d	4.85	6.00	7.01	8.31	-13.51	6.84	-6.18	3.82
Target Headroom	Ml/d	0.75	1.35	0.86	1.43	1.84	1.84	1.43	1.43
Supply Demand Balance	Ml/d	4.10	4.65	6.16	6.87	-15.35	5.00	-7.16	2.39

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

ADO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Western Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Isle of Wight WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	25.99	25.99	30.79	32.40	31.39	31.39	33.45	33.45
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.48	0.00	3.39	3.39	1.05	1.05
Outage Allowances	Ml/d	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93
Process Losses/Operational Use	Ml/d	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
Water Available For Use (own sources)	Ml/d	23.57	24.06	27.89	30.47	25.58	25.58	30.47	30.47
Potable Water Imported	Ml/d	11.85	14.00	14.00	14.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Water Available For Use	Ml/d	35.42	37.57	41.89	43.98	25.58	25.58	30.95	30.95
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	141.47	135.20	146.69	138.52	173.46	173.46	167.08	167.08
Total Properties	000's	66.56	67.23	69.86	68.50	89.54	89.54	88.42	88.42
Distribution Input	Ml/d	34.36	44.36	35.12	45.00	39.64	39.64	47.32	47.32
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	35.42	37.57	41.89	43.98	25.58	45.93	30.95	40.95
Available Headroom	Ml/d	1.06	2.61	6.77	8.68	-14.06	6.29	-5.93	4.07
Target Headroom	Ml/d	0.75	1.35	0.86	1.43	1.84	1.84	1.43	1.43
Supply Demand Balance	Ml/d	0.31	1.25	5.92	7.24	-15.90	4.45	-7.37	2.63

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

J.1.2 Hampshire South WRZ

PDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Western Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Hampshire South WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	284.70	284.70	289.59	264.23	290.65	290.65	276.23	276.23
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	86.05	86.05
Outage Allowances	Ml/d	6.27	6.54	6.27	6.54	6.27	6.27	6.54	6.54
Process Losses/Operational Use	Ml/d	3.07	1.18	3.07	1.18	3.07	3.07	1.18	1.18
Water Available For Use (own sources)	Ml/d	275.36	278.16	280.25	257.69	281.31	281.31	171.69	171.69
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	34.55	37.00	36.70	37.00	22.70	22.70	23.00	23.00
Total Water Available For Use	Ml/d	240.81	239.98	243.55	219.51	258.61	258.61	159.46	159.46
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	593.67	589.15	603.77	605.49	670.39	670.39	728.41	728.41
Total Properties	000's	256.47	257.73	268.47	263.51	329.65	329.65	339.04	339.04
Distribution Input	Ml/d	221.88	206.41	219.33	204.88	225.43	225.43	202.17	202.17
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	240.81	239.98	243.55	219.51	258.61	242.53	159.46	159.46
Available Headroom	Ml/d	18.93	33.57	24.21	14.63	33.18	17.10	-42.71	15.19
Target Headroom	Ml/d	7.16	10.91	7.75	10.87	17.10	17.10	10.11	10.11
Supply Demand Balance	Ml/d	11.77	22.66	16.47	3.76	16.08	0.00	-52.82	5.08

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

MDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Western Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Hampshire South WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	252.94	252.94	257.83	245.79	258.89	258.89	253.79	253.79
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	107.00	107.00
Outage Allowances	Ml/d	4.56	4.59	4.56	4.59	4.56	4.56	4.59	4.59
Process Losses/Operational Use	Ml/d	3.07	1.18	3.07	1.18	3.07	3.07	1.18	1.18
Water Available For Use (own sources)	Ml/d	245.31	248.35	250.20	241.20	251.26	251.26	134.20	134.20
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	34.55	37.00	36.70	37.00	22.70	22.70	23.00	23.00
Total Water Available For Use	Ml/d	210.76	210.17	213.50	203.02	228.56	228.56	118.02	118.02
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	593.67	589.15	603.77	605.49	670.39	670.39	728.41	728.41
Total Properties	000's	256.47	257.73	268.47	263.51	329.65	329.65	339.04	339.04
Distribution Input	Ml/d	153.25	152.33	152.91	151.23	160.46	160.46	151.81	151.81
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	210.76	210.17	213.50	203.02	228.56	213.21	118.02	166.32
Available Headroom	Ml/d	57.51	57.84	60.59	51.79	68.09	52.74	-33.79	14.51
Target Headroom	Ml/d	6.19	8.52	6.42	8.53	8.50	8.50	7.71	7.71
Supply Demand Balance	Ml/d	51.31	49.32	54.17	43.26	59.60	44.25	-41.49	6.81

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

ADO		**Base Year**		**Start of Planning Period**		**End of Planning Period**			
		2006-07	**2007-08**	**2010-11**		**2034-35**			
Western Area	**Units**	**Draft WRMP**	**Final WRMP**	**Draft WRMP**	**Final WRMP**	**Draft WRMP**		**Final WRMP**	
Hampshire South WRZ						**Baseline**	**Final Planning**	**Baseline**	**Final Planning**
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	252.94	252.94	281.82	269.66	282.88	282.88	277.66	277.66
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	107.00	107.00
Outage Allowances	Ml/d	4.56	4.59	4.56	4.59	4.56	4.56	4.59	4.59
Process Losses/Operational Use	Ml/d	3.07	1.18	3.07	1.18	3.07	3.07	1.18	1.18
Water Available For Use (own sources)	Ml/d	245.31	248.35	274.19	265.07	275.25	275.25	158.07	158.07
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	34.55	37.00	36.70	37.00	22.70	22.70	23.00	23.00
Total Water Available For Use	Ml/d	210.76	210.17	237.49	226.89	252.55	252.55	141.89	141.89
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	593.67	589.15	603.77	605.49	670.39	670.39	728.41	728.41
Total Properties	000's	256.47	257.73	268.47	263.51	329.65	329.65	339.04	339.04
Distribution Input	Ml/d	160.61	157.83	160.23	156.74	168.18	168.18	157.54	157.54
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	210.76	210.17	237.49	226.89	252.55	237.20	141.89	190.19
Available Headroom	Ml/d	50.15	52.34	77.26	70.14	84.37	69.02	-15.65	32.65
Target Headroom	Ml/d	6.19	8.52	6.42	8.53	8.50	8.50	7.71	7.71
Supply Demand Balance	Ml/d	43.96	43.82	70.84	61.61	75.87	60.52	-23.36	24.94

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

J.1.3 Hampshire Andover WRZ

PDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Western Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Hampshire Andover WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	28.36	28.36	28.36	28.20	29.36	29.36	28.40	28.40
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Outage Allowances	Ml/d	2.65	2.44	2.65	2.44	2.65	2.65	2.44	2.44
Process Losses/Operational Use	Ml/d	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Water Available For Use (own sources)	Ml/d	25.58	25.92	25.58	25.76	26.58	26.58	25.76	25.76
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.31	0.41	0.31	0.41	0.31	0.31	0.41	0.41
Total Water Available For Use	Ml/d	25.27	25.38	25.27	25.22	26.27	26.27	25.42	25.42
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	64.32	63.90	66.45	66.24	74.74	74.74	79.53	79.53
Total Properties	000's	26.98	28.02	27.72	28.72	32.32	32.32	36.89	36.89
Distribution Input	Ml/d	21.26	21.30	21.32	19.75	22.11	22.11	21.19	21.19
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	25.27	25.38	25.27	25.22	26.27	26.27	25.42	25.42
Available Headroom	Ml/d	4.00	4.07	3.94	5.47	4.16	4.16	4.22	4.22
Target Headroom	Ml/d	0.81	1.44	0.93	1.48	1.68	1.68	1.50	1.50
Supply Demand Balance	Ml/d	3.20	2.63	3.01	3.89	2.48	2.48	2.73	2.73

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

MDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Western Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Hampshire Andover WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	22.86	22.86	22.86	22.47	23.86	23.86	22.67	22.67
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Outage Allowances	Ml/d	1.65	1.52	1.65	1.52	1.65	1.65	1.52	1.52
Process Losses/Operational Use	Ml/d	0.13	0.13	0.13	0.00	0.13	0.13	0.13	0.13
Water Available For Use (own sources)	Ml/d	21.08	21.34	21.08	20.95	22.08	22.08	20.95	20.95
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.31	0.41	0.31	0.41	0.31	0.31	0.41	0.41
Total Water Available For Use	Ml/d	20.77	20.90	20.77	20.51	21.77	21.77	20.70	20.70
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	64.32	63.90	66.45	66.24	74.74	74.74	79.53	79.53
Total Properties	000's	26.98	28.02	27.71	28.72	32.31	32.31	36.89	36.89
Distribution Input	Ml/d	16.51	21.30	16.67	19.75	17.57	17.57	21.19	21.19
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	20.77	20.90	20.77	20.51	21.77	21.77	20.70	20.70
Available Headroom	Ml/d	4.25	3.39	4.10	3.82	4.19	4.19	2.93	2.93
Target Headroom	Ml/d	0.66	0.94	0.76	0.97	1.31	1.31	0.94	0.94
Supply Demand Balance	Ml/d	3.59	2.45	3.34	2.85	2.89	2.89	1.99	1.99

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

ADO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Western Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Hampshire Andover WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	22.86	22.86	23.26	22.93	24.26	24.26	23.13	23.13
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Outage Allowances	Ml/d	1.65	1.52	1.65	1.52	1.65	1.65	1.52	1.52
Process Losses/Operational Use	Ml/d	0.13	0.13	0.13	0.00	0.13	0.13	0.13	0.13
Water Available For Use (own sources)	Ml/d	21.08	21.34	21.48	21.41	22.48	22.48	21.41	21.41
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.31	0.33	0.31	0.33	0.31	0.31	0.33	0.33
Total Water Available For Use	Ml/d	20.77	20.88	21.17	20.95	22.17	22.17	21.14	21.14
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	64.32	63.90	66.45	66.24	74.74	74.74	79.53	79.53
Total Properties	000's	26.98	28.02	27.71	28.72	32.31	32.31	36.89	36.89
Distribution Input	Ml/d	16.67	16.62	16.83	15.85	17.75	17.75	16.83	16.83
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	20.77	20.88	21.17	20.95	22.17	22.17	21.14	21.14
Available Headroom	Ml/d	4.10	4.25	4.34	5.10	4.42	4.42	4.31	4.31
Target Headroom	Ml/d	0.66	0.94	0.76	0.97	1.31	1.31	0.94	0.94
Supply Demand Balance	Ml/d	3.43	3.31	3.58	4.13	3.11	3.11	3.37	3.37

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

J.1.4 Hampshire Kingsclere WRZ

PDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Western Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Hampshire Kingsclere WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	9.18	9.18	9.18	9.48	9.93	9.93	10.68	10.68
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Outage Allowances	Ml/d	1.46	1.49	1.46	1.49	1.46	1.46	1.49	1.49
Process Losses/Operational Use	Ml/d	0.04	0.04	0.04	0.00	0.04	0.04	0.04	0.04
Water Available For Use (own sources)	Ml/d	7.68	7.69	7.68	7.99	8.43	8.43	7.99	7.99
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Water Available For Use	Ml/d	7.68	7.65	7.68	7.95	8.43	8.43	9.15	9.15
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	15.18	14.81	15.30	14.93	16.33	16.33	17.07	17.07
Total Properties	000's	6.75	6.62	6.98	6.67	8.44	8.44	8.13	8.13
Distribution Input	Ml/d	7.40	7.13	7.29	6.78	7.19	7.19	7.00	7.00
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	7.68	7.65	7.68	7.95	8.43	8.43	9.15	9.15
Available Headroom	Ml/d	0.28	0.52	0.39	1.17	1.24	1.24	2.15	2.15
Target Headroom	Ml/d	0.24	0.42	0.29	0.42	0.58	0.58	0.41	0.41
Supply Demand Balance	Ml/d	0.03	0.10	0.10	0.75	0.66	0.66	1.74	1.74

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

MDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Western Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Hampshire Kingsclere WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	8.68	8.68	8.68	8.68	9.43	9.43	8.68	8.68
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Outage Allowances	Ml/d	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Process Losses/Operational Use	Ml/d	0.04	0.04	0.04	0.00	0.04	0.04	0.04	0.04
Water Available For Use (own sources)	Ml/d	7.87	7.91	7.87	7.91	8.62	8.62	7.91	7.91
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Water Available For Use	Ml/d	7.87	7.87	7.87	7.87	8.62	8.62	7.87	7.87
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	15.18	14.81	15.30	14.93	16.33	16.33	17.07	17.07
Total Properties	000's	6.75	6.62	6.98	6.67	8.44	8.44	8.13	8.13
Distribution Input	Ml/d	4.79	4.95	4.77	4.83	4.78	4.78	4.92	4.92
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	7.87	7.87	7.87	7.87	8.62	8.62	7.87	7.87
Available Headroom	Ml/d	3.08	2.92	3.10	3.04	3.84	3.84	2.95	2.95
Target Headroom	Ml/d	0.18	0.29	0.22	0.29	0.43	0.43	0.27	0.27
Supply Demand Balance	Ml/d	2.90	2.63	2.88	2.75	3.41	3.41	2.68	2.68

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

ADO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Western Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Hampshire Kingsclere WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	8.68	8.68	8.68	8.68	9.43	9.43	8.68	8.68
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Outage Allowances	Ml/d	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Process Losses/Operational Use	Ml/d	0.04	0.04	0.04	0.00	0.04	0.04	0.04	0.04
Water Available For Use (own sources)	Ml/d	7.87	7.91	7.87	7.91	8.62	8.62	7.91	7.91
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Water Available For Use	Ml/d	7.87	7.87	7.87	7.87	8.62	8.62	7.87	7.87
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	15.18	14.81	15.30	14.93	16.33	16.33	17.07	17.07
Total Properties	000's	6.75	6.62	6.98	6.67	8.44	8.44	8.13	8.13
Distribution Input	Ml/d	5.10	5.24	5.07	5.11	5.09	5.09	5.21	5.21
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	7.87	7.87	7.87	7.87	8.62	8.62	7.87	7.87
Available Headroom	Ml/d	2.77	2.63	2.80	2.76	3.53	3.53	2.66	2.66
Target Headroom	Ml/d	0.18	0.29	0.22	0.29	0.43	0.43	0.27	0.27
Supply Demand Balance	Ml/d	2.60	2.35	2.58	2.47	3.10	3.10	2.38	2.38

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

J.2 Water Resources Strategy – Changes in Key Supporting Data Central Area

J.2.1 Sussex North WRZ

PDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Central Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Sussex North WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	80.81	83.81	63.24	63.79	64.09	64.09	64.09	64.09
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	1.66	0.00	11.64	11.64	0.03	0.03
Outage Allowances	Ml/d	2.67	2.30	2.67	2.30	2.67	2.67	2.30	2.30
Process Losses/Operational Use	Ml/d	0.39	0.39	0.39	0.00	0.39	0.39	0.39	0.39
Water Available For Use (own sources)	Ml/d	77.75	81.51	58.52	61.49	49.39	49.39	61.49	61.49
Potable Water Imported	Ml/d	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Potable Water Exported	Ml/d	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40
Total Water Available For Use	Ml/d	87.35	90.72	68.12	70.70	58.99	58.99	70.97	70.97
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	243.44	242.61	248.51	249.11	273.53	273.53	291.81	291.81
Total Properties	000's	106.76	107.08	111.07	109.21	134.04	134.04	136.90	136.90
Distribution Input	Ml/d	86.66	85.20	85.49	81.35	87.67	87.67	85.71	85.71
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	87.35	90.72	68.12	70.70	58.99	93.99	70.97	105.97
Available Headroom	Ml/d	0.69	5.52	-17.37	-10.65	-28.69	6.31	-14.73	20.27
Target Headroom	Ml/d	1.83	3.96	2.24	3.99	5.01	5.01	3.87	3.87
Supply Demand Balance	Ml/d	-1.14	1.55	-19.62	-14.64	-33.69	1.31	-18.60	16.40

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

MDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Central Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Sussex North WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	57.94	60.94	39.68	40.05	40.33	40.33	40.15	40.15
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	1.05	0.00	7.37	7.37	0.03	0.03
Outage Allowances	Ml/d	2.47	2.34	2.47	2.34	2.47	2.47	2.34	2.34
Process Losses/Operational Use	Ml/d	0.44	0.44	0.44	0.00	0.44	0.44	0.44	0.44
Water Available For Use (own sources)	Ml/d	55.03	58.60	35.72	37.71	30.05	30.05	37.71	37.71
Potable Water Imported	Ml/d	15.00	16.01	15.00	15.00	15.00	15.00	15.00	15.00
Potable Water Exported	Ml/d	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40
Total Water Available For Use	Ml/d	64.63	68.77	45.32	46.88	39.65	39.65	46.95	46.95
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	243.44	242.61	248.51	249.11	273.53	273.53	291.81	291.81
Total Properties	000's	106.76	107.08	111.07	109.21	134.04	134.04	136.90	136.90
Distribution Input	Ml/d	66.52	65.92	66.31	64.43	68.78	68.78	67.19	67.19
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	64.63	68.77	45.32	46.88	39.65	72.13	46.95	78.95
Available Headroom	Ml/d	-1.89	2.85	-20.99	-17.55	-29.13	3.35	-20.24	11.76
Target Headroom	Ml/d	1.36	2.85	1.65	2.94	3.35	3.35	2.84	2.84
Supply Demand Balance	Ml/d	-3.24	0.00	-22.64	-20.49	-32.48	0.00	-23.08	8.92

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

ADO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Central Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Sussex North WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	62.68	62.68	63.31	63.73	63.96	63.96	63.83	63.83
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	1.05	0.00	7.37	7.37	0.03	0.03
Outage Allowances	Ml/d	2.47	2.34	2.47	2.34	2.47	2.47	2.34	2.34
Process Losses/Operational Use	Ml/d	0.44	0.44	0.44	0.00	0.44	0.44	0.44	0.44
Water Available For Use (own sources)	Ml/d	59.77	60.34	59.35	61.39	53.68	53.68	61.39	61.39
Potable Water Imported	Ml/d	15.00	11.56	15.00	4.45	15.00	15.00	4.45	4.45
Potable Water Exported	Ml/d	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40
Total Water Available For Use	Ml/d	69.37	66.06	68.95	60.00	63.28	63.28	60.08	60.08
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000’s	243.44	242.61	248.51	249.11	273.53	273.53	291.81	291.81
Total Properties	000’s	106.76	107.08	111.07	109.21	134.04	134.04	136.90	136.90
Distribution Input	Ml/d	66.98	67.57	66.77	66.05	69.27	69.27	68.96	68.96
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	69.37	66.06	68.95	60.00	63.28	95.28	60.08	88.08
Available Headroom	Ml/d	2.39	-1.51	2.18	-6.05	-5.99	26.01	-8.89	19.11
Target Headroom	Ml/d	1.36	2.85	1.65	2.94	3.35	3.35	2.84	2.84
Supply Demand Balance	Ml/d	1.03	-4.36	0.53	-8.98	-9.34	22.66	-11.73	16.27

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

J.2.2 Sussex Worthing WRZ

PDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Central Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Sussex Worthing WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	68.13	78.68	74.28	68.98	74.78	74.78	70.73	70.73
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.23
Outage Allowances	Ml/d	4.42	4.39	4.42	4.39	4.42	4.42	4.39	4.39
Process Losses/Operational Use	Ml/d	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.60
Water Available For Use (own sources)	Ml/d	63.11	74.29	69.26	64.59	69.76	69.76	64.59	64.59
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Water Available For Use	Ml/d	62.77	73.69	69.26	63.99	69.76	69.76	65.51	65.51
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000’s	171.32	168.38	174.60	171.91	195.24	195.24	200.38	200.38
Total Properties	000’s	80.14	88.05	82.61	89.21	100.72	100.72	108.93	108.93
Distribution Input	Ml/d	60.09	51.57	59.08	50.07	61.50	61.50	48.66	48.66
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	62.77	73.69	69.26	63.99	69.76	72.92	65.51	75.51
Available Headroom	Ml/d	2.66	22.12	10.20	13.92	8.20	11.36	16.85	26.85
Target Headroom	Ml/d	2.67	3.45	3.12	3.40	4.99	4.99	2.89	2.89
Supply Demand Balance	Ml/d	0.00	18.67	7.08	10.52	3.21	6.37	13.97	23.97

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

MDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Central Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Sussex Worthing WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	49.73	62.34	57.45	57.85	58.95	58.95	62.10	62.10
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.18
Outage Allowances	Ml/d	3.31	3.07	3.31	3.07	3.31	3.31	3.07	3.07
Process Losses/Operational Use	Ml/d	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.60
Water Available For Use (own sources)	Ml/d	45.82	59.27	53.54	54.78	55.04	55.04	54.78	54.78
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.00	1.01	0.00	0.00	0.00	0.00	0.00	0.00
Total Water Available For Use	Ml/d	45.82	57.66	53.54	54.18	55.04	55.04	58.26	58.26
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	171.32	168.38	174.60	171.91	195.24	195.24	200.38	200.38
Total Properties	000's	80.14	88.05	82.61	89.21	100.72	100.72	108.93	108.93
Distribution Input	Ml/d	46.31	41.94	46.07	40.91	48.57	48.57	40.40	40.40
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	45.82	57.66	53.54	54.18	55.04	52.29	58.26	63.26
Available Headroom	Ml/d	-0.47	15.72	7.50	13.27	6.42	3.67	17.85	22.85
Target Headroom	Ml/d	2.15	2.85	2.39	2.80	3.67	3.67	2.47	2.47
Supply Demand Balance	Ml/d	-2.62	12.87	5.12	10.48	2.75	0.00	15.39	20.39

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

ADO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Central Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Sussex Worthing WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	56.58	56.58	58.23	57.55	59.73	59.73	61.80	61.80
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.18
Outage Allowances	Ml/d	3.31	3.07	3.31	3.07	3.31	3.31	3.07	3.07
Process Losses/Operational Use	Ml/d	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.60
Water Available For Use (own sources)	Ml/d	52.67	53.51	54.32	54.48	55.82	55.82	54.48	54.48
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.00	7.11	0.00	0.00	0.00	0.00	0.00	0.00
Total Water Available For Use	Ml/d	52.67	45.80	54.32	53.88	55.82	55.82	57.95	57.95
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	171.32	168.38	174.60	171.91	195.24	195.24	200.38	200.38
Total Properties	000's	80.14	88.05	82.61	89.21	100.72	100.72	108.93	108.93
Distribution Input	Ml/d	47.33	42.95	47.08	41.89	49.66	49.66	41.39	41.39
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	52.67	45.80	54.32	53.88	55.82	53.55	57.95	62.95
Available Headroom	Ml/d	5.36	2.85	7.27	11.99	6.10	3.83	16.56	21.56
Target Headroom	Ml/d	2.15	2.85	2.39	2.80	3.67	3.67	2.47	2.47
Supply Demand Balance	Ml/d	3.21	0.00	4.88	9.19	2.43	0.16	14.09	19.09

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

J.2.3 Sussex Brighton WRZ

PDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Central Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Sussex Brighton WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	116.24	116.24	106.49	108.52	112.99	112.99	115.77	115.77
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.24
Outage Allowances	Ml/d	5.22	5.18	5.22	5.18	5.22	5.22	5.18	5.18
Process Losses/Operational Use	Ml/d	0.50	0.50	0.50	0.00	0.50	0.50	0.50	0.50
Water Available For Use (own sources)	Ml/d	110.52	111.06	100.77	103.34	107.27	107.27	103.34	103.34
Potable Water Imported	Ml/d	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00
Total Water Available For Use	Ml/d	110.86	110.56	100.77	102.84	107.27	107.27	105.85	105.85
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	333.48	320.82	340.05	327.72	377.09	377.09	374.85	374.85
Total Properties	000's	161.52	154.94	167.07	157.36	198.57	198.57	190.52	190.52
Distribution Input	Ml/d	114.36	103.80	112.64	100.25	116.55	116.55	94.00	94.00
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	110.86	110.56	100.77	102.84	107.27	128.11	105.85	105.85
Available Headroom	Ml/d	-3.48	6.76	-11.78	2.59	-9.31	11.53	11.85	11.85
Target Headroom	Ml/d	3.49	5.39	4.08	5.55	7.53	7.53	4.72	4.72
Supply Demand Balance	Ml/d	-6.97	1.37	-15.87	-2.96	-16.84	4.00	7.13	7.13

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

MDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Central Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Sussex Brighton WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	94.52	95.62	85.44	89.30	90.69	90.69	96.55	96.55
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.39
Outage Allowances	Ml/d	3.92	3.63	3.92	3.63	3.92	3.92	3.63	3.63
Process Losses/Operational Use	Ml/d	0.50	0.50	0.50	0.00	0.50	0.50	0.50	0.50
Water Available For Use (own sources)	Ml/d	90.10	91.99	81.02	85.67	86.27	86.27	85.67	85.67
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00
Total Water Available For Use	Ml/d	90.10	91.49	81.02	85.17	86.27	86.27	88.03	88.03
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	333.48	320.82	340.05	327.72	377.09	377.09	374.85	374.85
Total Properties	000's	161.52	154.94	167.07	157.36	198.57	198.57	190.52	190.52
Distribution Input	Ml/d	88.06	84.39	87.71	81.97	92.06	92.06	78.49	78.49
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	90.10	91.49	81.02	85.17	86.27	107.54	88.03	88.03
Available Headroom	Ml/d	2.05	7.10	-6.66	3.20	-5.89	15.38	9.54	9.54
Target Headroom	Ml/d	2.57	4.41	3.09	4.31	5.96	5.96	3.84	3.84
Supply Demand Balance	Ml/d	-0.52	2.69	-9.75	-1.11	-11.85	9.42	5.70	5.70

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

ADO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Central Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Sussex Brighton WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	100.18	100.18	89.55	92.05	94.80	94.80	99.30	99.30
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.39
Outage Allowances	Ml/d	3.92	3.63	3.92	3.63	3.92	3.92	3.63	3.63
Process Losses/Operational Use	Ml/d	0.50	0.50	0.50	0.00	0.50	0.50	0.50	0.50
Water Available For Use (own sources)	Ml/d	95.76	96.55	85.13	88.42	90.38	90.38	88.42	88.42
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00
Total Water Available For Use	Ml/d	95.76	96.05	85.13	87.92	90.38	90.38	90.79	90.79
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	333.48	320.82	340.05	327.72	377.09	377.09	374.85	374.85
Total Properties	000's	161.52	154.94	167.07	157.36	198.57	198.57	190.52	190.52
Distribution Input	Ml/d	90.04	86.47	89.67	83.97	94.15	94.15	80.42	80.42
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	95.76	96.05	85.13	87.92	90.38	111.65	90.79	90.79
Available Headroom	Ml/d	5.73	9.58	-4.51	3.95	-3.88	17.39	10.37	10.37
Target Headroom	Ml/d	2.57	4.41	3.09	4.31	5.96	5.96	3.84	3.84
Supply Demand Balance	Ml/d	3.17	5.17	-7.60	-0.36	-9.83	11.44	6.53	6.53

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

J.3 Water Resources Strategy – Changes in Key Supporting Data Eastern Area

J.3.1 Kent Medway WRZ

PDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Eastern Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Kent Medway WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	184.54	194.58	188.05	182.57	199.26	199.26	192.82	192.82
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	3.41	0.00	23.86	23.86	20.39	20.39
Outage Allowances	Ml/d	5.10	5.90	5.10	5.90	5.10	5.10	5.90	5.90
Process Losses/Operational Use	Ml/d	1.15	1.20	1.15	0.00	1.15	1.15	1.20	1.20
Water Available For Use (own sources)	Ml/d	178.29	188.68	178.39	176.67	169.15	169.15	176.67	176.67
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	12.17	13.56	19.28	19.32	19.28	19.28	19.32	19.32
Total Water Available For Use	Ml/d	156.12	163.92	159.11	156.15	149.87	149.87	146.01	146.01
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	442.16	441.31	450.59	449.41	498.59	498.59	516.72	516.72
Total Properties	000's	190.74	192.11	198.53	195.71	239.81	239.81	243.17	243.17
Distribution Input	Ml/d	151.78	148.95	150.14	146.57	152.39	152.39	141.07	141.07
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	156.12	163.92	159.11	156.15	149.87	167.35	146.01	192.09
Available Headroom	Ml/d	4.34	14.98	8.97	9.58	-2.52	14.96	4.95	51.02
Target Headroom	Ml/d	4.34	7.76	5.13	7.76	10.48	10.48	7.35	7.35
Supply Demand Balance	Ml/d	0.00	7.21	3.84	1.82	-12.99	4.49	-2.40	43.67

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

MDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Eastern Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Kent Medway WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	155.61	166.90	145.31	144.58	154.94	154.94	153.33	153.33
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	2.48	0.00	17.33	17.33	12.35	12.35
Outage Allowances	Ml/d	3.92	4.06	3.92	4.06	3.92	3.92	4.06	4.06
Process Losses/Operational Use	Ml/d	1.15	1.20	1.15	0.00	1.15	1.15	1.20	1.20
Water Available For Use (own sources)	Ml/d	150.54	162.84	137.76	140.52	132.54	132.54	140.52	140.52
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	10.73	11.36	18.38	18.12	18.38	18.38	18.12	18.12
Total Water Available For Use	Ml/d	123.81	134.28	119.38	121.20	114.16	114.16	117.60	117.60
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	442.16	441.31	450.59	449.41	498.59	498.59	516.72	516.72
Total Properties	000's	190.74	192.11	198.53	195.71	239.81	239.81	243.17	243.17
Distribution Input	Ml/d	117.06	116.47	116.85	114.89	121.04	121.04	113.08	113.08
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	123.81	134.28	119.38	121.20	114.16	136.40	117.60	163.17
Available Headroom	Ml/d	6.75	17.81	2.54	6.32	-6.88	15.36	4.52	50.09
Target Headroom	Ml/d	3.32	5.82	3.85	5.85	7.90	7.90	5.47	5.47
Supply Demand Balance	Ml/d	3.42	11.99	-1.32	0.47	-14.78	7.46	-0.95	44.62

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

ADO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Eastern Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Kent Medway WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	175.75	175.75	147.13	141.34	158.25	158.25	150.09	150.09
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	2.28	0.00	17.33	17.33	12.35	12.35
Outage Allowances	Ml/d	3.92	4.06	3.92	4.06	3.92	3.92	4.06	4.06
Process Losses/Operational Use	Ml/d	1.15	1.20	1.15	0.00	1.15	1.15	1.20	1.20
Water Available For Use (own sources)	Ml/d	170.68	171.69	139.78	137.28	135.85	135.85	137.28	137.28
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	6.81	7.25	18.38	18.32	18.38	18.38	91.60	91.60
Total Water Available For Use	Ml/d	147.87	147.24	121.40	117.77	117.47	117.47	114.17	114.17
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	442.16	441.31	450.59	449.41	498.59	498.59	516.72	516.72
Total Properties	000's	190.74	192.11	198.53	195.71	239.81	239.81	243.17	243.17
Distribution Input	Ml/d	123.87	122.33	123.63	120.67	128.13	128.13	118.90	118.90
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	147.87	147.24	121.40	117.77	117.47	143.97	114.17	163.37
Available Headroom	Ml/d	24.00	24.92	-2.22	-2.90	-10.66	11.59	-4.74	44.46
Target Headroom	Ml/d	3.32	5.82	3.85	5.85	7.90	7.90	5.47	5.47
Supply Demand Balance	Ml/d	20.68	19.10	-6.07	-8.75	-18.55	3.69	-10.21	38.99

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

J.3.2 Kent Thanet WRZ

PDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Eastern Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Kent Thanet WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	63.19	63.19	60.43	60.79	62.43	62.43	60.79	60.79
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	3.28	3.28
Outage Allowances	Ml/d	4.64	4.64	4.64	4.64	4.64	4.64	4.64	4.64
Process Losses/Operational Use	Ml/d	0.60	0.61	0.60	0.00	0.60	0.60	0.61	0.61
Water Available For Use (own sources)	Ml/d	57.95	58.55	55.19	56.15	57.19	57.19	56.15	56.15
Potable Water Imported	Ml/d	4.14	0.00	0.01	0.00	0.01	0.01	0.10	0.10
Potable Water Exported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00
Total Water Available For Use	Ml/d	62.09	63.02	55.20	55.64	57.20	57.20	50.36	50.36
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	182.97	180.19	185.05	182.96	203.63	203.63	210.63	210.63
Total Properties	000's	89.24	89.73	92.26	91.10	110.67	110.67	112.52	112.52
Distribution Input	Ml/d	64.00	59.81	62.86	58.62	63.76	63.76	55.99	55.99
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	62.09	63.02	55.20	55.64	57.20	67.92	50.36	57.28
Available Headroom	Ml/d	-1.91	3.21	-7.66	-2.98	-6.56	4.16	-5.63	1.29
Target Headroom	Ml/d	1.77	3.21	2.04	3.24	4.16	4.16	3.29	3.29
Supply Demand Balance	Ml/d	-3.68	0.00	-9.70	-6.23	-10.72	0.00	-8.93	-2.00

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

MDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Eastern Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Kent Thanet WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	49.89	49.89	50.13	54.47	52.38	52.38	54.47	54.47
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	2.58	2.58
Outage Allowances	Ml/d	3.66	3.62	3.66	3.62	3.66	3.66	3.62	3.62
Process Losses/Operational Use	Ml/d	0.60	0.61	0.60	0.00	0.60	0.60	0.61	0.61
Water Available For Use (own sources)	Ml/d	45.63	46.27	45.87	50.85	48.12	48.12	50.85	50.85
Potable Water Imported	Ml/d	3.93	4.51	0.01	0.10	0.01	0.01	0.10	0.10
Potable Water Exported	Ml/d	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Total Water Available For Use	Ml/d	45.56	46.17	41.88	46.34	44.13	44.13	43.76	43.76
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	182.97	180.19	185.05	182.96	203.63	203.63	210.63	210.63
Total Properties	000's	89.24	89.73	92.26	91.10	110.67	110.67	112.52	112.52
Distribution Input	Ml/d	44.14	43.67	43.79	42.89	45.31	45.31	44.24	44.24
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	45.56	46.17	41.88	46.34	44.13	48.39	43.76	43.86
Available Headroom	Ml/d	1.42	2.50	-1.91	3.45	-1.17	3.08	1.91	2.01
Target Headroom	Ml/d	1.42	2.50	1.64	2.43	3.08	3.08	2.39	2.39
Supply Demand Balance	Ml/d	0.00	0.00	-3.55	1.01	-4.26	0.00	-0.48	-0.38

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

ADO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Eastern Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Kent Thanet WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	64.92	64.92	53.58	60.87	55.83	55.83	60.87	60.87
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	2.58	2.58
Outage Allowances	Ml/d	3.66	3.62	3.66	3.62	3.66	3.66	3.62	3.62
Process Losses/Operational Use	Ml/d	0.60	0.61	0.60	0.00	0.60	0.60	0.61	0.61
Water Available For Use (own sources)	Ml/d	60.66	61.30	49.32	57.25	51.57	51.57	57.25	57.25
Potable Water Imported	Ml/d	0.01	0.10	0.01	0.10	0.01	0.01	0.10	0.10
Potable Water Exported	Ml/d	1.00	1.33	1.00	1.33	1.00	1.00	2.67	2.67
Total Water Available For Use	Ml/d	59.67	59.46	48.33	55.41	50.58	50.58	51.49	51.49
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	182.97	180.19	185.05	182.96	203.63	203.63	210.63	210.63
Total Properties	000's	89.24	89.73	92.26	91.10	110.67	110.67	112.52	112.52
Distribution Input	Ml/d	47.54	46.39	47.14	45.57	48.79	48.79	44.52	44.52
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	59.67	59.46	48.33	55.41	50.58	54.84	51.49	51.59
Available Headroom	Ml/d	12.13	13.06	1.19	9.84	1.79	6.05	6.97	7.07
Target Headroom	Ml/d	1.42	2.50	1.64	2.43	3.08	3.08	2.39	2.39
Supply Demand Balance	Ml/d	10.71	10.56	-0.45	7.40	-1.30	2.96	4.58	4.68

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

J.3.3 Sussex Hastings WRZ

PDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Eastern Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Sussex Hastings WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	39.69	39.69	47.41	46.35	47.66	47.66	46.60	46.60
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.71	0.00	4.98	4.98	5.93	5.93
Outage Allowances	Ml/d	2.62	3.94	2.62	3.94	2.62	2.62	3.94	3.94
Process Losses/Operational Use	Ml/d	0.38	0.38	0.38	0.00	0.38	0.38	0.38	0.38
Water Available For Use (own sources)	Ml/d	36.69	35.75	43.70	42.41	39.68	39.68	42.41	42.41
Potable Water Imported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40
Potable Water Exported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Water Available For Use	Ml/d	35.09	33.77	35.70	34.03	31.68	31.68	28.35	28.35
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	101.44	101.03	102.10	102.13	110.48	110.48	114.58	114.58
Total Properties	000's	51.56	51.80	53.02	52.53	63.67	63.67	63.85	63.85
Distribution Input	Ml/d	33.25	32.69	32.53	33.44	33.13	33.13	30.80	30.80
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	35.09	33.77	35.70	34.03	31.68	38.68	28.35	30.85
Available Headroom	Ml/d	1.84	1.09	3.17	2.49	-1.45	5.55	-0.92	1.58
Target Headroom	Ml/d	1.29	1.91	1.38	1.90	2.73	2.73	1.53	1.53
Supply Demand Balance	Ml/d	0.54	-0.82	1.79	0.59	-4.18	2.82	-2.45	0.05

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

MDO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Eastern Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Sussex Hastings WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	22.77	22.77	40.76	40.48	40.76	40.76	40.48	40.48
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.68	0.00	4.75	4.75	5.22	5.22
Outage Allowances	Ml/d	1.25	1.62	1.25	1.62	1.25	1.25	1.62	1.62
Process Losses/Operational Use	Ml/d	0.34	0.34	0.34	0.00	0.34	0.34	0.34	0.34
Water Available For Use (own sources)	Ml/d	21.18	21.15	38.49	38.86	34.42	34.42	38.86	38.86
Potable Water Imported	Ml/d	0.00	15.80	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Water Available For Use	Ml/d	28.98	28.61	30.49	30.52	26.42	26.42	25.30	25.30
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	101.44	101.03	102.10	102.13	110.48	110.48	114.58	114.58
Total Properties	000's	51.56	51.80	53.02	52.53	63.67	63.67	63.85	63.85
Distribution Input	Ml/d	26.93	26.69	26.64	25.89	27.50	27.50	24.53	24.53
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	28.98	28.61	30.49	30.52	26.42	33.32	25.30	27.70
Available Headroom	Ml/d	2.05	1.92	3.85	4.62	-1.07	5.83	0.76	3.16
Target Headroom	Ml/d	1.17	1.57	1.26	1.57	2.27	2.27	1.26	1.26
Supply Demand Balance	Ml/d	0.87	0.35	2.60	3.06	-3.35	3.55	-0.50	1.90

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

ADO		Base Year		Start of Planning Period		End of Planning Period			
		2006-07	2007-08	2010-11		2034-35			
Eastern Area	Units	Draft WRMP	Final WRMP	Draft WRMP	Final WRMP	Draft WRMP		Final WRMP	
Sussex Hastings WRZ						Baseline	Final Planning	Baseline	Final Planning
BASIC SUPPLIES BASELINE									
Deployable Output[1]	Ml/d	22.77	22.77	40.93	39.97	40.93	40.93	39.97	39.97
Reductions in Deployable Output[2]	Ml/d	0.00	0.00	0.68	0.00	4.75	4.75	5.22	5.22
Outage Allowances	Ml/d	1.25	1.62	1.25	1.62	1.25	1.25	1.62	1.62
Process Losses/Operational Use	Ml/d	0.34	0.34	0.34	0.00	0.34	0.34	0.34	0.34
Water Available For Use (own sources)	Ml/d	21.18	21.15	38.66	38.35	34.59	34.59	38.35	38.35
Potable Water Imported	Ml/d	0.00	15.80	0.00	0.00	0.00	0.00	0.00	0.00
Potable Water Exported	Ml/d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Water Available For Use	Ml/d	28.98	28.61	30.66	30.01	26.59	26.59	24.79	24.79
POTABLE WATER CUSTOMER USE BASELINE									
Total Population	000's	101.44	101.03	102.10	102.13	110.48	110.48	114.58	114.58
Total Properties	000's	51.56	51.80	53.02	52.53	63.67	63.67	63.85	63.85
Distribution Input	Ml/d	27.33	26.95	27.03	26.14	27.91	27.91	24.77	24.77
SUPPLY DEMAND BALANCE									
Total Water Available For Use	Ml/d	28.98	28.61	30.66	30.01	26.59	33.49	24.79	27.19
Available Headroom	Ml/d	1.65	1.66	3.63	3.87	-1.31	5.59	0.02	2.42
Target Headroom	Ml/d	1.17	1.57	1.26	1.57	2.27	2.27	1.26	1.26
Supply Demand Balance	Ml/d	0.47	0.09	2.37	2.30	-3.59	3.31	-1.24	1.16

Notes: [1] Deployable Output includes AMP5 improvements where relevant by end of planning period;
[2] Reductions in Deployable Output include Sustainability Reductions where relevant and reductions in Deployable Output due to climate change

Appendix K: WILLINGNESS TO PAY

K.1 Willingness to Pay

As part of the formulation of the Strategic Direction Statement, Southern Water commissioned a Willingness to Pay (WTP) survey. The frequency of hosepipe bans was one of the measures investigated in this survey. The following presents a summary of the findings of this survey.

One of the questions asked was related to customers' WTP to increase the current out-turn performance for the introduction of hosepipe bans from up to 8 bans in 20 years (RST) to:

- A reduction in frequency of 5 in 20 years (RST+1); and
- A reduction to 2 in 20 years (RST+2), which is the Southern Water Target Level of Service for the introduction of such restrictions.

The results of the survey are presented in the following tables:

- Willingness to Pay for residential properties;
- Willingness to Pay for residential properties; and
- Summary of Willingness to Pay.

Reference: PR09 Willingness to Pay Survey (eftec) – Final Report 11 April 2008

K.1.1 Willingness to Pay (WTP) Residential Properties

Level of service	**Existing (RST)**	**Enhanced (RST+1)**	**Enhanced (RST+2)**
Frequency of hosepipe bans (n in 20 years)	8	5	2
Mean WTP (£/household/annum)	-	3.00	3.00
No. households	981657	981657	981657
WTP (£m./annum)	-	2.945	2.945
WTP (£m. NPV 25-year @3.5%)	**-**	**51.48**	**51.48**
Sensitivity analysis - Lower bound (95% confidence limit)			
Mean WTP (£/household/annum)	-	1.60	1.60
No. households	981657	981657	981657
WTP (£m./annum)	-	1.57	1.57
WTP (£m. NPV 25-year @3.5%)	-	27.46	27.46
Sensitivity analysis - Upper bound (95% confidence limit)			
Mean WTP (£/household/annum)	-	4.40	4.40
No. households	981657	981657	981657
WTP (£m./annum)	-	4.32	4.32
WTP (£m. NPV 25-year @3.5%)	-	75.51	75.51

K.1.2 Willingness to Pay (WTP) Business Properties

Level of service	Existing (RST)	Enhanced (RST+1)	Enhanced (RST+2)
Frequency of hosepipe bans (n in 20 years)	8	5	2
Mean WTP (% of bill/org)	-	1.1	1.6
No. non-households	60800	60800	60800
Average bill (£/annum)	-	1100	1100
WTP (£m./annum)	-	0.74	1.07
WTP (£m. NPV 25-year @3.5%)	**-**	**12.86**	**18.71**
Sensitivity analysis - Lower bound (95% confidence limit)			
Mean WTP (% of bill/org)	-	0.2	2.1
No. non-households	60800	60800	60800
Average bill (£/annum)	-	1100	1100
WTP (£m./annum)	-	0.13	1.40
WTP (£m. NPV 25-year @3.5%)	-	2.34	24.55
Sensitivity analysis - Upper bound (95% confidence limit)			
Mean WTP (% of bill/org)	-	0.8	2.3
No. non-households	60800	60800	60800
Average bill (£/annum)	-	1100	1100
WTP (£m./annum)	-	0.54	1.54
WTP (£m. NPV 25-year @3.5%)	-	9.35	26.89

K.1.3 Summary of Willingness to Pay (WTP) for Residential and Business Properties

Level of service	Enhanced (RST+1)	Enhanced (RST+1)
Frequency of hosepipe bans (n in 20 years, from 8 in 20 years (RST))	5	2
Mean WTP (£m. NPV 25-year @3.5%)		
Residential	51.48	51.48
Non-households	12.86	18.71
Total	**64.34**	**70.19**
Sensitivity analysis - Lower bound (95% confidence limit)		
Mean WTP (£m. NPV 25-year @3.5%)		
Residential	27.46	27.46
Non-households	2.34	24.55
Total	29.80	52.01
Sensitivity analysis - Upper bound (95% confidence limit)		
Mean WTP (£m. NPV 25-year @3.5%)		
Residential	75.51	75.51
Non-households	9.35	26.89
Total	84.86	102.40