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Water resources planning guideline

February 2003



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WATER RESOURCES PLANNING GUIDELINE

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WATER RESOURCES PLANNING GUIDELINE

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AMENDMENT RECORD

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WATER RESOURCES PLANNING GUIDELINE

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WATER RESOURCES PLANNING GUIDELINE

1. INTRODUCTION

The Water Resources Planning Guideline provides a framework for the development and presentation of water company plans. It will help the water industry show how it intends to maintain the balance between water supply and demand. The planning period is 2002/3 to 2029/30. The plans are used by both the Environment Agency and Ofwat. The Environment Agency evaluates the plans to ensure that companies are making adequate provision for their customers' needs in a way that is environmentally and economically sustainable. Ofwat will use the plans to assess the supply-demand balance and quality enhancement elements of price limits for water companies.

The structured approach taken in this new guideline builds on the version used for the third periodic review of water company prices. The Environment Agency's team has worked closely with Ofwat on the form and content of this version of the guideline. The changes have been informed by discussions with the water industry and its umbrella body, Water UK. The guideline is modular so that as new methods can be incorporated into it as they develop.

Decisions companies make about the contents of their plans need to be based both on company policy and on an assessment of customers' expectations. The plans should set out clearly the basis for these decisions. The Agency and Ofwat expect to work closely with water companies as their plans are developed, and will be happy to address any queries that may arise.

This guideline is also available on the Environment Agency's website at www.environment-agency.gov.uk.

2. INSTRUCTIONS

2.1 Overview

The precise content of a company's plan will depend to some extent on the company's specific characteristics, such as the size of its supply-demand surplus or deficit. While flexibility is essential, a common structure and approach to the preparation of Water Resource Plans is nevertheless needed to allow the Agency to make consistent and comparable assessments of such plans. This structure, as set out in this guideline, should be regarded as the standard framework and basis for the preparation of plans for the Agency. However, company's may extend or develop supporting analyses for presentation with their final plan submission.

The water resources plan is required to enable the Agency to advise Ofwat and the Secretary of State during the Periodic Review process. The plans will also form an essential component of companies' Strategic Business Plans through *Part C4. Supply-Demand Appraisal*. The structure will incorporate a series of data tables providing the information that will allow the Agency and Ofwat to assess the plans and identify strategic water resources issues that may need wider debate.

The Agency expects plans to be based on a sound business planning approach aimed at delivering good value solutions. Water resources plans should draw on, and be consistent with, other key strategic and operational plans currently in place that affect water resources and the supply-demand balance programme. For example, companies will need to consider drought plans, water efficiency plans, the Environment Programme and other agreed changes / risks to licensed abstraction, and other supply-demand balance actions and reporting requirements on companies. Early discussion and agreement with the Agency of approaches, assumptions and key information will be an essential pre-requisite of a successful water resources plan.

Figure 1 illustrates the reporting requirements in the current planning framework, including the periodic review of water prices. The submissions for Ofwat are shown in the context of this process, as are various key planning timescales. While this is the best estimate of the timetable, any future changes will be notified in writing to companies' Regulatory Directors.

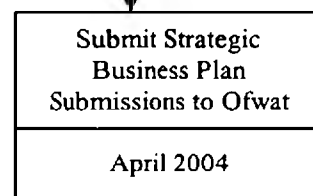
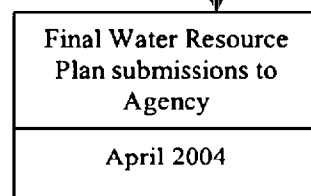
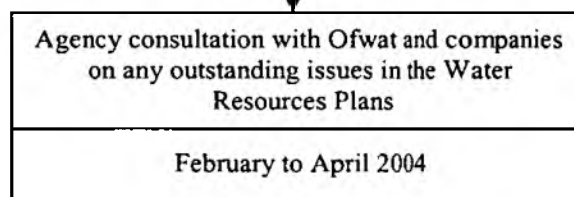
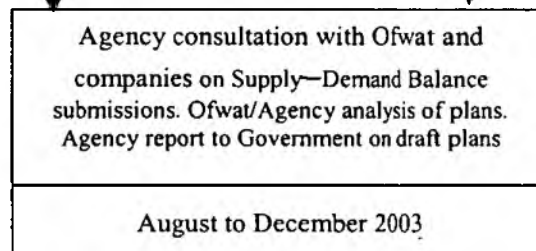
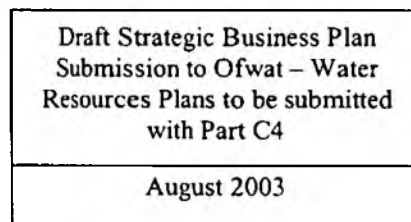
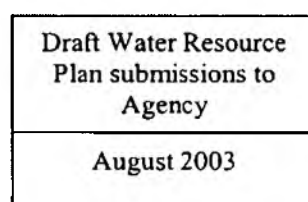
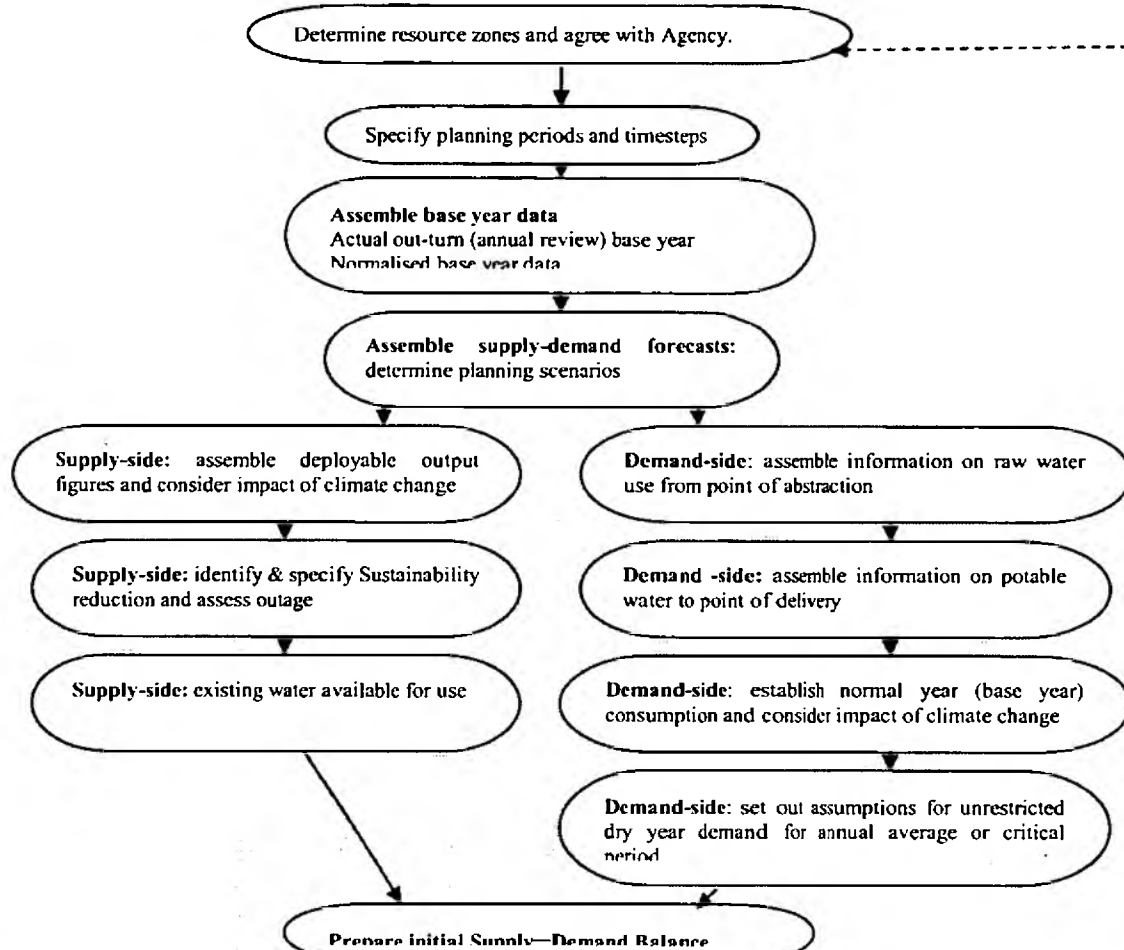
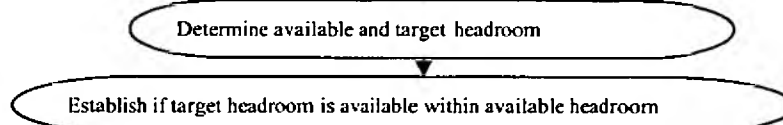


Figure 1 Timetable for development of Draft and Final Water Resources Plans to the Agency and Business Plans to Ofwat

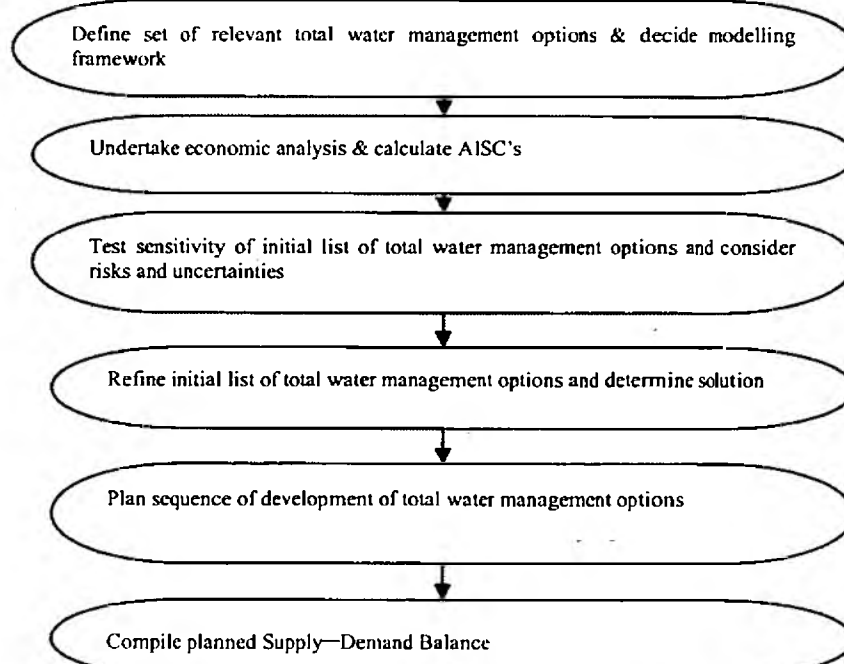
**STAGE 1
ASSEMBLE
BASE YEAR
DATA &
SUPPLY/
DEMAND
FORECASTS**



**STAGE 2
IDENTIFY
PLANNING
PROBLEM**



**STAGE 3
OPTION
SELECTION**



Amend as necessary through consultation with the Agency

WATER RESOURCES PLAN

2.2. Key changes in the guideline

One of the most significant changes in the requirements of companies' Water Resource Plan submissions, reflecting the closer working of Ofwat and the Agency, is a new requirement to report on supply-demand balance and Zonal Investment Programmes (see Table 8 & Chapter 4). Companies must now report on schemes, programme costs and yield at resource zone level (see section 2.6), rather than at company level, as would have been reported in Tables 6 & 7 of the previous (1999) water resources plan.

Another important change to the requirements is the inclusion of the fourth annual review of water resource plans. Inclusion of the annual review provides a basis for companies to report actual out-turn figures for the base year 2002/03, and to explain the derivation of the dry year annual average base year figures.

Other significant changes include:

- a revised format and presentation of the guideline to help guide users.
- a road map of the key steps in the process, with reference to published methodologies.
- a new section outlining water resource plan (WRP) tables and line definitions;

2.3 Approach, key stages and work packages

Figure 2 shows the Agency's conceptual framework for the preparation of a plan. This sets out the required stages of data input, analyses and plan appraisal for a particular scenario at either resource zone or company level.

Figure 2 is intended to be conceptual; in practice there are a number of additional feedbacks and interdependencies that are not fully illustrated. For example, consultation with the Agency is expected to take place throughout the development a draft plan, rather than only at the end of the process.

Table 1 illustrates where text in the guideline refers to the main stages identified in Figure 1. It also illustrates the links to the guidance outlined in *Economics of Balancing Supply and Demand* Report.

Key early stages for discussion with the Agency include identification of:

- resource zones;
- deployable output (DO), outage and so water available for use (WAFU);
- levels of service;
- current and forecast population, housing numbers and occupancy;
- water balance, components of current demand and reconciliation of Maximum Likelihood Estimation (MLE);
- actual out-turn (annual review) base year and normalised base year data for the normal and dry year scenarios, respectively;
- identifying the driving scenario(s), explaining the assumed relationships between annual and seasonal resources, deployable outputs and demand patterns;
- supply-demand scenarios and sensitivity scenarios around them.

The Agency recommends that companies identify "packages" of work, the results of which can be discussed and, as far as possible, agreed with the Agency early in the process of preparing the plan. Inevitably there may be some need for iterative revision, but early and continued dialogue with the Agency should reduce uncertainty in the process and aid agreement of key elements of the plan during its preparation.

Table 1 Water Resource Planning Guideline Roadmap

Water resource planning guideline stage (as per figure 2)	Water resource plan sub processes	Water resource planning guideline – cross reference figure 2 to guideline text, figures and tables Section & Title of Section	Economics of balancing supply & demand guideline stages – cross reference	Economics of balancing supply & demand main report – cross reference
Stage 1: assemble supply–demand forecasts	Determine resource zones and agree with Agency.	Section 2.6: the resource zone as the building block.	Section 1.2: specify geographical areas for analysis Stage 1.3 identify existing capacity for transfers between resource zones	No commentary in main report
Supply-side	Specify planning periods and time steps.	Section 2.7: planning periods and time steps	Stage 1.1 specify the planning period	Chapter 2: forecasting supply and demand and identifying planning problems
	Assemble base year data Actual out-turn (annual review) Base year Normalised base year	Section 2.4 submission format	No specific commentary in the EBSD guideline but briefly covered in stage 1.1	
	Assemble supply–demand forecasts: determine planning scenario's	Section 2.8: identifying the driving supply – demand scenario's Table 3: tables required to support each planning scenario in WRPs	No commentary in the EBSD guideline.	
	Supply-side: assemble deployable output figures and consider impact of climate change	Section 3.1: description of requirements for WRP Table 1 – deployable output of licensed sources Section 5.1.1: deployable outputs – yield assessment Section 5.1.2: Level of Service	Stage 1.5 assemble and present supply forecasts	Chapter 2.4: forming a view of supply
		Section 5.3 & 5.3.1: treatment of climate change – impact on supply	Text box 1.4	Chapter 2.5: identifying critical periods
				Chapter 2.6: detailing prospective failures
				Chapter 5 & 5.1: level of service (security of supply) indicators
				Chapter 3: risk & uncertainty in water resource planning

Water resource planning guideline stage (as per figure 2)	Water resource plan sub processes	Water resource planning guideline – cross reference figure 2 to guideline text, figures and tables Section & Title of Section	Economics of balancing supply & demand guideline stages – cross reference	Economics of balancing supply & demand main report – cross reference
Stage 1 – assemble supply–demand forecasts (continue) Supply-side Demand-side	Identify and specify sustainability reduction	Section 5.1.3: Environment Programme and restoring sustainable abstraction		Chapter 3.2: the sources of risk and uncertainty
	Assess outage	Section 5.1.4: outage		Chapter 3.3: risk and uncertainty in the water industry
	Existing water available for use	Section 3.1 – description of requirements for table WRP 1		Chapter 3.4: modelling uncertainty
	Assemble information on raw water use from point of abstraction	Section 3.2: description of requirements for table WRP 2 – raw water	Stage 1.4 assemble and present demand forecasts	Chapter 2.2: forming a view of demand
	Assemble information on potable water to point of delivery	Section 3.3: description of requirements for table WRP 3 – potable water		Chapter 2.3: the dimensions of demand
	Demand side: refer to each relevant section when undertaking the following: A) Establish normal year (base year) consumption and consider impact of climate change And B) Set out assumptions for unrestricted dry year demand for annual average or critical period	Section 5.2.1 & 5.2.2: demand forecasting overview and methodology		Chapter 2.5: identifying critical periods
		Section 5.2.3: data requirements		Chapter 3: risk and uncertainty in water resource planning
		Section 5.2.4: establishing a base year demand		Chapter 3.2: the sources of risk and uncertainty
		Section 5.2.5: per capita consumption		Chapter 3.3: risk and uncertainty in the water industry
		Section 5.3.2: treatment of climate change – demand side		Chapter 3.4: modelling uncertainty
		Section 5.2.6: leakage levels		
		Section 3.4: description of requirements for table WRP 4 – potable customer base.		

Water resource planning guideline stage (as per figure 2)	Water resource plan sub processes	Water resource planning guideline – cross reference figure 2 to guideline text, figures and tables Section & Title of Section	Economics of balancing supply & demand guideline stages – cross reference	Economics of balancing supply & demand main report – cross reference
Stage 1 – assemble supply–demand forecasts (continue) Demand-side	Demand side: (continued) refer to each relevant section when undertaking the following: A) Establish normal year (base year) consumption and consider impact of climate change And B) Set out assumptions for unrestricted dry year demand for annual average or critical period	Section 3.5: description of requirements for table WRP5 – water delivered. Description of consumption monitors and results; population; housing and occupancy		Chapter 2.2: forming a view of demand
	Prepare initial supply–demand balance	Section 2.8: identifying the driving supply–demand scenario's		
Stage 2 – identify planning problem	Determine available and target headroom	Section 5.4: headroom	Stage 1.6 estimate target headroom	Chapter 4: headroom
		Section 3.8: description of requirements for table WRP9 – s supply–demand balances and headroom		Chapter 4.2: the definition of headroom
	Establish if target headroom is available within available headroom		Stage 2: identify the planning problem	Chapter 4.4: the supply demand balance uncertainties
			Stage 2.1 select the appropriate set of forecasts for analysis	Chapter 2.7: defining the supply–demand balance problem
			Stage 2.2: define the supply–demand balance problem for each resource zone	Chapter 2.7: defining the supply–demand balance problem

Water resource planning guideline stage (as per figure 2)	Water resource plan sub processes	Water resource planning guideline – cross reference figure 2 to guideline text, figures and tables Section & Title of Section	Economics of balancing supply & demand guideline stages – cross reference	Economics of balancing supply & demand main report – cross reference
Stage 2 – Identify planning problem (continued)	Establish if target headroom is available within available headroom (continued)		Stage 2.3 identify the causes and consequences of any supply–demand problems	
			Stage 2.4 specify the constraints on the planning system	
			Stage 2.5 report any supply demand balance problems	
Stage 3 options selection	Define set of relevant total management options	Section 5.6: selection of options and determination of solution	Stage 3: identify an unconstrained options set	Chapter 6: How options contribute to a planning solution
			Stage 3.1: review the general list of options included in the EBSD guidance.	Chapter 6.2: demand management options
		Section 2.10 expected features of the final planning scenario	Stage 3.2 add options that do not appear on the general list	Chapter 6.3: supply-side options
			Stage 3.3 Consult with Regulators to Agree the Unconstrained List	Chapter 6.4: dependencies and indivisibilities
	Undertake economic analysis & calculate AISC's	Section 5.5: economic analysis	Stage 5: quantify all impacts, costs and benefits of options	Chapter 8: differences between the company objectives and social objectives
		Section 5.5.1: Environment Economics	Stage 5.1: Assess the Impact on the Supply Demand Balance	Appendix A: environmental, social and benefits
		Section 3.7: description of requirements for table WRP 7 – total water management options	Stage 5.2: identify environmental and social impacts	
			Stage 5.3 Identify links and dependencies between options	Chapter 6.4: dependencies and indivisibilities
			Stage 5.4: quantify financial costs	Chapter 7: key cost concepts
			Stage 5.5: quantify environmental and social costs and benefits	Chapter 8: differences between the company objectives and social objectives
			Stage 8: calculate AISC's for options	Chapter 8.2: the wedge Between company objectives and social objectives
				Chapter 8.3: achieving a social optimum
				Chapter 7: key cost concepts

Water resource planning guideline stage (as per figure 2)	Water resource plan sub processes	Water resource planning guideline – cross reference figure 2 to guideline text, figures and tables Section & Title of Section	Economics of balancing supply & demand guideline stages – cross reference	Economics of balancing supply & demand main report – cross reference
Stage 3 options selection (continued)	Undertake economic analysis & calculate AISC's (continued)	Section 3.7: description of requirements for table WRP 7 – total water management options (continued)	Stage 8.1: Identify type of AISC that is relevant to the planning problem	Chapter 7.2: Cost Inputs
			Stage 8.2: Collect Cost and Output Data	Chapter 7.3 Cost Measures Used in the Selection Routine
			Stage 8.3: Set the parameters of the AIC calculation	Chapter 7.4: Cost Outputs
			Stage 8.4: Calculate AICs and AISC's	
			Stage 8.5: Consider Calculation Sensitivities	
			Stage 8.6: Report AISCs and AICs	Chapter 10.4: critical period planning
	Test sensitivity of initial list of total management options, considering risks and uncertainties.	Section 2.9: sensitivity testing and development of final planning scenario & section 4.4 headroom	Stage 4.4: Consider reapplying the screening criteria (taking account of cost) and/or rationalising similar schemes	Chapter 3: risk and uncertainty in water resource planning, in particular section 3.3 & 3.4
	Refine initial list of total management options and determine solution.	Section 5.6: selecting the optimum solution	Stage 4: screen the unconstrained options set to identify feasible options	Chapter 6: how options contribute to a planning solution
			Stage 4.1: review the unconstrained options set according to screening criteria	
			Stage 4.2 develop a feasible options set	
			Stage 4.5: report the feasible options set	
			Stage 6: decide on the modelling framework	Chapter 9: modelling and water resource planning
			Stage 6.1 assess the feasibility of collecting the necessary data and applying the frameworks	Chapter 9.2 models and modelling
			Stage 6.2: confirm regulatory support for the chosen framework	Chapter 9.3: the modelling process
			Stage 6.3 select a modelling framework	Chapter 9.4: codifying the supply–demand balance problem and Appendix C

Water resource planning guideline stage (as per figure 2)	Water resource plan sub processes	Water resource planning guideline – cross reference figure 2 to guideline text, figures and tables Section & Title of Section	Economics of balancing supply & demand guideline stages – cross reference	Economics of balancing supply & demand main report – cross reference
Stage 3 options selection (continued)	Refine initial list of total management options and determine solution. (continued)	Section 5.6: selecting the optimum solution (continued)	Stage 7: decide on the selection routine	Chapter 10: selection routines
			Stage 7.1: qualitatively assess the problem complexity	Chapter 10.2: the AISC heuristic
			Stage 7.2: consider the consequences of the chosen modelling framework	Chapter 10.3: linear/integer programming approaches
			Stage 7.3: assess possible selection routines	Chapter 10.5: stochastic programming approach
			Stage 7.4: select an appropriate approach	Chapter 10.6: monte carlo approach
			Stage 7.5: report the basis for selecting the chosen approach	Chapter 11: modelling frameworks
			Stage 9: establish the target level of service or collect willingness to pay data.	Chapter 11.2: the current framework
			Stage 9.1: confirm the reliability data required by the modelling approach	Chapter 11.3: the intermediate framework
			Stage 9.2: specify the target level of service (for the 'current framework' and the 'intermediate framework')	Chapter 11.4: advantages of the intermediate framework
			Stage 9.3: Collect data on Customers Willingness to Pay for the Different Levels of Service (for the 'Advanced Framework')	Chapter 11.5: the advanced framework
			Stage 10 & 10.1: apply the modelling framework and selection routine	Chapter 11.6: the advantages of the advanced framework
			Stage 11: improve the solution by taking account of indivisibilities (for the AISC approach)	Chapter 7.3 cost measures used in the selection routine
			Stage 11.1: review the initial solution and identify large lumpy investments	

Water resource planning guideline stage (as per figure 2)	Water resource plan sub processes	Water resource planning guideline – cross reference figure 2 to guideline text, figures and tables Section & Title of Section	Economics of balancing supply & demand guideline stages – cross reference	Economics of balancing supply & demand main report – cross reference
Stage 3 options selection (continued)	Refine initial list of total management options and determine solution. (Continued)	Section 5.6: selecting the optimum solution (continued)	Stage 11.2: examine yield provided by the initial solution	
			Stage 11.3: check the impact of scheme ordering on the programme NPV	
			Stage 12: consider tariff and demand feedbacks	
			Stage 12.1: review the costs of the working solution	
			Stage 12.2 calculate totals costs over the planning horizon	
			Stage 12.3 collect data on metered customers	
			Stage 12.4: consider the likely impact of the initial solution on tariffs	
			Stage 12.5 re-estimate demand where appropriate	
			Stage 12.6: assess the supply-demand balance in context of the new demand forecast	
			Stage 12.7: determine whether new interactions are required.	
	Plan sequence of development of total management options	Section 3.6: description of requirements for WRP6 – total water management options Section 3.7: description of requirements for WRP Table 7 – total water management options cost and solution	Stage 6.4: report the selection of the modelling framework	

Water resource planning guideline stage (as per figure 2)	Water resource plan sub processes	Water resource planning guideline – cross reference figure 2 to guideline text, figures and tables Section & Title of Section	Economics of balancing supply & demand guideline stages – cross reference	Economics of balancing supply & demand main report – cross reference
Stage 3 options selection (continued)	Compile planned supply-demand balance	Section 3.8: description of requirements for Table WRP 9 – supply-demand balances and headroom	Stage 13: make further allowances for risk, the environment and equity	
			Stage 13.1: identify additional sources of uncertainty	
			Stage 13.2: deal with additional sources of uncertainty	
			Stage 13.3: equity	

2.4 Submission Format

The plan will centre on a series of data tables that illustrate the supply-demand balance and supporting analyses at resource zone and company level, depending upon the nature of the supply system. The WRP tables, supplementary tables (WRPSup) and annual review (AR) table capture the data input and analyses that are implicit in the planning process shown in Figure 2 stages 1–3.

The WRP tables represent the supply-demand balance of the plan, while the supplementary tables provide some of the key supporting information necessary to help the Agency understand and appraise the plan. Companies will report actual out-turn (annual review) base year and normalised base year data in the fourth and fifth column of each WRP table. The AR table summarises the actual out-turn (annual review) figures for 2002/03.

Annexes 2 and 3 provide standard blank WRP tables, an AR table and additional WRP tables. Copies of all of the tables, in Microsoft Excel Version 5.0c, will be available via the Agency's website. This will allow companies to set up links to existing spreadsheets that they may wish to use in preparing their plans. The derivation of certain data is shown both in the tables and associated line definitions where appropriate. Shaded parts of the tables indicate that no data entry is required. With the exception of lines AR1 to AR11 in the AR table, lines 1 to 69 require no data entry as the data for these rows are automatically compiled via links between each relevant WRP table and the AR table.

Companies need to complete nine tables and one supplementary table for each resource zone (see section 2.6) (or company wide if appropriate, see section 2.5) and each planning scenario presented. Do not add to, or delete, any of the reporting lines in the WRP tables. If companies wish to provide further reporting, included this with the main body of the WRP text.

Table 2 below lists the content of each table:

Table 2: WRP tables and Annual Review (AR) table

WRP tables	
WRP 1	Deployable output of licensed sources
WRP 2	Raw water
WRP 3	Potable water to point of delivery
WRP 4	Potable water customer base
WRP 5	Potable water delivered
WRP 6	Total water management options
WRP 7	Total water management option costs and solutions
WRP 8	Supply-demand balance and zonal investment programme – average incremental cost information capture system
WRP 9	Supply-demand balances and headroom
AR table	
WRPAR 04	Reported actual out-turn 2002/03 base year

Each WRP table and the AR table provide a unique row reference for the input data required. This referencing system is intended to assist the Agency and companies in quality assuring the data.

Table 3 shows the tables that are required to support each planning scenario. Only one table WRP 8 is required for each resource zone (see section 2.6), as it includes information for all the planning scenarios presented. Further information on planning scenarios is included in section 2.8.

The presentational details of a full company plan will be for an individual company to determine, but it must incorporate the required tables (see Tables 2 & 3), completed at the appropriate scale (resource zone / company) in support of a comprehensive written report. The plan should develop specific issues relating to its formulation and content and provide commentary and supporting evidence. This information will give the rationale for the planning assumptions used, particularly in relation to the development of the dry year demand forecast.

The first chapter of the report should clearly set out the basis of the derivation of the actual out-turn and normalised base year, with the following elements:-

- describe the derivation of the actual out-turn, setting out clearly which components are measured and which are estimated;
- explain how the company has adjusted water balance components;
- clearly set out the adjustment factors used to derive a normalised base year and describe the method and assumptions used.
- explanation of how the actual out-turn compares to company estimates for a dry year and/or critical period scenario.

2.5 WRP tables and scenarios

Table 3 sets out which scenarios companies should address within their plan. The necessary WRP tables will vary from company to company according to supply-demand circumstances and the planning scenarios required to capture all water resources planning issues.

The “dry year” should be the fundamental basis of the water demand planned for in the water resources plan based on 2002/03 normalised base year figures. All companies should submit two full sets of WRP tables showing their baseline and final planning scenarios for the dry year annual average daily demand, with company assumptions regarding the potential impacts of climate change on water available for use, demand and headroom. Companies should note that WRP1 and WRP9 are consistent to both scenarios and WRP8 relates to the final planning scenario; these need only be submitted once. Supplementary guidance on assumptions and assessment of climate change within plans will be provided by the Agency (see section 5.3). The dry year scenarios should be developed from “normal year” demand forecasts, which should also be reported in the WRP tables. In most cases, it will not be necessary to carry the normal year reporting beyond reporting for WRP5 as this will not be the critical period. Additional supply-demand balance scenarios may also be relevant; for example, in addition to the dry year annual average, critical period scenarios (typically, average day - peak week demand) may need to be explored, including sensitivities within and around them.

TABLE 3: Tables required in support of each planning scenario in the Water Resources Plans.

WRP or WRP Sup reference table number	Water Resource Plan Scenario				
	Normal year annual average unrestricted daily demand (baseline)	Dry year annual average unrestricted daily demand (baseline)	Dry year annual average unrestricted daily demand (final planning)	Dry year critical period unrestricted daily demand (baseline)	Dry year critical period unrestricted daily demand (final planning)
WRP					
1		✓		✓**	
2		✓	✓*	✓**	✓***
3	✓	✓	✓*	✓**	✓***
4	✓	✓	✓*	✓**	✓***
5	✓	✓	✓*	✓**	✓***
6		✓	✓*	✓**	✓***
7		✓	✓*		✓***
9		✓*	✓*		✓***
WRP Sup					
1				✓**	

Footnotes

- * Required if a supply deficit is forecast for the dry year annual average baseline demand
- ** Required if the company is sensitive to critical period.
- *** Required if a supply deficit is forecast for the dry year critical period baseline demand

A number of sensitivity scenarios or a “risk envelope” can be presented in “developing the final planning scenario” (see 2.9). However, the final scenario upon which the plan (and Strategic Business Plan) is based must be clearly identified (including the rationale behind its selection) and should be the main focus of the report.

The full plan should be submitted to the Agency and Ofwat in hard copy format. The WRP tables should also be submitted electronically. Submissions without completed tables will not be regarded as representing a company’s water resources plan. Full instructions for companies’ submissions are set out in the covering letter accompanying this guideline.

Each table should carry the name of the company and the resource zone (see section 2.6) to which it relates. Each set of WRP tables should be identified numerically as representing resource zone x of n within the check boxes provided at the base of each table. For smaller water only companies, or water service companies with a fully integrated supply system, the tables may only need to be completed at company level provided that all water resources planning is carried out at this scale. If the whole company area is one resource zone, then the term “company wide” (rather than the resource zone name) should be entered on the WRP tables.

Minor, discrete non-potable systems should be incorporated into an appropriate potable supply resource zone (see section 2.6) for the purposes of the water resources plan.

Each table presented as part of the plan should be signed off and dated by an appropriate responsible officer within the company. Any tables provided to the Agency during the process of formulating the plan should be dated, marked as "draft" and signed in the box provided. Final tables should be marked "final".

2.6 The resource zone as the building block

For most companies, the forecast at company level should be built up from smaller area forecasts, for which the supply-demand balance can be expressed reliably through the planning period. In most cases this will be at resource zone level. The definition of a resource zone is:

The largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which all customers experience the same risk of supply failure from a resource shortfall.

Companies should identify and agree resource zones at an early stage with the Agency.

The company plan should be built up from a set of WRP tables presented for each resource zone within a company. Tables WRP 6 and 7 are designed to be completed at company level, cross referenced to relevant resource zone supply-demand balance and zonal investment programmes as reported in the new Table 8.

As part of the plan, companies should also submit a map of the company area clearly showing the location of the resource zones used. The map should show any links between resource zones, giving capacities. Likewise the key links within a resource zone and sources, including bulk supplies, transfers and capacities, should be indicated on separate maps.

Companies intending to submit "company wide" plans should agree this in advance with the Agency. Description and evidence of the infrastructure that justifies this will be expected. This will also apply where a company wishes to amalgamate what were previously reported as separate resources zones.

In some situations or to understand particular features, the Agency may request information at sub-resource zone levels, such as water supply zones that may exist within a resource zone.

2.7 Planning period and time steps

The planning period for the plan required by the Agency the same as that used by Ofwat for the current periodic review.

The planning period stipulated by the Agency is 2002/03 to 2029/30. Companies should report yearly data during this period.

The base year for the plan should be 2002/03, the same as that used by Ofwat for the periodic review Strategic Business Plan submission. Accordingly, the demand forecast base year 02/03 should draw on data provided in the 2003 return to Ofwat and be consistent with the actual out-turn data submitted in table AR04. The plan horizon will extend to 2029/30.

Since the timescales are challenging, companies may wish to initiate their planning processes using an earlier base year as an interim measure. This would allow early discussion with the Agency on the approaches being developed in the company's plan. However, the final plan must use the 2002/03 actual out-turn and normalised data as the base year.

2.8 Identifying the driving supply-demand scenario(s)

It is important to develop an early understanding of the investment-driving supply-demand scenarios. In particular, companies should establish whether any critical period (other than dry year annual average) scenarios are likely to be significant in driving investment or operational decisions.

It may be important to consider critical periods where resource zones possess only groundwater or run of river abstractions and limited storage, or where resource zone supply-demand balances are judged to be particularly sensitive to peak demands and where resource management rather than operational measures are required.

A critical period planning scenario can be presented in which the dry year annual average daily demand forecast is replaced with the dry year daily demand forecast for the critical period of the resource zone. The average day peak week (ADPW) is one possible critical period scenario, but other critical periods may be more appropriate.

Companies will need to prepare this critical period scenario in addition to the dry year annual average daily demand scenario, and agree it with the Agency if it is to be a component of the company's chosen final planning scenario, influencing the supply-demand balance solution.

Where a critical period scenario is proposed, the plan should set out and discuss the assumptions behind the critical period demand forecast and the relationship between demands, deployable output (DO), outage and headroom. These relationships should be compared to the equivalent relationships of the dry year, annual average situation. Companies should include a seasonal demand profile or profiles to support this discussion. Companies submitting critical period scenarios within their plans will need to include appropriate explanation of how their preferred strategy will manage, and is influenced by, the annual average and critical period supply – demand conditions.

2.9 Sensitivity testing and developing the final planning scenario

In developing the final plan, companies should consider a range of planning scenarios to test the sensitivity, robustness and flexibility of their preferred strategy in maintaining security of supply in view of the risks and uncertainties within, and outside the final planning scenario.

At its simplest, upper and lower scenarios about a chosen final or best estimate dry year planning scenario should be presented as part of the final plan. These upper and lower limits could be viewed as demonstrating a "risk envelope" against which companies should derive a balanced portfolio of (supply and demand management) options. The UKWIR / Environment Agency report *Economics of balancing supply and demand* provides a number of alternative, more detailed approaches for evaluating more complex supply-demand situations; most companies should be able to use the intermediate methodologies referred to within the report. The choice of approach is for each company to determine. However, we expect the approach

adopted to relate to the size of the perceived supply–demand imbalance, the complexities involved in determining a solution (for example the range of options, zonal connectivity) and the size of the company.

Companies should explore different scenarios of future growth, consumption and demand management before arriving at a single planning forecast for the final plan and Strategic Business Plan. For example, companies will need to assess different assumptions about the pace and type (that is, optional versus selective) of metering or alternative options to further reduce leakage. In developing different growth scenarios companies could consider the risks and opportunities of possible changes in political, social, economic and technological development. Assumptions should be fully described in supporting text.

In evaluating sensitivity, companies will need to consider the phasing of options within their preferred strategy, the requirement for further options, and any consequent impact on costs of the preferred strategy, in addition to the assessment of risk and uncertainty of the individual options, to assess supply-side sensitivity and risks.

Although sensitivity testing is essentially concerned with capturing risk to security of supply in view of uncertainties in available information, companies will be expected to provide robust evidence in support of their assessment of risk. Companies will need to demonstrate that they have taken steps to quantify risk where appropriate, and in so doing reduce the level of uncertainties within proposed strategies. For example, on supply-side options companies' assessments should draw on feasibility studies, experiences elsewhere, pilot schemes etc. On the demand-side, companies' assessments should be supported by customer surveys, consumption monitors, extensive metering of demand (from customer and DMA through to zonal metering) and measures to reduce the reconciliation factors in the water balance.

Whilst companies' final plans should be based on a single planning scenario, the plan should demonstrate how the chosen strategy is robust and flexible to the risks and uncertainties identified.

2.10 Expected features of the final planning scenario

The Agency will expect the final planning scenario to have the following common features:

- assessment of water available for use based on the deployable output determined for the companies proposed level of service. This must allow for licence reduction as required through the implementation of the Environment Programme as identified by the Agency (see Figure 2 and section 5.1.3).
- forecast of average daily water demand for a dry year (as defined in Annex 1).
 - The “baseline” or initial demand forecast should be based on a continuation of current policies regarding demand management. This should assume the swiftest possible achievement of the current target for leakage during the planning period as well as the implementation of the company water efficiency plan, irrespective of any supply surplus. The expected impact of each element of the water efficiency plan in terms of water savings will need to be identified separately within the water resources plan report. The baseline forecast is “unrestricted” insofar as it is the demand for water when no formal restrictions are in place.

- the 'final planning' scenario may be considered "restricted" in that it may incorporate further changes with respect to the baseline scenario deriving from additional demand management policies, and potentially, reflecting alternative levels of service used in the simulation analysis to derive deployable output. The impact of the application of the service level must be specifically identified in the plan.
- to include appropriate allowance for climate change. This is to include an assessment of climate change uncertainty within target headroom and, subject to guidance in 5.3.1 and 5.3.2, an assessment of the potential impacts of climate change on demand and water available for use within each planning scenario presented.
- a "final planning" demand forecast reflecting the implementation of the preferred demand management measures beyond those associated with the continuation of current demand management policies. This forecast should take account of levels of service, full economic analysis and sustainable development principles. Companies' preferred strategies should be supported by diagrammatic presentation of the supply demand balance.
- a well argued, economically and environmentally justified solution to meeting any potential supply-demand deficits and providing a positive contribution towards sustainable development.

2.11 Reporting and supplementary information requirements

Figure 1 sets out the main elements of the plan and periodic review processes and the timetable for reporting. The expected methodological development of the plan and its contents, including supporting information, are set out in chapters 3, 4 and 5.

The plan should be a stand-alone document in its own right that provides a realistic and efficient strategic plan for managing water resources. Companies will be expected to provide robust evidence in their plans in support of their preferred strategy and full details of the assumptions being made in the plan and of supporting information. Companies will need to demonstrate a clear understanding of the performance of their systems, of the key factors affecting their supply-demand balance, and how their preferred plan is both flexible and robust to the various risks and uncertainties, including the potential impacts of climate change.

Essential elements to be included in support of all plans will be:

- (i) Actual out-turn (annual review) base year and normalised base year reporting of data for the normal year and dry year scenarios, respectively.
- (ii) Explanation of adjustment factors, methods, justification and assumptions used to derive the normalised base year.
- (iii) A full update, including revisions, of deployable outputs.
- (iv) Outage calculation and supporting information.
- (v) Population, household and occupancy forecasts.
- (vi) Demand forecasts.
- (vii) Details of consumption monitors and consumption monitoring results.
- (viii) Micro-component (of consumption) data and assumptions.
- (ix) Option description and selection.

- (x) A detailed economic and sustainability appraisal of options.
- (xi) Determination of option/programme solution.
- (xii) Headroom calculation and supporting information.
- (xiii) Further investigation needs.
- (xiv) The necessary WRP tables, on paper and electronically.

Companies are encouraged to make early contact with the Agency to agree a programme of meetings so that most, if not all, of these steps can be agreed at least in part in a timely sequence.

2.12 Public information and consultation

The Agency will use the information in individual submissions to advise the Director General of Water Services, the Welsh Assembly Government and the Secretary of State, on the Agency's views of plans and to develop regional and national strategies for water resources development. The Agency expects water companies to publish, in an appropriate format, their plans or appropriate summaries to demonstrate to the community at large how they intend to take account of their interests. This should include the potential impact of proposed measures to manage their supply-demand balance on the environment. It is expected that increased transparency and openness in the planning process will result in an improved understanding of the issues by the public and non governmental organisations, together with better informed and quicker decisions by the Agency and others.

3. DETAILS OF WATER RESOURCES PLAN TABLES

The following sections describe the details of the tables that will form the principal data annexes to the written company water resources plan submission. Blank tables are provided for use in Annex 2 and copies of the spreadsheets will be available through the Agency's website:

<http://www.environment-agency.gov.uk/subjects/waterres/408371/?version=1>

A full set of WRP tables comprises core tables, labelled WRP.

Definitions of the terms used in the tables are provided in the line definition below, along with references to chapter 5, which outlines the methodologies and techniques that should be followed when producing the entries to the tables. These relate, for example, to deployable output, sustainability reductions, outage, headroom, levels of service, demand forecasting, economic analysis and selection of options and solutions.

3.1 Deployable output of licensed sources (WRP 1 & WRPSup 1)

Table WRP1:

ROW Ref.	DERIVATION	DESCRIPTION	UNITS	Actual 2002-03 Annual Review	Dry Year 2002-03	2003-04.	2026-27	2027-28	2028-29	2029-30
1	Input	Deployable output (specify individual source yields on Table WRP 1 [Annex])	M/d							
2	Input as appropriate	Reduction in deployable output; specify below.	M/d							
			M/d							
			M/d							
			M/d							
			M/d							
3	Input	Outage allowance	M/d							
4	1-(2+3)	Water available for use (own sources)	M/d		0	0	0	0	0	0
5	1-2-3+(9+18)-(7+19)	Total water available for use	M/d		0	0	0	0	0	0

Company:	(enter name here)		
Resource zone name			
Resource zone number:		of	
Planning scenario name:			
Chosen level of service:			
Responsible officer:	Signed:	Dated:	Version: Draft/Final*

* - Delete as appropriate

Table WRPSup 1:

LICENCE NUMBER	SOURCE NAME	SOURCE (GW/SW/RES/CONJ. USE)	TYPE	DEPLOYABLE (MI/d)	OUTPUT	ANNUAL QUANTITY (MI/d)	LICENSED

Company:	(enter name here)		
Resource zone name	_____		
Resource zone number:	_____	of	_____
Planning scenario name:	_____		
Chosen level of service:	_____		
Responsible officer:	Signed:	Dated:	Version: <i>Draft/Final</i>

* - Delete as appropriate

Description

Table WRP 1 concerns deployable output information. The deployable output (DO) figure presented should relate to the company proposed level of service (see section 5.1.2)

In order to allow reconciliation of individual source DO with the overall DO figure for a resource zone, the DO figure for each source in a resource zone should be identified on table WRPSup 1. The DO reported in row 1 of WRP1 should be equal to the total DO for those sources listed in WRPSup1 for the reporting zone, allowing for conjunctive use benefits rather than summing individual source DO for appropriate groupings of sources.

In most cases the DO entered in row 1 should be the same figure for each time step up to 2029/30. Any additional resource given by development options (or improvements to existing sources) is identified in subsequent tables (WRP 6 and WRP 7).

Details of changes in DO (for example, new sources, revocations, and variations) should be highlighted in WRP1Sup 1 and reported in the commentary.

Any reductions in DO required to meet statutory and / or environmental obligations should be specified and identified individually for each resource zone in the rows provided. Further rows can be added if necessary.

Outage in row 3 should be deducted after calculating deployable output. It will apply to the entire resource zone rather than individual sources. Water available for use (WAFU) results from deducting outage from deployable output.

Line definitions

1	Deployable output	MI/d
---	-------------------	------

Definition: The output of a commissioned source or group of *sources* or of bulk supply as constrained by:

- environment
- licence, if applicable
- pumping plant and/or well/aquifer properties
- raw water mains and/or aquifers
- transfer and/or output main
- treatment
- water quality

Processing rules: Input

Methods/Techniques: Deployable output - See section 5.1.1

2	Reductions in deployable output	MI/d
---	---------------------------------	------

Definition: Reductions in *deployable output* required by the Environment Agency to meet statutory and/or environmental obligations

Processing rules: Input as appropriate

Methods/Techniques: Reductions – see section 5.1.3

3	Outage allowance	MI/d
---	------------------	------

Definition: A temporary loss of deployable output. (Note that an outage is temporary in the sense that it is retrievable, and therefore deployable output can be recovered. The period of time for recovery is subject to audit and agreement. If an outage lasts longer than 3 months, analysis of the cause of the problem would be required in order to satisfy the legitimacy of the outage).

Processing rules: Input

Methods/Techniques: Outage allowance – see section 5.1.4

4	Water available for use (Own Sources)	MI/d
---	---------------------------------------	------

Definition: The value of MI/d calculated by the deduction from *deployable output* of allowable *outages* and *sustainability reductions* in a resource zone.

Processing rules: 1-(2+3)

5	Total water available for use	ML/d
---	-------------------------------	------

Definition: The value of ML/d calculated by the deduction from *deployable output* of *sustainability reductions* and *outages*. To this *imports* are added and *exports* deducted (both raw water and potable).

Processing rules: 1-2-3+(9+18)-(7+19)

3.2 Raw water (WRP2)

Table WRP2:

ROW Ref.	DERIVATION	DESCRIPTION	UNITS	Actual 2002-03 Annual Review	Dry Year 2002-03	2003-04....	2026-27	2027-28	2028-29	2029-30
6	Input	Raw water abstracted	ML/d							
7	Input as appropriate	Raw water exported (existing); specify below.								
		To	ML/d							
		To	ML/d							
		To	ML/d							
		To	ML/d							
8	6-7	Raw water retained	ML/d		0	0	0	0	0	0
9	Input as appropriate	Raw water imported (existing); specify below.								
		From	ML/d							
		From	ML/d							
		From	ML/d							
		From	ML/d							
10	8+9	Raw water collected	ML/d		0	0	0	0	0	0
11	Input	Raw water losses	ML/d							
12	Input	Raw water operational use	ML/d							
13	Input as appropriate	Non potable supplies (existing); specify below.								
		To	ML/d							
		To	ML/d							
		To	ML/d							
		To	ML/d							
14	10-11-12-13	Raw water into treatment	ML/d		0	0	0	0	0	0

Company: (enter name here)	
Resource zone name	
Resource zone number:	_____ of _____
Planning scenario name:	
Chosen level of service:	
Responsible officer:	Signed: _____ Dated: _____ Version: <i>Draft/Final*</i>

* - Delete as appropriate

Description

Table WRP 2 concerns information on raw water use from the point of abstraction to the point of production.

Companies should ensure that where elements of "raw water losses" and / or "raw water operational use" reported in WRP2 have been used to derive their estimates of DO, they are clearly reported in their plan or accompanying supporting information.

Existing raw water exports and imports will include both inter- and intra- company transfers since, if the tables are being completed at resource zone level, there may be definable raw water transfers between zones.

For all transfers, the donor and recipient company or resource zone must be clearly indicated in the rows provided. Further rows can be added if necessary.

New raw water transfers (or yet to be agreed increases) should not be shown on this table, but in tables WRP 6 and WRP 7 as part of the Total Water Management options. Imports and exports should therefore be shown as planned transfer per time step where this is within existing physical and operational transfer capacities (and agreed in the case of inter-company transfers) across the planning period. The existing maximum transfer capacity and its limiting factors should be declared and explained in the plan report.

Line definition

6	Raw water abstracted	MI/d
---	----------------------	------

Definition: *Raw Water Abstracted* is taken from the *Point of Chargeable Abstraction**, and together with *Raw Water Imported* less *Raw Water Exported*, constitutes *Raw Water Collected* (UKWIR/NRA (1995) *Demand Forecasting Methodology - Main Report*)

Processing rules: Input

* Defined as: the top of the borehole for a borehole abstraction; the river intake for a river abstraction to direct supply or bankside storage; the draw-off tower for a direct supply reservoir.

7	Raw water exported (existing)	MI/d
---	-------------------------------	------

Definition: *Raw water exported from the forecast geographical area to outside the forecast geographical area.* (UKWIR/NRA (1995) *Demand Forecasting Methodology - Main Report*)

Processing rules: Input

8	Raw water retained	MI/d
---	--------------------	------

Definition: Raw water abstracted minus raw water exported.

Processing rules: 6-7

9	Raw water imported (existing)	MI/d
---	-------------------------------	------

Definition: *Raw water imported from outside the forecast geographical area to the forecast geographical area. (UKWIR/NRA (1995) Demand Forecasting Methodology - Main Report)*

Processing rules: Input

10	Raw water collected	MI/d
----	---------------------	------

Definition: Raw water retained plus raw water imported

Processing rules: 8+9

11	Raw water losses	MI/d
----	------------------	------

Definition: Net loss to the resource system(s) being considered, comprised of mains/aqueduct (pressure system) losses, open channel/low pressure system losses, and losses from break-pressure tanks and small reservoirs. (UKWIR/NRA (1995) Demand Forecasting Methodology - Main Report)

Processing rules: Input

12	Raw water operational use	MI/d
----	---------------------------	------

Definition: Regular washing-out of mains due to sediment build up and poor quality of source water. (UKWIR/NRA (1995) Demand Forecasting Methodology - Main Report)

Processing rules: Input

13	Non potable supplies (existing) MI/d	MI/d
----	--------------------------------------	------

Definition: All non-potable water supplied to supply area.

Processing rules: Input

14	Raw water into treatment	MI/d
----	--------------------------	------

Definition: Raw water into treatment works.

Processing rules: 10-11-12-13

3.3 Potable water to the point of delivery (WRP 3)

Table WRP 3:

ROW Ref.	DERIVATION	DESCRIPTION	UNITS	Actual 2002-03 Annual Review	Dry Year 2002-03	2003-04	2026-27	2027-28	2028-29	2029-30
15	Input	Treatment works losses	M/d							
16	Input	Treatment works operational use	M/d							
17	14-15-16	Potable water produced	M/d		0	0	0	0	0	0
18	Input as appropriate	Potable water imported; specify below.								
		From	M/d							
		From	M/d							
		From	M/d							
		From	M/d							
19	Input as appropriate	Potable water exported; specify below.								
		To	M/d							
		To	M/d							
		To	M/d							
		To	M/d							
20	Input	Distribution input	M/d							
21	Input	Distribution losses	M/d							
22	20-21	Water taken	M/d		0	0	0	0	0	0
23	Input	Distribution system operational use	M/d							
24	22-23	Water delivered	M/d		0	0	0	0	0	0

Company:	(enter name here)		
Resource zone name	<hr/>		
Resource zone number:	<hr/>	of	<hr/>
Planning scenario name:	<hr/>		
Chosen level of service:	<hr/>		
Responsible officer:	Signed:	Dated:	Version: <i>Draft/Final*</i>

* - Delete as appropriate

Description

Table WRP 3 concerns information on potable water use from the point of production to the point of delivery.

Where elements of "treatment works losses" and/or "treatment works operational use" have been used to derive the estimates of DO, companies should clearly report this in their plan or accompanying supporting information.

Existing potable water imports and exports can be both inter and intra company transfers since, if the tables are being completed at resource zone level, there may be definable potable water transfers between resource zones.

For all transfers the donor and recipient company or resource zone must be clearly indicated in the rows provided.

Do not show potable water transfers (or yet to be agreed increases) on this table, but in tables WRP 6 and WRP 7 as part of the total water management options. Imports and exports should be shown as planned transfer per time step where this is within existing physical and operational transfer capacities (and agreed in the case of inter-company transfers) across the planning period. The existing maximum transfer capacity and its limiting factors should be declared and explained in the plan

Line definition

15	Treatment works losses	MI/d
----	------------------------	------

Definition: Made up of structural water loss and both continuous and intermittent over-flows (UKWIR/NRA (1995) *Demand Forecasting Methodology - Main Report*)

Processing rules: Input

16	Treatment works operational use	MI/d
----	---------------------------------	------

Definition: Treatment process water – i.e., net loss that excludes water returned to source water. (UKWIR/NRA (1995) *Demand Forecasting Methodology - Main Report*)

Processing rules: Input

17	Potable water produced	MI/d
----	------------------------	------

Definition: Raw water into treatment less treatment work operational use and treatment work losses. (UKWIR/NRA (1995) *Demand Forecasting Methodology - Main Report*)

Processing rules: 14-15-16

18	Potable water imported	MI/d
----	------------------------	------

Definition: Potable water imports from outside the forecast geographical area to the forecast geographical area. (UKWIR/NRA (1995) *Demand Forecasting Methodology - Main Report*)

Processing rules: Input as appropriate

19	Potable water exported	MI/d
----	------------------------	------

Definition: Potable water from within the forecast geographical area to an area outside the forecast geographical area. (UKWIR/NRA (1995) *Demand Forecasting Methodology - Main Report*)

Processing rules: Input as appropriate

20	Distribution input	MI/d
----	--------------------	------

Definition: The amount of water entering the distribution system at the point of production. (UKWIR/NRA (1995) *Demand Forecasting Methodology - Main Report*)

Processing rules: Input

21	Distribution losses	MI/d
----	---------------------	------

Definition: Made up of losses on trunk mains, service reservoirs, distribution mains and communications pipes. Distribution losses are distribution input less water taken. (UKWIR/NRA (1995) *Demand Forecasting Methodology - Main Report*)

Processing rules: Input

22	Water taken	MI/d
----	-------------	------

Definition: Distribution input minus distribution losses. (UKWIR/NRA (1995) *Demand Forecasting Methodology - Main Report*)

Processing rules: 20-21

23	Distribution system operational use	MI/d
----	-------------------------------------	------

Definition: Water knowingly used by a company to meet its statutory obligations particularly those relating to water quality. Examples include mains flushing and air scouring. (UKWIR/NRA (1995) *Demand Forecasting Methodology - Main Report*)

Processing rules: Input

24	Water delivered	MI/d
----	-----------------	------

Definition: Water delivered to the point of delivery.

Processing rules: 22-23

3.4 Potable water customer base (WRP 4)

Table WRP 4:

ROW Ref.	DERIVATION	DESCRIPTION	UNITS	Actual.. 2002-03 Annual Review	Dry Year 2002-03	2003-04....	2026-27	2027-28	2028-29	2029-30
25	Input	Billed unmeasured household – population	000's							
26	Input	Billed unmeasured household – properties	000's							
27	25/26 (or Input)	Billed unmeasured household - occupancy rate	h/pr							
28	Input	Billed measured household – population	000's							
29	Input	Billed measured household – properties	000's							
30	28/29 (or Input)	Billed measured household – occupancy rate	h/pr							
31	Input	Billed unmeasured non-household – population	000's							
32	Input	Billed unmeasured non-household – properties	000's							
33	31/32 (or Input)	Billed unmeasured non-household - occupancy rate	h/pr							
34	Input	Billed measured non-household – population	000's							
35	Input	Billed measured non-household – properties	000's							
36	34/35 (or Input)	Billed measured non-household - occupancy rate	h/pr							
37	25+28+31+34	Total population	000's							
38	Input	Void households	000's							
39	Input	Void non-households	000's							
40	26+29+32+35+38+39	Total properties	000's		0	0	0	0	0	0

Company: _____		(enter name here)	
Resource zone name		_____	
Resource zone number:		_____ of _____	
Planning scenario name:			
Chosen level of service:			
Responsible officer:	Signed:	Dated:	Version: <i>Draft/Final*</i>

* - Delete as appropriate

Description

Table WRP 4 concerns information on the customer base for potable water demand. The Agency needs the information in order to be able to assess the demand forecasts contained in subsequent tables.

Companies should set out clearly in their plans and any supporting documentation, key supporting data and sources, and details of assumptions being made. Key data sources might include: Office of National Statistics, local authorities, National Survey of English Housing, company billing systems and customer databases, specific customer surveys and consumption monitors.

Companies should clearly indicate which data sources have been used, how their current best estimates have been reconciled and the basis on which their forecasts are made. This is an important early step in the WRP process and should be identified for early discussion and agreement with the Agency.

Billed measured households

Water companies should provide information in support of their assessments of the actual and forecast metered customer base in accordance with the methods set out in the UKWIR/NRA reports on Demand Forecasting Methodology and Forecasting Water Demand Components (see Annex 5) defining industry good practice. Companies should distinguish different groups of measured household according to their water using characteristics (for example, new property, optant, metered due to sprinkler use, etc). The plan should clearly set out the method used, the assumptions and adjustments made regarding their forecasts of changes to the measured base and the impacts on demand.

Where companies are unable to provide this information, they should clearly say so in their plan, providing a clear explanation of the reasons why and a plan of how they intend to move towards the implementation of good practice methods and data collection.

Table WRPSup 2 in Annex 3 provides an example of the type of information companies could provide in support of their plans.

Line definition

25	Billed unmeasured household – population	000's
----	--	-------

Definition: Resident population in billed households supplied with unmeasured water.

Processing rules: Input

26	Billed unmeasured household – properties	000's
----	--	-------

Definition: Average number of households billed for unmeasured water within the supply area.

Processing rules: Input

27	Billed unmeasured household – occupancy rate	H/pr
----	--	------

Definition: Average population per household property supplied with unmeasured water.

Processing rules: 25/26 (or Input)

28	Billed measured household – population	000's
----	--	-------

Definition: Resident population in billed households supplied with measured water.

Processing rules: Input

29	Billed measured household – properties	000's
----	--	-------

Definition: Average number of households billed for measured water within the supply area.

Processing rules: Input

30	Billed measured household - occupancy rate	H/pr
----	--	------

Definition: Average population per household property supplied with measured water.

Processing rules: 28/29 (or Input)

31	Billed unmeasured non-household – population	000's
----	--	-------

Definition: Resident population in billed non-households supplied with unmeasured water.

Processing rules: Input

32	Billed unmeasured non-household – properties	000's
----	--	-------

Definition: Average number of non-households billed for unmeasured water within the supply area.

Processing rules: Input

33	Billed unmeasured non-household – occupancy rate	H/pr
----	--	------

Definition: Average population per non-household property supplied with unmeasured water.

Processing rules: 31/32 (or Input)

34	Billed measured non-household – population	000's
----	--	-------

Definition: Resident population in billed non-households supplied with measured water.

Processing rules: Input

35	Billed measured non-household – properties	000's
----	--	-------

Definition: Average number of non-households billed for measured water within the supply area.

Processing rules: Input

36	Billed measured non-household – occupancy rate	H/pr
----	--	------

Definition: Average population per non-household property supplied with measured water.

Processing rules: 34/35 (or Input)

37	Total population	000's
----	------------------	-------

Definition: The sum of total average household and non-household population.

Processing rules: 25+28+31+34

38	Void households	MI/d
----	-----------------	------

Definition: Average number of household properties, within the supply area, which are connected to the distribution system but do not receive a charge as there are no occupants.

Processing rules: Input

39	Void non-households	MI/d
----	---------------------	------

Definition: Average number of non-household properties, within the supply area, which are connected to the distribution system but do not receive a charge as there are no occupants.

Processing rules: Input

40	Total properties	000's
----	------------------	-------

Definition: The sum of total average household and non-household properties including void properties.

Processing rules: 26+29+32+35+38+39

3.5 Potable water delivery (WRP5)

TABLE WRP 5:

ROW Ref.	DERIVATION	DESCRIPTION	UNITS	Actual 2002-03 Annual Review	Dry Year 2002-03	2003-04...	2027-28	2028-29	2029-30
41	Input	Water taken unbilled	MI/d						
42	24-41	Water delivered billed	MI/d		0	0	0	0	0
43	Input	Water delivered billed unmeasured household	MI/d						
44	Input	Billed unmeasured household - USPL	MI/d						
45	43-44	Billed unmeasured household – consumption	MI/d		0	0	0	0	0
46	$(45 \times 1000000) / (25 \times 1000)$	Billed unmeasured household - PCC	l/h/d						
47	Input	Water delivered billed measured household	MI/d						
48	Input	Billed measured household - USPL	MI/d						
49	47-48	Billed measured household – consumption	MI/d		0	0	0	0	0
50	$(49 \times 1000000) / (28 \times 1000)$	Billed measured household - PCC	l/h/d						
51	Input	Water delivered billed unmeasured non-household	MI/d						
52	Input	Billed unmeasured non-household - USPL	MI/d						
53	Input	Billed unmeasured non-household – consumption	MI/d						
54	Input	Water delivered billed measured non-household	MI/d						
55	Input	Billed measured non-household - USPL	MI/d						
56	Input	Billed measured non -household – consumption	MI/d						
57	Input	Void properties - USPL	MI/d						
58	21+44+48+52+55+57	Total leakage	MI/d		0	0	0	0	0
59	$(58 \times 1000000) / (40 \times 1000)$	Total leakage	l/pr/d						

Company:	(enter name here)		
Resource zone name	_____		
Resource zone number:	_____	of _____	
Planning scenario name:	_____		
Chosen level of service:	_____		
Responsible officer:	Signed:	Dated:	Version: <i>Draft/Final*</i>

* - Delete as appropriate

Description

Table WRP 5 concerns information on the main components of water delivered for unmeasured and measured household and non household properties, including reporting of underground supply pipe losses, total leakage (using distribution losses, Line 21) and consumption.

The reporting of current and future leakage targets (and their components) should be supported by submission C4 Economic Leakage Appraisal of their Strategic Business Plan to OFWAT. Companies will be expected to demonstrate clearly within their plan how their leakage appraisal builds from district metered areas (DMA) source data, to resource zone assessments of economic level of leakage (ELL), and to company level leakage strategy.

Section 5.2 outlines methodologies and techniques for producing demand forecasts.

Household micro component consumption

Water companies should submit a base year demand broken-down into micro-components. UKWIR/EA reports on Demand Forecasting Methodology and Forecasting Water Demand Components recommend the use of micro-component analysis to construct forecasts and examine the impacts of forecast assumptions on drivers of household demand (see Annex 5 for references). All estimates of pcc should be expressed in units of litres/head/day and exclude underground pipe losses. Companies should also clearly set out in their plan, the method used, sources of data (for example, consumption monitors), assumptions and adjustments made. It should also explain how companies assess average occupancy for each category of household demand and its application in driving pcc values.

Where companies are unable to provide this information, they should clearly say so in their plan, providing a clear explanation of the reasons why and a plan of how they intend to move towards the implementation of good practice methods and data collection.

Table WRPSup 3 in Annex 3 provides a suggested format for summarising forecast micro-components.

Non-household demand

In accordance with good practice methods set out in the UKWIR/NRA reports on Demand Forecasting Methodology and Forecasting Water Demand Components (see Annex 5), companies should provide a breakdown of total non-household consumption in support of their base year and forecast assessments. This may follow the two-letter Standard Industrial Classification (SIC (92)) categories published by ONS (1992) or similar alternative. Alternative categorisations should be accompanied by an explanation of what industries / businesses they include and how they relate to SIC (92). Companies should also clearly set out in their plan, the method used, and assumptions and adjustments made regarding the impact on non-household demand.

Categories of non-household use with no appropriate SIC code should be described separately and quantified in terms of number of properties and consumption (Ml/d). This might apply, for example, to a block of flats receiving a single water bill and which is therefore included as non-household use.

Where companies are unable to provide this information, they should clearly say so in their plan, providing a clear explanation of the reasons why and a plan of how they intend to move towards the implementation of good practice methods and data collection.

Table WRPSup 4 in Annex 3 provides an example of the type of information companies would be expected to provide in support of their plans.

Line definition

41	Water taken unbilled	MI/d
----	----------------------	------

Definition: Water taken legally unbilled plus water taken illegally unbilled (UKWIR/NRA (1995) *Demand Forecasting Methodology - Main Report*)

Processing rules: Input

42	Water delivered billed	MI/d
----	------------------------	------

Definition: Water delivered less water taken unbilled. It can be split into unmeasured household, measured household, unmeasured non-household and measured non-households water delivered billed. (UKWIR/NRA (1995) *Demand Forecasting Methodology - Main Report*)

Processing rules: 24-41

43	Water delivered billed unmeasured household	MI/d
----	---	------

Definition: Average volume of water delivered to households billed for unmeasured water within the supply area.
This is to include supply pipe leakage.

Processing rules: Input

44	Billed unmeasured household - USPL	MI/d
----	------------------------------------	------

Definition: Estimated underground supply pipe leakage for households that are supplied with unmeasured water. This figure applies to billed unmeasured households.
Underground supply pipe leakage is any loss of water from the underground supply pipe.

Processing rules: Input

45	Billed unmeasured household – consumption	MI/d
----	---	------

Definition: Estimated consumption of households that are supplied with unmeasured water. This figure applies to billed unmeasured households and excludes underground supply pipe leakage.

Processing rules: 43-44

46	Billed unmeasured household - PCC	l/h/d
----	-----------------------------------	-------

Definition: Estimated per capita consumption of households that are supplied with unmeasured water. This figure applies to billed unmeasured households and excludes underground supply pipe leakage.

Processing rules: $(45 \times 1000000) / (25 \times 1000)$

47	Water delivered billed measured household	MI/d
----	---	------

Definition: Average volume of water delivered to households billed for measured water within the supply area.

Processing rules: This is to include supply pipe leakage.
Input

48	Billed measured household – USPL	MI/d
----	----------------------------------	------

Definition: Estimated underground supply pipe leakage for households that are supplied with measured water. This figure applies to billed measured households.
Underground supply pipe leakage is any loss of water from the underground supply pipe.

Processing rules: Input

49	Billed measured household – consumption	MI/d
----	---	------

Definition: Estimated consumption of households that are supplied with measured water. This figure applies to billed measured households and excludes underground supply pipe leakage.

Processing rules: 47-48

50	Billed measured household – PCC	l/h/d
----	---------------------------------	-------

Definition: Estimated per capita consumption of households that are supplied with measured water. This figure applies to billed measured households and excludes underground supply pipe leakage.

Processing rules: $(49*1000000)/(28*1000)$

51	Water delivered billed unmeasured-non household	MI/d
----	---	------

Definition: Average volume of water delivered to non-households that are supplied with unmeasured water. This is to include supply pipe leakage.

Processing rules: Input

52	Billed unmeasured non-household – USPL	MI/d
----	--	------

Definition: Estimated underground supply pipe leakage for non-households that are supplied with unmeasured water. This figure applies to billed unmeasured households. Underground supply pipe leakage is any loss of water from the underground supply pipe.

Processing rules: Input

53	Billed unmeasured non-household – consumption	MI/d
----	---	------

Definition: Estimated consumption of non-households that are supplied with unmeasured water. This figure applies to billed unmeasured non-households and excludes underground supply pipe leakage.

Processing rules: Input

54	Water delivered billed measured non-household	MI/d
----	---	------

Definition: Average volume of water delivered to non-households that are supplied with measured water. This is to include supply pipe leakage.

Processing rules: Input

55	Billed measured non-household – USPL	MI/d
----	--------------------------------------	------

Definition: Estimated underground supply pipe leakage for non-households that are supplied with unmeasured water. This figure applies to billed measured households.
Underground supply pipe leakage is any loss of water from the underground supply pipe

Processing rules: Input

56	Billed measured non-household – consumption	MI/d
----	---	------

Definition: Estimated consumption of non-households that are supplied with measured water. This figure applies to billed measured non-households and excludes underground supply pipe leakage.

Processing rules: Input

57	Void properties – USPL	MI/d
----	------------------------	------

Definition: Estimated underground supply pipe leakage for void households and non-households. Underground supply pipe leakage is any loss of water from the underground supply pipe.

Processing rules: Input

58	Total leakage	MI/d
----	---------------	------

Definition: The sum of distribution losses underground and supply pipe losses. (UKWIR/NRA (1995) *Demand Forecasting Methodology - Main Report*)

Processing rules: 21+44+48+52+55+57

59	Total leakage	l/prop/d
----	---------------	----------

Definition: The sum of distribution losses underground and supply pipe losses. (UKWIR/NRA (1995) *Demand Forecasting Methodology - Main Report*)

Processing rules: $(58 \times 1000000) / (40 \times 1000)$

3.6 Total water management options (WRP 6)

Table WRP 6:

ROW Ref.	DERIVATION	OPTION DESCRIPTION	OPTION REFERENCE No.	NAME OF RESOURCE ZONE TO BENEFIT	Actual 2002-03 Annual Review	PLANNED GAINS IN WAFU OR SAVINGS IN DEMAND (Mld)							
						Dry Year 2002-03	2003/04	2025/26	2026/27	2027/28	2028/29	2029/30
60	Input as appropriate	Customer-side management, specify below.											
61	Input as appropriate	Distribution-side management, specify below.											
62	Input as appropriate	Production-side management, specify below.											
63	Input as appropriate	Resource management, specify below.											

Company:	(enter name here)		
Resource zone name	<hr/>		
Resource zone number:	<hr/>	of	<hr/>
Planning scenario name:	<hr/>		
Chosen level of service:	<hr/>		
Responsible officer:	Signed:	Dated:	Version: <i>Draft/Final*</i>

* - Delete as appropriate

Description

The plan must consider options available across the full range of "total water management" actions. These include:

- customer side management (policies affecting customer use and supply pipe losses);
- distribution management (policies targeted at activities between distribution and the point of consumption);
- production management (policies targeted at activities between abstraction and distribution input)
- resource management (policies affecting DO, such as new reservoirs or resource transfers).

The list of options should include a reference number to indicate where in the plan a full explanation of that option can be found. Annex 4 outlines the main elements to consider in the appraisal and reporting of options.

Milestones for the design and implementation of each option should be included with a programme for the complete range of options identified in companies' preferred strategies. The table should also show the increase in the WAFU or demand savings as a result of implementing this option and which resource zones it can benefit. Table WRP 6 is a company-level summary that identifies the options taken forward for appraisal as the preferred or best solution. Tables 6 and 7 should be supported by the detailed supply-demand and investment appraisal for options at the resource zone level, as reported in Table 8.

Line definition

60	Customer-side management	MI/d
----	--------------------------	------

Definition: A list of options that affect customer use and supply pipe losses

Processing rules: Input as appropriate

61	Distribution-side management	MI/d
----	------------------------------	------

Definition: A list of options targeted at activities between distribution and the point of consumption

Processing rules: Input as appropriate

62	Production-side management	MI/d
----	----------------------------	------

Definition: A list of options targeted at activities between abstraction and distribution input.

Processing rules: Input as appropriate

63	Resource management	MI/d
----	---------------------	------

Definition: A list of actions that affect deployable output (DO), for example new reservoirs or resource transfers

Processing rules: Input as appropriate

3.7 Total water management option costs & solution (WRP 7)

Table WRP 7:

ROW Ref.	OPTION DESCRIPTION	OPTION REFERENCE No.	NPV of WAFU (M)	CAPEX (EM)	NPC (EM)	OPEX (EM)	NPC OF ANY OPEX SAVINGS (EM)	SOCIAL & ENVIRONMENTAL NPC (EM)	TOTAL NPC (EM)	AISC (p/M3)	RANK OF OPTIONS
64	Customer-side management, specify below.										
65	Distribution-side management, specify below.										
66	Production-side management, specify below.										
67	Resource management, specify below.										

Company: _____
Page: _____ of _____

Planning scenario name: _____

Responsible officer:
Dated: _____

Signed: _____

Version: DRAFT/FINAL*

* - Delete as appropriate

Description

For each of the options listed in WRP 6, an economic analysis should be carried out according to the approach set out in section 5.5, using the central or best estimates of costs and yields. The results should be reported in Table WRP 7, in terms of average incremental social cost (AISC) and effective volume of water; the discounted total volume of water that contributes to the reduction in the supply deficit should be used in calculating AISC and included in the table. Options presented in Table 7 should be ranked, from lowest to highest AISC.

Table WRP 7 is a company level summary, cross referenced to WRP 6, and based on the detailed supply-demand balance and appraisal of options investment required at the resource zone level as reported in Chapter 4 and Table 8. The overall strategy for the company must also solve deficits in each of its individual resource zones. The optimum solution may not necessarily be the combination of the least cost options required to match the supply-demand deficit at the company level. Companies' optimum solution should be:

- in line with industry best practice;
- robust and flexible to the range of risks and uncertainties identified;
- selected to make a positive contribution to sustainable development.

Section 5.5 and 5.6 summarise techniques for appraisal and selection of an optimum solution. An initial assessment should be carried out to identify those options to be taken forward (and those rejected, and why) for more detailed consideration; in accordance with the methodologies referred to in Chapter 5 and following discussion and agreement with the Agency. Whilst there is no desire to be over-prescriptive with regard to demand management measures the Agency would nevertheless expect the following options to be fully considered in the development of a company's preferred or optimum plan and reported in Table WRP 7.

Customer-side management

- metering and tariffs (for different customer types, for example optants, compulsory, etc.);
- the effect of the new water regulations/ market trends;
- retrofit programmes/appliance exchange (waterless urinals, showerheads, toilet displacement bags etc);
- behavioural/ awareness;
- water audits (households and non-households) .

Distribution management

- leakage control (including different components);
- trunk mains leakage;
- leakage/overflows at service reservoirs.

Production management

- reduction in process water losses.
- recycling of water and / or improved treatment technology.

Where the option is listed in WRP 6 it must be cross-referenced to a more detailed explanation / calculation in the supporting text and / or option appraisal (see Annex 4).

Some of the measures listed above have a number of components. This is particularly true of leakage control, when the predicted overall saving is likely to consist of individual contributions from the different components, which are:

- pressure reduction;
- enhanced active leakage control;
- free/subsidised supply pipe repair policy;
- mains replacement.

The separate components of a particular policy should be individually listed (and by resource zone) in Tables WRP 6 & 7. It is important that all options assessed in detail appear in Table WRP 7 (that is, the options should not be limited to those forming part of the total water management solution).

Any savings due to metering are also likely to be a sum of individual components (meter optants, sprinkler owners, new properties, etc.), since demand suppression factors will be different for different classes of customer. Table WRPSup 2 provides one summary for metering categories, but companies should provide a full explanation in their plan. Companies will need to set out clearly their assumptions and information used to support the assessment of different options.

The Agency also encourages water companies to make the case for further investigations of supply-demand options within their water resources plan and in submissions to Ofwat. WRP7 should summarise the cost implications of investigation proposals and the plan should outline any proposed investigations.

Line definition

64	Customer-side management	
----	--------------------------	--

Definition: Customer-side management options cost and solutions

Processing rules: Input

65	Distribution-side management	
----	------------------------------	--

Definition: Distribution-side management options cost and solutions

Processing rules: Input

66	Production-side management	
----	----------------------------	--

Definition: Production-side management options cost and solutions

Processing rules: Input

67	Resource management	
----	---------------------	--

Definition: Resource management options cost and solutions

Processing rules: Input

3.8 Supply-demand balances and headroom (WRP 9)

Table WRP 9:

INITIAL SUPPLY-DEMAND BALANCE											
ROW Ref.	DERIVATION	DESCRIPTION	UNITS	Actual 2002-03 Annual Review	Dry Year 2002-03	2003/04	2025/26	2026/27	2027/28	2028/29	2029/30
68	Input	Surplus/deficit (i.e. available headroom)	MI/d								
69	Input	Assessed target headroom requirement	MI/d								
FINAL PLANNING SUPPLY-DEMAND BALANCE ACCOUNTING FOR TOTAL WATER MANAGEMENT SOLUTION											
ROW Ref.	DERIVATION	DESCRIPTION	UNITS	2002-03 Actual	2002-03	2003/04	2025/26	2026/27	2027/28	2028/29	2029/30
70	Input	Surplus/deficit (i.e. available headroom)	MI/d								
71	Input	Assessed target headroom requirement	MI/d								

Company: _____ (enter name here)	
Resource zone name: _____	
Resource zone number: _____ of _____	
Planning scenario name: _____	
Chosen level of service: _____	
Responsible officer: _____	Signed: _____ Dated: _____ Version: <i>Draft/Final*</i>

* - Delete as appropriate

Description

Table WRP 9 summarises the supply-demand balance situation comparing available and target headroom for the “initial” or baseline situation and for the “final”, preferred or optimum, planning scenario. Supply deficits should be shown as a negative.

The “initial” or baseline scenario should reflect known changes to WAFU (planned and approved changes to abstraction licences) and the continuation of current policies in demand management (including the swiftest possible achievement of the current target for leakage and implementation of companies’ water efficiency plans).

The “final planning” forecast scenario should reflect changes to both supply and demand as a result of the implementation of the company’s preferred or optimum solution. Target headroom for the final scenario should also reflect the implementation of the company’s preferred or optimum solution.

Line definition

68	Surplus-deficit (i.e. available headroom)	MI/d
----	---	------

Definition: Available headroom – the difference (in MI/d) between water available for use (including imported water) and demand at any given point in time

Processing rules: Input

69	Assessed target headroom requirement	MI/d
----	--------------------------------------	------

Definition: Target headroom – the threshold of minimum acceptable headroom that would trigger the need for total water management options to increase *water available for use* or decrease demand.

Processing rules: Input

Methods/techniques: See section 5.4

70	Surplus-deficit (i.e. available headroom)	MI/d
----	---	------

Definition: Available headroom – the difference (in MI/d) between water available for use (including imported water) and demand at any given point in time

Processing rules: Input

71	Assessed target headroom requirement	MI/d
----	--------------------------------------	------

Definition: Target headroom – the threshold of minimum acceptable headroom that would trigger the need for total water management options to increase *water available for use* or decrease demand.

Processing rules: Input

Methods/techniques: See Section 4

3.9 Fourth Annual Review Table - Table WRPAR4

Row Ref	Derivation	WATER BALANCE COMPONENT	Units	Resource Zone:
BASIC RESOURCES				
1	Input (link to WRP1)	Deployable output	MI/d	0.00
3	Input (link to WRP1)	Outage allowance	MI/d	0.00
4	Calculated (link to WRP1)	Water available for use	MI/d	0.00
RAW WATER				
6	Input (link to WRP2)	Raw water abstracted	MI/d	0.00
7	Input (link to WRP2)	Raw water exported	MI/d	0.00
8	Calculated (link to WRP2)	Raw water retained	MI/d	0.00
9	Input (link to WRP2)	Raw water imported	MI/d	0.00
10	Calculated (link to WRP2)	Raw water collected	MI/d	0.00
11	Input (link to WRP2)	Raw water losses	MI/d	0.00
12	Input (link to WRP2)	Raw water operational use	MI/d	0.00
13	Input (link to WRP2)	Non-potable supplies	MI/d	0.00
14	Calculated (link to WRP2)	Raw water into treatment	MI/d	0.00
POTABLE WATER TO POINT OF DELIVERY				
15	Input (link to WRP3)	Treatment works losses	MI/d	0.00
16	Input (link to WRP3)	Treatment works operational use	MI/d	0.00
17	Calculated (link to WRP3)	Potable water produced	MI/d	0.00
18	Input (link to WRP3)	Potable water imports	MI/d	0.00
19	Input (link to WRP3)	Potable water exports	MI/d	0.00
20	Input (link to WRP3)	Distribution input	MI/d	0.00
21	Input (link to WRP3)	Distribution losses	MI/d	0.00
22	Calculated (link to WRP3)	Water taken	MI/d	0.00
23	Input (link to WRP3)	Distribution system operational use	MI/d	0.00
24	Calculated (link to WRP3)	Water delivered	MI/d	0.00
POTABLE WATER CUSTOMER BASE				
25	Input (link to WRP4)	Unmeasured household – population	000's	0.00
26	Input (link to WRP4)	Unmeasured household – properties	000's	0.00
27	Calculated (link to WRP4)	Unmeasured household – occupancy rate	h/pr	#DIV/0!
28	Input (link to WRP4)	Measured household – population	000's	0.00
29	Input (link to WRP4)	Measured household – properties	000's	0.00
30	Calculated (link to WRP4)	Measured household – occupancy rate	h/pr	#DIV/0!
31	Input (link to WRP4)	Unmeasured non-household population	000's	0.00
32	Input (link to WRP4)	Unmeasured non-household – properties	000's	0.00
34	Input (link to WRP4)	Measured non-household – population	000's	0.00
35	Input (link to WRP4)	Measured non-household – properties	000's	0.00
37	Calculated (link to WRP4)	Total population	000's	0.00
38	Input (link to WRP4)	Void household – properties	000's	0.00
39	Input (link to WRP4)	Void non-households – properties	000's	0.00
40	Calculated (link to WRP4)	Total properties	000's	0.00
POTABLE WATER DELIVERED				
41	Calculated (link to WRP5)	Water taken unbilled	MI/d	0.00
42	Calculated (link to WRP5)	Water delivered billed	MI/d	0.00
43	Input (link to WRP5)	Unmeasured household water delivered	MI/d	0.00
44	Input (link to WRP5)	Unmeasured household – USPL	MI/d	0.00
45	Calculate (link to WRP5)	Unmeasured household – consumption	MI/d	0.00
46	Calculate (link to WRP5)	Unmeasured household – PCC	l/h/d	#DIV/0!
47	Input (link to WRP5)	Measured household water delivered	MI/d	0.00
48	Input (link to WRP5)	Measured household – USPL	MI/d	0.00
49	Calculate (link to WRP5)	Measured household – consumption	MI/d	0.00
50	Calculate (link to WRP5)	Measured household – PCC	l/h/d	#DIV/0!
51	Input (link to WRP5)	Unmeasured non-household water delivered	MI/d	0.00
52	Input (link to WRP5)	Unmeasured non-household – USPL	MI/d	0.00
53	Calculate (link to WRP5)	Unmeasured non-household – consumption	MI/d	0.00
54	Input (link to WRP5)	Measured non-household water delivered	MI/d	0.00
55	Input (link to WRP5)	Measured non-household – USPL	MI/d	0.00
56	Calculate (link to WRP5)	Measured non-household – consumption	MI/d	0.00
57	Input (link to WRP5)	Void properties – USPL	MI/d	0.00
LEAKAGE				
58	Calculate (link to WRP5)	Total leakage	MI/d	0.00
59	Calculate (link to WRP5)	Total leakage	l/prop/d	#DIV/0!
AR1	Input	Total leakage in m ³ / km of mains/ day	m ³ /d	
AR2	Input	Number of bursts/1000km	Nr	
AR3	Input	Number of DMAs	Nr	
AR4	Input	Average zonal night pressure (AZNP)	m	
AR5	Input	Background leakage	MI/d	

AR6	Input	Length of trunk mains	km	
AR7	Input	Length of distribution mains	km	
AR8	Input	Average length of supply pipe	m	
AR9	Input	Number of connected properties	000's	
AR10	Input	Hour/day factor	Nr	
AR11	Input	Number of connections	Nr	
SUPPLY DEMAND BALANCE				
68	Input (link to WRP9)	Available headroom	M/d	0.00
69	Input (link to WRP9)	Target headroom	M/d	0.00

Description

Table WRPAR4 concerns the actual out-turn (annual review) figures for 2002/03 and additional rows on detailed leakage components.

Companies should note that rows 1 to 69 **do not** require data input. Data in these rows will be automatically compiled via links between the WRP and AR table.

Data input is **required** in rows AR1 and AR11 in support of information in table WRP5 and should be consistent with companies C4 Economic Leakage Appraisal.

Line definition

AR1	Total leakage	m ³ /km/d
-----	---------------	----------------------

Definition: The sum of distribution losses underground and supply pipe losses per Km of main per day.

Processing rules: Input field

AR2	Number of bursts/1000km	Nr
-----	-------------------------	----

Definition: Mains bursts include all physical repair work to mains from which water is lost which is attributable to pipes, fittings, or joint material failures or movement, or caused or deemed to be caused by conditions or original pipe laying or subsequent changes in ground conditions (such as changes to a road formation, loading, etc where the costs of repair cannot be recovered from a third party). Include ferrule failures that are attributable to mains material condition or local ground movements, but not incidents of ferrule failure due to ferrule materials or poor workmanship, or associated with the communication pipe connection.

Exclude maintenance work on valve packing, hydrant seals, air valves etc. For the avoidance of doubt, all leakage occurring at locations or through joint or material failures which would have been designed for the life of the main (irrespective of whether earlier failure occurs) should be regarded as mains bursts. Failure of consumable or maintainable items (valve packing etc) should be classified as leakage. Also include incidents of over-pressure or pressure cycling, and surge failures etc. which reflect the system operating conditions, even where these failures are accidental rather than associated with weaknesses in pipe condition.

All third party damage should be excluded where costs are potentially (rather than actually) recovered from a third party. If these incidents are significant they should be reported in the commentaries.

Processing rules: Input field

AR3	Number of DMAs	Nr
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Definition:

District Metered Areas are hydraulically secure zones with permanent boundaries defined by either closed valves or other physical constraint and where all inflows and outflows are metered for the purpose of assessing leakage.

Processing Rules: Input Field

AR4	Average zonal night pressure (AZNP)	m
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Definition:

The night pressure in a managed area that is either calculated or measured at a surrogate point and deemed to be the average of all night pressures in a demand management area

Processing Rules: Input Field

AR5	Background leakage	MI/d
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Definition:

The sum of numerous minor leaks and seepage from valves, joints, hydrants, stop-taps, meters and boundary boxes on mains and service pipes; and from dripping taps and overflows from cisterns and roof tanks. Background leaks rarely exceed 100 l/hr (at 50m pressure). (Managing Leakage, Report E, 1994 and UKWIR Report97/WM/08/10).

Processing rules: Input field

AR6	Length of trunk mains	Km
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Definition:

Total length of trunk mains, potable water.

Processing rules: Input

AR7	Length of distribution mains	Km
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Definition:

Total length of distribution mains, potable water.

Processing rules: Input

AR8	Average length of supply pipe	Km
-----	-------------------------------	----

Definition:

Average length of supply pipe (that length of the service pipe for which customers are responsible, excluding the communication pipe).

Processing rules: Input

AR9	Number of connected properties	000's
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Definition:

The total number of properties (household and non-household) connected to the water supply distribution system. This must include properties which are connected but not billed (for example, temporarily unoccupied / voids) but should exclude properties which have been permanently disconnected.

A group of properties supplied by a single connection should be counted as

several properties. They should only be treated as a single property if a single bill covers the whole property.

Processing rules: Input

AR10	Hour/day factor	Nr
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Definition: The ratio of average pressure and average zone night pressure over a 24 hour period, expressed in hours. Assuming an approximately linear relationship between pressure and leakage, daily leakage can be calculated by multiplying the minimum night flow by the hour to day factor.

Processing rules: Input

AR11	Number of connections	000's
------	-----------------------	-------

Definition: The total number of connections (household and non-household) to the water supply distribution system.

Processing rules: Input

4 SUPPLY-DEMAND BALANCE ZONAL INVESTMENT PROGRAMME - AVERAGE INCREMENTAL COST INFORMATION CAPTURE SYSTEM

Table WRP 8:

SUPPLY-DEMAND BALANCE - ZONAL INVESTMENT PROGRAMME

Line no	Units	NOTE: shaded cells are calculated fields																									
5		Company																									
6		Resource zone																									
7		Level of service (freq. hosepipe ban)																									
8																											
9		Discount rate (%)																									
10																											
11		Year	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
12		BASE DRY YEAR ANNUAL AVERAGE PLANNING SCENARIO																									
13	MI/d	Present policy demand																									
14	MI/d	Present policy leakage																									
15	MI/d	Target headroom																									
16	MI/d	Base WAFU																									
17	MI/d	Reductions in output imposed by EA																									
18	MI/d	Reductions in output to meet other statutory obligations																									
19	MI/d	Base supply-demand balance																									
20		CUMULATIVE IMPACT OF SDB INTERVENTIONS ON DRY YEAR ANNUAL AVERAGE SCENARIO																									
21	MI/d	Change in demand																									
22	MI/d	Change in leakage																									
23	MI/d	Change in WAFU																									
24		PLANNED DRY YEAR ANNUAL AVERAGE SUPPLY/DEMAND BALANCE																									
25	MI/d	Demand (managed)																									
26	MI/d	Economic level of leakage																									
27	MI/d	Target headroom																									
28	MI/d	Planned WAFU																									
29	MI/d	Planned supply/demand balance																									

		2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
30		BASE CRITICAL PERIOD PLANNING SCENARIO																								
31	MI/d	Present policy critical period demand																								
32	MI/d	Base critical period WAFU																								
33	MI/d	Reductions in output imposed by EA																								
34	MI/d	Reductions in output to meet other statutory obligations																								
35	MI/d	Base critical period supply-demand balance																								
36		CUMULATIVE IMPACT OF SDB INTERVENTIONS ON CRITICAL PERIOD SCENARIO																								
37	MI/d	Change in demand																								
38	MI/d	Change in leakage																								
39	MI/d	Change in WAFU																								
40		CRITICAL PERIOD ASSUMPTIONS																								
41	days	Critical period plan duration																								
42	nr	Average utilisation of incremental capacity available during critical period plan duration																								
43	MI	Average annual volume impact of planned critical period plan interventions																								
44		PLANNED CRITICAL PERIOD SUPPLY-DEMAND BALANCE																								
45	MI/d	Critical period Demand (managed)																								
46	MI/d	Planned critical period WAFU																								
47	MI/d	Planned critical period supply-demand balance																								
48		CUMULATIVE IMPACT OF SDB INTERVENTIONS ON NORMAL YEAR ANNUAL AVERAGE SCENARIO																								
49	MI/d	Demand management																								
50	MI/d	Cumulative increase in water usage																								
51	MI/d	Supply interventions in response to reduction in output																								
52																										

Supply-Demand Balance Zonal Investment Programme – AIC estimation:

Description

Table WRP8 is intended to summarise the selected supply/demand balance investment programme for each water resource zone. It captures financial cost and presents these on an annuitised basis by year, alongside details of the changes in the supply-demand balance secured by the selected supply side and demand side interventions.

If companies do not plan any interventions in a given zone throughout the entire planning period, they should present an estimate of average incremental cost based on the NPV of costs associated with a small permanent stepped reduction in leakage for that zone. This should be consistent with their appraisal of leakage costs as presented in their economic level of leakage analysis. Companies should also highlight any anomalies introduced in the calculation of AIC by the projection of future declines in demand from customers.

Line definitions

Base dry year annual average planning scenario

O13	Present policy dry year demand	MI/d
-----	--------------------------------	------

Full line title:

Present policy dry year annual average daily zonal demand. This line is made up of billed consumption (excluding supply pipe leakage), meter under registration, operational use and water taken unbilled (legally and illegally). Companies should assume that consumption is unconstrained by efficient use of water schemes that have been identified as part of the optimum solution to balance supply and demand. Companies should include the impact on demand of water efficiency activity carried out in exercising the duty to promote the efficient use of water by customers in their forecasts. The expected impact on demand of a passive/reactive approach to metering should be included in the demand forecast; the impact of a proactive approach, identified as a cost effective means of balancing supply and demand, should not. Present policy demand should be after any reconciliation of components using maximum likelihood estimation (MLE). Companies should indicate in their commentaries the impact of climate change on their demand forecasts

Definition:

Average zonal volumes of

- Measured household water consumption (MI/d). This is to include meter under-registration but exclude supply pipe leakage. (Amendments may be necessary to take account of billing periods different to the report year and meter under-registration).
- Measured non-household water consumption (MI/d). This is to include meter under-registration but exclude supply pipe leakage. (Amendments may be necessary to take account of billing periods different to the report year and meter under-registration).
- Billed unmeasured household consumption (MI/d). This is to exclude supply pipe leakage.
- Billed unmeasured non-household consumption (MI/d). Estimated average volume of water consumed by unmeasured non-households. This is to exclude supply pipe leakage.
- Distribution system operational use (MI/d). Water knowingly used by company to meet its statutory obligations, particularly those relating to water quality. This includes, amongst other things, service reservoir cleaning, mains flushing/air scouring, swabbing, draining networks, discharges to control pH or other chemical parameters.

- Water taken unbilled (MI/d). Water taken legally unbilled: this should include all water supplied to customers for legitimate purposes that is unbilled. It should not have been included in the breakdown of billed customers' consumption. It can include public supplies for which no charge is made (some sewer flushing etc), uncharged church supplies, fire training and fire-fighting supplies where these are not charged irrespective of whether or not they are metered. Illegally taken water should only be included if it is based on actual occurrences using sound and auditable identification and recording procedures. If not, it should be classified as distribution losses in the present policy leakage estimate (line 14). The water taken unbilled estimate should exclude void property supply pipe leakage.

Processing rules: Input field.

O14	Present policy leakage	MI/d
-----	------------------------	------

Full line title: Present policy zonal leakage.

Definition: Estimated zonal total leakage. Companies should assume that the sum of base year leakage for each zone is the company target for that base year where Ofwat has accepted the company's economic level of leakage appraisal as robust or where not, the targets that Ofwat has set. The leakage estimate should include:

- distribution losses representing the losses on the company's potable water distribution system including potable water losses from service reservoirs and trunk mains; and
- supply pipe leakage (this is to include void property supply pipe leakage).

Processing rules: Input field for the base year (2002-03) – calculated field for years 2003-04 to 2026-27 (held at 2002-03 levels).

O15	Target headroom – Baseline	MI/d
-----	----------------------------	------

Full line title: Target zonal headroom for company's planned level of service – Baseline scenario.

Definition: The threshold or minimum acceptable headroom which, under the planning conditions assumed for the forecast of dry year demand, would trigger the need for the introduction of those water management activities (from source to end use) that would result in an increase in water available for use or a decrease in demand (including leakage). The target headroom may have regard to the methodology given in the UKWIR research project *Converting Uncertainty into Headroom*.

Processing rules: Input field. Equivalent to Line 67 of WRP9 for the resource zone.

O16	Base water available for use	MI/d
-----	------------------------------	------

Full line title: Base dry year annual average daily zonal water available for use.

Definition: Zonal water available for use is defined as the deployable output (excluding process losses) plus bulk supply imports, less bulk supply exports and less reductions made for outage allowance. Where:

- the deployable output for groundwater sources is defined as: the output for specified conditions and demands of a commissioned source or group of sources as constrained by: licensed quantities; water quantity; environment (constraints in licence); treatment; raw water mains and/or aqueducts; pumping plant; transfer and/or output main; well construction; aquifer properties.
- the deployable output for surface water systems, is defined as: the constant rate of supply that can be maintained from the water resources system except during periods of restriction within the following constraints: given level of service; the historic period for which data is available or could be derived; supply without storage entering the emergency storage zone; supply within the defined physical capacities of the existing system adopted for the simulation; source operation in accordance with the licence, or, for specified scenarios, a Drought Order or Permit.

- Bulk supply imports – existing available volume of water imported from other companies in bulk supplies by the appointed business or from other zones of the appointee. Include treated imports and untreated imports, which are treated by the appointed business, but exclude non-potable supplies.
- Bulk supply exports – existing potential volume of water exported to other companies in bulk supplies by the appointed business or to other zones of the appointee. Include treated exports and untreated exports, which are treated by the appointed business, but exclude non-potable supplies.

Base water available for use is the WAFU available at the start of the planning period. Companies should explain the basis for any reductions in WAFU over the period i.e. through climate change. Companies should note in their commentaries if they are unable to calculate average dry year WAFU where sources are dependent on short term varying hydrology. In these cases companies should comment whether minimum drought output has been used rather than average drought output.

Processing rules: Input field. Equivalent to Line 5 of WRP1 for the resource zone.

O17	Reductions in output imposed by the EA	MI/d
-----	--	------

Full line title: Cumulative reduction in output imposed by the Environment Agency
Definition: The cumulative reduction in zonal deployable output that results from licence reductions imposed by the Environment Agency. This should also include expiry of time limited licences.
Processing rules: Input field. Values should be entered as a negative

O18	Reductions in output to meet other statutory obligations	MI/d
-----	--	------

Full line title: Cumulative reduction in output to meet other statutory obligations.
Definition: The cumulative reduction in zonal deployable output that results from the need to meet other statutory obligations, such as a new water quality standard or to deal with deteriorating raw water quality.
Processing rules: Input field. Values should be entered as a negative.

O19	Base dry year supply/demand balance	MI/d
-----	-------------------------------------	------

Full line title: Base dry year zonal supply demand balance.
Definition: The dry year supply/demand balance that results prior to water company interventions on WAFU, leakage or demand management
Processing rules: Calculated field the sum of line 16 plus line 17 plus line 18 less lines 13, 14 and 15. Equivalent to Line 66 of WRP9 for the resource zone.

Cumulative impact of SDB interventions on dry year annual average scenario

Companies should report the cumulative impacts of demand, leakage and WAFU initiatives that result from their optimum policy mix to balance supply and demand.

O21	Change in demand	MI/d
-----	------------------	------

Full line title: Cumulative impact of demand interventions on zonal dry year Annual Average Scenario - Change in demand

Definition: The changes to zonal demand arising from company interventions i.e. as a result of companies' water efficiency strategies reducing customers' consumption. Companies will identify strategies to generate the least cost solution to addressing supply/demand imbalances. Companies should not include changes to supply pipe leakage. Companies should not include expected demand reductions arising from a passive approach to optional metering. This should already be incorporated in line 13. Companies should include expected demand reductions attributable to pro-activity on metering if this forms part of the least cost strategy. Companies should also include the growth in demand that it has to meet

Processing rules: Input field. Values should be entered as a negative.

O22	Change in leakage	MI/d
-----	-------------------	------

Full line title: Cumulative impact of leakage interventions on zonal dry year Annual Average Scenario - Change in leakage

Definition: The changes to zonal leakage (both customer supply pipe leakage and distribution losses) arising from company interventions. The reductions recorded should accord with companies' economic levels of leakage appraisals submitted to Ofwat as part of their Business Plans.

Processing rules: Input field. Values should be entered as a negative.

O23	Change in WAFU	MI/d
-----	----------------	------

Full line title: Cumulative impact of supply side interventions on zonal dry year Annual Average Scenario - Change in WAFU

Definition: The changes to zonal WAFU arising from company interventions. Companies should be able to demonstrate that the measures to increase WAFU are economic and have been incorporated into the least cost solution to balance supply and demand.

Processing rules: Input field. Values should be entered as a positive.

Planned annual average supply/demand balance

O25	Demand (managed)	MI/d
-----	------------------	------

Full line title: Planned dry year annual average managed zonal demand

Definition: Dry year annual average zonal demand constrained by efficient use of water and other demand management initiatives and/or reduction in consumption attributable to company's pro-activity on metering where this represents part of the company's least cost solution to balancing supply and demand.

Processing rules: Calculated field (Line 13 plus Line 21)

O26	Economic level of leakage	MI/d
-----	---------------------------	------

Full line title: Economic level of leakage

Definition: Company's zonal economic levels of leakage profiles. This should be consistent with companies' economic levels of leakage appraisals provided to Ofwat in their Business Plans. Companies should report total leakage levels consistent with their June Return methodology

Processing rules: Calculated field (Line 14 plus Line 22)

O27	Target headroom - Final Plan	MI/d
-----	------------------------------	------

Full line title: Target headroom - for the final planning scenario of the WRP.

Definition: The threshold or minimum acceptable zonal headroom which, under the conditions assumed for the forecast of dry year annual average demand, would trigger the need for the introduction of water management activities (from source to end use) that would increase the supply/demand balance. The target headroom may have regard to the methodology given in the UKWIR research project *Converting Uncertainty into Headroom*. Companies should provide details and justification where an alternative has been used

Processing rules: Calculated field (equivalent to line 15). Equivalent to Line 69 of WRP9 for the resource zone.

O28	Planned water available for use	MI/d
-----	---------------------------------	------

Full line title: Planned dry year annual average zonal water available for use.

Definition: Zonal water available for use after company interventions on WAFU.

Processing rules: Calculated field (Line 16 plus Line 17 plus line 18 plus line 23)

O29	Planned supply/demand balance	MI/d
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Full line title: Planned dry year annual average zonal supply demand balance

Definition: The zonal supply/demand balance that results after water companies' interventions to balance supply and demand. Companies' interventions should have been considered within an economic framework to generate the least cost solution to addressing supply/demand imbalances.

Processing rules: Calculated field (line 28 minus line 27 minus line 26 minus line 25). Equivalent to Line 68 of WRP9 for the resource zone.

Base critical period planning scenario

O31	Present policy critical period demand	MI/d
-----	---------------------------------------	------

Full line title: Present policy average daily zonal demand over the company's critical period. Companies should indicate in commentary the timing and duration of their critical or peak periods. This line is made up of billed consumption (excluding supply pipe leakage), meter under registration, operational use and water taken unbilled (legally and illegally). The expected impact on demand of a passive/reactive approach to optional metering should be included in the demand forecast; the impact of a proactive approach should not. Present policy demand should be after any reconciliation of components using maximum likelihood estimation (MLE).

Definition: Average volumes of

- Measured household water consumption (MI/d). This is to include meter under-registration but exclude supply pipe leakage (Amendments may be necessary to take account of billing periods different to the report year and meter under-registration)
- Measured non-household water consumption (MI/d). This is to include meter under-registration but exclude supply pipe leakage. (Amendments may be necessary to take account of billing periods different to the report year and meter under-registration)
- Billed unmeasured household consumption (MI/d). This is to exclude supply pipe leakage.
- Billed unmeasured non-household consumption (MI/d). Estimated average volume of water consumed by unmeasured non-households. This is to exclude supply pipe leakage.

- Distribution system operational use (MI/d). water knowingly used by company to meet its statutory obligations, particularly those relating to water quality. This includes, amongst other things, service reservoir cleaning, mains flushing/air scouring, swabbing, draining networks, discharges to control pH or other chemical parameters.
- Water taken unbilled (MI/d). Water taken legally unbilled: this should include all water supplied to customers for legitimate purposes, which is unbilled. It should not have been included in the breakdown of billed customers' consumption. It can include public supplies for which no charge is made (some sewer flushing etc), uncharged church supplies, fire training and fire-fighting supplies where these are not charged irrespective of whether or not they are metered. Illegally taken water should only be included if it is based on actual occurrences using sound and auditable identification and recording procedures. If not it should be classified as distribution losses in the present policy leakage estimate. Water taken unbilled should exclude void property supply pipe leakage.

Processing rules: Input field.

O32	Base critical period WAFU	MI/d
-----	---------------------------	------

Full line title: Base critical period average daily zonal water available for use.

Definition: Company wide water available for use over the peak period is defined as the deployable output (excluding process losses) plus bulk supply imports, less bulk supply exports and less reductions made for outage allowance. Where:

- The deployable output for groundwater sources, the deployable output is defined as: The output for specified conditions and demands of a commissioned source or group of sources as constrained by: licensed quantities; water quantity; environment (constraints in licence); treatment; raw water mains and/or aqueducts; pumping plant; transfer and/or output main; well construction; aquifer properties.
- The deployable output for surface water systems, the deployable output is defined as: the constant rate of supply that can be maintained from the water resources system except during periods of restriction within the following constraints: given level of service; the historic period for which data is available or could be derived; supply without storage entering the emergency storage zone; supply within the defined physical capacities of the existing system adopted for the simulation; source operation in accordance with the licence, or, for specified scenarios, a Drought Order or Permit.
- Bulk supply imports – existing available volume of water imported from other companies in bulk supplies by the appointed business or from other zones of the appointee. Include treated imports and untreated imports, which are treated by the appointed business, but exclude non-potable supplies.
- Bulk supply exports – existing potential volume of water exported to other companies in bulk supplies by the appointed business or to other zones of the appointee. Include treated exports and untreated exports, which are treated by the appointed business, but exclude non-potable supplies.
- Base Water available for use is the WAFU available at the start of the planning period. Companies should explain the basis for any reductions in WAFU over the period i.e. through climate change.

Processing rules: Input field. Equivalent to Line 5 of WRP1 for the resource zone critical period.

O33	Reductions in output imposed by the EA	MI/d
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Full line title: Cumulative reduction in output imposed by the Environment Agency

Definition: The cumulative reduction in zonal critical deployable output that results from licence reductions imposed by the Environment Agency. This should also include expiry of time limited licences.

Processing rules: Input field.

O34	Reductions in output to meet other statutory obligations	MI/d
-----	--	------

Full line title: Cumulative reduction in output to meet other statutory obligations.
Definition: The cumulative reduction in zonal critical deployable output that results from the need to meet other statutory obligations, such as a new water quality standard or to deal with deteriorating raw water quality.
Processing rules: Input field.

O35	Base critical period supply/demand balance	MI/d
-----	--	------

Full line title: Base critical period zonal supply/demand balance
Definition: The zonal supply/demand balance that results over the company's critical demand period prior to water company interventions on leakage or demand constraints through efficient use of water initiatives
Processing rules: Calculated field (line 30 plus line 31 plus line 32 less line 29 less line 12 less line 13). Equivalent to Line 66 of WRP9 for the resource zone critical period.

Cumulative impact of SDB interventions on critical period demand

O37	Demand management	MI/d
-----	-------------------	------

Full line title: Cumulative impact of zonal demand interventions on critical period scenario – Change in demand
Definition: The changes to demand arising from company interventions necessary to maintain supply/demand balance during the identified critical period. Companies will identify strategies to generate the least cost solution to addressing supply/demand imbalances. This will be as a result of companies' water efficiency strategies reducing customers' consumption. Companies should not include changes to supply pipe leakage. Companies should not include demand reduction arising from their reactive optional metering work. Companies should include demand reductions attributable to that element of metering associated with pro-activity on optional metering i.e. a large promotional campaign.
Processing rules: Input field. Values should be entered as a negative

O38	Change in Leakage	MI/d
-----	-------------------	------

Full line title: Cumulative impact of leakage interventions on zonal critical period scenario - Change in leakage
Definition: The changes to zonal leakage (both customer supply pipe leakage and distribution losses) arising from company interventions. The reductions recorded should accord with companies' economic levels of leakage appraisals submitted to Ofwat as part of their Business Plans.
Processing rules: Calculated field. (Equal to line 22)

O39	Change in WAFU – Critical Period	MI/d
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Full line title: Cumulative impact of supply side interventions on zonal critical period scenario - Change in WAFU
Definition: The total changes to zonal WAFU arising from company interventions to increase supply capacity during critical periods. This should include interventions driven by dry year annual average planning considerations to the extent that they also increase

capacity available during critical periods. Companies should be able to demonstrate that the measures to increase WAFU are economic and have been incorporated into the least cost solution to balance supply and demand.

Processing rules:

Input field. Values should be entered as a positive.

Critical period assumptions

O41	Critical period plan duration	Days
-----	-------------------------------	------

Full line title: Critical period plan duration

Definition: The length of the period in which the company requires the capacity to implement the identified critical period plan. This may not be the same as the length of the critical period. For example, the critical period may be the peak week, but this critical period might occur at any time throughout a longer summer period. The critical period plan duration refers to the longer period over which the company must plan to have the capacity to implement critical period interventions.

Processing rules: Input field.

O42	Average critical period plan capacity utilisation	Nr
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Full line title: The average use made of the identified critical period plan interventions

Definition: The average use over the critical period plan duration made of the incremental capacity (i.e. extra volumes delivered or saved, by comparison with the planned dry year annual average supply/demand balance) delivered by critical period supply/demand interventions identified in the critical period plan.

Processing rules: Input field. The number entered should be less than or equal to one

O43	Average annual volume impact of planned critical period interventions	MI
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Full line title: Effective volume impact of critical period interventions

Definition: The average total volumes delivered or saved by comparison against the base critical period planning scenario by the implementation of critical period plan interventions, during the critical period plan duration.

Processing rules: Calculated field. ((Line 39 minus line 23)+(Line 37 minus line 21)) multiplied by line 41 multiplied by line 42

Planned critical period supply/demand balance

O45	Demand (managed)	MI/d
-----	------------------	------

Full line title: Planned managed critical period zonal demand

Definition: Annual average critical period zonal demand constrained by efficient use of water and other demand management initiatives and/or reduction in consumption attributable to company's metering policy where this represents part of the company's least cost solution to balancing supply and demand.

Processing rules: Calculated field {Line 31 + Line 37}

O46	Planned Water Available for Use	MI/d
-----	---------------------------------	------

Full line title: Planned critical period zonal water available for use.
Definition: Zonal water available for use after company interventions on WAFU.
Processing rules: Calculated field (Line 32 plus line 39).

O47	Planned supply/demand balance	MI/d
-----	-------------------------------	------

Full line title: Planned critical period supply demand balance
Definition: The critical period supply/demand balance that results after water companies' interventions to balance supply and demand. Companies' interventions should have been considered within an economic framework to generate the least cost solution to addressing supply/demand imbalances.
Processing rules: Calculated field (Line 46 minus line 45 minus line 26 minus line 27).
Equivalent to Line 68 of WRP9 for the resource zone critical period.

Cumulative impact of All SDB interventions on normal year Annual Average Scenario

Companies should report the cumulative impacts of demand, leakage and WAFU initiatives that result from their optimum policy mix to balance supply and demand at all times (i.e. taking account of both dry year annual average, and critical period planning scenarios) which contribute volumes of water to the normal year annual average supply/demand balance.

O49	Demand management	MI/d
-----	-------------------	------

Full line title: Cumulative impact of demand management interventions on normal year Annual Average Scenario - Change in demand
Definition: The changes to demand in a normal year arising from all company interventions measured as the difference between normal year annual average demand under a base planning scenario and that under the planned supply/demand balance programme. Companies will identify strategies to generate the least cost solution to addressing supply/demand imbalances. This will be as a result of companies' water efficiency strategies reducing customers' consumption. Companies should not include changes to supply pipe leakage. Companies should not include expected demand reductions arising from a passive approach to optional metering. This should already be incorporated in line 8. Companies should include demand reductions attributable to that element of metering associated with pro-activity on optional metering e.g. a large promotional campaign if this forms part of the least cost strategy.
Processing rules: Input field

O50	Cumulative increase in water usage	MI/d
-----	------------------------------------	------

Full line title: Cumulative change in normal year annual average water use by customers
Definition: The normal year annual average water usage by customers (managed demand) less the normal year annual average demand⁰ in the base year or zero whichever is greater.
Processing rules: Input field

O51	Company supply interventions in response to reductions in output	MI/d
-----	--	------

Full line title:	Cumulative impact of company interventions on the normal year annual average scenario -
Definition:	The changes to the company's ability to deliver water to customers in the zone implemented to counter-balance the effect of reductions in output (lines 15 and 16). This may be interventions to restore WAFU or replace lost WAFU through leakage reductions. Companies should be able to demonstrate that the measures have been incorporated into the least cost solution to balance supply and demand.
Processing rules:	Input field. Values should be entered as a positive. Generally equal to lines 17 and 18 unless the company's plan includes the expectation of an emerging headroom deficit.

Planned annual average supply/demand balance expenditure – annual average scenario

O55	Capex (inclusive of costs to remove baseline scenario imbalance)	£'000
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Full line title:	Cumulative annuitised capital expenditure
Definition:	<p>Cumulative annuitised capital expenditure for the provision of assets to provide water services for new customers, to accommodate increased use of water by existing customers and to accommodate any reductions in output either imposed by the EA or to meet other statutory obligations and potential impact of climate change, while maintaining existing levels of service. Companies should include:</p> <ul style="list-style-type: none"> • Capital expenditure associated with meeting or offsetting changes in demand from new and existing customers, while maintaining existing levels of service. • The capital costs associated with maintaining existing levels of service while accommodating any additional environmental obligations. Expenditure to address the potential impact of climate change on source yields may be included provided that the Environment Agency has accepted the case for yield re-assessment. • The capital costs associated with any leakage reductions in the period. Companies should not include the capital costs of maintaining leakage at a steady state • The capital costs associated with the promotion of the efficient use of water where this forms part of the company's least cost strategy • The capital costs of promoting a customer's right to a free meter if this forms part of the company's least cost strategy. Companies should only include costs where they have been pro-active e.g. a promotional campaign. <p>Where expenditure in one zone benefits an alternative zone, both the costs and the benefits should be recorded in the zone which receives the benefit.</p>
Processing rules:	Input field. The annuitised capex should be calculated as an annuity over the life of the asset that is equivalent to the present value of the capital cost.

O56	Opex (inclusive of costs to remove baseline scenario imbalance)	£'000
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Full line title:	Cumulative change in operating expenditure
Definition:	<p>Cumulative incremental change in base operating expenditure due to growth related capital expenditure, capital investment for new development and capital investment to accommodate any reductions in output either imposed by the EA or to meet other statutory obligations and potential impact of climate change, while maintaining existing levels of service. This should include:</p> <ul style="list-style-type: none"> • The adjustments made to base operating expenditure associated with changes to water delivered to new and existing customers while maintaining existing levels of service. • The adjustments made to base operating expenditure as a result of capital costs associated with maintaining existing levels of service while accommodating reductions in output either imposed by the EA or to meet other statutory obligations Expenditure to address the potential impact of climate change on

source yields may be included provided that the case for yield re-assessment has been accepted by the Environment Agency.

- The operating costs associated with any leakage reductions in the period. Companies should not include the operating costs of maintaining leakage at a steady state
- The operating costs associated with the promotion of the efficient use of water
- The operating costs of metering where the company has been proactive in promoting customers' right to a free meter. Companies should not include the costs associated with reactive metering.

Where expenditure in one zone benefits an alternative zone, both the costs and the benefits should be recorded in the zone which receives the benefit.

Processing rules:

Input field

O57	Capex (excluding costs to remove baseline scenario imbalance)	£'000
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Full line title:

Cumulative annuitised capital expenditure

Definition:

Cumulative annuitised capital expenditure for the provision of assets to provide water services for new customers, to accommodate increased use of water by existing customers and to accommodate any reductions in output either imposed by the EA or to meet other statutory obligations and potential impact of climate change, while maintaining existing levels of service. Companies should include:

- Capital expenditure associated with meeting or offsetting changes in demand from new and existing customers, while maintaining existing levels of service.
- The capital costs associated with maintaining existing levels of service while accommodating any additional environmental obligations. Expenditure to address the potential impact of climate change on source yields may be included provided that the Environment Agency has accepted the case for yield re-assessment.
- The capital costs associated with any leakage reductions in the period. Companies should not include the capital costs of maintaining leakage at a steady state
- The capital costs associated with the promotion of the efficient use of water where this forms part of the company's least cost strategy
- The capital costs of promoting a customer's right to a free meter if this forms part of the company's least cost strategy. Companies should only include costs where they have been pro-active e.g. a promotional campaign.

Where expenditure in one zone benefits an alternative zone, both the costs and the benefits should be recorded in the zone which receives the benefit.

Processing rules:

Input field. The annuitised capex should be calculated as an annuity over the life of the asset that is equivalent to the present value of the capital cost.

O58	Opex (excluding costs to remove baseline scenario imbalance)	£'000
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Full line title:

Cumulative change in operating expenditure

Definition:

Cumulative incremental change in base operating expenditure due to growth related capital expenditure, capital investment for new development and capital investment to accommodate any reductions in output either imposed by the EA or to meet other statutory obligations and potential impact of climate change, while maintaining existing levels of service. This should include:

- The adjustments made to base operating expenditure associated with changes to water delivered to new and existing customers while maintaining existing levels of service.
- The adjustments made to base operating expenditure as a result of capital costs associated with maintaining existing levels of service while accommodating reductions in output either imposed by the EA or to meet other statutory obligations. Expenditure to address the potential impact of climate change on source yields may be included provided that the case for yield re-assessment has been accepted by the Environment Agency.

- The operating costs associated with any leakage reductions in the period. Companies should not include the operating costs of maintaining leakage at a steady state
- The operating costs associated with the promotion of the efficient use of water
- The operating costs of metering where the company has been proactive in promoting customers' right to a free meter. Companies should not include the costs associated with reactive metering.

Where schemes contribute both to restoring security of supply and for example demand growth, scheme costs should be apportioned according to scheme volumes. Where expenditure in one zone benefits an alternative zone, both the costs and the benefits should be recorded in the zone which receives the benefit.

Processing rules:

Input field

Expenditure – critical period scenario

O61	Capex (inclusive of costs to remove baseline scenario imbalance)	£'000
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Full line title:

Cumulative annuitised capital expenditure to meet peak demands

Definition:

Cumulative annuitised capital expenditure for the provision of assets to provide water services for new customers, to accommodate increased use of water by existing customers and to accommodate any reductions in output either imposed by the EA or to meet other statutory obligations and potential impact of climate change, while maintaining existing levels of service. The capex should be that incurred over and above the expenditure on interventions in the planned dry year annual average supply/demand scenario. Companies should include:

- Capital expenditure associated with meeting or offsetting changes in demand from new and existing customers, while maintaining existing levels of service.
- The capital costs associated with maintaining existing levels of service while accommodating any additional environmental obligations. Expenditure to address the potential impact of climate change on source yields may be included provided that the Environment Agency has accepted the case for yield re-assessment.
- The capital costs associated with any leakage reductions in the period. Companies should not include the capital costs of maintaining leakage at a steady state
- The capital costs associated with the promotion of the efficient use of water where this forms part of the company's least cost strategy
- The capital costs of promoting a customer's right to a free meter if this forms part of the company's least cost strategy. Companies should only include costs where they have been pro-active e.g. a promotional campaign.

Where expenditure in one zone benefits an alternative zone, both the costs and the benefits should be recorded in the zone which receives the benefit.

Processing rules:

Input field. The annuitised capex should be calculated as an annuity over the life of the asset that is equivalent to the present value of the capital cost.

O62	Opex (inclusive of costs to remove baseline scenario imbalance)	£'000
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Full line title:

Cumulative change in operating expenditure to meet peak demands

Definition:

Cumulative incremental change in base operating expenditure due to growth related capital expenditure, capital investment for new development and capital investment to accommodate any reductions in output either imposed by the EA or to meet other statutory obligations and potential impact of climate change, while maintaining existing levels of service. The opex should be that incurred over and above the expenditure on interventions in the planned dry year annual average supply/demand scenario. This should include:

- The adjustments made to base operating expenditure associated with changes to water delivered to new and existing customers while maintaining existing levels of service.

- The adjustments made to base operating expenditure as a result of capital costs associated with maintaining existing levels of service while accommodating reductions in output either imposed by the EA or to meet other statutory obligations. Expenditure to address the potential impact of climate change on source yields may be included provided that the case for yield re-assessment has been accepted by the Environment Agency.
- The operating costs associated with any leakage reductions in the period. Companies should not include the operating costs of maintaining leakage at a steady state
- The operating costs associated with the promotion of the efficient use of water
- The operating costs of metering where the company has been proactive in promoting customers' right to a free meter. Companies should not include the costs associated with reactive metering.

Where expenditure in one zone benefits an alternative zone, both the costs and the benefits should be recorded in the zone which receives the benefit.

Processing rules:

Input field

O63	Capex (excluding costs to remove baseline scenario imbalance)	£'000
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Full line title:

Cumulative annuitised capital expenditure to meet peak demands

Definition:

Cumulative annuitised capital expenditure for the provision of assets to provide water services for new customers, to accommodate increased use of water by existing customers and to accommodate any reductions in output either imposed by the EA or to meet other statutory obligations and potential impact of climate change, while maintaining existing levels of service. The capex should be that incurred over and above the expenditure on interventions in the planned dry year annual average supply/demand scenario. Companies should include:

- Capital expenditure associated with meeting or offsetting changes in demand from new and existing customers, while maintaining existing levels of service.
- The capital costs associated with maintaining existing levels of service while accommodating any additional environmental obligations. Expenditure to address the potential impact of climate change on source yields may be included provided that the Environment Agency has accepted the case for yield re-assessment.
- The capital costs associated with any leakage reductions in the period. Companies should not include the capital costs of maintaining leakage at a steady state
- The capital costs associated with the promotion of the efficient use of water where this forms part of the company's least cost strategy
- The capital costs of promoting a customer's right to a free meter if this forms part of the company's least cost strategy. Companies should only include costs where they have been pro-active e.g. a promotional campaign.

Where expenditure in one zone benefits an alternative zone, both the costs and the benefits should be recorded in the zone which receives the benefit.

Processing rules:

Input field. The annuitised capex should be calculated as an annuity over the life of the asset that is equivalent to the present value of the capital cost.

O64	Opex (excluding costs to remove baseline scenario imbalance)	£'000
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Full line title:

Cumulative change in operating expenditure to meet peak demands

Definition:

Cumulative incremental change in base operating expenditure due to growth related capital expenditure, capital investment for new development and capital investment to accommodate any reductions in output either imposed by the EA or to meet other statutory obligations and potential impact of climate change, while maintaining existing levels of service. The opex should be that incurred over and above the expenditure on interventions in the planned dry year annual average supply/demand scenario. This should include:

- The adjustments made to base operating expenditure associated with changes to water delivered to new and existing customers while maintaining existing levels of service.
- The adjustments made to base operating expenditure as a result of capital costs associated with maintaining existing levels of service while accommodating reductions in output either imposed by the EA or to meet other statutory obligations. Expenditure to address the potential impact of climate change on source yields may be included provided that the case for yield re-assessment has been accepted by the Environment Agency.
- The operating costs associated with any leakage reductions in the period. Companies should not include the operating costs of maintaining leakage at a steady state
- The operating costs associated with the promotion of the efficient use of water
- The operating costs of metering where the company has been proactive in promoting customers' right to a free meter. Companies should not include the costs associated with reactive metering.

Where expenditure in one zone benefits an alternative zone, both the costs and the benefits should be recorded in the zone which receives the benefit.

Processing rules:

Input field

NPV and AICs of normal year interventions

O68	NPV – programme (exc costs to remove initial headroom deficit)	£'000
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Full line title:

Net Present Value of the programme

Definition:

The NPV of the companies least cost programme for balancing supply and demand over the planning period based on the company's dry year scenario. Companies should include financial costs but exclude environmental costs

Processing rules:

Calculated field

O69	NPV – programme (inc costs to remove initial headroom deficit)	£'000
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Full line title:

Net Present Value of the programme

Definition:

The NPV of the companies least cost programme for balancing supply and demand over the planning period based on the company's dry year scenario. Companies should include financial costs but exclude environmental costs

Processing rules:

Calculated field

O70	NPV – water saved or supplied	£'000
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Full line title:

NPV of the water saved or supplied

Definition:

NPV of the additional water made available through companies demand management interventions-(where this is part of the companies' least cost solution to balance supply and demand), and the increase in normal year customer usage met through increasing WAFU and/or leakage reduction (where this is part of the companies' least cost solution to balance supply and demand). Volumes should be the contribution made to the normal year annual average scenario

Processing rules:

Calculated field

O71	Average Incremental Cost excl costs to remove initial imbalance	p/m ³ (2dp)
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Full line title: AIC of the water saved or supplied
Definition: AIC of the water saved or supplied excluding the costs to remove the initial imbalance.
Processing rules: Calculated field

O72	Average Incremental Cost incl costs to remove initial imbalance	p/m ³ (2dp)
-----	---	------------------------

Full line title: AIC of the water saved or supplied
Definition: AIC of the water saved or supplied including the costs to remove the initial imbalance.
Processing rules: Calculated field

NPV and AICs of critical period interventions

O76	NPV – programme (exc costs to remove initial headroom deficit)	£'000
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Full line title: Net Present Value of the programme
Definition: The NPV of the companies least cost programme for balancing supply and demand over the planning period based on the company's critical period scenario.
Processing rules: Calculated field

O77	NPV – programme (inc costs to remove initial headroom deficit)	£'000
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Full line title: Net Present Value of the programme
Definition: The NPV of the companies least cost programme for balancing supply and demand over the planning period based on the company's dry year scenario. Companies should include financial costs but exclude environmental costs
Processing rules: Calculated field

O78	NPV – water saved or supplied	'000
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Full line title: NPV of the water saved or supplied
Definition: NPV of the additional water made available through companies demand management interventions (where this is part of the companies' least cost solution to balance supply and demand), and the increase in normal year customer usage met through increasing WAFU and/or leakage reduction (where this is part of the companies' least cost solution to balance supply and demand). Volumes should be the contribution made to the normal year annual average scenario
Processing rules: Calculated field

O79	Average Incremental Cost excluding costs to remove initial imbalance	p/m ³ (2dp)
-----	--	------------------------

Full line title: AIC of the water saved or supplied
Definition: AIC of the water saved or supplied excluding the costs to remove the initial imbalance.
Processing rules: Calculated field

080	Average Incremental Cost incl costs to remove initial imbalance	p/m ³ (2dp)
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Full line title: AIC of the water saved or supplied
Definition: AIC of the water saved or supplied including the costs to remove the initial imbalance.
Processing rules: Calculated field

O90	NPV Programme	£'000
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Full line title: Net Present Value of expenditure driven by both the dry year annual average scenario (columns 2 to 7) and critical period scenario (columns 15 to 20) excluding costs to remove any initial headroom deficit

Definition: The NPV of the companies least cost programme for balancing supply and demand over the critical period and normal year planning scenarios. The line reports (for both normal year and critical period scenarios):

- NPV of years 2002-03 to 2006-07 (25-year cashflow) where expenditure for the remaining 20 years of the cashflow are held at 2006-07 levels
- NPV of years 2007-08 to 2011-12 (25-year cashflow) where expenditure for the remaining 20 years of the cashflow are held at 2011-12 levels
- NPV of years 2012-13 to 2016-17 (25-year cashflow) where expenditure for the remaining 20 years of the cashflow are held at 2016-17 levels
- NPV of years 2017-18 to 2021-22 (25-year cashflow) where expenditure for the remaining 20 years of the cashflow are held at 2021-22 levels
- NPV of years 2022-23 to 2026-27 (25-year cashflow) where expenditure for the remaining 20 years of the cashflow are held at 2026-27 levels

Processing rules: Calculated Field

O91	NPV Programme (water saved or supplied)	MI
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Full line title: Net Present Value of expenditure driven by both the dry year annual average scenario (columns 2 to 7) and critical period scenario (columns 15 to 20) excluding costs to remove any initial headroom deficit

Definition: The NPV of the companies least cost programme for balancing supply and demand over the critical period and normal year planning scenarios. The line reports (for both normal year and critical period scenarios):

- NPV of years 2002-03 to 2006-07 (25-year cashflow) where expenditure for the remaining 20 years of the cashflow are held at 2006-07 levels
- NPV of years 2007-08 to 2011-12 (25-year cashflow) where expenditure for the remaining 20 years of the cashflow are held at 2011-12 levels
- NPV of years 2012-13 to 2016-17 (25-year cashflow) where expenditure for the remaining 20 years of the cashflow are held at 2016-17 levels
- NPV of years 2017-18 to 2021-22 (25-year cashflow) where expenditure for the remaining 20 years of the cashflow are held at 2021-22 levels
- NPV of years 2022-23 to 2026-27 (25-year cashflow) where expenditure for the remaining 20 years of the cashflow are held at 2026-27 levels

Processing rules: Calculated Field

O92	Average Incremental Cost excl costs to remove initial imbalance	p/m ³
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Full line title: AIC of the water saved or supplied

Definition: AIC of the water saved or supplied excluding the costs to remove the initial imbalance in both dry year annual average and critical period scenarios based on the cashflows explained in lines 90 and 91 above.

Processing rules: Calculated Field

* The costs of leakage control, together with metering and other demand management measures, are less easily allocated across the above categories. As far as possible, the costs of these measures should be allocated in the same proportions as the alternative supply-side schemes for which they are substitutes.

† Estimates are required for the costs of meeting or offsetting increments of steady demand and demand for garden watering respectively.

5 METHODOLOGIES AND TECHNIQUES

When applying any of the following methods and techniques for producing the plan, companies should also discuss expectations with the Agency at the earliest opportunity.

5.1 Supply

5.1.1 Deployable outputs - yield assessment

The following documents give full details of the methodologies for reassessing deployable output of surface water and groundwater:

- *Reassessment of water company yields* (1997)
- *A methodology for the determination of outputs of groundwater sources* (1995)
- *Surface water yield assessment* (1995)
- *A unified methodology for the determination of deployable output from water sources* (2000)
- *Critical period groundwater yield* (2001)

Copies of these documents are available for consultation at Agency offices, should they be required.

Companies will not be required to undertake a detailed review of source deployable outputs for their PR04 submissions. However, where companies have undertaken new work or where a more advanced method can now be applied, updated assessments should be fully reported. Typically, this may include reporting of updated assessments of conjunctive-use output, enhancements to groundwater assessments, revisions to output in connection with environmental or other obligations or where a company is proposing changes to its planned levels of service from those represented in previous work. This should be specifically identified in supporting commentary.

Revised estimates will need to be agreed with the Agency in time to support the preparation of the water resources plan. Any revisions should be analysed and reported at least as thoroughly as the 1997 work.

5.1.2 Levels of service

The Agency's yield reassessment guidelines previously issued to water companies describe three levels of service scenarios for reassessing surface water yields. These are:

- (i) no restrictions in supply or drought orders / permits to authorise increased abstraction;
- (ii) water company proposed levels of service;
- (iii) reference scenario (5% reduction in demand 1 in 10 years, 10% reduction in demand 1 in 40 years).

The company proposed level of service as used in surface water yield assessment should determine the contents of Table WRP 1, and should be cross-referenced to yield reassessment work.

Where a company has adopted an approach linking groundwater deployable outputs and levels of service, or proposes to do so, this should be discussed with the Agency for agreement at an early stage.

Consistency with the company drought plan should be maintained.

Each water company should propose the levels of service it believes are appropriate for its customers, while giving due consideration to levels of service as a means of managing the supply-demand balance. Companies should justify their choice of level of service with reference to customer preferences, and to environmental and cost implications. When assessing the plans, the Agency will carefully consider the proposed levels of service alongside the other total water management options for managing the supply-demand balance given in a company's water resources plan (see Figure 2). Companies should specifically identify any proposed changes in their planned levels of service.

The plan should explicitly indicate the influence of applying the company level of service when moving from an "unrestricted" (baseline) demand forecast to a "restricted" (final planning) demand forecast.

5.1.3 The Environment Programme and Restoring Sustainable Abstraction

Planned or likely reductions in licensed abstraction relate to river and wetland sites, and have been agreed with and/or specified by the Agency. They will include statutory sites; Special Areas of Conservation and Special Protection Areas (specified in line with The Conservation (Natural Habitats) Regulations 1994, which implement the EU Birds Directive and EU Habitats Directive), as well as other SSSIs affected by abstraction. Non-statutory or discretionary schemes for low-flow sites will also be included where business cases have been prepared. Reductions in licensed abstraction in over-utilised aquifer units may also be sought in some areas on sustainability grounds. Where sustainability reductions are necessary, the Agency will liaise closely with the relevant companies during the planning process.

In considering schemes identified by the Agency, companies will need to address both tactical and strategic resource management issues. Companies should consider whether the required outputs can be solved by local solutions within a resource zone, or whether (in conjunction with schemes or other drivers affecting the supply-demand balance equation) the requirements of the Environment Programme will require more strategic solutions.

The requirements of many of the schemes being considered for the PR04 Environment Programme remain uncertain at this stage as they are still subject to considerable further investigation. In January 2003, the Government set out its guidance on priorities for improvement for the five years 2005/6 to 2009/10 as a first step in reducing uncertainty.

Following the ministerial guidance, the Agency will issue supplementary guidance to companies on how to cater for the potential implications for licensed abstraction within the water resources plan. More detailed guidance will also be provided on scheme outputs (the

changes to licensed abstraction or operating regime). We expect this guidance to be firmly based on the principle that whilst delivering new environmental objectives, any reduction in licensed abstraction should not lead to a potential risk to the security of public water supplies. Companies should clearly set out in their plan the implications for their supply-demand balance of meeting new environmental obligations and the additional requirement (cost, quantity, etc.) to be met.

5.1.4 Outage

Justification of outage levels will be required as part of the water resources plan submission. Outage should be considered separately from the determination of target headroom (see 5.4).

To determine outage allowances, the Agency encourages companies to follow the principles of the approach set out in the "Operating methodology" of the UKWIR R&D report "Outage allowances for water resources planning", published in March 1995. The Agency believes that the majority of companies have now taken steps to follow the principles of this approach and have gained a fuller insight into outage risks and the opportunities to minimise them.

The degree to which companies may need to explore outage will vary according to need and circumstance. As a minimum approach, companies should be able to justify outage allowances in relation to the likelihood of events recurring, given the magnitude, duration and timing of actual outage circumstances, with support from recorded data.

5.1.5 Water quality issues

A number of water companies have raised concerns about water quality problems and how to address them through the water resources planning process. These concerns range from short-term incidents, medium-term loss of sources and longer-term gradual loss of deployable output from sources due to pollution. Where there are material water quality implications for water companies' supply-demand balance strategies, companies should explore these in detail, with appropriate supporting information, in the development of their water resources plan.

Specific consideration should be given in companies' assessment of deployable output (short to medium-term loss of utility), outage (increased risk of temporary loss through pollution incidents) and headroom (gradual loss of deployable output over the longer-term). Companies should also include specific remedial solutions in their assessment of total water management solutions to their particular supply-demand balance problem, including further treatment options.

5.2 Demand forecasting:

This part of the Guideline is divided into eight sections related to producing demand forecasts for inclusion in the water resources plan. Section 5.2.1 provides an overview of the Agency's requirements while section 5.2.2 covers the forecast methods in more detail. Data requirements are covered in section 5.2.3. The base year demand issues are highlighted in section 5.2.4 and the issues relating to the forecasts themselves are in sections 5.2.5 to 5.2.8.

The scenarios that are required to be examined and presented to form the plan are set out in Chapter 2.

5.2.1 Overview

Companies must produce demand forecasts using best available information as part of assessing their supply-demand balance for the next 25 years. These should be prepared and presented for each water resource zone and aggregated to produce the company demand forecast. Forecasts should be prepared to the level of raw water abstracted (see WRP2), but it is expected that companies may wish to produce a forecast at the level of distribution input and then work back to derive the raw water components. The supporting data and planning assumptions used by companies should be clearly set out in the plan.

As a minimum companies need to produce a baseline forecast to indicate how unrestricted demands may change in a dry year assuming existing management policies are maintained and current initiatives are fully implemented. Where companies predict a deficit in the supply-demand balance, they should also submit a final planning forecast that demonstrates the likely consequences of their preferred option(s). The type(s) of forecast produced will depend upon the type and duration of demand under which there is an imbalance between supply and demand. Companies should submit forecasts for the normal and dry year situation. In some cases, companies may also wish to submit forecasts for critical period demands, typically the average day - peak week situation. The suite of options for the forecast type and duration are described in Chapter 2 and summarised in figure 2.

As well as defining the type and duration of the forecast water companies need to describe in detail how they perceive the drivers of demand might change through the planning period and reflect these changes in the forecast assumptions.

5.2.2 Methodology

The methodology used for producing demand forecasts should be according to that set out in the UKWIR/NRA R&D reports on *Demand Forecasting Methodology* and *Forecasting Water Demand Components* (see Annex 5 for references). The first of these provides an overall framework, definition of components and set of recommendations on data sources that should be followed. The second report provides more specific guidance on methods for forecasting the main components, in the form of a best practice manual. There are numerous methods identified within these reports varying in detail and data requirements. Companies will be expected to produce demand forecasts from micro-component analyses of household demand and from econometric modelling of the industrial and commercial sectors of non-household demand taking account of differences between resource zones.

In all cases, forecasts should follow the component definitions from the UKWIR/NRA methodology, but the level of detail will be for the company to justify, subject to the minimum requirements set out in tables WRP 2, WRP 3, WRP 4, WRP 5.

A spreadsheet model was also developed as part of the first project, and is available optionally for use in forecasting. Where an alternative model is used it must use the standard components and follow the general methodology set out in the UKWIR/NRA report.

A list of relevant reports and publications, which provide the most recent information on demand forecasting techniques, is included in Annex 5. It is expected that companies will adopt the findings contained in these references wherever possible, and where alternative methods are used these should be fully justified with supporting documentation as part of the final water resources plan report submission.

5.2.3 Data requirements

The forecast information required is set out in tables WRP 2, WRP 3, WRP 4 and WRP 5. These tables concern the component data only. As support to each of these tables a full description of the assumptions behind the component forecasts and derivations should be provided in support of the water resources plan. Companies should include and / or cross-reference supporting information to their plan; for example, where micro-component and / or consumption monitor data has been used to produce forecasts. Annex 3 provides a number of formats which companies may wish to use or develop for summarising this information.

Wherever possible, companies should derive their forecasts and water balance at the resource zone level. For most companies, the forecast at company level should be built up from smaller area forecasts, for which the supply-demand balance can be expressed reliably through the planning period. This should be derived from aggregation of assessments made at the resource zone level.

5.2.4 Establishing base year demand

The base year should be as specified in section 2.7 of this Guideline. Any reconciliation of base year components must use the Maximum Likelihood Estimation (MLE) methodology set out in the UKWIR/NRA main report (see Annex 5) and explained within the plan.

Base year demand must reflect the chosen type and duration of forecast (see previous section). Where the base year for which the water balance is being derived is a non-typical year in terms of climatic and / or supply conditions, this should be taken account of in demand forecasts. This will be the case where the base year has been particularly wet or where there have been temporary supply restrictions. In these circumstances, the water balance estimates should be adjusted ("normalised") to provide a separate 'average weather' base year set of estimates. Where companies have undertaken steps to normalise their data, a clear justification and audit trail should be provided, supported by appropriate historical data. Companies should report the actual out-turn and normalised demand estimate for the base year. Once the normalised base year demand is established, the dry year base demand can be forecast. The Agency expects the normal and dry year demand to be the same as that the companies submit to Ofwat in their Strategic Business Plan.

Reasons for departure of the dry year forecast from average and normal years forecasts must be explained in terms of the effect on individual components, quantified in the relevant WRP and WRPSup tables for both average and dry year forecasts.

The water resources plan should focus on the supply-demand requirements for the dry year condition. However, companies plans should include reporting of their normal year annual average unrestricted baseline demand forecast (see Table 3 for WRP Table requirements)

together with appropriate supporting evidence and analysis in support of their reporting of the dry year.

Companies are expected to submit plans that are based on data collected and water balances being derived at the resource zone level and aggregated up to company level. The MLE approach should also be applied at the resource zone level of water balance.

5.2.5 Per capita consumption

Base year estimates of unmeasured household consumption should be based on the company's own monitoring whenever possible, and should be presented in micro-component form. Alternatively if such information is unavailable neighbouring company data may be used. Any adjustment carried out to monitor data must be described.

Companies should report on their per capita consumption monitors describing its management and operation in addition to presenting the latest results. It is necessary to demonstrate both the quality of the consumption monitor / assessment method as well as the actual consumption. In the first instance, companies should demonstrate application of recommended methods as described in the UKWIR R&D "Best practice for unmeasured per capita consumption monitors". Given that consumption monitors record actual demand, evidence of normalisation and any adjustments to account for dry year demand should be included. A description of how measured per capita consumption is assessed should also form part of the report.

Micro-component analysis is the most appropriate method of examining the impacts of forecast assumptions applied to the drivers of household demand; for example, the specific effects of climate change or of water efficiency measures. Companies are required therefore to submit a base year demand broken down into micro-components. Table WRPSup 4 in Annex 3 provides a suggested breakdown.

Companies may submit an alternative grouping of micro-components to that listed in Table 4 below provided that it is accompanied with detailed explanations as to the specific water use within each category.

For household use the micro-components of demand as described in Table WRPSup 4 should be quantified for each resource zone. It is expected that the recommended methods described in the UKIRW R&D "Forecasting water demand components – best practice manual" would be applied. Base year estimates of PCC derived as a residual in the annual balance should be avoided. Measured consumption estimates should be based on the company's own metering records.

Table 4: Suggested groupings of micro-components

Water use per person (l/h/d)	Water use per household (l/hhld/d)
Toilet flushing	Clothes washing (by machine and by hand)
Bath	Dish washing (by machine and by hand)
Shower (standard and power shower)	Garden use (sprinkler, hand held hose and watering can)
Hand basin use	Car washing (by hose and by bucket)
	Non-specific miscellaneous uses

5.2.6 Leakage levels

Leakage levels should be expressed in the supporting text in terms of distribution losses and underground supply pipe losses (USPL). Total leakage and USPL are presented in table WRP 5. Leakage for the base year should be the actual reported leakage and must be consistent with that reported to Ofwat for the same year.

Additional data requirements are set out in the AR table.

Leakage targets should be determined from an economic assessment that includes long-term investment, environmental and social costs. The methodology is set out in the report of the Leakage Tripartite Group and the UKWIR/Agency R&D report on *The Economics of Balancing Supply and Demand* (2002). Leakage targets should be given in units of Ml/d, litres/property/day, litres/service connection/day and cubic metres/km/day.

Targets should be as set by Ofwat where Ofwat has already set targets and for future years will be based, *inter alia*, on information submitted by companies in their economic level of leakage reports. Future perspectives should also be considered, for example, in relation to the likelihood of beneficial technological advance.

Companies should provide a copy of their economic leakage appraisal submission (Part C4 Supply-Demand Appraisal reporting to Ofwat) in support of their plan.

5.2.7 Water efficiency plans

Baseline demand forecasts should be based on continuation of current policies to promote the efficient use of water by customers, and consistent with a basic level of activity. Final planning demand forecasts should include the forecast impact of demand management interventions, including those to promote the efficient use of water, which form part of a balanced plan to manage supply and demand. The report must provide clear details of the quantified savings for each initiative.

5.2.8 Future projections

The UKWIR/NRA Demand Forecasting Methodology report (see Annex 5) recommends sources of data for projections of population and properties and these should be followed wherever possible. Future levels of leakage will follow from the setting of targets, based on an economic assessment.

The Guideline recognises that climate change is an important consideration in water demand forecasting (see section 5.3).

Methods for estimating future component values are covered in the UKWIR/Agency Best Practice Manual for Forecasting Water Demand Components, published in December 1997. Companies are expected to follow this methodology detailing all the assumptions made and the supporting data used (e.g. appliance ownership, frequency of use and volume data, socio-economic and household information used etc.).

5.3 Treatment of climate change

New climate change scenarios were published by UKCIP in March 2002 (Hume et al., 2002). Work is currently being undertaken by WaterUK, Defra, the Agency and others to evaluate the implications for water supplies and demand for water. The Agency will review this work as swiftly as possible to identify and agree appropriately what may need to be done by companies to ensure water resources plans account for the latest indications of climate change impacts. The Agency expects to publish further supplementary guidance covering the following key areas of the water resources planning process:

- Comparison of the new scenarios against those anticipated during 1997 source yield reassessment work and in preparing 1999 water resources plans;
- Identifying an agreed approach to accommodate the latest scenarios in implementing the water resources planning guidelines.

The results arising from the application of climate change scenarios must be used sensibly, pragmatically and consistently, accepting that continued research effort will no doubt go on to refine and develop better and more reliable climate predictions.

In the water resources plans, climate change may be considered in two complementary parts; specifically on the supply-demand balance, and, within target headroom addressing uncertainties in the estimation of the impact of climate change on the supply-demand balance. Overall the Agency encourages a “low regrets” approach, built around the robustness of options and flexibility of companies plans in adaptation to alternative scenarios.

5.3.1 Impact on supply

Even where specific account of climate change is taken in the supply side of the supply-demand balance, some uncertainty will inevitably continue. Uncertainty surrounds the important issue of a possible change in magnitude, frequency and duration of extreme events such as droughts. However, even if significant changes in water availability are to occur, it is not expected that these will be sudden or dramatic.

If a company believes other potential climate change influences to be significant and important to its water resource plan, it should present this separately in addition to the information requested. Such a view will require clear justification.

To cater for some uncertainties, target headroom (see section 5.4) includes a climate change component which uses the magnitude of the spread in an individual company's specific results from the agreed climate change scenarios to give an allowance, by proxy, for these uncertainties. A greater range in results is an indication of greater uncertainty and will therefore provide more target headroom.

5.3.2 Impact on demand

In assessing the impact of climate change on demand, companies should refer to: *Climate Change and the Demand for Water* (DoE 1997 and Defra 2003) and supplementary guidance on climate change to be released by the Agency as part of the preparation of water resources

plans. *Water Resources and Supply: Agenda for Action* also asked water companies to conduct further studies of the implications of climate change on the demand for water. Where companies have undertaken company-specific research, the findings may be used to aid in the preparation of the plan, provided that full and comprehensive details of the research are provided as part of the final plan submission.

5.4 Headroom

The UKWIR R&D report *A Practical Method for Converting Uncertainty into Headroom* (1998) provides a pragmatic initial estimate of target headroom. All companies are expected to use this methodology in the production of their water resources plan, setting out key assumptions and sensitivities. Companies may also wish to present alternative estimates of headroom, using the alternative approaches discussed in the UKWIR/EA report *The Economics of Balancing Supply and Demand* (2002). The Agency will publish supplementary guidance regarding new methods developed and proposed by WaterUK (*Uncertainty and Risk in Supply – Demand Forecasting: An Improved Method for Assessing Headroom*). Where reference is made below to “the headroom methodology”, it refers to that reported in *A Practical Method for Converting Uncertainty into Headroom* (1998).

Companies should include full supporting information about the calculation of target headroom as an appendix or supporting document to the plan. Part of the process of determining target headroom will be discussion and agreement with the Agency and Ofwat on the values ascribed to the various components of the calculation. Wherever possible such agreement should be reached before the submission of the draft plan, and in all cases prior to the submission of the final plan.

The headroom methodology identifies appropriate elements to be included in target headroom. Companies should ensure that, where their plan requires specific provisions to meet target headroom, the associated AISC of this provision is shown and clearly accounted for.

Water companies will be expected to adopt a well-informed approach to the determination of target headroom (the difference between expected demand and expected supply). This may need to balance the costs and risks to customers and the environment of a low allowance for headroom against those of a high allowance.

The headroom methodology also allows for uncertainty due to climate change and has been structured so as to avoid double counting when allowing specifically for climate change impacts on supply and demand (see section 5.3).

The target headroom methodology is applicable to dry year annual average daily demand but needs to be used sensibly in relation to critical period dry year daily demand scenarios. The main need for a headroom allowance arises from water resources planning requirements that would normally be related to longer-term critical periods. The headroom methodology suggests that the focus for water resources planning should be on critical periods spanning between a week and several months (tending more toward the latter). Managing supplies for critical periods of a week or less would normally rely on operational rather than resource development measures.

Companies should have a reasonable understanding of the issues driving critical period supply-demand issues over the shorter-term; uncertainty (or the required headroom) will, therefore, be low for the early years of the plan but rise over the plan period. A clear justification and audit trail should be provided for the assumptions used by companies in the determination of target headroom.

In following the approved method, companies should evaluate the sensitivity of the headroom assessment to the parameters and assumptions used. The target headroom calculation should be checked, and revised if necessary, in relation to the final planning forecast and water resources plan solution. If investment need is driven primarily by target headroom requirements, the plan should demonstrate the sensitivity of the required scale of solution to the target headroom calculation and the risk-based merits of the solution(s) put forward. If water supply-demand management investment is driven primarily by the requirement to meet target headroom, the sensitivity of the solution to the target headroom should be explored. This may also influence the optimisation of the solution.

5.4.1 Uncertainty: Catchment Abstraction Management Strategies (CAMS), Time Limited Licences and the Environment Programme

A number of companies have expressed concerns about the potential impact of CAMS and new time limited licensing policies on their base resource provision. Companies' plans should:

- be firmly based on guidance from the Agency regarding demand for reduction in licensed abstraction at those sites identified in the Environment Programme for PR04;
- reflect known and agreed (with the Agency) implications of existing time limited authorisations, where there are identified risks to the environment;
- be based on the assumption that, in the case of future time limiting policies, the presumption would be for licences to be renewed.

Where specific source output changes have yet to be identified by the Agency, but a risk to the long-term sustainability of the current authorisation has been identified as a result impacts on the environment, companies should follow the headroom method in allowing for uncertainties to their deployable output. Companies should establish an early dialogue with the Agency to ensure a clear view is reached on those schemes to be included and the level of uncertainties identified.

Companies should not use their water resources plans to pre-empt the outcome of future CAMS or associated investigations yet to be undertaken / completed, or changes to the abstraction licensing legislation in establishing the potential requirement for licence reductions.

5.5 Economic analysis

A key feature of the development of the plan is the economic analysis of options to manage the supply-demand balance. Approaches to the economic assessment of options have recently been reviewed by the UKWIR/Environment Agency project *The Economics of balancing supply and demand* (2002). The approaches proposed by this work build on the average incremental social cost (AISC) approach used by the Agency and companies in the development of water resources plans in 1999. It goes on to propose intermediate and advanced approaches that companies may use to assess the optimum solution in managing

headroom; most companies are expected to follow the intermediate methods beyond simple AISC's. A number of new methodologies exploring alternative approaches to risk and headroom are also proposed. Supplementary guidelines to the water resources planning guideline will be issued once these reports have been published and the implications to the current approaches agreed.

The *Economics of Balancing Supply and Demand* provides a set of definitions, a comprehensive list of "total water management" options and an overall framework for assessing those options in order to ensure that supply and demand are balanced into the future.

The economics of water resources plan options are to be expressed in terms of AISC. The analysis of each option should include the following: the net present capital or fixed cost (CAPEX), the net present revenue or variable costs (OPEX), the net present value of OPEX savings to the company (if any) and the net present environmental and social costs and benefits. The discount rate used should be the Treasury discount rate, which is currently 3.5%. The discounted total volume of water which contributes to the 'reduction in' the deficit (additional water delivered or reduced demand) should be used in the calculation of AISC in Table WRP 8 and summarised in Table WRP 7.

An appropriate option or set of options that maintain the balance of supply with demand may be the set having the lowest AISC. Ranking the individual option AISC in order of least cost first will provide an initial indication of least cost solution to the supply-demand deficit. The overall AISC of the set of options or programme, required to manage the supply demand balance should be compared with the AISC of alternative programme solutions. The most economic programme may not necessarily be the combination of the least (AISC) cost options from first to the last ranked option required to match the supply-demand deficit. Further economic analysis of different combinations of options should be undertaken. Alternative programmes of options may offer different linkages between options, provide greater resilience to risk, or provide other benefits through their contribution to social progress and sustainable development.

The final solution to the water resources plan should result from consideration of wider factors such as risks and uncertainties and the contribution made towards sustainable development. (see section 4.6, "Selecting the optimum solution"). This is where the proposed approaches in the *Economics of Balancing Supply and Demand* may provide more robust solutions for companies with complex strategic resource issues and requirements.

If the chosen solution differs from one based on the simple ranking of individual AISC, this should be clearly explained in the report and supported by alternative scenario costs (detailed in copies of Tables WRP7 and WRP8) and consideration of all wider factors.

Companies should present a summary of the solution, using a figure similar to Figure B4.2 on page 95 of *The Economics of Demand Management* report.

It should be noted that Table WRP 8 captures only the financial costs of selected options (that is, excluding social and environmental costs). Social costs should, however, be taken into account in the selection of options.

An annotated supply-demand balance graph should also be provided demonstrating the final planning demand forecast, proposed WAFU and other schemes.

5.5.1 Environmental economics

The UKWIR/Agency guidelines *The Economics of Balancing Supply and Demand* recognises the need to take environmental impacts into account in evaluating the costs of different options. Environmental impacts can sometimes be regarded as a constraint; if, for example, a proposed scheme would cause more than a specified ("critical") amount of environmental damage, it would be excluded from the set of options considered in economic appraisal. *The Economics of Balancing Supply and Demand* provides a framework for screening options, to filter out those where the risks of environmental, economic or social impacts would be unacceptably high, focussing in on those options that should be taken forward for more detailed assessment.

Environmental impacts can be valued in monetary terms so that they can be added to, or subtracted from other items with monetary value such as capital and operating costs. A number of techniques exist for estimating the value that society has placed on the environment. These are summarised in *The Economics of Balancing Supply and Demand*, which also recognises that not all factors can be given a monetary value.

Given the importance that having sound assessments of environmental and social costs and benefits can play in supporting the selection of schemes, the Environment Agency has commissioned the development of a revised comprehensive methodology and associated guidance for assessing water resource and water quality management schemes. This is reported in *Benefits Assessment Guidance and Valuation for Water resources and Water Quality Schemes, 2003* (which is also available on the Agency web site). The Guidance:

- has been developed for use by both Agency planners and water company planners to ensure consistency across the different decision-making contexts within the Periodic Review;
- builds on existing methodologies (*The Environmental Costs and Benefits of Water Resources (1998)*) and expands or revises these as appropriate, drawing on new data sources and approaches;
- provides a means of evaluating the environmental and social costs and benefits of schemes proposed under the Periodic Review in a manner that can be applied at a desk-top level;
- is based on cost-benefit analysis, where as many of the impacts (positive as well as negative) as possible are measured in monetary terms; and
- also requires the non-monetary assessment of benefits / dis-benefits using qualitative and quantitative descriptions.

The Guidance sets out standardised assessment approaches and utilises data that are readily available. It has been subject to a peer review and testing process by relevant policy stakeholders (the Agency, DEFRA, Ofwat, English Nature), academics and a water company economist.

A preliminary approach may be appropriate for water resources planning purposes, so long as this acknowledges that more work will be needed in promoting schemes to implement the plan. The over-riding concern for water resources planning is to consider options on a consistent basis, in respect to both their non-monetary and monetary aspects. Environmental values must be assessed in a consistent way across the range of options.

It will be important to understand how sensitive proposed solutions are to considerations of environmental value and sensitivity tests should be reported in the plan.

5.6 Selecting the Optimum Solution

Companies will be expected to demonstrate that their plans are robust in terms of the wider considerations influencing selection of the optimum solution. Companies' plans should also be compatible with the principles set out in the Agency's Water Resources Strategies and in the UKWIR / EA guidelines on "The Economics of Balancing Supply and Demand."

Water resources for the future, the Agency's national and regional water resources strategies published in 2001 provide an overall framework for planning supply-demand management solutions. *The Economics of balancing supply and demand (2002)* provides a more detailed guide to assessing supply-demand management options and determining solutions, focusing particularly on economic appraisal of individual options and combinations of options.

The Agency expects the widest range of total water management options to be considered at the outset of preparing the plan. An initial assessment should be carried out to identify those options to be taken forward for further detailed consideration and those to be rejected, and why. Discussions with the Agency will be essential to help guide and advise companies on the selection and assessment of options. This may lead to some options being eliminated, on environmental grounds for example but a sufficient range of options should be retained and assessed in more detail. Economic analysis should be a key aspect of this assessment and an initial solution may be chosen so as to meet the forecast deficits over the planning period utilising the least expensive options wherever feasible. The initial solution needs to be compared with other possible solutions before the preferred, final, solution is concluded.

In this process key aspects to consider further are:

- the time for promotion and implementation;
- whether there are any links and dependencies between options;
- the equity of different combinations of options;
- Uncertainties and risks, including climate change;
- The contribution made toward sustainable development.

Annex 4 outlines the main elements to consider in the appraisal and reporting of options. The detail required for individual options will need to be progressively increased as the screening and assessment process becomes more focussed and the main elements of the company's preferred or optimum plan are identified.

In broad summary the following steps should be identifiable in the development of the plan:

- Establish an overall basket of options;
- Determine the sub-set of options worthy of further consideration. This should still be a greater number of options than the final number required to achieve or maintain the supply-demand balance;
- Consider timing and scheduling;
- Apply economic appraisal;
- Identify an initial preferred economic solution;
- Consider linkages between options;
- Refine initial solution;
- Consider wider issues of risk, uncertainty, sustainability etc;
- Identify alternative combinations of options in respect to wider issues;
- Compare and contrast relative merits of alternative solutions;
- Conclude a "final planning" solution.

Companies' plans should include a detailed commentary on the selection and assessment of options. This should set out clearly the assumptions and information used in the assessment of individual options and identification of the preferred or optimum plan. This should include justification for those options ruled out of further consideration.

6. FURTHER INFORMATION AND GUIDANCE

Further information and clarification on the preparation and presentation of the water resources plan, methodologies, supporting information requirements and WRP data submissions can be obtained through discussion with the Environment Agency if required.

6.1 Assessment of water resources plans

The plans produced by water companies will be scrutinised by Ofwat and the Environment Agency. This will include scrutiny of the water resources plan by the Ofwat reporter, in line with guidance set out in Section B5 and C4 of the strategic business plan submission to Ofwat. The assessment of the plans will consider three main areas:

- Quality and robustness of underlying data;
- Consistency with the planning guideline and the methods that it encompasses;
- The synthesis of the information and methods to produce a plan for the future management of the company's water resources;
- The delivery of a balanced and appropriate water resources plan that secures public water supplies and delivers good value in economic and environmental terms.

Companies will need to provide supporting information to show how the plan has been developed. Reports covering individual stages will be beneficial for companies and should form the basis for an ongoing dialogue with the Agency as the plan is developed. The Agency expects the plan to be built up from resource zone data and will expect to see evidence of this.

Generic assessment criteria are given in Annex 5. These will form the basis of the assessment by the Agency and are provided to help companies to consider their plans objectively. It must be emphasised that these criteria are meant as an aid for companies in the development of their plans. They are not an exhaustive list of the questions that the Agency will ask, as the exact nature of the analysis will be determined by the characteristics of the resource zone in question. A good plan will provide convincing evidence across these areas but will also demonstrate a clear and effective synthesis of all of the components to produce a plan that meets the needs of the company's customers while protecting the environment.

The Agency understands that there is no single best plan for a given zone or company, and therefore that the plan must reflect the judgement and policy of the company. The final plan will be tested to ensure that it takes a reasonable approach to meeting the future needs of water company customers and accurately reflects stated company policy. The Agency will not try to define its preferred plan for a company but it will identify areas of weakness or unacceptable risk either to customers or the environment in a company's plan.

The Agency is seeking views about how its assessment of plans should be reported. We expect to explain this further when we issue further guidance in March 2003.

Annex 1

Glossary of Terms and Abbreviations

Annex 1 – Glossary of Terms

Abstraction	The removal of water from any source, either permanently or temporarily.
Abstraction Licence	The authorisation granted by the Environment Agency to allow the removal of water from a source.
ACORN	A Classification Of Residential Neighbourhoods (ACORN) is a socio-demographic classification of neighbourhoods published by CACI Ltd. The system is based on the assumption that people who live in similar neighbourhoods are likely to have similar behavioural and consumption habits.
Allowable Outage	The outage (calculated from legitimate unplanned and planned events) which affects the water available for use (e.g., during annual average, peak week or other critical resource planning period). An. outage allowance may be made for such outages.
Annual Average	The total demand in a year, divided by the number of days Daily Demand in the year.
Available Headroom	The difference (in Ml/d or %) between water available for use (including imported water) and demand at any given point in time.
Average Day Demand In Peak Week	One seventh of total demand in the peak week in any 12 month accounting period (ADPW).
Average Incremental Social Costs	The ratio of present Social Costs over Present Net Value of additional water delivered or reduced demand
Consumption Monitor	A sample of properties whose consumption is monitored in order to provide information on the consumption and behaviour of properties served by a company.
Baseline Forecast	A demand forecast which reflects a company's current demand management policy but which must assume the swiftest possible achievement of the current agreed target for leakage during the forecast duration, as well as the implementation of the current company Water Efficiency Plan, irrespective of any supply surplus.
Demand Management	The implementation of policies or measures that serve to Management control or influence the consumption or waste of water. (This definition can be applied at any point along the chain of supply).

Deployable Output	<p>The output of a commissioned source or group of <i>sources</i> or of bulk supply as constrained by:</p> <ul style="list-style-type: none"> • environment • licence, if applicable • pumping plant and/or well/aquifer properties • raw water mains and/or aquifers • transfer and/or output main • treatment • water quality
Distribution Input	The amount of water entering the distribution system at the point of production (see Glossary Figure 1).
Distribution Losses	Made up of losses on trunk mains, service reservoirs, distribution mains and communication pipes. Distribution losses are distribution input less water taken (see Glossary Figure 1).
Distribution System Operation Use (DSOU)	Water knowingly used by a company to meet its statutory Operation Use obligations particularly those relating to water quality. (DSOU) Examples include mains flushing and air scouring (see Glossary Figure 1).
Drought Order	An authorisation granted by the Secretary of State under , drought conditions which imposes restrictions upon the use of water and/or allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.
Drought Permit	An authorisation granted by the Environment Agency under drought conditions which allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.
Dry Year Annual Average Unrestricted Daily Demand	The level of demand, which is just equal to the maximum annual average which, can be met without the introduction of demand restrictions at any time during the year. This should be based on a continuation of current policies regarding demand management. The dry year demand should be expressed as the total demand in the year divided by the number of days in the year.
Final Planning Forecast	A demand forecast that reflects a company's preferred policy for managing demand and resources through the planning period, after taking account of all options through full economic analysis.
Final Planning Scenario	The scenario of <i>water available for use</i> and final planning demand forecast which constitute the company's best estimate for planning purposes, and which is consistent with information provided to Ofwat for the Periodic Review.

Forecast/Plan Horizon	The end date of demand forecast or Water resources plan (e.g., 2025).
Maximum Likelihood Estimation (MLE)	A statistical technique where a <i>reconciliation item</i> is distributed to the largest and least certain components of an estimate of the magnitude of a variable. The technique can be applied to the reconciliation of a water balance, for example.
Meter Optants	Properties in which a meter is voluntarily installed at the request of its occupants.
Meter Programme	Properties, which are to be metered according to current company metering policy.
Micro-Component Analysis	The process of deriving estimates of future consumption Analysis based on expected changes in the individual components of customer use.
Net Present Value	The difference between the discounted sum of all of the benefits arising from a project and the discounted sum of all the of the costs arising from the project.
Non-Households	Properties receiving potable supplies but which are not occupied as domestic premises, i.e., factories, offices and commercial premises; cattle troughs. They also include properties containing multiple households, which receive a single bill (e.g., block of flats).
Normal Year Annual Average Daily Demand	The total demand in a year with normal or average weather patterns, divided by the number of days in the year.
Outage	A temporary loss of <i>deployable output</i> . (Note that an outage is temporary in the sense that it is retrievable, and therefore deployable output can be recovered. The period of time for recovery is subject to audit and agreement. If an outage lasts longer than 3 months, analysis of the cause of the problem would be required in order to satisfy the regulating authority of the legitimacy of the outage).
Point of Abstraction	The top of a borehole for borehole abstraction; the river intake for a river abstraction to direct supply or bankside storage; the draw-off tower for a direct supply reservoir.
Point of Consumption	The point where the supply pipe rises above ground level Consumption within the property usually the inside stopcock or an internal meter.
Point of Delivery	The point at which water is transferred from mains or pipes, which are vested in the water supplier into, pipes which are the responsibility of the customer. In practice this is usually the outside stopcock, boundary box or external meter.

Point of Production Potable Water Produced	The point where treated water enters the distribution system. Raw water treatment less <i>treatment works operational use</i> and <i>treatment work losses</i> (see Glossary Figure 1).
Potable Water Exported	Potable water exports from within a defined geographical area to an area outside the defined geographical area (see Glossary Figure 1).
Potable Water Imported	Potable water imports from outside a defined geographical area to the defined geographical area (see Glossary Figure 1).
Raw Water Abstracted	Raw water abstracted at the point where abstraction charges are levied. It is made up of raw water retained and raw water exported (see Glossary Figures 1)
Raw Water Collected	Raw water retained plus raw water imported (see Glossary Collected Figure 1).
Raw Wafer Exported	Raw water exported from a specific geographical area (see Glossary Figure 1).
Raw Water Imported	Raw water imported from outside of a specified Imported geographical area (see Glossary Figure 1).
Raw water Losses	The net loss of water to the resource system(s) being considered, comprised of mains/aqueduct (pressure system) losses, open channel/very low pressure system losses, and losses from break-pressure tanks and small reservoirs (see Glossary Figure 1).
Raw Water Operational Use	Regular washing-out of mains due to sediment build-up and poor quality of source water (see Glossary Figure 1).
Reconciliation Item	The difference between the estimates of the magnitude of a variable and the sum of the estimates of the individual components of that variable.
Resource Zone	The largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which all customers experience the same risk of supply failure from a resource shortfall.
Risk	A measure of the probability and magnitude of an event and the consequences(s) of its occurrence.
Source	A named input to a resource zone. A multiple well/spring source is a named place where water is abstracted from more than one operational well/spring.

Supply/Demand Balance	The difference between water available for use (including imported water) and demand at any given point in time (c.f. Available Headroom).
Supply Pipes Losses	The sum of <i>underground supply pipe losses</i> and <i>above ground supply pipe losses</i> (see Glossary Figure 1).
Sustainability Reduction	Reductions in <i>deployable</i> output required by the Environment Agency to meet statutory and/or environmental requirements.
Target Headroom	The threshold of minimum acceptable Headroom, which would trigger the need for total water management, options to increase <i>water available for use</i> or decrease demand.
Total Leakage	The sum of distribution losses and underground supply pipe losses (see Glossary Figure 1).
Total Water Management	All water management activities from source to end use (i.e. Management resource management, production management, distribution management and customer-side management).
Treatment Work Losses	The sum of structural water loss and both continuous and intermittent over-flows (see Glossary Figure 1).
Treatment Work Operational Use	Treatment process water i.e. net loss, which excludes water returned to source water (see Glossary Figure 1).
Underground Supply Pipe Losses	Losses between the <i>point of delivery</i> and the <i>point of consumption</i> (see Glossary Figure 1.)
Unrestricted Demand	The demand for water when there are no restrictions in place. (Note that this definition can be applied at any point along the chain of supply).
WRP Tables	Water Resources Plan Tables used for presenting key quantitative data associated with a company <i>water resources plan</i> .
Water Available For Use	The value of MI/d calculated by the deduction from <i>deployable output</i> of allowable <i>outages</i> and <i>planning allowances</i> in a resource zone.
Water Delivered	Water delivered to the point of delivery (see Glossary Figure.1).
Water Delivered Billed	<i>Water delivered less water taken unbilled</i> . It can be split Billed into unmeasured household, measured household, unmeasured non-household and measured non-households water. delivered billed (see Glossary Figure 1).

Water Taken

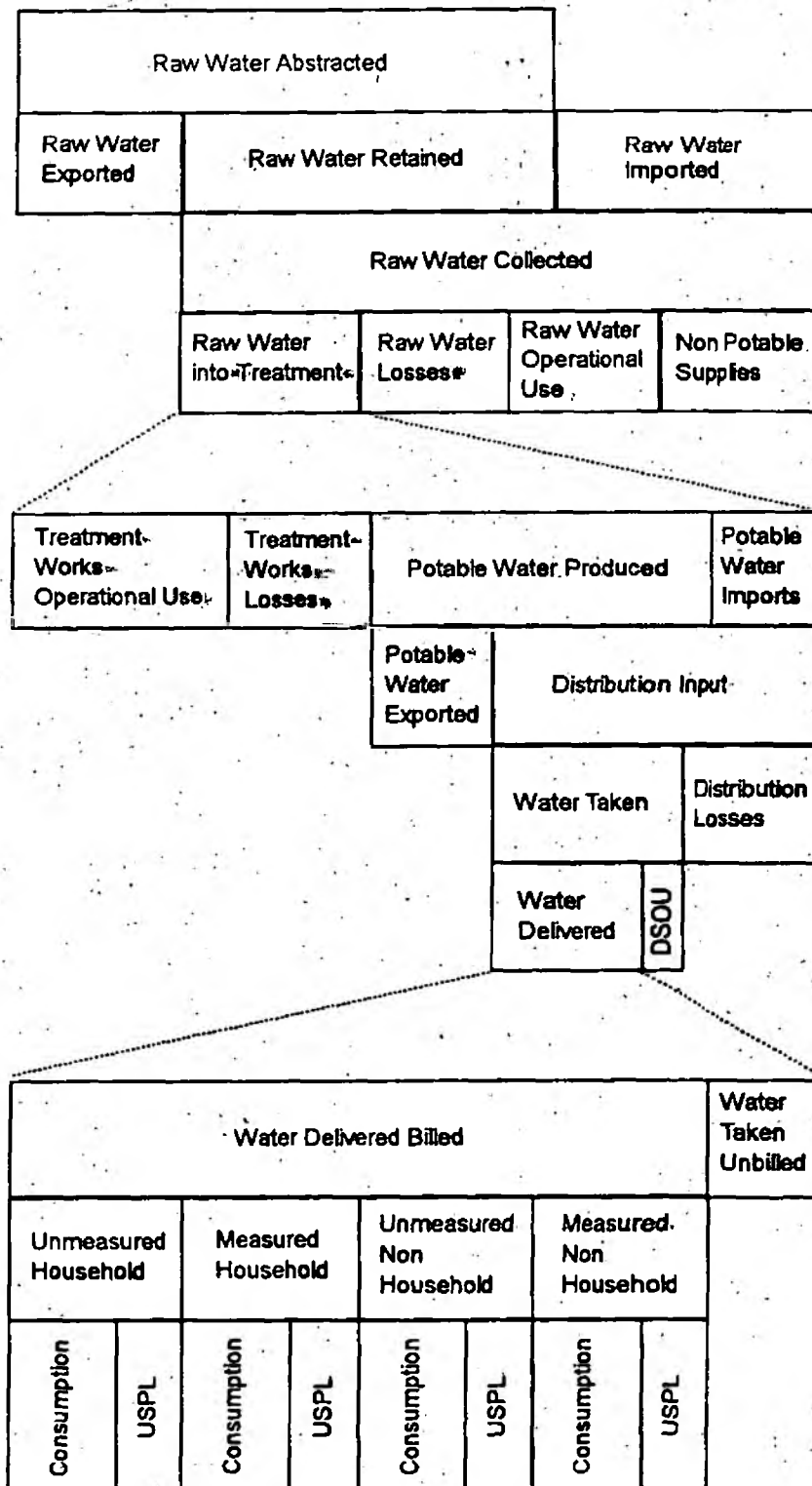
Distribution input minus distribution losses (see Glossary Figure 1).

Abbreviations

ADPW	Average day demand peak week
AISC	Average incremental social cost
CAMS	Catchment Abstraction management Strategies
CAPEX	Capital expenditure
Defra	Department of Environment, Food and Rural Affairs
DETR	Department of Environment, Transport and the Regions; (now Defra)
DoE	Department of the Environment; (now DETR)
DO	Deployable output
D.O.	Drought Order
D.P.	Drought Permit
LoS	Levels of Service
MI/d	Megalitres per day Megalitres = one million litres (1000 cubic metres)
MLE	Maximum Likelihood Estimation
Ofwat	Office of Water Services
OPEX	Operating expenditure
PCC	Per Capita consumption. Consumption per head of population
UKWIR	United Kingdom Water Industry Research Limited
WCA	Water Companies Association
WRP	Water resources plan
WSA	Water Services Association
WaterUK	WaterUK (formerly known as the Water Services Association)

Glossary Figure 1

COMPONENTS OF DEMAND



Annex 2

WRP Tables

WRP 1: DEPLOYABLE OUTPUTS OF LICENSED SOURCES

ROW Ref.	DERIVATION	DESCRIPTION	UNITS	Actual 2002-03 Annual Review Dry Year 2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
1	Input	Deployable Output (Specify individual Source Yields on Table WRP 1 (Annex))	M/d																												
2	Input as appropriate	Reductions in deployable output. Specify Below.																													
			M/d																												
			M/d																												
			M/d																												
			M/d																												
3	Input	Outage Allowance	M/d																												
4	1-(2+3)	Water Available For Use (own sources)	M/d																												
5	1-2-3+(9+18)-(7+19)	Total Water Available For Use	M/d																												

* - Delete as appropriate

Company:	Resource Zone Name:	Resource Zone Number: _____ of _____
Planning Scenario Name:		
Chosen Level of Service:		
Responsible Officer:	Signed:	Dated:
		Version: DRAFT/FINAL*

* - Delete as appropriate

WRPSup 1: RESOURCE ZONE/ DEPLOYABLE OUTPUT RECONCILIATION

[illegible]

Company:	Resource Zone Name:	Resource Zone Number:	_____ of _____
Planning Scenario Name:			
Chosen Level of Service:			
Responsible Officer:	Signed:	Dated:	Version: DRAFT/FINAL*

* - Delete as appropriate

WRP 2: RAW WATER

ROW Ref.	DERIVATION	DESCRIPTION	UNITS	Actual 2002-03 Annual Review Dry Year 2002-03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
6	Input	Raw Water Abstracted	M/d																												
7	Input as appropriate	Raw Water Exported (existing). Specify Below.																													
		To	M/d																												
		To	M/d																												
		To	M/d																												
		To	M/d																												
8	6-7	Raw Water Retained	M/d																												
9	Input as appropriate	Raw Water Imported (existing). Specify Below.																													
		From	M/d																												
		From	M/d																												
		From	M/d																												
		From	M/d																												
10	8+9	Raw Water Collected	M/d																												
11	Input	Raw Water Losses	M/d																												
12	Input	Raw Water Operational Use	M/d																												
	Input as appropriate	Non Potable Supplies (existing). Specify Below....																													
		to	M/d																												
		to	M/d																												
		to	M/d																												
		to	M/d																												
14	10-11-12-13	Raw Water Into Treatment	M/d																												

Company:	Resource Zone Name:	Resource Zone Number: _____ of _____
Planning Scenario Name:		
Chosen Level of Service:		
Responsible Officer:	Signed:	Dated:
		Version: DRAFT/FINAL*

* - Delete as appropriate

WRP 3: POTABLE WATER TO POINT OF DELIVERY

ROW Ref.	DERIVATION	DESCRIPTION	UNITS	Actual 2002 /03 Annual Review	Dry Year 2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
15	Input	Treatment Works Losses	MI/d																													
16	Input	Treatment Works Operational Use	MI/d																													
17	14-15-16	Potable Water Produced	MI/d																													
18	Input as appropriate	Potable Water Imported, Specify Below.....																														
		from	MI/d																													
		from	MI/d																													
		from	MI/d																													
		from	MI/d																													
19	Input as appropriate	Potable Water Exported, Specify Below.....																														
		to	MI/d																													
		to	MI/d																													
		to	MI/d																													
		to	MI/d																													
20	Input	Distribution Input	MI/d																													
21	Input	Distribution Losses	MI/d																													
22	20-21	Water Taken	MI/d																													
23	Input	Distribution System Operational Use	MI/d																													
24	22-23	Water Delivered	MI/d																													

Company:		Resource Zone Name:		Resource Zone Number: _____ of _____	
Planning Scenario Name:					
Chosen Level of Service:					
Responsible Officer:		Signed:		Dated:	
				Version: DRAFT/FINAL*	

* - Delete as appropriate

WRP 4: POTABLE WATER CUSTOMER BASE

ROW Ref.	DERIVATION	DESCRIPTION	UNITS	Actual 2002 /03 Annual Review	Dry Year 2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
25	Input	Billed Unmeasured Household Population	- 000's																													
26	Input	Billed Unmeasured Household Properties	- 000's																													
27	25/26 (or Input)	Billed Unmeasured Household Occupancy Rate	- h/pr																													
28	Input	Billed Measured Household - Population	- 000's																													
29	Input	Billed Measured Household - Properties	- 000's																													
30	28/29 (or Input)	Billed Measured Household - Occupancy Rate	- h/pr																													
31	Input	Billed Unmeasured Non Household Population	- 000's																													
32	Input	Billed Unmeasured Non Household Properties	- 000's																													
33	31/32 (or Input)	Billed Unmeasured Non Household Occupancy Rate	- h/pr																													
34	Input	Billed Measured Non Household Population	- 000's																													
35	Input	Billed Measured Non Household Properties	- 000's																													
36	34/35 (or Input)	Billed Measured Non Household Occupancy Rate	- h/pr																													
37	25+28+31+34	Total Population	- 000's																													
38	Input	Void Households	- 000's																													
39	Input	Void Non Households	- 000's																													
40	28+29+32+35+38+39	Total Properties	- 000's																													

Company:		Resource Zone Name:		Resource Zone Number: _____ of _____	
Planning Scenario Name:					
Chosen Level of Service:					
Responsible Officer:		Signed:		Dated:	
				Version: DRAFT/FINAL*	

* - Delete as appropriate

WRP 5: POTABLE WATER DELIVERED

ROW Ref.	DERIVATION	DESCRIPTION	UNITS	Actual 2002 /03 Annual Review Dry Year	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
41	Input	Water Taken Unbilled	M/d																													
42	24-41	Water Delivered Billed	M/d																													
43	Input	Water Delivered Billed Unmeasured Household	M/d																													
44	Input	Billed Unmeasured Household - USPL	M/d																													
45	43-44	Billed Unmeasured Household Consumption	M/d																													
46	(45*1000000)/(25*1000)	Billed Unmeasured Household - PCC	l/h/d																													
47	Input	Water Delivered Billed Measured Household	M/d																													
48	Input	Billed Measured Household - USPL	M/d																													
49	47-48	Billed Measured Household Consumption	M/d																													
50	(49*1000000)/(28*1000)	Billed Measured Household - PCC	l/h/d																													
51	Input	Water Delivered Billed Unmeasured Non Household	M/d																													
52	Input	Billed Unmeasured Non Household - USPL	M/d																													
53	Input	Billed Unmeasured Non Household Consumption	M/d																													
54	Input	Water Delivered Billed Measured Non Household	M/d																													
55	Input	Billed Measured Non Household - USPL	M/d																													
56	Input	Billed Measured Non Household Consumption	M/d																													
57	Input	Void Properties - USPL	M/d																													
58	21+44+48+52+55+57	Total Leakage	M/d																													
59	(58*1000000)/(40*1000)	Total Leakage	l/pr/d																													

Company:	Resource Zone Name:	Resource Zone Number: _____ of _____
Planning Scenario Name:		
Chosen Level of Service:		
Responsible Officer:	Signed:	Dated:
		Version: DRAFT/FINAL*

* - Delete as appropriate
Version 3.0 February 2003

WRP 6: TOTAL WATER MANAGEMENT OPTIONS

[illegible]**Company:**

Resource Zone Name:

Resource Zone Number: _____ of _____

Planning Scenario Name:

Chosen Level of Service:

Responsible Officer:

Signed:

Dated:

Version: DRAFT/FINAL*

* - Delete as appropriate

WRP 7: TOTAL WATER MANAGEMENT OPTION COSTS AND SOLUTION

ROW Ref.	OPTION DESCRIPTION	OPTION REFERENCE No.	NPV of WAFU (M£)	CAPEX NPC (£M)	OPEX NPC (£M)	NPC OF OPEX (£M)	ANY SAVINGS	SOCIAL ENVIRONMENTAL NPC (£M)	& TOTAL NPC (£M)	AISC (p/M3)	RANK OF OPTIONS
64	Customer Side Management, Specify Below....										
65	Distribution Side Management, Specify Below....										
66	Production Side Management, Specify Below....										
67	Resource Management, Specify Below....										

Company:	Resource Zone Name:	Resource Zone Number: _____ of _____
Planning Scenario Name:		
Chosen Level of Service:		
Responsible Officer: DRAFT/FINAL*	Signed:	Dated: _____
		Version: _____

* - Delete as appropriate

WRP 8 : SUPPLY/DEMAND BALANCE ZONAL INVESTMENT PROGRAMME – AVERAGE INCREMENTAL COST INFORMATION CAPTURE SYSTEM

SUPPLY/DEMAND BALANCE - ZONAL INVESTMENT PROGRAMME

Line no	Units	NOTE: shaded cells are calculated fields																											
5		Company																											
6		Resource zone																											
7		Level of service (freq. hosepipe ban)																											
8																													
9		Discount rate (%)																											
10																													
11		Year	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27		
12		BASE DRY YEAR ANNUAL AVERAGE PLANNING SCENARIO																											
13	MI/d	Present policy demand																											
14	MI/d	Present policy leakage																											
15	MI/d	Target headroom																											
16	MI/d	Base WAFU																											
17	MI/d	Reductions in output imposed by EA																											
18	MI/d	Reductions in output to meet other statutory obligations																											
19	MI/d	Base supply/demand balance																											
20		CUMULATIVE IMPACT OF SDB INTERVENTIONS ON DRY YEAR ANNUAL AVERAGE SCENARIO																											
21	MI/d	Change in demand																											
22	MI/d	Change in leakage																											
23	MI/d	Change in WAFU																											
24		PLANNED DRY YEAR ANNUAL AVERAGE SUPPLY/DEMAND BALANCE																											
25	MI/d	Demand (managed)																											
26	MI/d	Economic level of leakage																											
27	MI/d	Target headroom																											
28	MI/d	Planned WAFU																											
29	MI/d	Planned supply/demand balance																											

			2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
30		BASE CRITICAL PERIOD PLANNING SCENARIO																									
31	MI/d	Present policy critical period demand																									
32	MI/d	Base critical period WAFU																									
33	MI/d	Reductions in output imposed by EA																									
34	MI/d	Reductions in output to meet other statutory obligations																									
35	MI/d	Base critical period supply/demand balance																									
36		CUMULATIVE IMPACT OF SDB INTERVENTIONS ON CRITICAL PERIOD SCENARIO																									
37	MI/d	Change in demand																									
38	MI/d	Change in leakage																									
39	MI/d	Change in WAFU																									
40		CRITICAL PERIOD ASSUMPTIONS																									
41	days	Critical period plan duration																									
42	nr	Average utilisation of incremental capacity available during critical period plan duration																									
43	MI	Average annual volume impact of planned critical period plan interventions																									
44		PLANNED CRITICAL PERIOD SUPPLY/DEMAND BALANCE																									
45	MI/d	Critical period Demand (managed)																									
46	MI/d	Planned critical period WAFU																									
47	MI/d	Planned critical period supply/demand balance																									
48		CUMULATIVE IMPACT OF SDB INTERVENTIONS ON NORMAL YEAR ANNUAL AVERAGE SCENARIO																									
49	MI/d	Demand management																									
50	MI/d	Cumulative increase in water usage																									
51	MI/d	Supply interventions in response to reduction in output																									
52																											

[illegible]

WRP 9: SUPPLY/DEMAND BALANCE AND HEADROOM

INITIAL SUPPLY/DEMAND
BALANCE

ROW Ref.	DERIVATION	DESCRIPTION	UNITS	Actual 2002/03 Annual Review	Dry Year 2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
68	Input	Surplus/Deficit (i.e Available Headroom)	ML/d																													
69	Input	Assessed Target Headroom Requirement	ML/d																													

FINAL PLANNING SUPPLY/DEMAND BALANCE ACCOUNTING FOR TOTAL
WATER MANAGEMENT SOLUTION

ROW Ref.	DERIVATION	DESCRIPTION	UNITS	2002/03 Actual	Dry Year 2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
70	Input	Surplus/Deficit (i.e Available Headroom)	ML/d																													
71	Input	Assessed Target Headroom Requirement	ML/d																													

Company:	Resource Zone Name:	Resource Zone Number: _____ of _____
Planning Scenario Name:		
Chosen Level of Service:		
Responsible Officer:	Signed:	Dated:
		Version: DRAFT/FINAL*

* - Delete as appropriate

WRPAR4: Fourth Annual Review Table

Row Ref	Derivation	WATER BALANCE COMPONENT	Units	Resource Zone:
BASIC RESOURCES				
1	Input (link to WRP1)	Deployable Output	MI/d	0.00
3	Input (link to WRP1)	Outage Allowance	MI/d	0.00
4	Calculated (link to WRP1)	Water Available For Use	MI/d	0.00
RAW WATER				
6	Input (link to WRP2)	Raw Water Abstracted	MI/d	0.00
7	Input (link to WRP2)	Raw Water Exported	MI/d	0.00
8	Calculated (link to WRP2)	Raw Water Retained	MI/d	0.00
9	Input (link to WRP2)	Raw Water Imported	MI/d	0.00
10	Calculated (link to WRP2)	Raw Water Collected	MI/d	0.00
11	Input (link to WRP2)	Raw Water Losses	MI/d	0.00
12	Input (link to WRP2)	Raw Water Operational Use	MI/d	0.00
13	Input (link to WRP2)	Non Potable Supplies	MI/d	0.00
14	Calculated (link to WRP2)	Raw Water Into Treatment	MI/d	0.00
POTABLE WATER TO POINT OF DELIVERY				
15	Input (link to WRP3)	Treatment Works Losses	MI/d	0.00
16	Input (link to WRP3)	Treatment Works Operational Use	MI/d	0.00
17	Calculated (link to WRP3)	Potable Water Produced	MI/d	0.00
18	Input (link to WRP3)	Potable Water Imports	MI/d	0.00
19	Input (link to WRP3)	Potable Water Exports	MI/d	0.00
20	Input (link to WRP3)	Distribution Input	MI/d	0.00
21	Input (link to WRP3)	Distribution Losses	MI/d	0.00
22	Calculated (link to WRP3)	Water Taken	MI/d	0.00
23	Input (link to WRP3)	Distribution System Operational Use	MI/d	0.00
24	Calculated (link to WRP3)	Water Delivered	MI/d	0.00
POTABLE WATER CUSTOMER BASE				
25	Input (link to WRP4)	Unmeasured Household - Population	000's	0.00
26	Input (link to WRP4)	Unmeasured Household - Properties	000's	0.00
27	Calculated (link to WRP4)	Unmeasured Household - Occupancy rate	h/pr	#DIV/0!
28	Input (link to WRP4)	Measured Household - Population	000's	0.00
29	Input (link to WRP4)	Measured Household - Properties	000's	0.00
30	Calculated (link to WRP4)	Measured Household - Occupancy rate	h/pr	#DIV/0!
31	Input (link to WRP4)	Unmeasured Non-Household Population	000's	0.00
32	Input (link to WRP4)	Unmeasured Non-Household - Properties	000's	0.00
34	Input (link to WRP4)	Measured Non-Household - Population	000's	0.00
35	Input (link to WRP4)	Measured Non-Household - Properties	000's	0.00
37	Calculated (link to WRP4)	Total Population	000's	0.00
38	Input (link to WRP4)	Void Household - Properties	000's	0.00
39	Input (link to WRP4)	Void Non-Households - Properties	000's	0.00
40	Calculated (link to WRP4)	Total Properties	000's	0.00
POTABLE WATER DELIVERED				
41	Calculated (link to WRP5)	Water Taken Unbilled	MI/d	0.00
42	Calculated (link to WRP5)	Water Delivered Billed	MI/d	0.00
43	Input (link to WRP5)	Unmeasured Household Water Delivered	MI/d	0.00
44	Input (link to WRP5)	Unmeasured Household - USPL	MI/d	0.00
45	Calculate (link to WRP5)	Unmeasured Household - Consumption	MI/d	0.00
46	Calculate (link to WRP5)	Unmeasured Household - PCC	l/h/d	#DIV/0!
47	Input (link to WRP5)	Measured Household Water Delivered	MI/d	0.00
48	Input (link to WRP5)	Measured Household - USPL	MI/d	0.00
49	Calculate (link to WRP5)	Measured Household - Consumption	MI/d	0.00
50	Calculate (link to WRP5)	Measured Household - PCC	l/h/d	#DIV/0!
51	Input (link to WRP5)	Unmeasured Non-Household Water Delivered	MI/d	0.00
52	Input (link to WRP5)	Unmeasured Non-Household - USPL	MI/d	0.00
53	Calculate (link to WRP5)	Unmeasured Non-Household - Consumption	MI/d	0.00
54	Input (link to WRP5)	Measured Non-Household Water Delivered	MI/d	0.00
55	Input (link to WRP5)	Measured Non-Household - USPL	MI/d	0.00
56	Calculate (link to WRP5)	Measured Non-Household - Consumption	MI/d	0.00
57	Input (link to WRP5)	Void Properties - USPL	MI/d	0.00
LEAKAGE				
58	Calculate (link to WRP5)	Total Leakage	MI/d	0.00
59	Calculate (link to WRP5)	Total Leakage	l/prop/d	#DIV/0!
AR1	Input	Total Leakage in m3/ km of mains/ day	m3/d	
AR2	Input	Number of bursts/1000km	Nr	
AR3	Input	Number of DMAs	Nr	
AR4	Input	Average Zonal Night Pressure	m	
AR5	Input	Background leakage	MI/d	

AR6	Input	Length of trunk mains	km	
AR7	Input	Length of distribution mains	km	
AR8	Input	Average length of supply pipe	km	
AR9	Input	Number of connected properties	000's	
AR10	Input	Hour/day factor	Nr	
AR11	Input	Number of Connections	Nr	
SUPPLY DEMAND BALANCE				
68	Input (link to WRP9)	Available Headroom	M/d	0.00
69	Input (link to WRP9)	Target Headroom	M/d	0.00

Annex 3

Additional WRP Tables

WRPSup 2: BILLED MEASURED HOUSEHOLDS

Row Ref	Derivation	Description	Units	Dry Year 2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
S2.1	S2.6+S2.11+S2.16+S2.21+S2.26+S2.31+S2.36	Total	Population	000's																											
S2.2	S2.7+S2.12+S2.17+S2.22+S2.27+S2.32+S2.37	Total	Properties	000's																											
S2.3	S2.1/S2.2	Total	Occupancy	h/prop																											
S2.4	Input	Total	pcc	1/h/d																											
S2.5	S2.10+S2.15+S2.20+S2.25+S2.30+S2.35+S2.40	Total	Consumption	M1/d																											
S2.6	Input	Optant	Population	000's																											
S2.7	Input	Optant	Properties	000's																											
S2.8	Input	Optant	Occupancy	h/prop																											
S2.9	Input	Optant	pcc	1/h/d																											
S2.10	Input	Optant	Consumption	M1/d																											
S2.11	Input	New Property	Population	000's																											
S2.12	Input	New Property	Properties	000's																											
S2.13	Input	New Property	Occupancy	h/prop																											
S2.14	Input	New Property	pcc	1/h/d																											
S2.15	Input	New Property	Consumption	M1/d																											
S2.16	Input	Change In OCC	Population	000's																											
S2.17	Input	Change in OCC	Properties	000's																											
S2.18	Input	Change In OCC	Occupancy	h/prop																											
S2.19	Input	Change in OCC	pcc	1/h/d																											
S2.20	Input	Change in OCC	Consumption	M1/d																											
S2.21	Input	Selected	Population	000's																											
S2.22	Input	Selected	Properties	000's																											
S2.23	Input	Selected	Occupancy	h/prop																											
S2.24	Input	Selected	pcc	1/h/d																											
S2.25	Input	Selected	Consumption	M1/d																											
S2.26	Input	Sprinkler Use	Population	000's																											
S2.27	Input	Sprinkler Use	Properties	000's																											
S2.28	Input	Sprinkler Use	Occupancy	h/prop																											
S2.29	Input	Sprinkler Use	pcc	1/h/d																											
S2.30	Input	Sprinkler Use	Consumption	M1/d																											
S2.31	Input	Swimming Pools	Population	000's																											
S2.32	Input	Swimming Pools	Properties	000's																											
S2.33	Input	Swimming Pools	Occupancy	h/prop																											
S2.34	Input	Swimming Pools	pcc	1/h/d																											
S2.35	Input	Swimming Pools	Consumption	M1/d																											
S2.36	Input	Other high use	Population	000's																											
S2.37	Input	Other high use	Properties	000's																											
S2.38	Input	Other high use	Occupancy	h/prop																											
S2.39	Input	Other high use	pcc	1/h/d																											
S2.40	Input	Other high use	Consumption	M1/d																											

WRPSup3 : HOUSEHOLD MICRO-COMSUMPTION

Row Ref	Derivation	Description	Units	Dry Year 2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
S3.1	Input	Billed unmeasured toilet flushing	l/h/d																												
S3.2	Input	Billed unmeasured bath use	l/h/d																												
S3.3	Input	Billed unmeasured shower use	l/h/d																												
S3.4	Input	Billed unmeasured hand basin	l/h/d																												
S3.5	Input	Billed unmeasured clothes washing	l/h/d																												
S3.6	Input	Billed unmeasured dish washing	l/h/d																												
S3.7	Input	Billed unmeasured garden use	l/h/d																												
S3.8	Input	Billed unmeasured car washing	l/h/d																												
S3.9	Input	Billed unmeasured miscellaneous use	l/h/d																												
S3.10	Input	Billed measured toilet flushing	l/h/d																												
S3.11	Input	Billed measured bath use	l/h/d																												
S3.12	Input	Billed measured shower use	l/h/d																												
S3.13	Input	Billed measured hand basin	l/h/d																												
S3.14	Input	Billed measured clothes washing	l/h/d																												
S3.15	Input	Billed measured dish washing	l/h/d																												
S3.16	Input	Billed measured garden use	l/h/d																												
S3.17	Input	Billed measured car washing	l/h/d																												
S3.18	Input	Billed measured miscellaneous use	l/h/d																												

Company:	Resource Zone Name:	Resource Zone Number: _____ of _____
Planning Scenario Name:		
Chosen Level of Service:		
Responsible Officer:	Signed:	Dated:
		Version: DRAFT/FINAL*

* - Delete as appropriate

WRPSup4 : NON-HOUSEHOLD SECTOR CONSUMPTION

Row Ref	Derivation	Description	Units	Dry Year 2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
S4.1	Input	Extraction	M/d																												
S4.2	Input	Utilities	M/d																												
S4.3	Input	Fuel Refining	M/d																												
S4.4	Input	Chemicals	M/d																												
S4.5	Input	Minerals	M/d																												
S4.6	Input	Metals	M/d																												
S4.7	Input	Machinery	M/d																												
S4.8	Input	Electrical Equipment	M/d																												
S4.9	Input	Transport	M/d																												
S4.10	Input	Food and drink	M/d																												
S4.11	Input	Textiles	M/d																												
S4.12	Input	Wood	M/d																												
S4.13	Input	Paper	M/d																												
S4.14	Input	Rubber	M/d																												
S4.15	Input	Construction	M/d																												
S4.16	Input	Other	M/d																												
S4.17	Input	Retail	M/d																												
S4.18	Input	Education and Health	M/d																												
S4.19	Input	Hotels	M/d																												
S4.20	Input	Agriculture	M/d																												
S4.21	Input	Horticulture	M/d																												

Company:	Resource Zone Name:	Resource Zone Number: _____ of _____
Planning Scenario Name:		
Chosen Level of Service:		
Responsible Officer:	Signed:	Dated:
		Version: DRAFT/FINAL*

* - Delete as appropriate

Annex 4

- **Option descriptions and assessment**

ANNEX 4: OPTIONS DESCRIPTION & ASSESSMENT

This list provides an outline of the elements that companies should consider within the description and assessment of options within their water resources plans. It is neither intended to be exhaustive nor a detailed framework for environmental assessment (though companies may wish to submit more detailed scheme assessments as supporting documents to their plans).

Company:

Resource Zone:

Option:

1. **Description:** introduction and outline description of each scheme with supporting information including: key features of the scheme, a location map illustrating scale, source of supply and supply areas and a conceptual diagram showing key operational features and any links / dependencies to other resource schemes.
2. **Feasibility:**
 - 2.1 Yield profile (DO, maximum output, dry / average year); savings profile and target customer group for demand side measures.
 - 2.2 Flexibility (of yield, scheme, phasing)
 - 2.3 Available technology
 - 2.4 Scheme specific consideration / issues (such as links, dependencies and interactions between options).
 - 2.5 Time to implement (promotion, construction) and constraints (linked schemes, dependencies in implementation). Identification of key milestones for design and implementation.
 - 2.6 Security of supply of the scheme with reference to its location and where the source for the scheme may be. Security of supply issues should be annotated on the location map.
 - 2.7 Uncertainty in yield.
 - 2.8 Asset life / renewal.
 - 2.9 Option constraints: planning regulations, environmental legislation, health and safety, stakeholders and public i.e. promotability of scheme, environment and energy use etc.
3. **Appraisal of environmental and social impacts**

Cross reference to *Economics of balancing supply and demand* report.

 - 3.1 Introduction / Scoping and appraisal of impacts
 - 3.2 Construction
 - 3.3 Operation
 - 3.4 Decommissioning
 - 3.5 Environmental enhancements / risks (including links to programmes to restore, improve or optimise environmental benefits of existing schemes e.g. RSAP).

- 3.6 Opportunity to meet other needs stakeholders / environment.
- 3.7 Socio-economic factors: including social exclusion & benefits / improvement. Recognising entitlements & sharing benefits.
- 3.8 Constraints (policy & legislation, public & stakeholders, environment, energy).
- 3.9 Mitigation measures.
- 3.10 Detailed assessment criteria:
 - 3.10.1 Impacts on air/climate, flora/fauna, landscape/visual amenity, water, land use, culture/heritage/archaeology, transport, soil/geology, use of natural resources
 - 3.10.2 Matrices to score degree of impact i.e. high/low positive/negative, short/long term impact or damage reversible/irreversible.
- 4. Costs**
 - 4.1 Non reoccurring costs associated with acquisition or disposal of fixed assets including construction – (CAPEX).
 - 4.2 Operation costs (OPEX) – variable and fixed operating costs.
 - 4.3 Environmental economic valuation including techniques (markets, benefit transfer, willingness to pay, etc). Types of value affected by environmental impact i.e. use and non-use values
 - 4.4 Calculation of social costs and sustainability.
 - 4.5 Cost outputs: AISC's
- 5. Strategic Assessment Framework**
 - 5.1 Assessment of schemes in terms of sustainable development. Description of approaches to sustainability appraisal. Should cross-reference Defra's proposals for good practice on sustainability appraisal of regional planning guidance and Agency water resources strategies.
 - 5.2 Sustainability criteria.
 - 5.2.1 Effective protection of the environment
 - 5.2.2 Prudent use of natural resources
 - 5.2.3 Social Progress
 - 5.2.4 Maintain high and stable level of economic growth
 - 5.2.5 Summary table or matrix for appraising options.
- 7. Climate change**
 - 7.1 Risks
 - 7.2 Flexibility / Implications of UKCIP Scenario's
 - 7.3 Benefits

8. Opportunity, risk & uncertainty

- 8.1 Description of framework / methods (cross-reference Agency water resources strategies) of assessing risk, uncertainty and probability (cross reference to EBSD main report).
- 8.2 Identify sources of risk and uncertainty associated with each option including:
 - 8.2.1 Value of resource
 - 8.2.2 Technical including available technology and need for site investigations and EIA.
 - 8.2.3 Promotion, implementation and construction time
 - 8.2.4 Cost
 - 8.2.5 Environment
 - 8.2.6 Social i.e. rights of stakeholders
 - 8.2.7 Legislation and regulations i.e. planning issues and approaches
- 8.3 Identification of opportunities and constraints:
 - 8.3.1 Do options meet wider objectives?
 - 8.3.2 Flexibility of implementation
 - 8.3.3 Opportunities for environmental improvements
 - 8.3.4 Resilience to climate change
 - 8.3.5 Provision of recreation and amenity enhancements
 - 8.3.6 Barriers associated with option
- 8.4 Summary table or matrix.

9. Process of screening options

- 9.1 Description of screening process and criteria. Cross reference EBSD Guideline and Main Report. Also, cross-reference key source material such as World Commission on Dams, 2000).
- 9.2 Screen unconstrained options
 - 9.2.1 Compare and contrast merits of options including combinations of options. Table to compare strengths and weaknesses, opportunities and threats of options/combinations of options (derived from section 7 above).
 - 9.2.2 Compare option constraints, uncertainty's and risks associated with each option. Consider: does the option address the SDB problem; is the option promotable, is the risk of failure acceptable?
 - 9.2.3 Table to compare the unconstrained list of options that can be used to select feasible options set.
- 9.3 Consider how robust options are against risks and uncertainty. Could the options set be refined to improve contribution to sustainable development?
- 9.4 Characterise feasible option set in terms of capacity size, capital intensity, overall costs and operational costs.
- 9.5 Equity – consider impact of different options/combinations of options on different groups.

Annex 5:

Assessment and quality review of water companies water resources plans: generic assessment criteria.

Methodology

Are the approaches used robust?
 Do they follow the WR Planning Guideline?
 Do they comply with identified industry good practice?
 If not in all areas, what issues / weaknesses does this raise?
 How has the company addressed weaknesses in its plan (risk, sensitivity, breadth of analysis etc)?
 Has the company set out its water efficiency strategy and metering proposals and adequately explained any proposed future changes?
 Has the company demonstrated awareness and understanding of any significant variation in leakage between resource zones?

Data Quality & Comparative analysis

Does the plan provide a comparison of data with the previous submission and annual reviews, and explain differences in surplus / deficits and whether due to:

- Reassessment of yields
- Abandoned/commissioned resources
- Sustainability reductions
- Changes in imports/exports
- Changes in outage allowance
- Changes in targeted headroom
- Changes in demand projections, levels of leakage

Have best practice approaches been followed?
 Has company-specific data been used?
 Is the data derived at resource zone or company level?
 Has the source of data been provided?
 Has supplementary data been provided in support of the plan?
 Is the data derived from a snap-shot or longer-term monitoring?

Does the plan set out the assumptions made and their consistency with previous reports? For example, in the following:

- population changes – whether derived from Office of National Statistics or local authority estimates and whether any changes made.
- Forecasts of water delivered to measured & unmeasured household customers and the amount lost through leakage.

How do key assumptions / data compare with other companies / resource zones? Where there are differences, are they justifiable?

Breadth of analysis

Has the company considered a wide range of water management options in deriving its preferred strategy?
 Is the preferred strategy underpinned by a robust approach to companies' duty to promote efficient use, metering policies, leakage targets etc.?
 Has the preferred strategy been tested for robustness and sensitivity to change in any of the key components of the plan?

Has the company demonstrated that its preferred strategy will make a positive contribution to sustainable development?

Does the plan show alternative scenarios for balancing supply & demand e.g. import bulk supply vs new local source vs demand management?

**Resource Zone /
Company level**

Is the plan built up from an assessment of data at the resource?

Is the company water balance, leakage appraisal etc built up from resource zone information?

Has the water balance been accepted?

How has MLE been derived / applied?

Are the assumptions explicit? Has adequate information been provided in support of the plan?

Sensitivity

Have key data / components of the plan been tested for their Effects on the preferred strategy?

How have environmental and social costs been tested?

Are the climate change scenarios consistent with supplementary guidance?

Annex 6:

Recommended Bibliography

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13. UKWIR and Environment Agency R&D (forthcoming winter 2002) *The Economics of Balancing Supply and Demand*
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