



Partners for Water and Sanitation

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Partners for Water and Sanitation

Project No:

**Water Resources Management in Oromia Region,
Ethiopia:
Strategic support in Planning, Monitoring and
Evaluation**

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and

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1. Executive summary

The purpose of this visit and report was to assist the Oromia Water Resources Board (WRB) to review and adapt existing guidelines and regulation in planning, monitoring and evaluation of Water Resource Management (WRM) in the Region through transfer of best practises and by identifying the major activities in WRM. The report seeks to provide technical and management support for planning, monitoring and evaluation of the existing policy and regulation in WRM, by building the capacity of staff within the WRB and zonal Water Resources offices.

The scope for the work has been developed by the Oromia WRB and the Partners for Water and Sanitation (PAWS) country manager and follows on from a previous visit during March 2007 which made recommendations for further support. The full terms of reference for the visit are in appendix 1, but the two main activities were to:

- 1) Transfer skills and knowledge from UK practise in the area of water resource management
- 2) Undertake a gap assessment to help make recommendations for future work and support

The assessment team comprised of the PAWS country manager for Ethiopia and two PAWS UK project managers from the UK partners Severn Trent Water and the Environment Agency. The UK project partners were chosen as they have practical experience in water resource management with skills ranging from monitoring network designs, data collection, UK legislation, resource assessment and resource balance.

The assessment visit took place in April 2008, where the team met with Oromia WRB managers and staff; Oromia Environmental Protection Agency; Oromia Investment Bureau and managers from the Ministry of Water Resources. The meetings were set up to gather information on the issues that each organisation faced in terms of water resources management. The discussion at each meeting was wide ranging and some key points were emerging such as communications between organisations, the need for integrated water resource management (quality as well as quantity) and the need to start doing something as soon as possible. A two day assessment workshop enabled knowledge transfer and sharing with various presentations from the UK partners and the Oromia WRB. A field visit on the afternoon of day one and a break out session in the afternoon of day two further promoted discussion. A series of site visits to relevant sites enabled the team to understand the issues facing the region at first hand.

Some of the key issues of the assessment include an urgent need for integrated water resource management as this is a key step needing to start with the communication and co-ordination between the relevant authorities. This work will need to include a programme of monitoring water quality, issuing discharge consents, taking enforcement action when discharges exceed their consent and work with companies to improve the discharge to surface water and groundwater. Work is starting in this area but by working on a catchment basis cross-functional organisations can share information and knowledge to improve the catchment management. Setting up catchment groups will enhance communications and focus effort as a team.

In terms of water resource management there is adequate and suitable regulations to provide for the management of water resources in the Oromia region (Regulations No.../200_ Regulations to provide for the management of water resources of the Oromia regional state – 8 December 2003). A series of recommendations are made to help assist with the water resources management which will help identify the resources available and balance that with the need.

- Data collection is the first step to identify a network of observation boreholes, rain gauges and river flow stations.

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- Regular monitoring of the network, data validation and a secure database are the next steps.
 - Assessment of resources to produce a catchment abstraction strategy.
 - Identify the need for the resources to produce a long term strategy about how to manage the gaps.
 - Assessment of resources to provide maps of availability of water resources to assist with development and communication of the best places to develop new sources with other agencies.

The report concludes with a series of next step suggestions to move the work forward. There is the opportunity for further support visits from relevant UK partners where they are requested by the Oromia WRB. The most important area of work is for ownership to be taken by Oromia WRB to make water resource management a key deliverable, using in-house staff, knowledge, communications with other relevant groups to work together to improve the water resource management and sustainability for the future.

2. Introduction to Ethiopia and the Water Resources Management in Oromia

The Federal Republic of Ethiopia is a landlocked republic in northeast Africa covering an area of 1,104,300 km² and for the sake of comparison is five times the size of the UK. Roughly 7,500 km² of Ethiopia's surface area is water. The population of the country (2005) is approximately 70 million people. The capital is Addis Ababa which lies at the heart of the country in the central highlands at an altitude of 2,300 m (the third highest capital city in the world). Addis has grown in population from 1987 of 1.6 million it swelled to 2.3 million in 1994 and is now considered to have a population of around three million.

The country is divided into eight regional states and three city states. Each region is divided into a few zones and a larger number of districts or Woredas. Oromia is the most centrally placed region and covers an area of twice the size of the UK (350,000 km²) having a population of 20 million people. Roughly 85% of the regional population is Oromia and another 10% Amhara. With its fertile soils, Oromia is the breadbasket of Ethiopia, producing more than half the nation's agricultural crop and it is also home to half of its large livestock. Oromia is divided into 12 zones and 180 districts with a vast geographic and climatic diversity.

The Oromia Water Resources Bureau (OWRB) is one of the Oromia region government organisations that are involved and responsible for the water resource management and development activities in the region. Many development activities and industries are concentrated in this area, industries do not typically adhere to legislation or control over their practices and as a result Oromia region faces significant pressure on water resources, including over abstraction, pollution and flooding. Floriculture has become a flourishing business in Ethiopia in the past five years, with the industry's exports earnings set to grow to \$100-million by 2007, a five-fold increase on the \$20-million earned in 2005. A score of investors from The Netherlands, Germany, India and Israel have secured licences for floricultural developments covering 450ha of land in 2006 (Mail and Guardian 16th February 2006).

Although the region has developed water resources management (WRM) regulation based on the federal policy, this is not effectively implemented due to, amongst other reasons, a lack of understanding of the broad concept of WRM, as well as the capacity gap in planning, monitoring and evaluation (PME) mechanisms.

A PAWS scoping visit on WRM issues affecting the Oromia Region and SNNP Region, as well as National Legislation (41/53/75 Eth, combined visit Mar 07) identified gaps in the implementation of WRM strategy in Oromia, impacting on pollution, over abstraction and flooding. It also identified a lack of data collection for effective management.

There is a recognized need within the Oromia Region Water Resources Bureau (WRB) for strategies and guidelines to support sustainable WRM. Subsequently a term of reference was set up for a further visit between PAWS and the OWRB. This took place from 5th to 16th April 2008. Colin Day (Severn Trent Water) and Sarah Gaskill (Environment Agency) visited the region as part of an assessment visit to share experience in the implementation of water resources management. The visit comprised of various meetings (see the visit diary), a two day workshop and selected field visits. This report summarises the findings of that visit.

3. Project Objectives

The project aim was to assist Oromia Water Resources Bureau (WRB) to review and adapt the existing guidelines and regulation in planning, monitoring and evaluation of Water Resource Management (WRM) in the Region through transfer of best practices and also by identifying the major activities in WRM.

The visit was to provide technical and management support for planning, monitoring and evaluation (PME) of the existing policy and regulation in WRM, by building the capacity of staff within the WRB and Zonal Water Resource offices.

The key activities to support these objectives included:

- reviewing the application and suitability of existing WRM policy and regulation;
- direct discussion with relevant staff in Oromia WRB;
- assessment visits to local (Zonal) offices and to the industrial sector;
- exposure visits to relevant sites;
- A 2 day workshop with key Oromia WRB staff, Zonal office heads and senior staff, including stakeholders such as Environmental Protection Agencies (EPAs) at Federal level, Oromia regional & zonal levels and Addis Ababa EPA. The workshop was an opportunity to introduce international best practice and case studies in WRM, enhancing the link between concept and practice
- Follow-up discussions with key decision makers to identify the way forward.

The key deliverable from the visit is an extensive report that addresses:

- critical problems and appropriate solutions in the existing planning, monitoring and evaluation of WRM in Oromia Region;
- recommendations for the development of guidelines/manuals (or other suitable tools), to improve the capacity of the WRB to license, measure and consent abstractions and effluent discharges, monitor water quality and deterioration;
- relevant roles and responsibilities for effective planning, M&E (PME) of WRM within the Region – addressing regional, Zonal and community levels;
- the development of a strategy for PME in the Oromia WRB, in line with current prioritization and implementation criteria of broader WRM activities;
- opportunities for public/private initiatives and/or participation in WRM

The PAWS UK team were asked to assist the WRB in reviewing and adapting the existing WRM regulations, guidelines/manuals by transferring high level best practices, offering key technical advice and support to produce an effective and workable document

The scope of the project was to support the WRB in effective planning, monitoring and evaluation of WRM strategies in the Region. This support focused on areas of; assessment of existing WRM challenges, development of guidelines/manuals/strategies for sustainable WRM and identifying capacity gaps at a range of staffing levels. The PAWS team were also tasked with assisting in the development and delivery of capacity building training, to help implement the proposed WRM strategy, planning, monitoring and evaluation needs, although this is likely to be an activity for further support to the WRB.

4. Summary of information gathered during the visit

The assessment team wish to thank the following people for their time and patience during the visit. The complete list of findings can be found in appendix 2.

Partners for Water and Sanitation (PAWS)

Name	Ato Melkamu Jaleta
Job Title	Ethiopia Country Manager
Organisation	PAWS
Roles/Responsibilities	<ul style="list-style-type: none">• Transfer knowledge from UK.• Identify true gaps.• First assessment visit to be built on.

Oromia Water Resources Bureau

Name	Ato Motuma Metassa
Job Title	Head
Organisation	Oromia Water Resources Bureau
Roles/Responsibilities	Head of Oromia Water Resources Bureau.

Name	Ato Kebede Gerba
Job Title	Deputy Head
Organisation	Oromia Water Resources Bureau
Roles/Responsibilities	Deputy Head of: <ul style="list-style-type: none">• Technical Teams.<ul style="list-style-type: none">○ Operation and maintenance department – zone and woreda.○ Water Supply construction – zone and woreda.○ Resources Management Team – Regional.• Irrigation.• Drainage. Plus other support teams.

Name	Ato Tesfu Tesema
Job Title	Water Resource Management Team Leader
Organisation	Oromia Water Resources Bureau
Roles/Responsibilities	<ul style="list-style-type: none">• Issue licences for use by private water users.• Inspect the licence conditions.• Annually review the licence.• Collect fee for issue fee and annual asses potential of water resource – at business level is undertaken by the MINISTRY NOT REGION.• Monitor resources for depletion and replenishment.

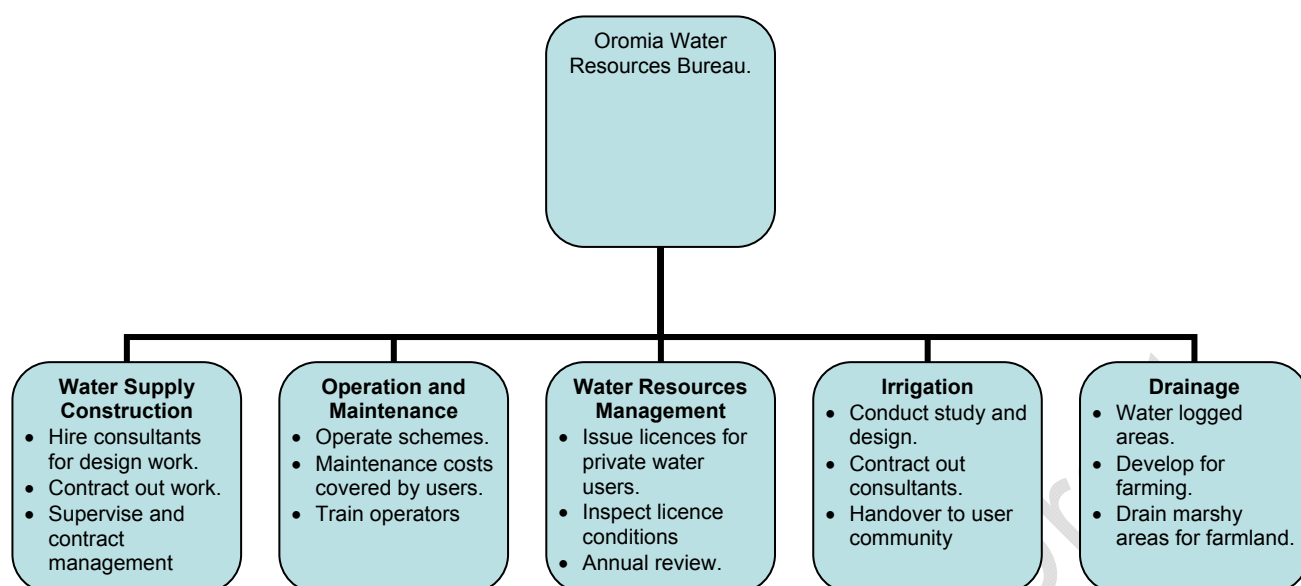


Figure 1, The organisational structure of the Water Resources Bureau

Ministry Of Water Resources

Name	Marta Solomon
Job Title	Head of Policy, Development, Cooperation and Foreign Affairs Department.
Organisation	Ministry of Water Resources.
Roles/Responsibilities	<ul style="list-style-type: none"> Capacity building in Ministry of Water Resources. Linking with practical partners.

Name	Ato Yohannes Gimedhin
Job Title	Head of Water Resources Administration, Urban Water Supply and Sanitation Department.
Organisation	Ministry of Water Resources.
Roles/Responsibilities	<ul style="list-style-type: none"> Federal level of administration. Give assistance to Regional Government. Policy and Regulation. Water Resources administration at both Federal and Regional.

Name	Mr Mark Harvard
Job Title	Advisor Water Supply and Sanitation
Organisation	On secondment to Ministry of Water Resources from UK DFID
Roles/Responsibilities	<ul style="list-style-type: none"> Co-ordination work. Creating links by seeing the bigger picture.

Oromia Investment Bureau

Name	Ato Mohamd Ibrahim
Job Title	Vice Commissioner and the Process owner of land affair and investment Promotion
Organisation	Oromia Investment Bureau
Roles/Responsibilities	<ul style="list-style-type: none"> Balance between investment and Water Resources. Write to Oromia WRB with proposals. Good links with Oromia EPA.

Federal Environmental Protection Agency

Name	Ato Dessalengne Mesfin
Job Title	Deputy Director General
Organisation	Federal Environmental Protection Agency
Roles/Responsibilities	<ul style="list-style-type: none"> • Policy and Strategy in place. • Pollution Prevention. • Enforcement.

Table 1 records the events during the assessment visit.

Date	Activity
Sun 6 th April	Meeting with Melkamu Jaleta – Ethiopia Country Manager for PAWS. Welcome, introductions, outline of the week and arrangements. Workshop preparation.
Mon 7 th April	<ul style="list-style-type: none"> • Meeting with Kebede Gerba – Deputy Head of Oromia Water Resources Bureau. • Meeting with Tesfu Tesema – Water Resources Teamleader – Oromia Water Resources Bureau. • Meeting with Marta Solomon - Head of Policy, Development, Cooperation and Foreign Affairs Department – Ministry of Water Resources. • Meeting with Yohannes Gimedhin - Head of Water Resources Administration, Urban Water Supply and Sanitation Department - Ministry of Water Resources. • Meeting with Mark Harvard - Advisor Water Supply and Sanitation - On secondment to Ministry of Water Resources from UK DFID. • Workshop preparation.
Tues 8 th April	<ul style="list-style-type: none"> • Workshop at Sululta in the morning. • Field visit to Addis catchment; Akaki river catchment; Aba Samuel dam and Addis groundwater well field.
Wed 9 th April	<ul style="list-style-type: none"> • Workshop at Sululta and group discussions.
Thurs 10 th April	<p>Field visits with Tesfu Tesema, Melkamu Jaleta, Colin Day and Sarah Gaskill</p> <ul style="list-style-type: none"> • Awash Basin • Soda Ash Factory and Lake Abiata • Bulbula River. • Flower Plantations and greenhouses. • Public Water Supply Works • Lake Ziway
Fri 11 th April	<ul style="list-style-type: none"> • Meeting with Mohamd Ibrahim - Vice Commissioner and the Process owner of land affair and investment Promotion - Oromia Investment Bureau. • Meeting with Dessalengne Mesfin - Deputy Director General - Federal Environmental Protection Agency.
Sat 12 th April	Field visits to Sodore; Bishoftue; Adama. Lake Kiroftu and Lake Bishoftu.
Sun 13 th April	Report writing and visits to Addis Museum and Holy Trinity Church.
Mon 14 th April	Report review at Water aid office.
Tues 15 th April	Wrap up with Motuma Mekassa – Head of Oromia Water Resources Bureau, Tesfu Tesema and Melkamu Jaleta

Table 1 – Summarised list of activities undertaken during the visit.

5. Workshop Summary

During the time in Ethiopia a workshop was organised for the 2nd and 3rd days of the visit. The workshop was held in Sululta a small town on Mount Intoto on the outskirts of Addis on the 8th and 9th April and was organised by the Water Resources Bureau in conjunction with the PAWS country representative. The aims of the workshop were to allow knowledge sharing in Water Resources Management, understand some of the gaps that currently exist in the Oromia region and identify potential ways forward to meet these gaps. The workshop was attended by a number of stakeholders including Water Aid, JAICA and many areas of the Water Resources Bureau including zonal and Woredas representatives.

The workshop consisted of an opening address by Ato Kebede Gerba followed by a presentation on the Water Resources Situation in Oromia and a series of site visits. The second day the presentations in Appendix 5 were delivered by the PAWS representatives and a breakout session to discuss the gaps and way forward were conducted. The summaries of the discussion can be seen in table 2. This details all the group activities findings in terms of the identification of gaps and the potential solutions.

	Gaps	Potential Ways forward
Communication		
1	Lack of Awareness of Water Resources Management issues Absence of full attention to WRM and value Lack of Information Exchange – Media	Promotion of WRM issues and regulations <ul style="list-style-type: none"> - Workshop - Production of materials and Manuals (UK examples in Appendix) - Lobbying of media to familiarise with the issues Advocacy and promotion of WRM using any appropriate media <ul style="list-style-type: none"> - TV - Radio - Newspaper Introduce WRM to the schools curriculum
2	Absence of WRM forum and clear roles and responsibilities Lack of Stakeholder integration and collaboration Interwoven nature of integrated WRM – absence of management of wastes from urban centres and industry	Establishment of Water Resources Board that consists of members from relevant stakeholders <ul style="list-style-type: none"> - Investment Bureau - EPA - NGOs - Forestry - Agriculture
Policy / Regulations		
3	Absence of implementation procedures and manuals No strong systems to support WRM	Make practices of the existing regulations and provide workshops. Provide simplified documentation and implementation manuals
4	Lack of timely preparing and implementation of policy and guidelines. Lack of enforcement of laws	Try to attract the attention of the policy makers and other responsible stakeholders

Manpower / Capacity		
5	Lack of capacity to implement – Logistics and Budget	Look for viable funding sources Sponsorship of MSc students (via Ripple)
6	Lack of centralised database- Lack of capacity to build database, budget and logistics	Implementation of database in pilot area with Water Aid and then try to replicate in other areas. Potential support from PAWS in hydrometric data collection in pilot area with capacity building which can be transferred to other areas.
7	Absence of appropriate capacity for planning, implementation and M&E Shortage of qualified manpower Absence of accountable professionals at Zone and Ana level Organisational Instability – Professional turnover	Continued training and capacity building in Integrated Water Resource Management, planning, implementation and monitoring and evaluation
Information and Data Collection		
8	Lack of Water Resources inventory and mapping No proper ways or means to monitor WRM	Capacity and Resource evaluation by starting to collect baseline data on <ul style="list-style-type: none"> - Ground water mapping - Water Level monitoring - Water Quality monitoring - Abstraction monitoring - Precipitation data - River/Runoff data - Estimates of recharge - Modelling in selected catchments where data already available
Actions with other organisations		
9		Provision of water to victims in Akaki river – link with Akaki River Basin task force.

Table 2 – summary of outcomes from the workshop

It is understood that the Oromia WRB is writing up the findings from the workshop and it was considered a success to get the process started and raise awareness. The workshop enabled vital stakeholders to see at first hand the issues that the Oromia region faces in terms of Water Resources Management. It was clear from the discussion that there was concern about the impact of current activities on the environment and subsequently on the people of the region. There was much determination to 'do something' quickly in a bid to improve the situation. It was emphasized that the workshop was an initial assessment visit but concern was made that there were often workshops but they need to be followed up with delivery on the ground.

It was apparent that Integrated Water Resource Management was a key issue that faced the region which needs to be dealt with on a catchment wide basis with all stakeholders involved; indeed there had been a recent workshop on such an issue. A part of IWRM is WRM and it was obvious that work could start immediately on collating data to initiate the WRM process.

6. Water Resource Management

6.1– Introduction

In simple terms water resource management is about understanding what is available (supply), what is required (demand), balancing the two and forecasting for the future. While talking to various stakeholders in Ethiopia, it became apparent that there had been a great deal of capacity building in the area of Integrated Water Resource management. The scope of this project was very much focused on the specific areas involved in water resource management rather than the wider area of Integrated Management. It was therefore necessary to explain the context of WRM under the wider umbrella of IWRM. Figure 2 simplifies IWRM into three main areas of Quality, Quantity and Land use. The scope of the project was to assist with the management of the quantity of water available and assessment of this however as much of current best practice moves towards a more integrated solution it could not be dealt with in isolation. Therefore a number of the useful websites in section 7 lead to a more detailed explanation of IWRM and how this can be implemented along side the specifics of WRM. However for the purposes of the remainder of the report the focus is very much on the assessment of quantity and availability with some references to support in the area of quality management.

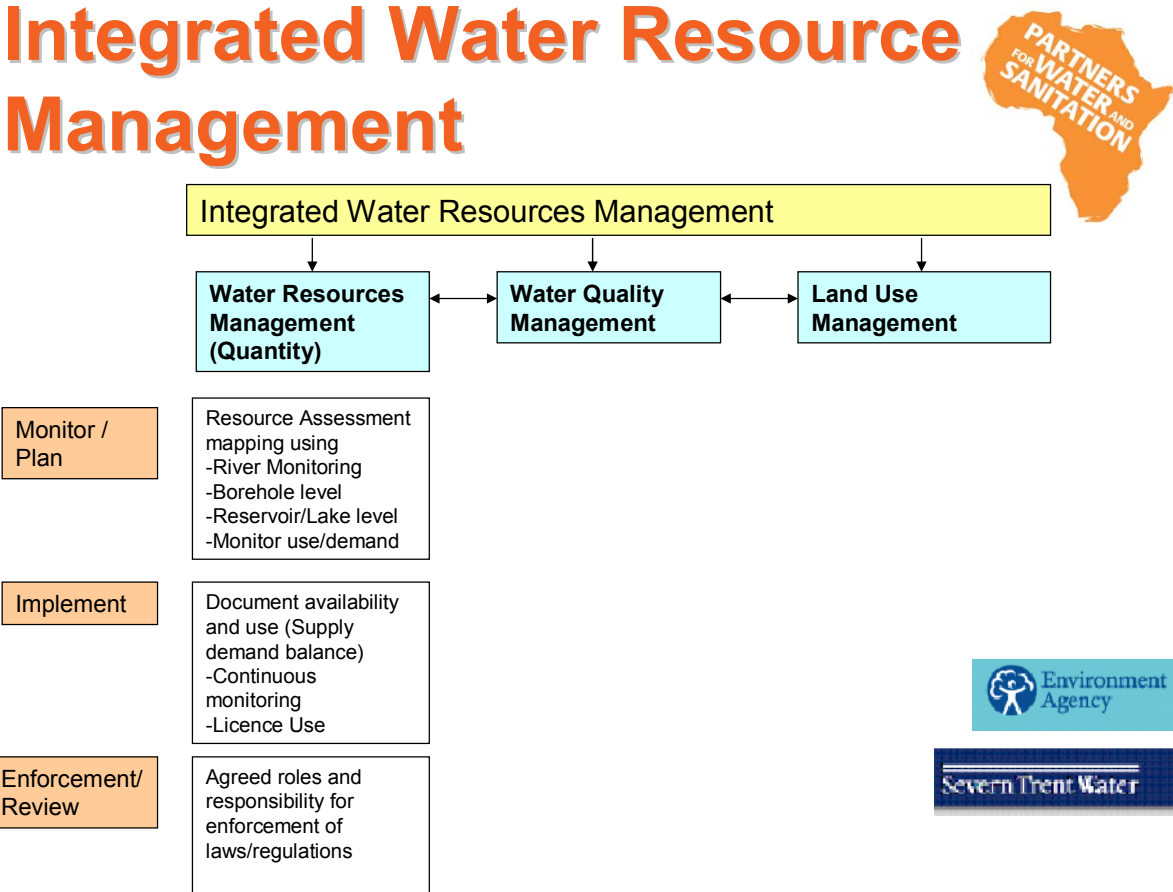


Figure 2, Simplified view of components of Integrated Water Resource Management

6.2 A summary of the UK institutional set up

Water Resource management in the UK is undertaken by several organisations including the government, the Environment Agency and the water companies. The government Department for Environment Food and Rural Affairs (Defra) and the Welsh Assembly Government have policy responsibility for water resources in England and Wales. There is the need to effectively manage water resources, as there is increasing pressure on water brought about by changes in societal demand, population increase and changing household patterns, and by climate change. The Government's approach to the management of water resources is the "twin track" approach to sustainable water resource management involving the consideration of demand management alongside sustainable resource development.

In the UK the Environment Agency has responsibility for managing the resources and the legislation whilst the water companies have a duty to secure supplies for the public. Some water companies also have sewage treatment responsibilities. Table 3 briefly outlines the key responsibilities of the Environment Agency and Water Companies in terms of water resources planning. In simple terms it is the Environment Agency's responsibility to assess the availability of resource for the next 25 years and it is the water company's responsibility to use that assessment alongside their own assessment of demand for water and balance the availability against demand.

Environment Agency	Severn Trent Water
Availability <ul style="list-style-type: none">• 25 year regional plans• 6 year catchment plans• Day to day licensing and monitoring	Need <ul style="list-style-type: none">• 25 year regional plan• 5 year investment plan• 1 year operational plan• Day to day monitoring

Table 3 Simplified summary of responsibilities in Water Resources Planning.

6.3 The Environment Agency and Catchment Abstraction Management Strategies

The Environment Agency, a non-departmental body sponsored by Defra and the National Assembly for Wales, has a duty to secure the proper and efficient use of water resources in England and Wales. The principal means of achieving this is through the abstraction licensing system. Through this system the Environment Agency aims to achieve a balance between the requirements of abstractors and adequate protection of the environment against the impacts of abstraction. The Environment Agency undertakes environmental monitoring and works closely with the water industry and abstractors to plan for future needs.

In 2001, the Environment Agency published Water Resources for the Future - a Strategy for England and Wales, which is a key part of the framework of integrated water resources planning, carried out by the Environment Agency and water users, particularly the water companies. The publication considers both national and regional water resource strategies, which are reviewed annually. These strategies set out pressures on water resources and how the Environment Agency expects these to be managed over the next 25 years.

All water companies have water resource management plans which look ahead 25 years and include projections of current and future demands for water. These plans are regularly updated to account for factors such as projections of household numbers and occupancy rates and the implications of climate change. These plans, which complement the Environment Agency's strategies, were prepared voluntarily until 1 April 2007 when they become a statutory requirement under provisions in the Water Act 2003.

Abstraction licenses are the key to managing water resources in a catchment. The abstraction licensing system in the UK came into force in the 1960's issuing a 'licence of right' to those who were already abstracting. Since then applicants have had to submit applications to the Environment Agency to ensure that there is water available and not impacting other license holders. The system for issuing abstraction licenses is summarised in the slides from the workshop held in appendix 5. In summary, the abstraction licence process follows several stages which are recorded in more detail in appendix 7.

1. Pre-application – applicant discuss application with the Environment Agency to determine if water resources are available in the location.
 - a. Groundwater abstraction – request will be sought to drill and test pump the borehole from the applicant to the Environment Agency. Applicant monitors a survey of sources in a radius around the borehole before during and after the test pump and submits data to the Environment Agency (radius depends upon hydrogeology and the volume of water required). A test pump report is written by the Environment Agency hydrogeologist reporting hydrogeological parameters and impacts on other sources etc.
 - b. Surfacewater – the hydrologists will be consulted to ensure that water is available in the river or lake. They may only allow abstraction at certain times of the year and may insist that abstraction ceases when a certain flow is reached – using Hands of Flows as calculated in the resource assessment (CAMS).
2. Application – completed application form is received from the applicant by the Environment Agency along with an application fee. The Environment Agency will technically assess the application. The application has to satisfy several criteria –
 - a. IS there sufficient water available?
 - b. Are the applicant's requests **reasonable**? Justification, best practice, efficiency, R&D
 - c. What are the potential **impacts**? Cannot derogate, unless have an agreement to do so
 - d. How can these be **mitigated**? Conditions, time limit
 - e. Agency's wider **duties**: Sustainable Development, Rural Communities, Cost/benefit
3. Outcome – the licence will then be
 - a. Issued.
 - b. Issued with conditions
 - c. Refused – there is then a route for the applicant to appeal if required.

The licence is a legal document that records the location of the abstraction (national grid reference), the licence holder's details, the purpose of abstraction, the period of abstraction, the source of water, the daily and annual quantity, an special conditions and other information. When the abstraction license has been issued, the Environment Agency undergoes an enforcement activity to ensure that the abstraction licence is being adhered to. If there is any non-compliance there is a route to undertake enforcement actions culminating in a financial fine.

The Environment Agency has developed Catchment Abstraction Management Strategies (CAMS) in order to assess the resources in the catchment and determine abstraction licensing policy consistently. The Environment Agency launched the CAMS process in April 2001 for every catchment in England and Wales. CAMS provide a consistent and structured approach to local water resources management, recognising the reasonable needs of abstractors and the needs of the environment. CAMS enable the consideration of how much water can be abstracted from watercourses without damaging the environment. They provide more local detail on the availability of water, and allow a detailed assessment of where action may be needed to deal with problems of over abstraction. The main aim of CAMS is to:-

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- to inform the public on water resources and licensing practice
 - to provide a consistent approach to local water resources management
 - to help to balance the needs of water users and the environment
 - to involve the public in managing the water resources in their area (consultation groups were set up)
 - Make abstraction licences time limited so that their impact on the environment can be reviewed.

In April 2001 the Environment Agency published 'Managing Water Abstraction: The Catchment Abstraction Management Strategy Process (updated July 2002).' Each CAMS area document should be read in conjunction with this as it:

- sets the national policy for local CAMS
- sets the regulatory framework
- describes the process of developing a CAMS
- provides information on the structure and content of CAMS documents.

The UK is split into suitable catchment sizes to produce relevant CAMS documents. The CAMS process has several stages as described below:-

- Pre-consultation stage – a leaflet is distributed to each licence holder allowing them to input into the process to make their views known
- Resource assessment – using local experts the CAMS area is conceptualised - noting the rivers of importance, the aquifers, monitoring stations etc. The area is then split into smaller areas and a resource assessment is undertaken including flow naturalisation using discharge and abstraction information. The output of this shows areas where water is available and where no water is available.
- Consultation Document – is produced allowing stakeholders to comment on the document.
- Final Document and technical document - is produced that will be the water resources policy for the next six years.

In order to produce the CAMS document important information is required. This must be a starting point for the work of water resource management in Ethiopia, this includes:-

- Defining suitable size catchments to undertake resource planning work.
- Having a good monitoring network for groundwater levels, river flows, rainfall and ecology data.
- Good quality data from the monitoring network that is quality assured and stored in one suitable database.

The main purpose of a CAMS document is to demonstrate where water is available. In Oromia this document could be used to advise the Investment Bureau of suitable locations for development. It would be a strategic document that has been produced by a stakeholder group to improve communications.

There are massive water resource challenges faced in the region including huge water resources (122 bm^3 annual surface runoff; 2.9 bm^3 groundwater in Ethiopia) but with high temporal and spatial variability; catchment degradation due to population pressures; degrading water quality; need for implementation capacity and awareness raising of the importance of water resources.

6.4 Severn Trent Water and Water Resource management

The water resources planning guideline Appendix 6 provides a framework for water companies to follow in developing and presenting their water resources plans. It helps water companies show how they intend to maintain the balance between demand for water and their supply. It sets out good practice behind the composition of a plan, the approaches to developing a plan and the information that a plan should contain. Companies should follow this guideline to ensure that their plans cover the requirements specified by the Water Industry Act 19911.

The Environment Agency has revised and updated the water resources planning guideline and worked closely with Ofwat on the form and content of this guideline and changes have been informed by discussions with the water industry and Water UK. This version builds on the one used for the periodic review of water company prices in 2004. Defra and the Welsh Assembly Government (WAG) require water companies to follow this planning guideline in developing their water resources plans.

The water resources planning guidelines has been split into four main parts to make it easier to navigate and use. Parts A and B are intended to be read by water companies, statutory consultees, such as Natural England or the Countryside Council for Wales, and interested members of the public. Parts C and D contain specific guidance for water companies to use in developing their water resources plans.

- Part A is an introductory section. It gives a short overview of the purpose of the plans and how they fit with other plans and processes. It also sets out the main changes to the water resources planning guideline from the previous version.
- Part B contains information on the new statutory process for developing water resources plans. It also sets out the timetable that water companies must follow for the process.
- Part C provides guidance on the technical content and development of plans, and the methodologies we recommend water companies use.
- Part D contains specific guidance on how water companies should complete the supply-demand balance data tables, which are an important element of the plan.

Water companies have a statutory duty to develop water resources plans. In the past, they submitted these on a voluntary basis to the Environment Agency. Now, the process for developing the plans is statutory, companies must submit their plans to the Secretary of State and the Welsh Assembly Government's Minister for Environment, Planning and Countryside. The relevant Minister will consider the plans, and can issue directions for the companies to change them. The Environment Agency has a duty for long-term water resources planning and is a statutory consultee in the development of the water resources plans. We will review all the water companies' water resources plans and make representation to Government on them. Ofwat sets price limits for water and sewerage companies in England and Wales. It is Ofwat's duty to enable companies to finance their functions. At the same time it protects customers' interests by making sure that they receive reliable services and value for money.

Figure 3 sets out the concept behind developing a water resources plan and some of the components that are used in the assessment.

While it is not envisaged that the Ethiopian Water Resources Bureaus will be able to complete an assessment of this type at present it should show the importance of beginning to collect key baseline data. The concepts behind the assessment of resources and availability are also largely the same and while due to data restrictions the assessment may be less complex the principles will be similar.

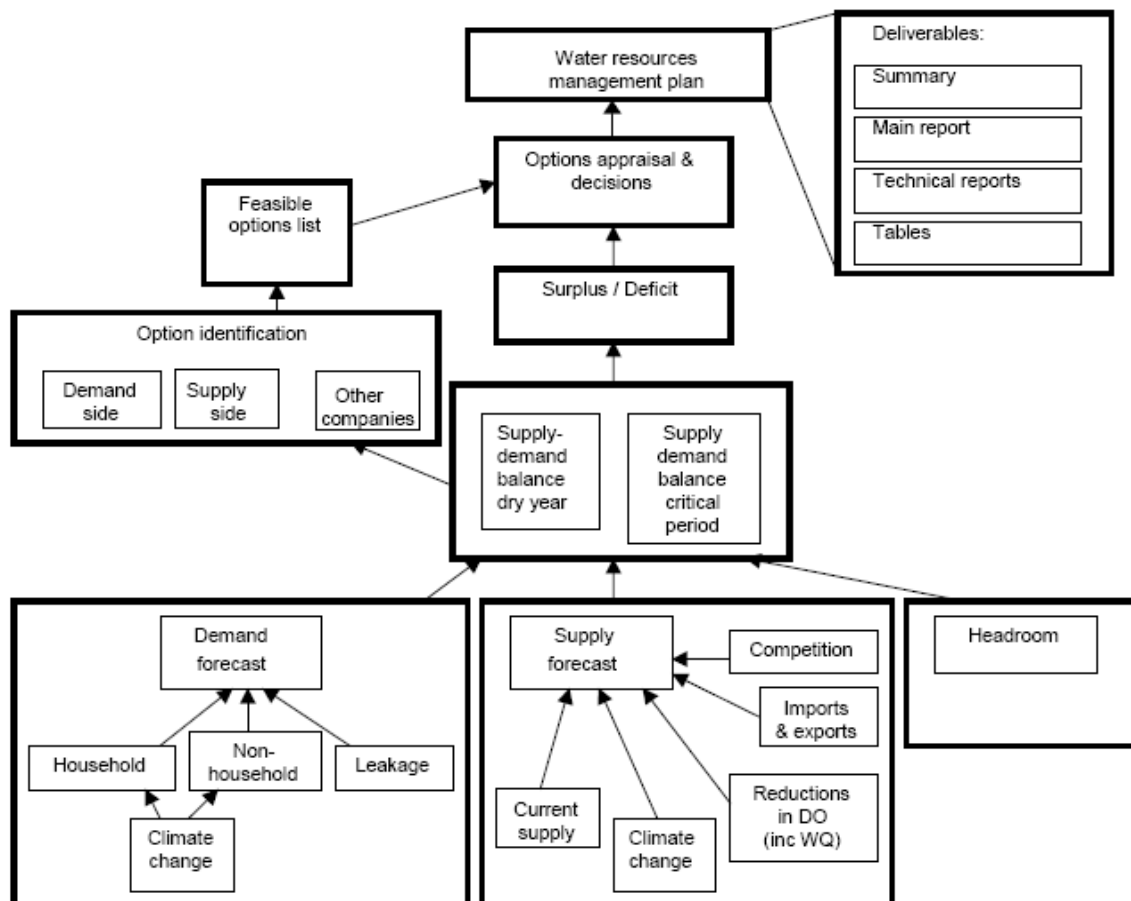


Figure 3, Components of a water resources plan

7. Useful web page links

Part of the support visit detailed a requirement for capacity building. Owing to the vast number of resources available via the internet, it was felt that much of this capacity building could be provided in a self service way for the Oromia Water Resources bureau staff. Therefore in this section are a number of useful links to websites covering resources for both developed and developing countries.

<http://www.defra.gov.uk/Environment/water/resources/abstraction/index.htm>

Defra (Department for Environment Food and Rural Affairs - part of UK government) webpage that focuses on water resource planning from legislation view point. Has links to some key UK policy documents that have set the way forward for water resource management and planning in the UK.

<http://www.environment-agency.gov.uk/subjects/waterres/>

Environment Agency homepage for water resources, has links to CAMS, abstraction licensing and water resource planning including guidelines.

<http://www.gwptoolbox.org/>

<http://www.gwptoolbox.org/index.cfm/site/Toolbox%20-%20en/pageid/466D78D8-DA21-0C84-CBE8BC663D008082/index.cfm>

The ToolBox is a compendium of good practices related to the principles of Integrated Water Resources Management presented under a structured reference framework. The ToolBox allows water related professionals, to discuss, analyse the various elements of the IWRM process and facilitates the prioritization of actions aimed at improving the water governance and management. The IWRM ToolBox comprises an organized collection of case studies submitted by external contributors which have been peer reviewed. Through this website the ToolBox aims to facilitate that professionals and specialists engage with a broader community for the solution of (water related) problems.

http://www.archive.cap-net.org/iwrm_tutorial/mainmenu.htm#

This is a must read tutorial on Integrated Water Resources Management. What is meant by integrated water resources management? Why is it so important? What are we losing without it? What are the gains to be made from introducing it? If it is so good, why isn't everybody doing it already? This brief introductory tutorial is aimed at policy makers, water managers, trainers and educators who want a basic understanding of IWRM principles.

<http://www.iwmi.cgiar.org/health/index.htm>

On this website you can learn more about IWMI's Water, Health and Environment research—including objectives, projects, outputs and impacts. This includes a complete listing of publications, the 2002 project portfolio, and logical framework for the theme. Current resource areas include:

- Malaria & water management
- Wetlands and biodiversity
- Wastewater use for agriculture
- Pesticide use & abuse in irrigated areas

<http://www.dwaf.gov.za/WaterTribunal/default.asp>

The Water Tribunal of South Africa was established in 1998 to hear appeals against directives and decisions made by responsible authorities, catchment management agencies or water management agencies about matters covered by the National Water Act, Act 36 of 1998, like the issuing of licenses to use water. It is an independent body and can hold hearings anywhere in the country. It also links to other areas in water resource management in South Africa

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8. Recommendations

There were a number of suggestions that came about from the workshop where further support could be offered from the UK partners. It is suggested that this is used as the framework for the way forward. The Oromia Water Resources Bureau is best placed to identify from this report areas of vulnerability and also areas that they are ready for support that is being offered. Between the Environment Agency and Severn Trent Water there is a broad range of skills in Water Resource Management and also other areas such as communication strategies or business management skills which could assist in the development of water resources management in the Oromia region. Table 4 summarises the main areas that were viewed as areas that needed to be developed with some suggestions as to areas of support and how that support might be offered. Since the delivery of effective water resources management will be by the Oromia Water Resources Bureau it is suggested that they take the lead in programming the use of this continued support. The setting up of a programme can be supported remotely from the UK partners with the experience gained from the visit; however, there are a number of stages to the development which include setting up appropriate structures and enabling people to enhance their capacity in appropriate areas, therefore the timing of delivery of each component is key to its success.

	Area for capacity building	Ideas for type of support that could be offered
1	Basic Field Hydrometry	A 1 week worth of hydrometric measurement including borehole dips (Appendix 5), river cross section measurement and gauging, abstraction measurement/metering, data logger familiarisation. This 1 weeks intensive training can then be passed on to other areas. Environment Agency hydrometric staff could offer support here.
2	Database Management	Support and training already offered from Water Aid. Remote support can be offered by PAWS alongside this if necessary. This will then support the data collection above. Environment Agency hydrologists could offer support to this role.
3	Test Pumping data collection	Support from PAWS for test pump data management. Supporting on a few test pumps and collecting the relevant data. This knowledge can again be transferred to other areas. Environment Agency hydrogeologists could offer support to this role.
4	Abstraction licensing and discharge consent	Environment Agency technical specialist could offer support. Continued support from the current PAWS team in providing relevant documentation and guidance.
5	Network development	Potential support from STW on network development in both clean water and sewerage systems. Including network management skills. Possible support alongside Water Aid in a pilot area.
6	Basic Treatment Techniques	Capacity building in the operation of treatment works and techniques from experienced treatment managers at STW.
7	Mapping of Resource Availability	Geographical Information system support can be offered to train in mapping techniques and displaying of information

8	Media management and communication strategies	Potential remote support from STW and EA in development of materials for communication using TV, Radio and leaflets. This would enable strategies to communicate resource availability information to a wider audience.
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Table 4, Summary of potential support areas from UK PAWS partners.

Effective Water Resource Management requires a baseline to be measured. It is essential for successful long term management that the collection of some simple core data begins as soon as possible to understand the changes in the baseline. This should be uncomplicated data that can be easily collected and replicated for a long period of time such as borehole dips to measure the water table levels. A simple installation of a borehole measurement is shown in Appendix 5. The following basic information collection can start now in the Oromia Region to provide the basis for effective water resources management in the future:

- Data collection
 - Groundwater – wells exist and a selection could be identified and monitored to form a basic monitoring network. By identifying the important aquifers a network can be established – observation wells should be used in the first instance but abstraction wells can be used as well (need to record if the well was pumping or not). Manual dips each time the visit is made can be done or dataloggers can be used.
 - Rainfall – bureau of meteorology produce many climate reports and these can be utilised to build a picture of available resource.
 - Surfacewater – identify gauging stations that are measuring flow at key locations – measured by the Bureau of Meteorology?
 - Other sources - Data exists in various areas – e.g. soda ash factory which can start to be pulled together to compose a picture of resource availability
 - Local Knowledge – there is extensive knowledge within the bureau that many of the staff have. If this knowledge can be collated and displayed in a clear way to show the current availability this could inform the rapid development that is occurring at present.

- Data management
 - Store the data after quality assurance on a central database – using the principles of good data management.
 - Data is important to support decisions, help get funding, help influence others and is often irreplaceable.

- Resource assessment
 - Conceptualise the catchment and determine the water resources availability. A start point to doing this is using current available information and then improve on this picture as more data becomes available over time.
 - Sit down and conceptualise the catchments – baselayers of the geology (using the BGS map), catchment boundaries, settlements, highlight the catchment issues – determine where water is available isn't available – to show a map to OIB and target where new business should go.
 - CAMS approach – Environment Agency can offer support in this area.

-
- Abstraction licensing
 - Focus on the individual abstractions – turn the guidelines into policy on the ground.
 - Is the water available? Is the need justified?
 - How to get an abstraction licence and who should licence it? – surface water (restrictions of abstraction in the summer to protect baseflow) or groundwater (test pumps to determine impact on other wells).
 - Issue abstraction licences with location, source, and volume recorded on it.
 - Enforce the use of abstraction licences.

When the above actions have been put into place this will be a massive step in undertaking effective water resource management in the Oromia region. The next step is to look to the future and determine the resources required to meet the growing demand.

The key to successful water resource management in the Oromia region will be to begin implementation of systems that utilise the current available data, while building on this with increased monitoring, with the flexibility to utilise more data as it is collected. This broadening of the data collection can begin now so that a more comprehensive and accurate resource assessment and plan can be developed in the future however this should not preclude the Bureau from carrying out initial assessments with current information. Once this rough cut plan has been developed this will need to be displayed and communicated effectively. The most important aspect of this will be providing an effective picture of resource availability and demand for this water, which non technical people and organisations can understand and act upon.

Appendices

Preliminary Report Draft

Appendix 1 – Terms of reference

PROJECT NO:	89-ETH
Project Title and Reference	Water Resources Management in Oromia Region, Ethiopia: Strategic support in Planning, Monitoring and Evaluation
Justification	<p>Oromia Region covers most of the central part of Ethiopia that encompasses Addis Ababa. Many development activities and industries are concentrated in this area, Industries do not typically adhere to legislation or control over their practices and as a result Oromia region faces significant pressure on water resources, including over abstraction, pollution and flooding.</p> <p>Although the region has developed water resources management (WRM) regulation based on the federal policy, this is not effectively implemented due to, amongst over reasons, a lack of understanding of the broad concept of WRM, as well as the capacity gap in planning, monitoring and evaluation (PME) mechanisms.</p> <p>A PAWS scoping visit on WRM issues affecting the Oromia Region and SNNP Region, as well as National Legislation (41/53/75 Eth, combined visit Mar 07) identified gaps in the implementation of WRM strategy in Oromia, impacting on pollution, over abstraction and flooding. It also identified a lack of data collection for effective management.</p> <p>There is a recognized need within the Oromia Region Water Resources Bureau (WRB) for strategies and guidelines to support sustainable WRM.</p>
Objectives	<p>This project aims to assist Oromia WRB to review and adapt the existing guidelines and regulation in planning, monitoring and evaluation of WRM in the Region through transfer of best practices and also by identifying the major activities in WRM.</p> <p>It seeks to provide technical and management support for planning, monitoring and evaluation (PME) of the existing policy and regulation in WRM, by building the capacity of staff within the WRB and Zonal Water Resource offices.</p> <p>PAWS UK partners can offer the transfer of best practice in WRM, through their expertise and experience.</p>
Deliverables	<p>The key activities to support these objectives are anticipated to include:</p> <ul style="list-style-type: none"> • reviewing the application and suitability of existing WRM policy and regulation; • direct discussion with relevant staff in Oromia WRB; • assessment visits to local (Zonal) offices and to the industrial

	<p>sector;</p> <ul style="list-style-type: none"> • exposure visits to relevant sites; • a 2 day workshop with key Oromia WRB staff, Zonal office heads and senior staff, including stakeholders such as Environmental Protection Agencies (EPAs) at Federal level, Oromia regional & zonal levels and Addis Ababa EPA . (This workshop is an opportunity to introduce international best practice and case studies in WRM, enhancing the link between concept and practice); and • Follow-up discussions with key decision makers to identify the way forward. <p>The key deliverable from the visit will be:</p> <ol style="list-style-type: none"> 1. An extensive report from the visit that addresses: <ul style="list-style-type: none"> • critical problems and appropriate solutions in the existing planning, monitoring and evaluation of WRM in Oromia Region; • recommendations for the development of guidelines/manuals (or other suitable tools), to improve the capacity of the WRB to license, measure and consent abstractions and effluent discharges, monitor water quality and deterioration; • relevant roles and responsibilities for effective planning, M&E (PME) of WRM within the Region – addressing regional, Zonal and community levels; • the development of a strategy for PME in the Oromia WRB, in line with current prioritization and implementation criteria of broader WRM activities; • opportunities for public/private initiatives and/or participation in WRM. 2. The PAWS UK team will assist the WRB in reviewing and adapting the existing WRM regulations, guidelines/manuals, etc. by transferring high level best practices, offering key technical advice and support to produce an effective and workable document.
<p>Impact</p>	<p>Support to the WRB will help to establish sustainable mechanisms for planning, monitoring and evaluation of WRM in the Region.</p> <p>Improved capacity and practical knowledge acquired by Oromia WRB and Zonal staff, together with clearer staff roles and responsibilities, will enhance the protection and management of water resources in the Region.</p>
<p>Scope</p>	<p>As per the mandates and responsibilities of Federal and regional bodies, the MoWR is responsible to develop and issue the national level policies and legislation while the Oromiya BWR is responsible to adapt it to the regional specific situation and also monitor its implementation. Accordingly, the Oromia WRB has developed regional regulations, WR development & management planning manuals and guidelines.</p> <p>The scope of this project is to support the WRB in effective planning, monitoring and evaluation of WRM strategies in the</p>

	<p>Region. This support will focus on areas of: assessment of existing WRM challenges, development of guidelines/manuals/strategies for sustainable WRM and identifying capacity gaps at a range of staffing levels.</p> <p>The development and delivery of capacity building training, to help implement the proposed WRM strategy, planning, monitoring and evaluation needs, is likely to be an activity for further support to the WRB.</p>
<p>Organisation and methodology</p>	<p>It is anticipated that this project requires a PAWS UK team of 2 experts, that can be from different organizations, offering complementary skills and experience in areas of water resources management, environmental protection and legislation, institutional development and capacity building/training. These experts should be familiar with aspects of "best practice" from the UK perspective (and ideally also at an international level) in these areas.</p> <p>The lead contact within the Oromia WRB will be Ato Tesfu Tessema, Head of the Department of Water Resources Management. He will be supported by Ato Kebede Gerba, the Deputy Bureau Head. They will both report to Ato Motuma Mekassa, the Bureau Head.</p> <p>The WRB will provide the existing documents related to WRM planning, monitoring and evaluation activities to PAWS so that it will be used as an initial assessment before the initial visit. The PAWS UK team and the WRB will review the assessment and use this to help develop a 2-day workshop program. The workshop will seek to review the existing WRM strategy and guidelines /manuals and other relevant training tools, which will later be developed by the WRB with technical support from the PAWS UK team.</p> <p>The PAWS UK team will provide ongoing technical support to the WRB, as they support the preparation of WRM strategy and training tools, over a period of approximately 6 weeks from the time of the visit.</p> <p>The delivery of any subsequent capacity building/training support to implement the reviewed strategy depends on agreements and recommendations reached during the workshop.</p>
<p>Milestone plan</p>	<p>Initial visit is placed to take place in the 1st week of April, 2008:</p> <ul style="list-style-type: none"> • assessment of existing WRM activities, based on WRB initial report (1 day), • discussions and WRM workshop with key stakeholders (5 days), • site visits (1 day). <p>Report on issues from the visit, affecting the planning, monitoring and evaluation of WRM, in support of the existing strategy/guidelines/manuals and other documentation (2 weeks</p>

	<p>after the initial visit)</p> <p>Ongoing technical input, to review a strategy on WRM and supporting training materials, will be lead by the WRB with technical assistance from PAWS. This will be provided through remote (UK-based) support.</p> <p>Final report on reviewed WRM strategy/guidelines or other tools and also development of training tools for the first phase training will be completed during the 6 weeks following the initial visit.</p> <p>Delivery of capacity building/training to support the implementation of the strategy, using developed training tools, will be carried out in three phases over a total of approximately 6 months. The 1st training is planned to be carried out in the 4th week of May, with further three trainings held every two months after that. This will allow time for feedback from earlier training to be included in later sessions.</p>
<p>Resource estimate</p>	<p>Input from the PAWS UK team will be phased over a number of activities and visits. For each member of the team, this is expected to consist of the following inputs:</p> <p>Initial visit: 9 days, allowing 2 days for initial (UK-based) preparation, 2 days for orientation and site visits, 2 days for a workshop and 3 days for discussions with key stakeholders</p> <p>Follow-up report writing from the initial visit: 2 days (UK-based)</p> <p>Ongoing technical support to the WRB on development of WRM strategy, guidelines/manuals/training tools, etc.: 10 days (UK-based)</p> <p>Possible future input to development and delivery of training: extent of input to be agreed.</p>
<p>Dependencies</p>	<p>The PAWS UK team will need to ensure that strategies developed at Regional level are consistent with Federal WRM policy and regulations.</p> <p>Timely access to existing documentation, together with effective communication from the WRB will be crucial to ensure the work is completed successfully and efficiently. Developing final documents will be highly dependent on the timely delivery of comments and ongoing input from both the WRB and the PAWS UK team.</p>
<p>Issues/Risks</p>	<p>Risk: Lack of available existing documentation. Mitigation: The Country Manager will approach WRB to secure availability of appropriate documents in advance of the project visit, to enable the UK team to prepare as much as possible.</p> <p>Risk: Delays in providing comments on draft reports and documents. Mitigation: The Country Manager and the WRB lead contact will seek to ensure timely comments are given.</p>

	<p>Risk: It is not possible to meet all the relevant stakeholders during one trip to Awassa.</p> <p>Mitigation: The Country Manager will prepare the visit itinerary to secure as many interviews with relevant people in advance.</p> <p>Risk: In country health, safety and security</p> <p>Mitigation: Country Manager and Secretariat to work with the UK team to carry out robust Health and Safety and Risk Assessment prior to each visit.</p>
Communications Strategy	<p>The key contact in Ethiopia is the PAWS Country Manager.</p> <p>Ato Tesfu Tessema will be the key contact within the WRB. The Deputy Bureau Head and the Bureau Head will offer support and receive regular reports from him.</p> <p>Direct communication between the PAWS UK team and Ato Tesfu Tessema or Ato Kebede Gerba will be established by the PAWS Country Manager as soon as is appropriate, in advance of the initial visit.</p>
Review Mechanism	<p>A visit report will be prepared after each trip to Ethiopia, reporting against the visit objectives. The draft report will be reviewed by the WRB, PAWS Country Manager and Secretariat before final production, to ensure objectives of the project are adequately met.</p> <p>The Country Manager will prepare a short report for the Secretariat's quarterly reports on project progress, for submission to the Steering Group.</p> <p>On completion of the project, the PAWS UK team will be required to help prepare a brief final project report, identifying the project outcomes and impacts.</p>
Approvals (as appropriate)	<p>Ato Kebede Gerba, Deputy Bureau Head (January 18th, 2008)</p> <p>Ato Motuma Mekassa, Bureau Head (January 18th, 2008)</p> <p>PAWS Secretariat – Rebecca Scott, Project Manager, 22nd Jan 2008</p>
Compiled by	<p>PAWS Country Manager – Melkamu Jaleta</p> <p>Head of WRM Process Team – Ato Tesfu Tessema</p>
Date	23 rd January 2008

Appendix 2 – Diary of events and findings

Water Resources Management in Oromia Region, Ethiopia: Strategic support in Planning, Monitoring and Evaluation – ETH 89.

Diary of events and evidence gathered – 6th April – 15th April 2008.

Sunday 6th April

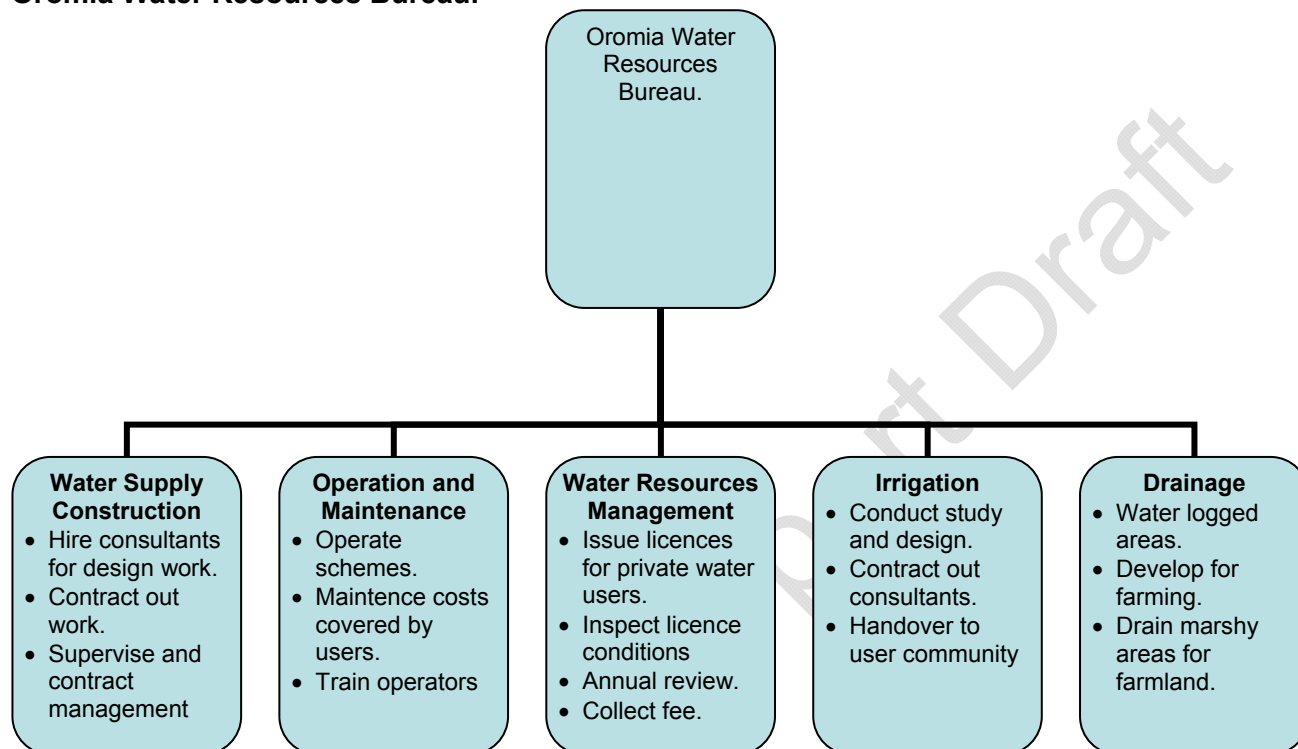
Name	Ato Melkamu Jaleta
Job Title	Ethiopia Country Manager
Organisation	PAWS
Roles/Responsibilities	Transfer knowledge from UK. Identify true gaps. First assessment visit to be built o.
Information gathered	Integrated WRM workshop held recently by Ethiopian Global Water Partnership – obtained presentations. EPA – Federal and regional. WRB – issue licences. Investment Bureau issue licences. WRB and EPA - no links. Link theory to practical implementation. Initial assessment visit with the purpose of sharing the UK experience and transferring knowledge.

Monday 7th April – 9.30 am.

Name	Ato Kebede Gerba
Job Title	Deputy Head
Organisation	Oromia Water Resources Bureau
Roles/Responsibilities	Head of: 1. Technical Teams. 1.1 Operation and maintenance department – zone and woreda. 1.2 Water Supply construction – zone and woreda. 1.3 Resources Management Team – Regional. 2. Irrigation. 3. Drainage. Plus other support teams.
Information gathered	Initial meeting to gain insight into the work of the Bureau. Low level of supply – 50% access. Pollution G/W resources, drying up, time to act. WRM Policy in the country from Federal level – needs to be implemented at Region level. What gaps – manpower, professional composition, areas to improve on and manage in the future – what can we learn. WRB know the number of schemes, what is working, not working and number of users per scheme. WRM activities not well organised and needs the transfer of knowledge. Oromia 1/3 of the population (30 million), centre of country, main issues pollution and overabstraction of the groundwater. Due to geographical location an area of high investment. No interconnecting sewage system. 50% access to water. Coverage – can get the potable amount of water they want – 20l/person in urban and 50 l/person in rural. Some areas only 5 or

	10 l/person. Resources depleting – population rising. Budget – for infrastructure of Bureau – towards, construction of schemes, salaries and monitoring. Second largest budget in the Bureau.
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Oromia Water Resources Bureau.



Name	Ato Tesfu Tesema
Job Title	Water Resource Management Team Leader
Organisation	Oromia Water Resources Bureau
Roles/Responsibilities	Issue licences for use by private water users. Inspect the licence conditions. Annually review the licence. Collect fee for issue fee and annual asses potential of water resource – at business level is undertaken by the MINISTRY NOT REGION. Monitor resources for depletion and replenishment.
Information gathered	Catchment maps exists, some wellfield monitoring in Addis, some river gauges (managed by Bureau of Meteorology). Spacing between the wells based on the aquifer parameters. Staff include economists, hydrogeologists, mechanical engineers and project engineers.

10.45 am - Meeting with some members of the operations and management team – economist, hydrogeologist, mechanical engineer.

Areas of concern/discussion.

- Concerns over agriculture the use of chemicals – pesticides, fertilisers.
- Human impact – awareness of the importance of good wrm.
- Development of Addis increasing pavement areas and reducing the recharge.
- Need to work together and start the WRM.
- Pollution is major issue for downstream people – gold mining a problem.
- Flora culture an issue of overabstraction.

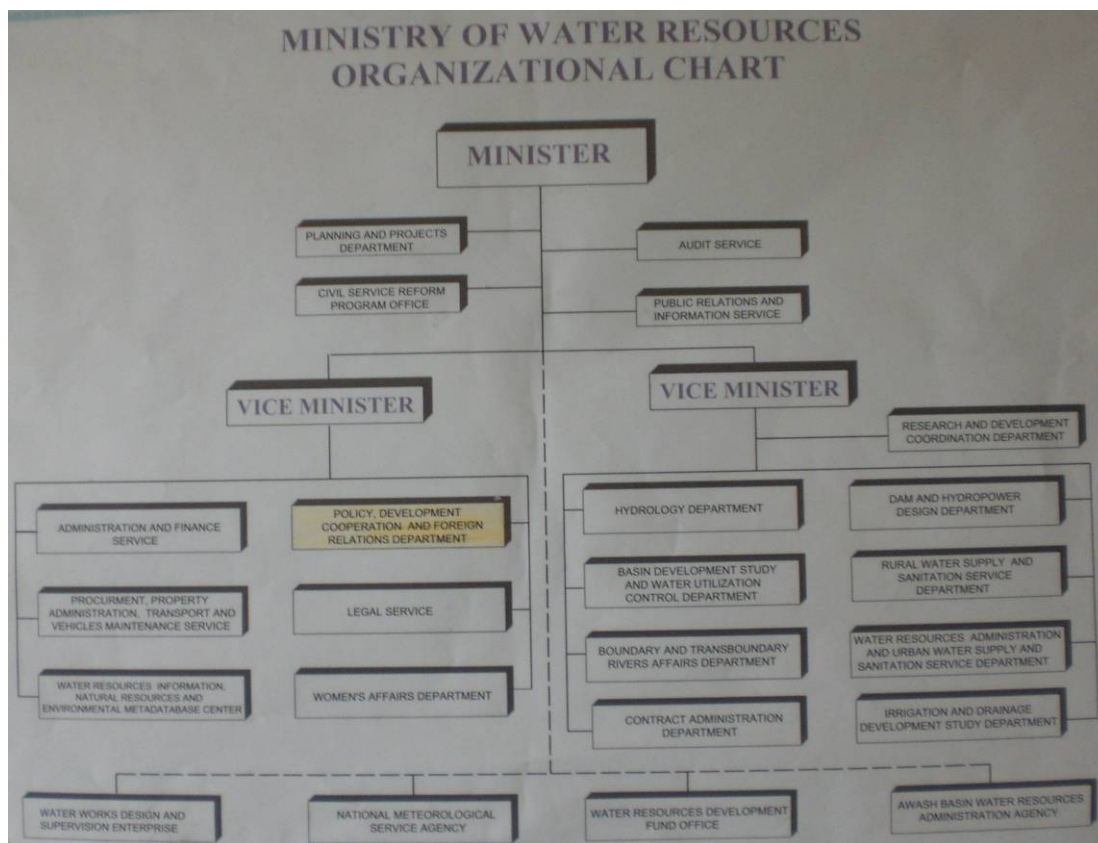
- Oromia Forestry Agency important stakeholder in catchment management – lots of Eucalyptus trees planted that require lots of water but they are quick growing and important for the construction that is essential for the economy – used as scaffold.
- Volcanic rock – fractured aquifer – shallow wells up to 50m.
- Sedimentary rocks in low lands – limestone up to 50 l/second (?). Some yield difficulties due to depth of gw.
- Two main issues – hydrochemistry (high fluoride in Rift Valley, Western Areas high Iron) and thermal (hot water springs from volcanic layers).
- No soil and water management – decrease productivity of springs – over the last couple of year's shallow wells dropped from 50m to 70m in depth.
- Bureau of Meteorology monitor raingauges

COMMENTS –

- licence is for the location of the well not the 'licensed volume of abstraction'.
- Strong bias towards groundwater use as high levels of pollution in surfacewater resources.
- What monitoring of resources is taking place?
- Create a series of stepping stones.
- Organisational Responsibilities?
- Working together.
- Short term outweighs the long term

2pm – Ministry of Water Resources

Name	Marta Solomon
Job Title	Head of Policy, Development, Cooperation and Foreign Affairs Department.
Organisation	Ministry of Water Resources.
Roles/Responsibilities	Capacity building in Ministry of Water Resources. Linking with practical partners.
Information gathered	Ministry of Water Resources issue licences for certain reasons. Co-ordinate bilateral and multilateral. Development plan – partners for the water sector. Challenges – capital intensive, capacity staff. Mobilise resources to sector and improve capacity of staff. Memo of Understanding finalised to bring capacity building under one umbrella to avoid replication of task. Capacity Building Funding available. Capacity building implementation – 9 vocational training centres to train graduates to work at Woreda level. Ministry of Water Resources at Federal level to facilitate large schemes e.g. big hydropower.



There have been some subtle organisation changes to this structure – not the team set up but at the Minister level.

3pm – Ministry of Water Resources

Name	Ato Yohannes Gimedhin
Job Title	Head of Water Resources Administration, Urban Water Supply and Sanitation Department.
Organisation	Ministry of Water Resources.
Roles/Responsibilities	Federal level of administration. Give assistance to Regional Government. Policy and Regulation. Water Resources administration at both Federal and Regional.
Information gathered	Permitting and Licensing Unit. Issue Water Permits, construction licence and water resources contractors professional qualifications certificates. Licensing issues – policy has a clear statement and WRM to be done on River Basin approach. Now building Basin Authorities and licensing will be done in these areas. Water Rights – drilling wells, interference of wells – licence only for drilling – test pump only for efficiency not impact on other wells/sources. Water Resource Administration – young unit – were discussing what data they should get back from the applicant e.g. borehole log etc. Interested to hear how the UK receives copies of the borehole logs. Septic tanks in Addis big problem – pollution of gw. Watering the gardens in the town with polluted water with high

	<p>nitrate – example given of a local school grounds being watered with such water.</p> <p>Sanitation – developed well at Federal level – important to advocate the focus on standard designs – sanitation is a wide issue, is a way of life, social/economic aspect input. Important to focus on hardware aspect and standard design – e.g. septic tank depends upon where it is to be implemented, pit latrines, oxidation ponds – only 10% of the city is on mains sewage. Standard designs can protect the groundwater – urban septic tanks, rural pit latrines.</p>
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3.30 pm – Ministry of Water Resources

Name	Mark Harvard
Job Title	Advisor Water Supply and Sanitation
Organisation	On secondment to Ministry of Water Resources from UK DFID
Roles/Responsibilities	Co-ordination work. Creating links by seeing the bigger picture.
Information gathered	<p>Discussed how sharing information is in its early stages and that work is still undertaken within individual 'silos'.</p> <p>Seems to be no grand plan, no oversight – the support on leakage was well received – how are the projects selected?</p> <p>PAWS can support with technical and capacity building with support to the sector.</p> <p>MOU between donors and government may not get completed.</p> <p>Need for a strategic approach, providing a nudge in the right direction, momentum and keep it going.</p> <p>Advice – avoid long term plan – what by when – keep it simple, test (is it a useful recommendation?), lots of data but not well organised?</p> <p>Water Services – organised at Region and District.</p> <p>Water Resources – organised at the Region? Not sure. At Federal level – policy, Mechanical and Engineering, capacity building on WR. Regions – have database, information systems.</p> <p>Basin studies – river basin work, Steve Crerar – French Development Corporation - setting up River Basin Organisation – 3 year project with funding – are there duplications/overlapping.</p> <p>Need to see the bigger picture and the links.</p>

Tuesday 8th April

Workshop at Sululta – in attendance – WR Bureau, Irrigation Engineer, Hydrogeologists, Wateraid, RIPPLE, JINC, Training Officer, SNR, Water Engineer.

AM – presentations from

- PAWS – Melkamu Jaleta – work of PAWS
- Oromia WR Bureau – Deputy Head (Kebede Gerba) - Keynote speech
- Oromia WR Bureau - Water Resources Team Leader (Tesfu Tesema) – scene setting for the Region – the challenges.
- Severn Trent Water and Environment Agency – Colin Day and Sarah Gaskill – introducing the work of the organisations.
- Discussions

PM – due to no power and the rain on the roof making it difficult to hear, field visit to

- Top of catchment at Addis – Eucalyptus trees have been planted not the indigenous trees – issues with the catchment management.
- Akaki River – Pollution, irrigation, large area of agriculture for tomatoes, cabbage, potatoes – water of poor quality directly irrigated to the land – water quality of the river is

the same content as the vegetables. Discussion that something needs to be done – use the media.

- Aba Samuel dam – created by the Italians in 1939 for country's first hydro-electric plant but is no longer operative because of silt.
- Addis Well field – 25 boreholes to supply the city with water.

Wednesday 9th April

Workshop at Sululta

AM – presentations from Colin Day and Sarah Gaskill

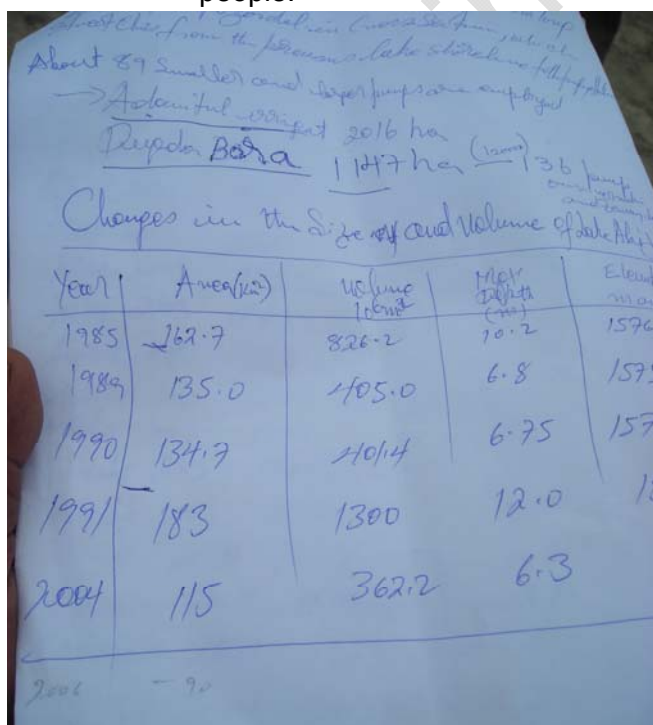
- Basic Concepts WR Management.
- Best Practise in UK
- Institutional Set up
- Discussions – received questions on:-
 - Groundwater monitoring – observation boreholes do exist, unsure of level of monitoring, dip tubes are installed on new production boreholes.
 - What scale geological maps exist in the UK?
 - Differences between institutional set up between UK and Ethiopia.
 - Landuse discussion – who protects, who is responsibility in Ethiopia?
 - Affordable technologies for treating hydrochemistry e.g. fluoride – suggestion made about blending and dual supplies (drinking and sanitation) could be implemented.
 - Comment from Kebede – in September they were unable to write a list of activities needed as part of a WR plan but not that he understands the basic principles he feels that he can now do that. Important to keep the balance between the supply and demand and if necessary move the balance.

PM – discussion in two groups on the gaps and the way forward. The outcome from the workshop is formally recorded in the content of the report.

Thursday 10th April

Field visits with Tesfu Tesema, Melkamu Jaleta, Colin Day and Sarah Gaskill

- Awash Basin
- Lake Ziway – freshwater lake that feeds River Bulbula – good source of water for people.



- Soda Ash Factory at Lake Abiata – input of three rivers to the lake. 125 million m³ per year. Lake level dropped in 2002 and started to recede but have now started to rise again (1.5 km recovery of shoreline). Saline lake used to make Soda Ash – use three large pumps that do 300m³/hour each – will operate for 10 to 20 hours per day dependent upon wind conditions. Water balance information available with the company – also a climate station at the site.

Year	Area km ²	Volume 10 ⁶ m ³
1985	162.7	826.2
1989	135.0	405.0
1990	134.7	401.4
1991	183	1300
2004	115	362.2

- Inputs to lake Abiata
 - Bulbula – 125 million m3
 - Holakello - 46 million m3
 - Gogeca – 17 million m3.
 - Rainfall 112.3 m3
 - Evaporation 310.4 million m3
 - Abstraction 1.38 million m3
- In Bulbula 1158 million m3 from irrigation abstraction – 30 % of the inflow to Abiata is the Bulbula.
- At Lake Abiata – saline water is pumped into large evaporation tanks (6km by 85m) – Brine is turned to Trona and following calcination creates sodium carbonate to be used in soap, glass and textiles industry.
- Flower Farms around Lake Ziway – each covering 1km2 and nine in total. Using chemicals and drip irrigation. Originally in Kenya but the government stopped production now moved to Ethiopia.
- Public Water Supply abstraction from the lake 2.5 ml/d – for population of 2000 families. Lake levels have decreased in last 8 years but this year they have risen.

Friday 11th April

10am – attempted to meet with Oromia Environmental Protection Agency – unavailable.

11.15 am

Name	Mohamd Ibrahim
Job Title	Vice Commissioner and the Process owner of land affair and investment Promotion
Organisation	Oromia Investment Bureau
Roles/Responsibilities	Balance between investment and Water Resources.
Information gathered	<p>Same objective to make a sustainable environment for all – improving the economy and protecting the environment.</p> <p>OIB write to OWRB over new issues e.g. mineral water bottling – to get comment and obtain a licence.</p> <p>Olto area – use lots of water for flower growing – need to control the investments.</p> <p>Pollution is a big issue in the Akaki catchment – OIB have a good relationship with OEPA – send comments to OEPA how to mitigate pollution with the new investment.</p> <p>Tanneries have new guidelines and need to plan to treat water.</p> <p>Business process at the regional level – potential investors come to the OIB and the OEPA approve the environmental issues.</p> <p>OEPA, OWRB and OIB – used to be a committee that met to discuss development and environmental issues – it may still exist but a good forum.</p> <p>Large geographical area covering manufacturing, real estate, agriculture chemicals production – lots of environmental challenges.</p> <p>New investment is everything for the future. The OIB monitor and check up on new investments and will stop work if pollution is occurring.</p> <p>OIB have a description of project environment impact mitigation that the OEPA checks.</p> <p>There is a need for support and materials to do best for the environment.</p>

2.30pm

Name	Dessalengne Mesfin
Job Title	Deputy Director General
Organisation	Federal Environmental Protection Agency
Roles/Responsibilities	Pollution Prevention. Enforcement.
Information gathered	<p>Main aim is to prevent pollution and minimise the impact.</p> <p>Urban solids are a big issue and work take place to prevent pollution. Water consumption is high – by products are discharged into the river need to protect the river quality. Catchment area has been developed and highly degraded thus reducing the recharge to the groundwater. Grazing land management is an issue in the upper catchments with the cattle compacting the ground and the rain washing over the land into the river.</p> <p>There is an incapacity for rainfall harvesting – need to store rain for irrigation.</p> <p>Need for appropriate technology not at excessive cost.</p> <p>Policy and strategy is in place – Environmental Protection Council is to meet on 23rd April to be chaired by the Prime Minister – includes Civil Society, Chamber of Commerce, Trade Unions. Will discuss pollution prevention. New guidelines coming in for eight industries (textiles, cement, tanneries and five others). New developments will have emission limits and existing industries will have 5 years grace for the environment impact assessment.</p> <p>Urban Waste Proclamation gained approval last year – with solid waste being dealt with at a district level based on life-cycle approach. Empowering local communities to do the work e.g. urban solid waste, smokeless charcoal.</p> <p>Some large topic areas:-</p> <ol style="list-style-type: none">1. Waste water management is a big gap – no initiatives – need for support from Environment Agency with future projects.2. Wetlands – lots of support financially to drain wetlands – working with the RAMSAR convention to reverse this. Proposing lakes for Ramsar status – lots of wetlands. Generate eco-friendly tourism around wetlands as an investment opportunity – lack of skill in implementation.3. Riverside rehabilitation and management – creating a buffer zone developed the Jelissa river 5-year plan around a polluted area to reclaim the land as a pilot. Need to write the report and hand the site to the local community but it is costly and may not be affordable to the local community. Need to introduce measures upstream. <p>Polluter pays principle to be introduced in September. Will define the activities next to the rivers – unplanned settlements need assistance to move people.</p> <p>Plastic is an issue polluting the catchments – thin plastic waste is banned but the challenge is local manufacture. Women's associations collect and sell the plastic.</p> <p>Catchment areas have the problem of charcoal creation – energy crisis – can't monitor rural energy use – need to empower the local community to plant the trees.</p> <p>Ministry of Agriculture and rural development have a role to play.</p> <p>Enforcement is a centralised system with federal EPA who have</p>

	<p>policy and regulation system in place but need to enhance its capacity. Each region has an EPA. Industry needs to become responsible and in most cases the consumers are driving the need to reduce pollution. Regulations not yet in place any person can make a claim of pollution. Public prosecution office will make a case – up to the industry to prove it is not polluting the environment.</p> <p>Lots of complaints of the development of the flora farms – EPA discussed the issues with the association and buyers. The industry developed a regulatory system by producing a code of practise that was signed with the EPA. Three years ago the situation was not good but now the situation has improved – there are still concerns over the sustainability of the business.</p>
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Monday 14th April – 10am.

Name	Motuma Metassa
Job Title	Head of Oromia Water Resources Bureau
Organisation	Oromia Water Resources Bureau
Roles/Responsibilities	Managing the Oromia Water Resources.
Information gathered	<p>Handed over draft report and welcomed comments.</p> <p>Lots of problems trying to do lots of things. Guidelines exist when GTZ (German based company) provided a six month international consultant to work along side a local consultant – created a big document in WRM in Oromia - need to issue guidelines at a regional level now – implementation of the policy.</p> <p>Problems with population size, location, geographically Addis is centre of Oromia and centre of the country. Pollution issues with EPA – water going out of Addis is useless – City of Addis needs to compensate the pollution that is being passed onto the region of Oromia.</p> <p>United National Environmental Protection have done work in the vegetables that supply Addis and there are lots of documentation about how the pollution from the Akaki river is transferred into the vegetables.</p> <p>Talking but no work on the ground.</p> <p>Need to endorse guidelines and issue to zonal WR offices.</p> <p>Need to implement the experience into the environment and provide skill on the ground – need a follow up system from this visit.</p> <p>Introduce a model with minimal money and design a system to follow up.</p> <p>Set up a different team to discuss how to organise water resource management.</p>

Basic Summary of potential work identified.

Water Resource Management requires the basic following information:-

- Data
 - Groundwater – wells exist and a selection could be identified and monitored to form a basic monitoring network. By identifying the important aquifers a network can be established – observation wells should be used in the first instance but abstraction wells can be used as well (need to record if the well was pumping or not). Manual dips each time the visit is made can be done or dataloggers can be used.
 - Rainfall – bureau of meteorology produce many climate reports.

-
- Surfacewater – identify gauging stations that are measuring flow at key locations – measured by the Bureau of Meteorology?
 - Other sources - Data exists in various areas – e.g. soda ash factory.
 - Store the data after quality assurance on a central database – using the principles of good data management. Data is important to support decisions, help get funding, help influence others and is often irreplaceable.
 - Conceptualise the catchment and determine the water resources availability. Sit down and conceptualise the catchments – baselayers of the geology (using the BGS map), catchment boundaries, settlements, highlight the catchment issues – determine where water is available isn't available – to show a map to OIB and target where new business should go. CAMS approach – EA can support on this.
 - Focus on the individual abstractions – turn the guidelines into policy on the ground.
 - Is the water available? Is the need justified?
 - How to get an abstraction licence – surfacewater (restrictions of abstraction in the summer to protect baseflow) or groundwater (test pumps to determine impact on other wells).
 - Issue abstraction licences with location, source, and volume recorded on it.
 - Enforce the use of abstraction licences.

Other initial suggestions.

- Meetings with OIB, OWRB and OEPA – promote the communication.
- Support to Federal EPA with discharge consent work – EA through international relations following work in Kenya.
- Support to OWRB on abstraction licensing and CAMS approach – turning policy into practise.
- Support to OWRB for monitoring network and subsequent database and data management – EA hydrometry.
- Support to OWRB for test pumping design and analysis – EA hydrogeologist.
- Need follow up system to turn the Policy into practice – Catchment Abstraction strategies (how much water is available and where), individual licence documents (surfacewater and groundwater), enforcement of abstraction, data collection of the environment.

Sarah Gaskill – May 2008.

Appendix 3 – Copy of Licence Application form

Preliminary Report Draft

Water abstraction or impoundment

Application for a full, transfer or impounding licence



Water Resources Act 1991 (as amended by the Water Act 2003), Environment Act 1995,
The Water Resources (Abstraction and Impounding) Regulations 2006

Please read through this form and Guidance note WR176 carefully before completing this form. Please write clearly in the answer spaces.

It will take about 30 minutes to fill in this form.

You'll need:

- your company's details
- an environmental statement or report (if required)
- a planning application number (if appropriate)

When to fill in this form

Use this form to:

- apply for a new licence to abstract water for a period of 28 days or more
- vary an existing licence
- apply to impound an inland water
- apply to licence an existing impounding structure (if you are using the form for this purpose please phone us on 08708 506506 before continuing).

To be entitled to apply for a licence to abstract water (of any type) you must be able to satisfy the requirements described in the application form relating to a right of access to, or occupation of, the land at the place(s) or point(s) where the abstraction is to be made.

If you wish to abstract water for less than 28 days you must apply for a temporary water abstraction licence using the form, WR171 'Application for a temporary abstraction licence'.

Contents

- 1 Type of application
- 2 The applicant
- 3 Environmental assessments and appraisals
- 4 Checklist
- 5 Data Protection Act 1998
- 6 Declaration and signature
- 7 How to contact us

1 Type of application

1.1 Please tell us about the type of application you are making.

Please tick the appropriate box

- I am applying for a new licence to abstract water for a period of 28 days or more. Please complete forms WR173 and WR174
- I am applying to vary an existing licence to abstract water. Please complete forms WR173 and WR174
- I am applying to impound water. Please complete forms WR173 and WR175
- I am applying to licence an existing unlicensed impoundment. Please complete forms WR173 and WR175

2 The applicant

2.1 Please give the full name and address of the person or organisation applying for the licence.

Name of person

Title

First name

Last name

Position

Name of organisation

Company/partnership

Company registration number, if applicable

2 The applicant, continued

Partners, if applicable

Address, registered address for company applications

Postcode

Contact numbers, please include the area code

Phone

Fax

Mobile

Email

2 The applicant, continued

2.2 Do you want to nominate someone we can contact with queries about your application?

No We will address all questions and correspondence to the applicant named in Section 2.1

Yes Please give details

We will send all correspondence about your application to the person you name here.

Name

Title

First name

Last name

Address

Postcode

Contact numbers, please include the area code

Phone

Fax

Mobile

Email

3 Environmental assessments and appraisals

If you have not already talked to us about whether you need to do an Environmental Impact Assessment (EIA) or environmental appraisal, **please phone us now on 08708 506506.**

Depending on how significant the potential environmental effects of your proposal are we may need from you:

- an environmental statement based on your EIA or
- an environmental report based on your environmental appraisal.

3.1 Do you need to do an Environmental Impact Assessment (EIA)?

No

Yes Please enclose a copy of the environmental statement with this application form

3.2 Do you need to do an environmental appraisal?

No

Yes Please enclose your environmental report with this form

3.3 Does any part of the proposed project require planning permission?

No Go to Section 4

Yes Go to question 3.4

3 Environmental assessments and appraisals, continued

3.4 What is the current status of your planning application?

Not yet submitted

Pending decision

Refused

Approved Consent no.

4 Checklist

4.1 Please read through this list and tick the items you are sending us with this application:

a completed form WR174 (and any associated documents)

a completed form WR175 (and any associated documents)

an environmental statement (see question 3.1)

an environmental report (see question 3.2)

continuation sheets for answers to questions

Please state how many

4.2 Fees

Please refer to our Abstraction Charges Scheme which can be found on our website at www.environment-agency.gov.uk/business/444669. Tick all the following that may apply:

I enclose the correct fee for processing this application

Please make cheques payable to the 'Environment Agency'

I require a receipt from the Environment Agency

5 Data Protection Act 1998

The Environment Agency will process the information you provide so that we can:

- deal with your application
- monitor compliance with the licence/permit/registration conditions
- process renewals
- keep the public register(s) up to date.

We may also process and/or disclose it in connection with the following:

- offering/providing you with our literature/services relating to environmental matters
- consulting with the public, public bodies and other organisations (for example Health and Safety Executive, local authorities, the emergency services, the Department for the Environment, Food and Rural Affairs) on environmental issues
- carrying out statistical analysis, research and development on environmental issues
- providing public register information to enquirers
- investigating possible breaches of environmental law and taking any resulting action
- preventing breaches of environmental law
- assessing customer service satisfaction and improving our service

5 Data Protection Act 1998, continued

- responding to requests for information under the Freedom of Information Act 2000 and the Environmental Information Regulations 2004, where the Data Protection Act allows.

We may pass it on to our agents/representatives to do these things on our behalf.

6 Application and declaration

Please see guidance notes as to who has authority to sign the form.

It is an offence to make a false statement when applying for a licence.

I declare that to the best of my knowledge the statements made in the application forms, including the map and any accompanying sheets, are true.

Signature

Name

Title

First name

Last name

Position

Date (DD/MM/YYYY)

Where to send the application

Please send your completed application form and any supporting documentation to the Water Resources Team in your local area office. This address can be found by phoning 08708 506506 or by using the 'What's in my backyard?' feature of our internet site
www.environment-agency.gov.uk/maps/

7 How to contact us

If you need help filling in the form, please contact the person who sent you this form or call our general enquiries number shown below.

General enquiries: 08708 506 506 (Mon–Fri 8–6)

Minicom: 08702 422549 (Mon–Fri 8–6)

Email: enquiries@environment-agency.gov.uk

Website: www.environment-agency.gov.uk

If you are happy with our service, please tell us. It helps us to identify good practice and encourages our staff. If you're not happy with our service, please tell us how we can improve it.

Please tell us if you have any communication needs such as community language or alternative format so we can keep in touch with you more easily.

For Environment Agency use only

Application reference number

Computer reference

Appendix 4 – Copy of abstraction licence.

Preliminary Report Draft

		Licence Serial No:	18/54/X/xxxx/S/1
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Please quote the serial number in all correspondence about this licence



FULL LICENCE TO ABSTRACT WATER

The Environment Agency ("the Agency") grants this licence to:-

Name ("the licence holder")

See attached Schedule of names and addresses of licence holders

Address

This licence authorises the licence holder to abstract water from the source of supply described in the Schedule of Conditions to this licence and subject to the provisions of that Schedule. The licence became effective on the relevant date shown below and shall remain in force until the date of expiry shown below.

Signed	Date of Issue
Team Leader, Regulatory (Water Resources) Environment Agency Hafren House Welshpool Road Shelton Shrewsbury SY3 8BB	Date effective 1 April 2008 Date of expiry 31 March 2013 Date of original issue 10 May 2002

The licence should be kept safe and its existence disclosed on any sale of the property to which it relates. Please read the 'important notes' on the cover to this licence.

Note: References to "the map" are to the map, which is attached to this licence.
References to "the Agency" are to the Environment Agency or any successor body.

Environment Act 1995
Water Resources Act 1991 as amended by the Water Act 2003
Water Resources (Abstraction and Impounding) Regulations 2006

Licence Serial No:	18/54/x/xxx/S/1
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SCHEDULE OF CONDITIONS

1. SOURCE OF SUPPLY

Inland water (River Teme) at LOCATION.

2. POINT(S) OF ABSTRACTION

Between National Grid References SO xxxx and SO xxxx indicated by arcs marked "A" and "B" on the map.

3. MEANS OF ABSTRACTION

A pump or pumps.

4. PURPOSE(S) OF ABSTRACTION

Direct spray irrigation.

5. PERIOD(S) OF ABSTRACTION

During the months May to September inclusive each year.

6. MAXIMUM QUANTITY OF WATER TO BE ABSTRACTED DURING THE SPECIFIED PERIOD(S)

Per day	1,100	cubic metres
Per year	27,000	cubic metres

At an instantaneous rate not exceeding 15.3 litres per second.

Note: A day means any period of 24 consecutive hours and a year means the 12 month period beginning on April 1 and ending on March 31.

7. MEANS OF MEASUREMENT/ASSESSMENT OF WATER ABSTRACTED

The licence holder shall use a meter to measure quantities of water abstracted. The licence holder shall provide and install the meter before any abstraction takes place. The licence holder shall position and install the meter in accordance with any written directions given by the Agency. The licence holder shall maintain the meter in such a condition, and if necessary replace it, so as to measure quantities of water abstracted accurately and efficiently. The licence holder shall calibrate it regularly, in accordance with the recommendations of the manufacturer or at any time required by the Agency, and shall replace it as necessary. The licence holder shall retain evidence of current certification for inspection by the Agency.

The Agency may have regard to its Abstraction Metering Good Practice Manual (or equivalent guidance) in directing any of the following: where the meter should be located or how it should be installed; whether the meter measures accurately, and/or efficiently and/or is properly maintained; whether it is necessary to require repair or replacement of the meter.

8. RECORDS

Meter readings shall be recorded and sent to or be made available to the Agency at such intervals and in such a manner as the Agency may from time to time direct.

9. FURTHER PROVISIONS

- (1) Abstraction of water pursuant to this licence shall cease upon receipt by the licence holder of a notice in writing from the Agency that the average daily flow measured by the gauge is less than the prescribed flow and abstraction shall not be resumed until receipt by the licence holder of a further notice in writing from the Agency that the average daily flow measured by the gauge is greater than the prescribed flow.
- (2) In the above condition(s):
 - (i) 'The gauge' means the gauging station maintained by the Agency and located at National Grid Reference SO 5977 6851 on the River Teme at Tenbury or such other gauge located on the River Teme as may be substituted therefor by the Agency and notified in writing to the licence holder.
 - (ii) 'The prescribed flow' is a flow of 190 megalitres per day in the River Teme at National Grid Reference SO 5977 6851 or such other flow in the River Teme at such location of the gauge as may from time to time be notified in writing to the licence holder in accordance with paragraph (i) above as may be prescribed by the Agency taking into account all relevant considerations so as not to be likely to give rise to a greater frequency in the operation of the restriction contained in the above condition 9(1) than would have been the case under that condition as originally in force.
 - (iii) If the licence holder is dissatisfied with the flow notified to him hereafter under (ii) above he may by notice in writing to the Agency require the matter to be referred to a single arbitrator to be appointed between the parties, or in default of agreement, by the President of the Institution of Civil Engineers provided that until the matter is determined by the arbitrator the flow notified by the Agency shall be the prescribed flow for the purpose of these special conditions.

**SCHEDULE OF THE NAMES AND (WHERE RELEVANT)
THE ADDRESSES OF THE INDIVIDUAL PERSONS WHO
COMPRISE THE LICENCE HOLDER**

NAME trading as **Company name**.

IMPORTANT INFORMATION

The licence holder shall use water abstracted under the terms of this licence in an efficient manner. The agency may have regard to its guidance on Water Efficiency (or equivalent guidance) in determining whether water is being used efficiently and any measures required to meet this condition. This is in line with the Agency's responsibilities under the Water Resources Act 1991 to secure the proper use of water (Section 19(1)(b)).

REASONS FOR CONDITIONS

Note: the following information is provided for information only. It does not form part of the licence.


Further conditions 9(1) and 9(2) have been included to safeguard the downstream aquatic environment and the interests of lawful users.

The abstraction authorized by this licence is time-limited in order to allow for future reassessment of the impact of the abstraction.

The abstraction is required to be metered to accurately assess water resources demands in the region.

Appendix 5 – Copy of workshop presentation.

Preliminary Report Draft






Water Resources Management Support Assessment Visit

Colin Day and Sarah Gaskill

Severn Trent Water and Environment Agency




April 08

Introduction

- Natural resources are being degraded and depleted
- Water is becoming increasingly scarce
- Floods and droughts are becoming more frequent
- Economic growth and industrialisation risk increased pollution





Independent Public body
Report to UK government
12,000 staff

- Protecting and improving quality of air land and water
- Integrated approach to regulation and management




- Water Resources
- Flooding
- Industry management
- Cleaning contaminated land

Private regulated business for the supply of water and sanitation
5000 staff covering Midlands

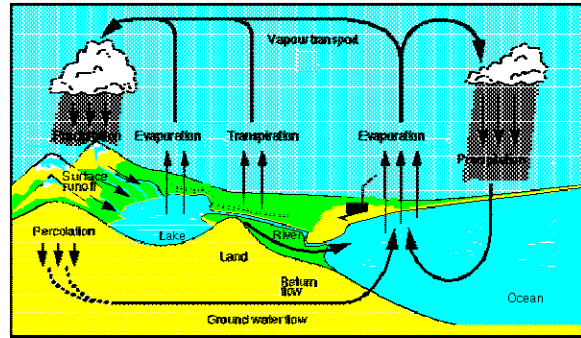

- Providing clean water for domestic and industry
- Providing sanitation to the region
- Ensuring sustainable development

Concepts, guiding principles and critical activities embraced in water resources management








Basic Water Cycle

Basic Water Resources Management Concepts

- Water Resources Management
 - Understanding what you have (Supply)
 - Understanding what you use (Demand)
 - Balancing the two (Supply Demand Balance)
 - Forecasting the future

Basic Water Resources Management activities



Understanding what you have (Supply)

- Monitoring
 - Borehole levels
 - River
 - Rainfall
 - Reservoir levels
 - Water Quality
 - Geology

Monitoring a baseline

- Simple long term measures to assess and understand availability and trends



Basic Water Resources Management Activities



Understanding what you use (Demand)

- Population (changes)
- Location
- Use per person
- Abstraction volumes for all uses
- Industrial use
- Leakage
- Irrigation



Basic Water Resources Management Activities



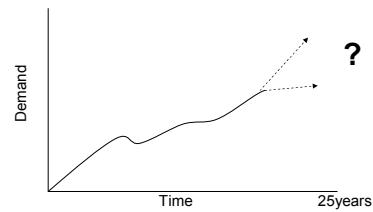
Balancing the two (Supply Demand Balance)



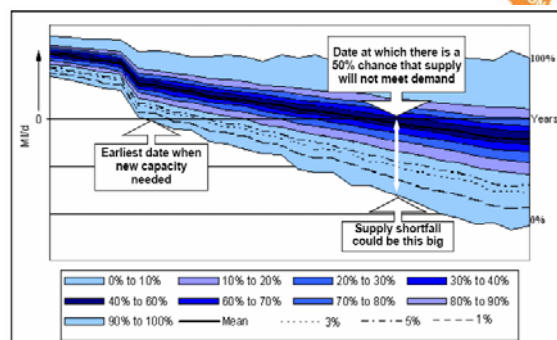
Basic Water Resources Management Activities



Balancing the two with a view to the future needs



Basic Water Resources Management Activities



Best Practices in Water Resources Management



Best Practices in Water Resources Management



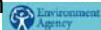
Availability

- 25 year plan regional plans
- 6 year catchment plans
- Day to day licensing and monitoring

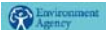
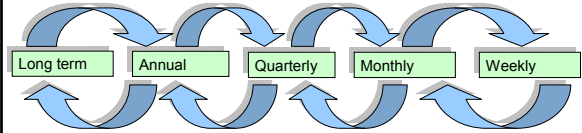
Need

- 25 year regional plan
- 5 year investment plan
- 1 year operational plan
- Day to day monitoring

Resources Assessment and Evaluation



How the water resources strategy develops?

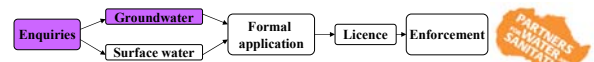


Abstraction Licensing



Enquiries advice...

- Receive an enquiry to Regulatory Officer.
- Consult Current Licensing Policy - CAMS.
- Advise applicant on the availability of water.



THE GROUNDWATER INVESTIGATION CONSENTS PROCEDURE

Receive completed Section 32(3) form from applicant

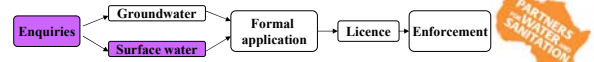
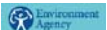
Consult with other departments
GW&CL advise applicant on radius of survey of sources

Suitable survey of sources received

Issue consent to drill

Issue consent to test pump

Carry out test pump



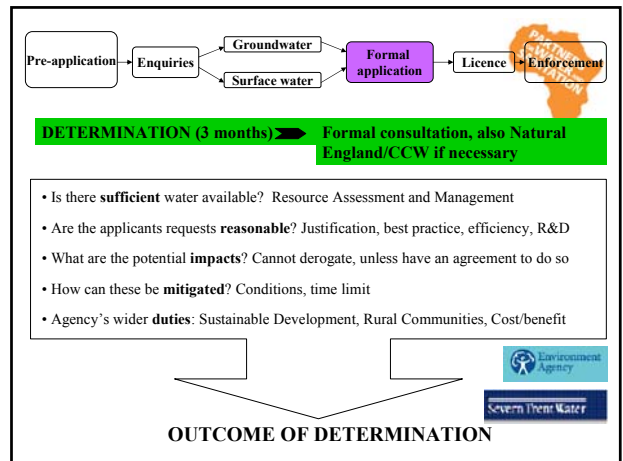
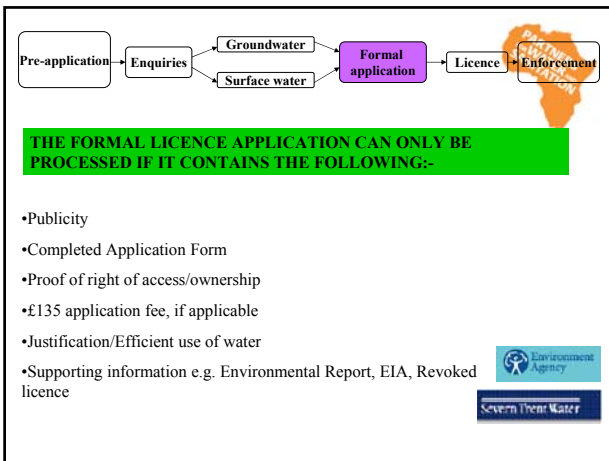
Completed enquiry form received

Other departments consulted. Hydrologist asked if sufficient water available and what conditions required to protect flow

If necessary, arrange for flow gaugings to be taken.

SEND APPLICATION FORMS

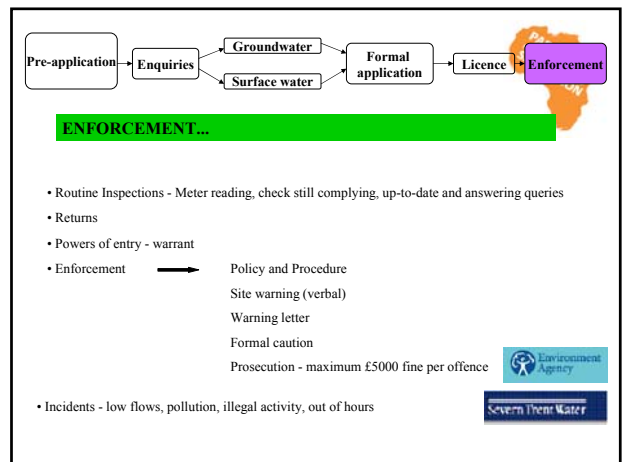




Abstraction Licences will specify:

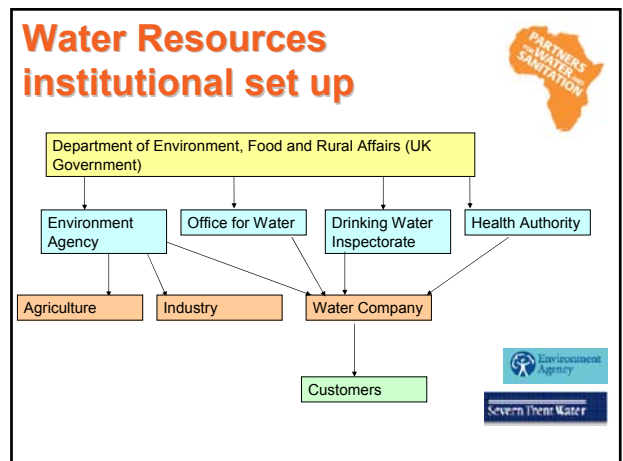
- Source of supply
- Maximum annual, daily and instantaneous quantities
- Purpose for which water is to be used
- Period of abstraction
- Form of measurement, recording and frequency of returns
- Special conditions e.g Low flows

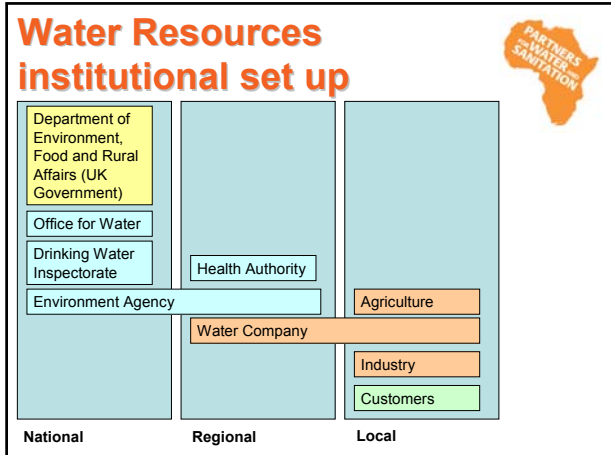
Environment Agency
Severn Trent Water



International Practices towards best institutional set up for sustainable water resources management

Environment Agency
Severn Trent Water

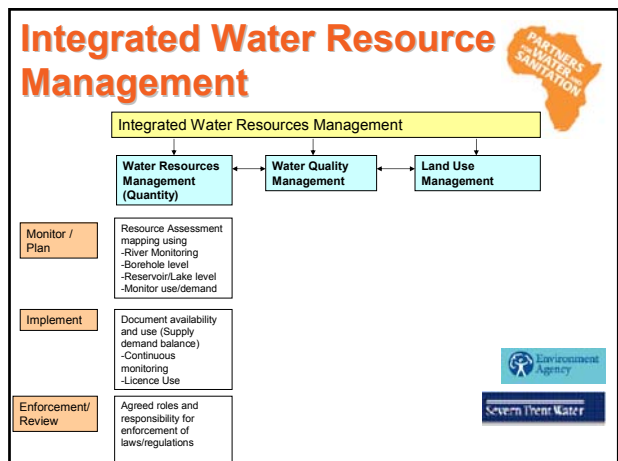
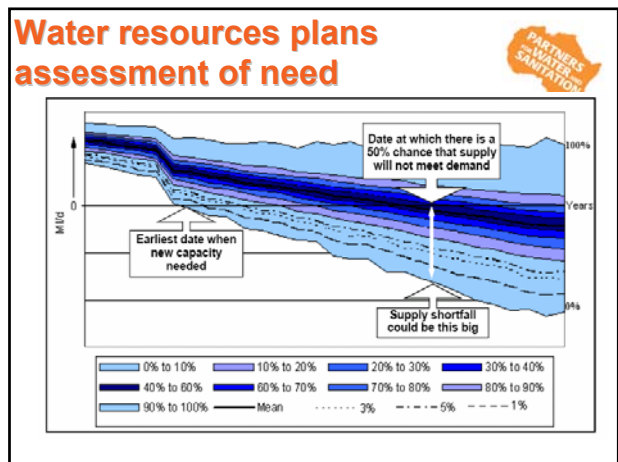
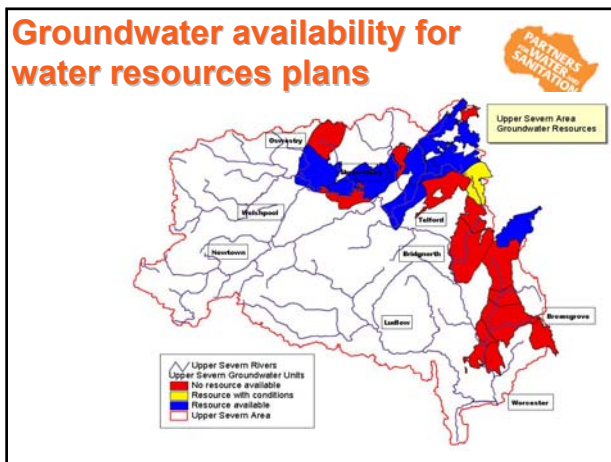




Water company resources plan obligations

We have taken account of three main external drivers in shaping our plan. These are:

- The Environment Agency's advice, as defined in its Water Resource Planning Guideline (WRPG)
- The guidance issued by the Water Services Regulatory Authority (OFWAT) in regard to operating standards and measures, and the formulation of business investment plans
- The obligations and duties placed upon us by European Directives and their legal transpositions in England and Wales. We have taken care to ensure that we have, in our planning process and procedures, taken proper account of all of the primary and secondary duties and obligations upon us as water supply and wastewater service providers, as defined by the Department for the Environment, Food and Rural Affairs (Defra) in their recently issued Statement of Obligations (January 2008).



Appendix 6 - Copy of EA guidance on completion of water resources plan.

Preliminary Report Draft

enhancing... improving... cleaning... restoring...
changing... tackling... protecting... reducing...
creating a better place... influencing...
inspiring... advising... managing... adapting...

Water resources planning guideline

April 2007

We are the Environment Agency. It's our job to look after your environment and make it **a better place** - for you, and for future generations.

Your environment is the air you breathe, the water you drink and the ground you walk on. Working with business, Government and society as a whole, we are making your environment cleaner and healthier.

The Environment Agency. Out there, making your environment a better place.

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This guideline is also available on our internet site at www.environment-agency.gov.uk. Updates to the guideline will be detailed there.

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A. OVERVIEW

This part of the guideline provides an overview of the water resources planning process and how this document fits within that process. It also covers planned updates to the guideline.

1 Introduction

1.1 The water resources planning guideline

The water resources planning guideline provides a framework for water companies to follow in developing and presenting their water resources plans. It helps water companies show how they intend to maintain the balance between demand for water and their supply. It sets out good practice behind the composition of a plan, the approaches to developing a plan and the information that a plan should contain. Companies should follow this guideline to ensure that their plans cover the requirements specified by the Water Industry Act 1991¹.

The Environment Agency has revised and updated the water resources planning guideline. We have worked closely with Ofwat on the form and content of this guideline and changes have been informed by discussions with the water industry and Water UK. This version builds on the one used for the periodic review of water company prices in 2004. Defra and the Welsh Assembly Government (WAG) require water companies to follow this planning guideline in developing their water resources plans.

The water resources planning guideline has been split into four main parts to make it easier to navigate and use.

Parts A and B are intended to be read by water companies, statutory consultees, such as Natural England or the Countryside Council for Wales, and interested members of the public. Parts C and D contain specific guidance for water companies to use in developing their water resources plans.

Part A is an introductory section. It gives a short overview of the purpose of the plans and how they fit with other plans and processes. It also sets out the main changes to the water resources planning guideline from the previous version.

Part B contains information on the new statutory process for developing water resources plans. It also sets out the timetable that water companies must follow for the process.

Part C provides guidance on the technical content and development of plans, and the methodologies we recommend water companies use.

Part D contains specific guidance on how water companies should complete the supply-demand balance data tables, which are an important element of the plan.

¹ Water Industry Act 1991 Section 37 A to D, as amended by Section 62 of the Water Act 2003.

1.2 Statutory water resources management plans

Water undertakers have a statutory duty to prepare and maintain a water resources plan (also known as water resources management plans) under new sections of the Water Industry Act 1991, brought in by the Water Act of 2003².

This is the first time that water resources plans will be statutory. Water companies submitted plans on a voluntary basis to the Environment Agency in 1999 and 2004, following agreement at the 1997 Water Summit.

The Water Industry Act sets out procedural requirements for the process which companies must follow in developing their plans. The associated regulations, due to be published in early 2007, will provide more detail on these requirements. In part B we set out the process that water companies must follow as prescribed by the legislation.

This guideline sets out how the two Governments expect the water companies of England and Wales to follow sections 37A-D of the Water Industry Act 1991, the water resources plan regulations and any water resources plan directions. The Secretary of State and the Welsh Assembly Government's Minister for Environment, Planning and Countryside expect water companies to follow this guideline. The Secretary of State and the Welsh Assembly Government's Minister for Environment, Planning and Countryside can specify further requirements in regulations and can direct a company under s37A (6)(b) of the Water Industry Act to revise its plan as necessary.

1.3 What is a water resources management plan?

A water resources plan shows how a water company intends to maintain the balance between supply and demand for water over the next 25 years. The plans are complemented by the water company drought plans, which set out the short-term operational steps a company will take as a drought progresses.

Companies should set out a baseline forecast of demand for water for 25 years, assuming current demand policies. This should include Government policy and any forthcoming changes in legislation about demand management. Companies should also consider the impact of climate change on demand.

This should then be compared against a baseline forecast of available water supply, assuming current resources and future changes that are known about. Companies also should consider the impact of climate change on supply and forecast the required level of headroom to allow for uncertainty in the assessment. Headroom is a buffer between supply and demand designed to cater for specified uncertainties.

This gives a calculated surplus or deficit of water for each year. This is known as the baseline supply-demand balance and companies aim not to have a deficit.

² Water Industry Act Section 37 A to D, as amended by Section 62 of the Water Act 2003.

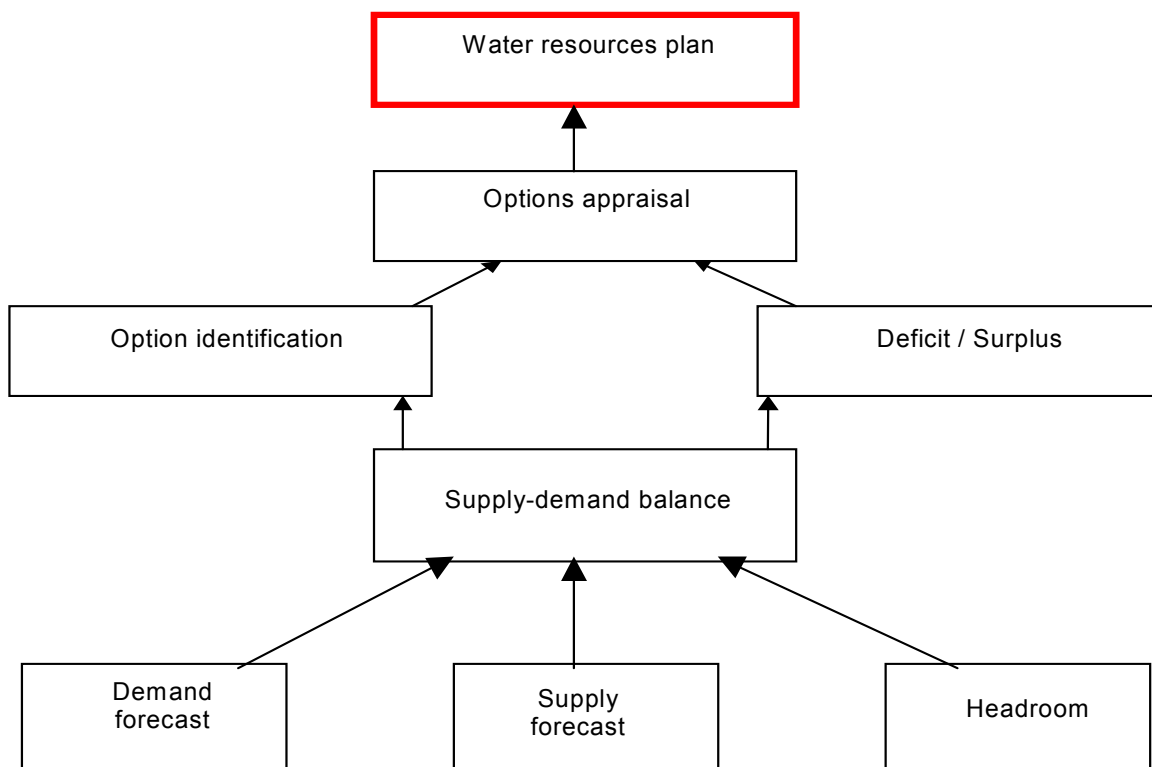
Where there is a deficit, companies should choose water management options to meet the difference. A company's water resources plan should consider the costs and benefits of a range of options and justify the preferred option set.

The company should then prepare a final supply-demand balance, taking into account its preferred options for water management, to demonstrate that the plan meets the forecast demand.

A company's water resources plan should be a stand-alone document that provides a realistic strategic plan for managing water resources. Companies should provide evidence in their plans in support of their preferred strategy and full details of the assumptions they have made. Companies should demonstrate a clear understanding of the performance of their systems, the main 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.

Figure 1.1 sets out the concept behind developing a water resources plan. This diagram is set out in greater detail in figure 5.1 in section 5.

Figure 1.1: Components of a water resources plan



1.4 Roles

Water companies have a statutory duty to develop water resources plans.

In the past, they submitted these on a voluntary basis to the Environment Agency. Now, the process for developing the plans is statutory, companies must submit their plans to the Secretary of State and the Welsh Assembly Government's Minister for Environment, Planning and Countryside. The relevant Minister will consider the plans, and can issue directions for the companies to change them.

The Environment Agency has a duty for long-term water resources planning and is a statutory consultee in the development of the water resources plans. We will review all the water companies' water resources plans and make representation to Government on them.

Ofwat sets price limits for water and sewerage companies in England and Wales. It is Ofwat's duty to enable companies to finance their functions. At the same time it protects customers' interests by making sure that they receive reliable services and value for money. The water resources plans form the supply-demand balance component of the companies' strategic business plans submitted to Ofwat (section 1.5).

1.5 Periodic review 2009

Water companies have a statutory obligation to produce water resources plans. The process for developing the plans and the periodic review are two separate processes. The Department for Environment, Food and Rural Affairs (Defra), the Welsh Assembly Government (WAG), the Water Services Regulation Authority (Ofwat) and the Environment Agency have worked together to streamline the two processes to complement each other as much as possible.

Ofwat will use the water resources plans to assess the supply-demand balance element of price limits as part of the periodic review of water company prices. This incorporates the work that the companies need to carry out on water supply and demand.

The water resources plans should take account of, as far as is possible, the synergies and overlaps that will result from investment in other areas of the business. For example, investment to maintain the serviceability of the network would reduce leakage and the water made available for use should be included in the water resources plan. Alternatively, some investment to meet water quality obligations may result in a reduction to water available for use. Ofwat will expect companies to provide an update of these synergies as part of the strategic business plan.

Ofwat reviews price limits every five years in the periodic review process. The plans developed in 2004 were used by Ofwat to review water company price limits for the five years from April 2005 to March 2010. The next review will be in 2009 and cover price limits for the five years from April 2010 to March 2015.

The Environment Agency has worked with Ofwat on this guideline to make sure that it meets Ofwat's requirements for a supply-demand balance submission as part of a company's business plan.

Section 4 sets out the statutory process and timetable for developing the water resources plans. This links with the timetable for the periodic review. The final water resources plans are planned to be submitted to the Secretary of State or the Welsh Assembly Government's Minister for Environment, Planning and Countryside by April 2009. This will be in time to be used by Ofwat in their work for the draft determinations of the companies' business plans. The final water resources plans will then be published after they have been checked to ensure that companies have followed Ministerial directions.

The statutory timetable set out in figure 4.1 does not allow any time for hearings or inquiries on a plan. Therefore if a plan does require a hearing or inquiry, the company will be unlikely to have a final plan in time for the draft determination. We anticipate that in this case, Ofwat may be able to assess the non-contentious elements of the plan for the draft determination and the company would refer to Ofwat for further funding decisions once any contentious elements had been agreed following a hearing or inquiry. This could be between draft and final determination or it could be as an interim determination of the K factor (the annual increase in charges that companies can make, as determined by Ofwat).

2 Changes to the water resources planning guideline

This section describes the changes to the water resources guideline since the 2003 version and the draft 2007 version.

2.1 Differences since 2003 guideline

Following feedback from the previous version we have made some substantial changes to the guideline.

2.1.1 Structure of the guideline

The planning guideline has been split into four main parts to make it easier to use:

- Part A - Introduction
- Part B - Information and timetable on the statutory process for developing water resources plans
- Part C - Guidance on the technical content and development of plans and recommended methodologies
- Part D - Guidance on how to complete the supply-demand balance data tables (WRP tables).

We have added text boxes to many of the sections. Companies will still need to read the associated text but the text boxes will provide a quick overview of our expectations.

2.1.2 Changes to guideline

The main changes to the guideline since the previous version are summarised below.

Information on statutory process

In part B, the water resources planning guideline sets out the new statutory process that water companies must follow in preparing water resources plans.

Tables

We have worked with water companies to simplify the supply-demand balance tables. Our aim has been to make them easier to use and to reduce the quantity of data that water companies submit. The most significant changes are listed in section 13.1.

Demand forecasting

We have amended the guidance to ask companies to justify their approach to demand forecasting, whether that uses micro-components or an alternative approach.

The guideline contains updated guidance on population and property estimates and projections. This was developed in liaison with Communities and Local Government department (CLG department).

We want to see clearly where leakage and water efficiency forms part of the baseline water balance and forecasts, and exactly how the final options proposed differ from this. We have made changes to the guideline to provide information to make these distinctions; see section 7.

Options

The water resources planning guideline sets out the information companies should provide in their plans and in the supply-demand balance tables on the different options lists: the unconstrained options list, the feasible options list, and the preferred options which form part of the final plan.

We have incorporated Annex 4 from the previous water resources planning guideline (Environment Agency, 2003) within the main body of the guideline and amended it to encourage companies to provide better description and information on options; see section 11.

Competition

The planning guideline sets out the information we expect companies to include on any licensees within their area; see section 5.10.

Leakage

We have amended the guideline so that companies state their current leakage policies, explain what is included within the baseline assessment of leakage and how the preferred leakage option varies from the current approach to leakage management.

Water Framework Directive

The Water Framework Directive includes the requirement for more ecologically based environmental objectives within a statutory process of river basin management planning. In order to avoid compromising these environmental objectives, river basin management plans are to include measures to promote efficient and sustainable water use.

The planning guideline explains the impact of the Water Framework Directive on water resources planning; see section 11.4.3.

Sustainability reductions

The planning guideline explains what we expect companies to do in relation to sustainability reductions; see section 6.2.1.

2.2 Changes to the draft 2007 guideline

In February 2007 we released a draft version of this guideline for consultation. The guideline has been amended to take account of comments that were provided. During this period of time we completed work on some outstanding projects. This current version has incorporated the outcomes of these projects. For future changes to the guideline please see Section 2.3. The main changes to this guideline are:

2.2.1 Peak demand forecasting

UKWIR commissioned a review of water company methodologies for forecasting demand during peak periods. We have reviewed the guidance and do not feel that we need to make any further changes except refer water companies to the updated UKWIR guidance. This is covered in Section 7.1.2 – Peak demand forecasting.

2.2.2 Carbon cost of water resource options

We investigated the requirements for providing new guidance to water companies about the inclusion of carbon-related costs associated with energy consumption and emissions for new water resource options. In section 11.4.7 we have provided an update about how to incorporate the cost of carbon in options.

2.2.3 Sensitivity analysis

In developing their water resources plans, water companies have to make many assumptions, affecting almost every part of the plan. This section outlines that we expect companies to include a description of the sensitivity of the plan to these assumptions. The sensitivity analysis should help to provide reassurance that the plan is robust and flexible. The new section is within section 5.8.

2.3 Future changes to the guideline

We are still progressing some areas of work. We are building on recent technical studies and working closely with Government and Ofwat to take account of forthcoming policy developments. We will update the guideline when each piece of work is complete, to explain how we expect water companies to take it into account. The areas in which we anticipate change are set out below:

2.3.1 Statutory process

The water resources planning guideline sets out the statutory process that water companies will follow, as it stands in April 2007. Any directions will set out the process in greater detail and we may need to update this guideline following their publication.

2.3.2 Climate change

Since the Reynard and Young (2002) review of the *Flow Factors* methodology (Arnell, 1998; 2002), the Environment Agency and UKWIR have funded several research projects to inform new guidance for the 2009 water resources plans. These include:

- a project developing a tiered approach to planning water resources under climate change, including uncertainty;
- a project that developed a method of incorporating uncertainty (climate change and hydrological) within water resources plans.

Other projects that investigate the climate change impacts on surface and groundwater resources have also been recently completed.

We have now commissioned work to collate the latest scientific evidence of projected climate change impacts on surface and groundwater resources. This will also appraise the methodologies for incorporating climate change within water resources planning being developed by the various national projects.

The work will summarise the outcomes and methodologies of the projects, and produce guidance on how to factor climate change into water company plans. This is to be completed during the summer 2007 and we will publish an update to cover the latest guidance.

2.3.3 Work to review the economic level of leakage (ELL)

In March 2002, Defra, the Environment Agency and Ofwat (the Tripartite Group) published *Future approaches to leakage target setting for water companies in England and Wales* (Defra, Environment Agency and Ofwat, 2002). This recommends suitable methods for companies to follow for both assessing and incorporating financial, environmental and social costs into the leakage target setting process.

Four years on from the publication of this report, Ministers have asked Ofwat along with the Environment Agency and others to review:

- the guidance given in 2002;
- how companies have used the guidance;
- identify examples of best practice.

The review also includes an assessment of alternative approaches to leakage target setting and a full carbon footprint analysis of the leakage control function.

The resulting report will provide guidance to water companies on the costs to include in leakage planning and management decision making and how to assess and value them. It will also providing practical examples of good practice from inside and outside the water industry. The advice will be based on the most recent understanding of environmental and social costs.

The report is due later in 2007 and we will update the water resources planning guideline to explain how companies should take its findings into account.

2.3.4 Metering in water stressed areas

Defra is consulting on extending opportunities for metering in areas of water stress. We expect this work to be completed during summer 2007 and we will provide further guidance on how companies should take the results into account.

2.3.5 Cost benefit analysis guidance

Ofwat will consult on and issue guidance on cost benefit analysis during 2007. This will take account of the UKWIR study *The role and application of cost benefit analysis*.

2.4 Issuing future updates

Future updates to this version of the guideline will be posted on our web site. We will communicate these updates through Water UK as well as through our direct contacts with water companies. For other interested parties we suggest that they regularly check for updates on our web site.

Updates will be hosted on our web site in sections so people can download each section separately to avoid downloading the entire guideline each time.

B. GUIDANCE ON STATUTORY PROCESS

The Water Act 2003³ inserted a statutory requirement for water companies to prepare, maintain and publish water resources plans (also known as water resource management plans) into the Water Industry Act 1991. The relevant provisions are contained in new section 37A-D of the Water Industry Act 1991, and came into force on 1 April 2007 ([Water Resources Management Plan Regulations 2007](http://www.opsi.gov.uk/si/si2007/20070727.htm) (<http://www.opsi.gov.uk/si/si2007/20070727.htm>)).

The process for preparing water resources plans is statutory. A water company will have a duty to prepare a plan but the plan will have no new legal status and will not be statutory itself. Any schemes and actions resulting from the plan will need all the normal permissions to proceed.

This part of the guideline explains the statutory process and outlines the timetable for its implementation.

³ Water Industry Act 1991 Section 37 A to D, as amended by Section 62 of the Water Act 2003.

3 Changes from previous water resources plans

The main changes are:

- Companies have to submit plans to the Secretary of State and/or the Welsh Assembly Government's Minister for Environment, Planning and Countryside instead of the Environment Agency.
- Companies have to publish both draft and final plans.
- Any person or organisation has the opportunity to comment on the draft plans.
- The relevant Minister can direct companies to change their plans so the final published plan is the result of public consultation and ministerial direction.

The amended legislation specifies consultation and submission procedures. The outline procedure is as follows:

- A water company must consult specified organisations (including Ofwat and the Environment Agency) before developing its plan.
- The water company prepares a draft plan taking into account the outcomes of the initial consultation exercise.
- The water company submits the draft plan to the relevant Minister, with a statement of any areas that it considers to be confidential.
- The relevant Minister decides on any confidentiality and national security issues.
- The water company publishes the draft plan for consultation, excluding any areas agreed by the relevant Minister to be either confidential or matters of national security.
- People and organisations make representations to the relevant Minister on the draft plan.
- The water company submits a statement on the representations that are received to the relevant Minister and publishes the statement on the internet.
- The water company sends a copy of the statement to those who have made representations.
- The Environment Agency assesses the statement of responses and comments on them to Government.
- The relevant Minister may choose to hold a hearing on the draft plan.
- The relevant Minister may direct the company to make changes to its plan.
- The company develops a final plan following any Ministerial direction;
- The Environment Agency on behalf of the Secretary of State and the Welsh Assembly Government's Minister for Environment, Planning and Countryside checks that the final plan follows any direction.
- The final plan is checked to ensure that information contrary to national security has not been added.
- The water company publishes the final plan.

3.1 Commercial confidentiality and national security

The relevant Minister will advise water companies about decisions on commercial confidentiality and national security issues at the same time.

Companies should be mindful of the advice provided to them during the statutory drought plan process in relation to commercial confidentiality and national security as well as advice from the security service. Companies must not include specific grid references or location details in their water resources plans. Maps should be schematic to show how sources are, or will be, used without giving exact locations. Companies can list abstraction licence numbers, as these are not a national security issue.

3.2 Draft plans and final plans

A water company's draft plan should be structurally identical to its final water resources plan. It is important that a water company's draft plan is as close to the final plan in structure, content and format as possible. This will help to make sure that the consultation process is successful.

If the final plan is likely to be significantly different to the draft plan, companies should explain the reason within their statement of response (see section 4) and identify what has changed as a result. The plan may need to change as a result of the consultation responses or for another reason, such as new information becoming available, for example in spatial plans.

4 Statutory Process

Figure 4.1: Statutory water resources plan process and indicative timetable

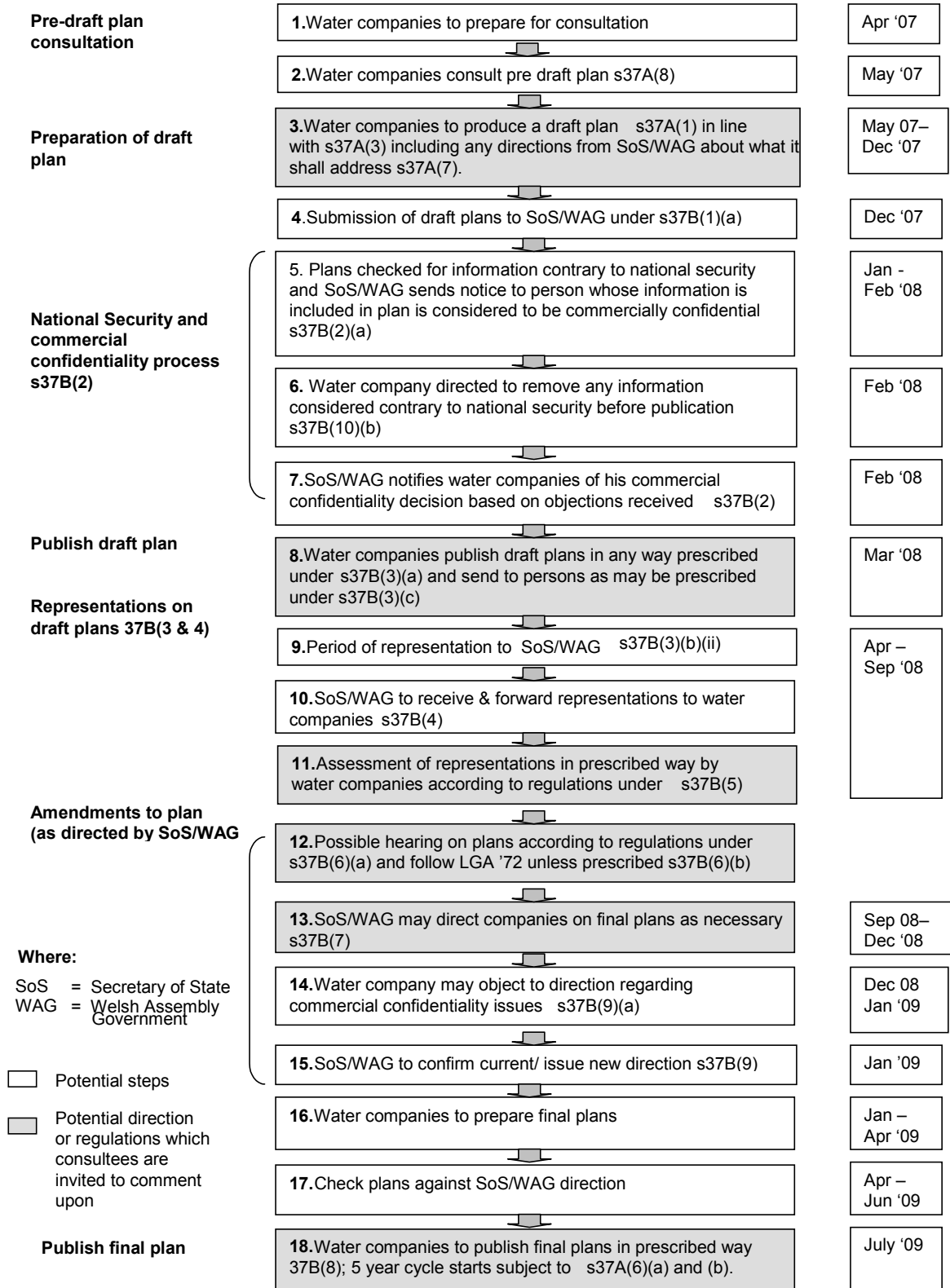


Figure 4.1 provides an overview of the statutory process and timetable. The steps numbered below refer to the steps shown in this figure. We estimate that the process will take over 2 years from start to finish and expect that most water companies will have submitted their final water resources plans by April 2009.

Step 1

The duty to commence comes into effect in April 2007. Water companies should prepare to consult prior to starting to develop their plans.

Step 2

Before preparing their plans, water companies must consult with the Secretary of State and/or the Welsh Assembly Government, the Environment Agency, Ofwat, and any licensed water supplier which supplies water to premises in the company's area via the company's supply system⁴. The companies can choose how they carry out this consultation. They should also consider starting discussions with other groups that may have a particular interest in the water resources plan or are likely to be directly affected.

Step 3

Water companies prepare their draft water resources plans following this water resources planning guideline and any regulations made or directions issued by the Secretary of State and the Welsh Assembly Government.

Step 4

Water companies must submit their draft plans to the Secretary of State and / or the Welsh Assembly Government by December 2007. This submission should include a summary, main report, technical reports and tables as outlined in Section 5.3.

They should also submit a statement with their plan declaring any aspects of the plan that they consider are commercially confidential. All the plan content should be publicly available unless companies make a case to the Secretary of State and / or the Welsh Assembly Government for it to be considered commercially confidential.

The Secretary of State or the Welsh Assembly Government will pass the plans at this stage to the Environment Agency for review in its role as the Government's environmental advisor and in relation to its responsibility for the management of water resources. They will also pass the plans to Ofwat for review in its role as the independent financial regulator.

Step 5, 6 and 7

The Secretary of State or the Welsh Assembly Government will check the draft water resources plans for information contrary to national security and will also send notice to any person whose information is included in a plan and is considered to be potentially commercially confidential s37B (2)(a).

⁴ WIA, s37A(8)

The Secretary of State or the Welsh Assembly Government will review the representations on whether information should be excluded from the published plan on the grounds of commercial confidentiality and will notify the relevant water company accordingly⁵. At the same time, the Secretary of State or the Welsh Assembly Government will direct a company to take any material out of its plan that they deem to be of national security risk.

If a company does not consider that there is any information in its plan that may be commercially confidential it must confirm with the Secretary of State or the Welsh Assembly Government whether it can proceed to publish its plan⁶.

Step 8

Companies must publish the draft plan for consultation within four weeks of receiving confirmation about commercial confidentiality and national security from the Secretary of State or the Welsh Assembly Government.

Section 5.3 of this guideline gives more detail on submission format. Companies should publish an appendix to their plans containing a list of the people and organisations they have directly consulted and providing details of where and how they have made the plan available to the public. Defra or the Welsh Assembly Government will request this information if companies do not provide it. Ministers expect water companies to fully engage the public when consulting on their draft plans. Water companies should send copies of plans to the organisations outlined in the Water Resources Management Plan Regulations 2007.

Water companies should publish draft plans both in paper form and on their website as outlined in the [Regulations](http://www.opsi.gov.uk/si/si2007/20070727.htm) (<http://www.opsi.gov.uk/si/si2007/20070727.htm>). Companies should also consider how best to communicate and engage with anyone who is likely to be affected by the plan. Companies could advise customers when issuing water bills for 2007/2008, advertise in local media or place the plan in places such as local council offices, libraries or National Parks offices in addition to the water company's principal office. This might be particularly appropriate for companies operating over large areas.

Water companies must also publish a statement with the draft plan to say whether any commercially confidential information has been excluded. It must describe the process for an interested party to make representations⁷ specifying where the representations should be sent (as will be set out in regulations) and the date by which representations must be received by the Secretary of State and /or the Welsh Assembly Government⁸. We recommend that water companies allow at least 12 weeks to respond to the draft plans, and longer for more complex plans. The consultation will include parties who are not familiar with the plan or with water resources planning and they should be allowed a reasonable amount of time to consider the issues.

⁵ WIA, s37B(2)

⁶ WIA, s37B(1)(b)

⁷ WIA, s37B(3)(b)

⁸ WIA, s37B(3)(b)

Step 9

Period of representation to the Secretary of State and the Welsh Assembly Government. This is open to all individuals and organisations.

Step 10

The Secretary of State and the Welsh Assembly Government receive representations and forward them to the relevant water company.

Step 11

Water companies must produce a statement of response to the representations they receive. This should describe any changes the company plans to make to the draft plan as a result of the consultation and the reasons for the changes. It must also include an explanation where no changes have been made as a result of representations.

Companies must publish the statement of response within 26 weeks of the date they publish their draft plan for consultation. They must publish the statement on the company's internet site and notify anyone who has made a representation on the plan that it has been published.

Step 12

The Secretary of State and the Welsh Assembly Government do not expect public hearings or inquiries to be the norm. It is anticipated that hearings would be held for a case that requires detailed discussion but does not require a formal inquiry. Inquiries will be held where a plan is particularly complex or controversial, or has caused particular local interest. The Secretary of State or the Welsh Assembly Government will decide on a case-by-case basis.

Step 13

The Secretary of State or the Welsh Assembly Government may make directions applying to a single company or a number of companies⁹.

The Secretary of State and the Welsh Assembly Government have powers¹⁰ to enforce the duty of the water undertaker in relation to publishing its water resources plan including any directions made regarding the content of its plan¹¹.

Step 14 and 15

Water companies may object to a direction regarding commercial confidentiality. The Secretary of State and the Welsh Assembly Government will confirm the direction or issue a new direction.

Step 16

Water companies prepare their final water resources plans and submit them to the Secretary of State and the Welsh Assembly Government.

⁹ WIA, s37D(1)

¹⁰ under section 18 of the Water Industry Act (1991)

¹¹ WIA, s37D(3)

Step 17

The Environment Agency checks that the plans follow any directions on behalf of the Secretary of State and the Welsh Assembly Government and the final plan is checked to ensure that no information contrary to national security has been added.

Step 18

Water companies publish the final water resources plans. This is likely to be when the Secretary of State and the Welsh Assembly Government directs them to do so.

4.1 Submission arrangements for companies partly or wholly in Wales

The following arrangements will apply to water companies that supply customers in Wales or obtain water supplies from sources in Wales.

The Welsh Assembly Government takes decisions on the plans of water companies whose supply area is wholly or mainly in Wales (Dŵr Cymru Welsh Water, Dee Valley Water and Albion Water), but only after consulting the Secretary of State on those parts of a plan that include England. Companies whose supply area includes any part of England should also send their plans to the Secretary of State when they are submitted to the Welsh Assembly Government. Under the Welsh Language Act 1993, companies operating wholly or mainly in Wales should publish both Welsh and English language versions of their plans.

The Secretary of State takes decisions on the plans of those companies whose supply area is mainly in England (Severn Trent Water and United Utilities), but may consult the Welsh Assembly Government on those aspects of a plan that include any part of Wales. These companies should also send their draft plans to the Welsh Assembly Government when they are submitted to the Secretary of State.

4.2 Working with consultees

The statutory process sets out defined stages for consultation. This should not prohibit water companies from consulting with interested or knowledgeable parties at any stage in the process. In particular, water companies should consider discussing any new approaches that they propose with interested people or organisations.

The Environment Agency will respond when companies consult before developing their plans. We will make formal representation on the draft plans when they are published. We will also advise Defra and the Welsh Assembly Government on companies' statements of response, check companies have followed directions, and are likely to be involved in any hearings or inquiries. This does not preclude water companies from working closely with us as they develop their plans. We advise companies to discuss approaches, assumptions and key information with us at an early stage. This could include discussing:

Environment Agency Water resources planning guideline

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

Water companies should also work with Ofwat reporters as they develop water resources plans.

4.3 Revisions to plans

In addition to preparing and publishing a water resources plan, a water company is also required to maintain it¹². A water resources plan is a live document, and water companies must prepare a revised plan:

- a) if an annual review of the plan indicates a material change of circumstances;
- b) if directed to do so by the Secretary of State or the Welsh Assembly Government (as appropriate);
- c) in any event, no later than five years after the plan was published¹³.

Water companies are likely to need to change their water resources plans between cycles as circumstance change. Significant changes to a water resources plan may indicate a material change in circumstances and the company would need to undertake the full statutory process again. It is up to a company to decide when there has been a material change of circumstances.

Companies must detail all the changes to their water resources plan in the annual review of the plan. They may also want to inform any parties that have made representations on the draft plans of any changes to the final plan or alternatively make them aware in some way of the annual review, which will describe these changes. We will provide guidance on the form and content of the annual review later in the process.

¹² WIA, s37A(1)

¹³ WIA, s37A(6)

C. TECHNICAL GUIDANCE

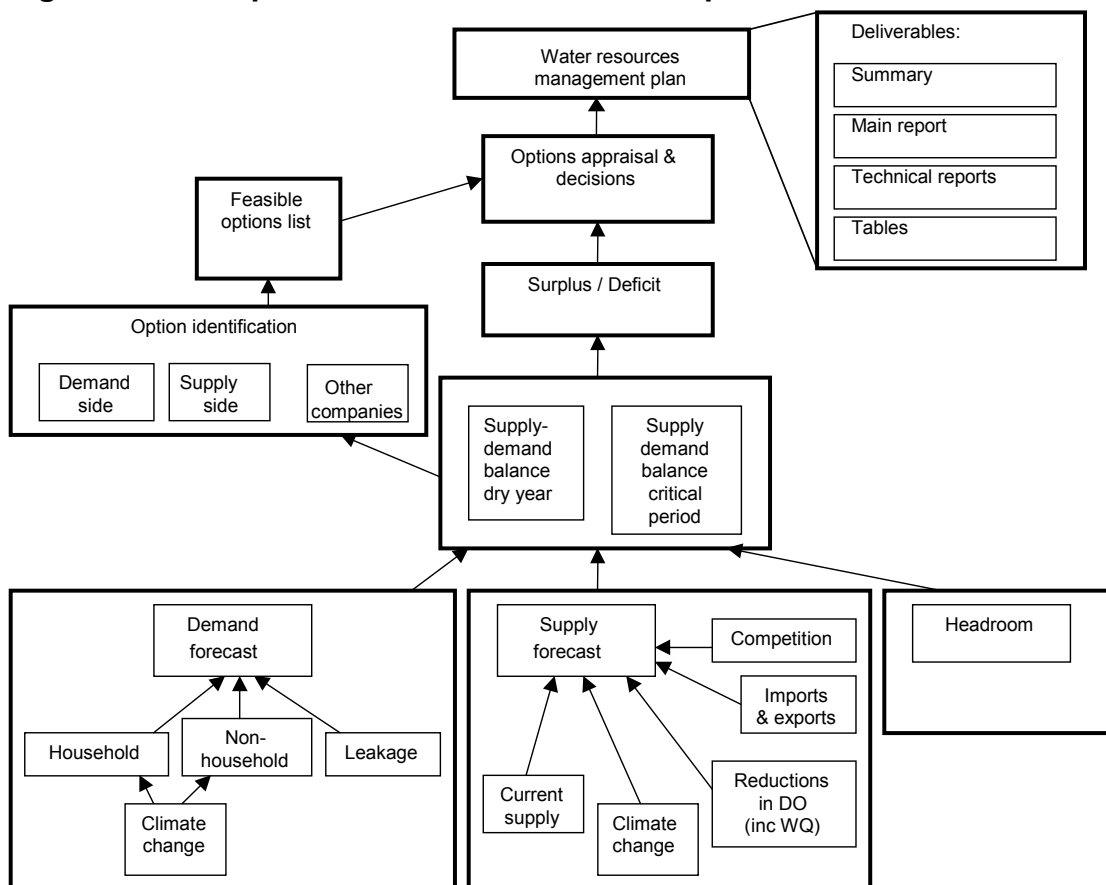
This part of the guideline contains technical guidance on the form and content of a water resources plan. It covers each step in producing a plan and explains the methodologies and approaches we expect companies to follow. For each step it also provides guidance on the information we expect to see in a company's plan.

5 General guidance on plan content and development

5.1 Summary of water resources plan content

Figure 5.1 sets out the concept behind developing a water resources plan. This diagram shows the same concepts as figure 1.1 but gives greater detail behind the main components. This diagram is repeated throughout Part C Technical Guidance in various sections; each diagram has different elements shaded to show which part of developing a plan that section covers.

Figure 5.1: Components of a water resources plan



A company's water resources plan must contain the following features:

- An assessment of water available for use based on the annual deployable output determined for a company's proposed level of service and for a critical period, if applicable.
- A forecast of daily water demand for a dry year and for a critical period if applicable. The baseline demand forecast should be based on current company policies continuing, including demand management, leakage and metering. It should assume the swiftest possible achievement of the current target for leakage during the planning period as well as the implementation of

the company's water efficiency plan, irrespective of any supply surplus. The expected water savings from each element of the water efficiency plan should be identified separately within the water resources plan.

- An appropriate allowance for climate change. This is to include an assessment of climate change uncertainty within target headroom and an assessment of the potential impacts of climate change on demand and water available for use. Companies should explain the impact on the final supply-demand balance.
- A final planning dry year demand forecast (and a critical period demand forecast if applicable) showing how the forecast will look once the preferred options for demand management, leakage and metering are implemented in addition to savings achieved through continuing current policies. This forecast should take account of levels of service, economic analysis and sustainable development principles (including the forthcoming water efficiency regulations and the Code for Sustainable Homes).
- A well argued, economically, socially, and environmentally justified final planning solution to meet any potential supply-demand deficits and contribute positively towards sustainable development.

In addition, the plan should also contain the following elements:

- An explanation of adjustment factors, methods, justification and assumptions used to derive the normalised base year.
- Assessments of deployable output, specifying and justifying any revisions.
- Outage calculation and supporting information.
- Population, household and occupancy estimates and forecasts and an explanation of their derivation.
- The assumptions behind the demand forecasts including details of consumption monitors and consumption monitoring results and micro-component (of consumption) data.
- Headroom calculation and supporting information.
- Option description.
- A detailed economic and sustainability appraisal of options.
- Needs for further investigation.
- The necessary WRP data tables in electronic format.

5.2 Water resources plan final planning solution

The most important part of a water resources plan is the final planning solution; the actions companies propose to take to manage the supply and demand in their water resource zones.

Firstly, companies should set out their strategic aims of the water resources plan.

Water companies should then explain the water resources planning problems: for example, whether there is a deficit or surplus and whether this is seen in the dry year scenario, the critical period scenario or both. Companies will need to show this at resource zone level and possibly also at company level.

Companies should detail the main issues associated with dealing with the problem and then explain and justify the solution. This solution is likely to be made up of a series of water management options and these need to be justified economically, socially, and environmentally. Again, companies will need to show this at resource zone level and possibly also at company level.

Section 12 sets out the information that water companies should include to justify their final planning solution. Companies should also include a summary of this information in the overview section of their plans (section 5.3.1).

Companies should also make the case within their water resources plan for further investigations of supply-demand options where appropriate.

5.3 Submission format

Water companies should follow the guidance in section 4 on submitting their statutory plans.

A company's water resources plan should incorporate the required data tables that illustrate the supply-demand balance (WRP tables) and the supporting analyses completed at the appropriate scale (resource zone or company) in support of a comprehensive written report.

The precise content of a company's written report will depend to some extent on the company's specific characteristics, such as the size of the supply-demand surplus or deficit. While flexibility is essential, a common structure and approach will help people and organisations to make consistent and comparable assessments of the plans. The structure below is not obligatory but is recommended as the standard basis for a water company's plan. The planning guideline also follows this structure so that companies can easily identify the guidance for each of the recommended sections of a water resources plan.

Recommended structure for a water resources plan

OVERVIEW

Introduction

Summary of plan

WATER RESOURCES PLAN

General information on plan content and development

Planning period

Resource zones

Scenarios

Reconciliation of data

Sensitivity testing

Company policies including level of service

Details of competitors for each resource zone

Water supply

Deployable output

- Reductions in deployable output
- Outage
- Raw and potable water transfers and bulk supplies
- Distribution and treatment works operational use and losses
- Water demand
 - Demand forecasts
 - Water efficiency, metering and leakage control (details of what is included in baseline)
- Climate change
 - Supply
 - Demand
 - Impact on supply-demand balance
- Target headroom
 - Method
 - Target headroom
- Baseline supply-demand balance
- Option appraisal
 - Approach for option appraisal
 - Unconstrained list
 - Feasible list
 - Options description and assessment
- Final water resources strategy
 - Justify the optimum solution
 - Final planning supply-demand balance
 - Overall water resources strategy
 - Water resource zone strategies
 - Further investigations

TABLES

- Completed tables
- Supporting information and assumptions

APPENDICES

- List of consultees and details of consultation
- Potentially commercially confidential information on specific options

As part of the plan, companies should submit a schematic 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 main links within a resource zone and sources, including bulk supplies, transfers and capacities, should be indicated on separate maps. The maps should not give precise location details (see section 3.1).

Water companies should submit four paper copies and four electronic copies of their full water resources plan – this should include the plan text, all supporting information and a complete set of WRP tables. These should be provided on four CDs, which should be clearly labelled with the company name. Submissions without completed tables will not be regarded as representing a company's water resources plan. Defra and WAG will tell water companies where each copy of the plan must be sent but we expect they will need to send one copy to Defra and/ or

WAG as appropriate, one copy to Ofwat and two copies to the relevant Regional Director at the Environment Agency.

Under the Welsh Language Act 1993, companies operating wholly or mainly in Wales must publish both Welsh and English language versions of their plans.

5.3.1 Summary overview of a plan

Water resources plans are now subject to consultation as part of the new statutory process brought in by the Water Act 2003. Anyone can comment on a water company's plan to the Secretary of State or the Welsh Assembly Government. It is expected that this 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 us and others.

Companies should include a summary in their water resources plans. This will help consultees and readers get a quick, high-level understanding of the main features of the plan and will demonstrate to customers how companies intend to take account of their interests. The summary should:

- briefly outline the baseline water resources situation for each resource zone through the planning period;
- explain what the baseline situation would mean for water supply and the environment if allowed to continue;
- give an overview of how the company plans to manage the supply-demand balance, describing the final planning solution and summarising the costs, benefits, drawbacks and overall justification;
- explain why the final planning solution has been chosen over alternatives with reference to financial, social and environmental costs, providing estimated bill impacts of the chosen solution and alternatives;
- describe the impact of the proposed solution on water supply and the environment;
- summarise any influential existing policies (such as leakage control or metering) and plans (such as drought plans).

The summary should provide a brief overview of the key issues in plain terms. It could be presented as a separate section at the start of the plan or could form part of the executive summary. It may be useful to include a table showing some of this information for each resource zone.

5.4 Planning period

Companies should plan ahead until 2034/2035 for both the draft and final water resources plans. Water companies should use 2006/2007 as the base year for both the draft and final plans as this will enable them to use the most recent available data.

For the final plan companies can decide to use 2007/08 as the base year. Changing the base year would mean additional work for companies and we would expect the differences between 2006/07 and 2007/08 to be small.

Ofwat plans to use 2007/2008 as the base year for the periodic review business plan submission.

A company's plan should:

- plan ahead to 2034/2035;
- use 2006/2007 as the base year.

5.5 Resource zones

We believe that water resources planning is best carried out at the resource zone level and that water companies should divide their supply areas into one or more resource zones. A resource zone is defined as 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. Resource zones vary in size depending on the way that the supply network functions.

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. We would expect this to be at resource zone level.

Companies should discuss any changes to resource zones with the Environment Agency at an early stage. If companies are changing or realigning resource zones where there have been supply difficulties, they should justify how the new zones will meet the definition of a resource zone. If companies intend to submit a company-wide plan, they should discuss this in advance with the Environment Agency. They should describe and provide evidence of the infrastructure that justifies this. We will also want to see this evidence where a company plans to amalgamate separate resources zones.

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

Discrete non-potable systems that can affect potable public water supplies should be incorporated into an appropriate potable supply resource zone for the purposes of the water resources plan.

A company's plan should:

- include a schematic diagram of the resource zones;
- justify any changes to resource zones from those last reported to the Environment Agency;

5.6 Planning scenarios

Companies should consider their supply-demand balance under different planning scenarios. All companies should forecast supply and demand under the dry year annual average daily demand planning scenario, otherwise referred to as the **dry year scenario**. By showing the actions they will take to balance supply and demand in a dry year, companies will be able to reassure people and organisations that they will meet their level of service.

The dry year forecast is developed from **normal year** data and companies should describe how this has been done. Some companies will also need to look at a **critical period scenario** where their supply-demand balance is sensitive at certain critical periods.

Companies should explain in their plans what different planning scenarios mean for their supply-demand balance and their preferred options set. They should also cover the impact that solutions derived to resolve deficits in one scenario has on another. For example, if a company proposes options to resolve deficits identified under the dry year scenario, it should explain how these will affect any critical period deficits it has.

5.6.1 Dry year annual average scenario

The dry year, a period of low rainfall and unconstrained demand, is the basis of a company's water resources plan. All companies should submit WRP tables showing their baseline and final planning forecasts under the dry year scenario. This should include their assumptions regarding the potential impacts of climate change on water available for use, demand and headroom for a dry year. The dry year forecast should be developed from 2006/2007 normalised base year figures and the plan should explain how a company has obtained the dry year from the normal year data. In 2006/2007, many companies had demand saving campaigns and customer restrictions in place. These companies should explain how they have taken these into account in generating dry year demand for the base year.

Companies are recommended to set out the dry year demand as a continuous profile over a year at monthly or weekly intervals. Companies are expected to analyse historical supply and climate data to produce this profile. Examples of actual demand should be shown against the profile used for planning. This demand profile should be the same as that used by the company to determine its deployable output. Where a company uses sub-resource zone demand patterns the average for the zone should also be presented.

5.6.2 Normal year annual average scenario

Companies should develop a normalised set of data from the 2006/2007 base year by making assumptions about the impact of normal or average weather patterns on the 2006/2007 base year data.

Companies do not need to show all the information behind the normal year forecasts in the WRP tables. However, the plans should clearly set out the basis for deriving the normalised base year data. The plans should:

Environment Agency Water resources planning guideline

- describe how a company has derived supply and demand, setting out clearly which components are measured and which are estimated;
- explain how a 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;
- explain how the normal year data compares to dry year and/or critical period forecasts.

Table WRP9 sets out the normal year final planning information that companies should submit. Companies' plans should explain how each data item in table WRP9 reconciles with the data reported for the dry year forecast in table WRP4-FP. We will expect companies to make reference to dry year adjustment factors and other relevant factors and to explain the basis for these.

5.6.3 Critical period scenario

In addition to the dry year scenario, companies may need to explore forecasts under critical period scenarios. If a critical period forecast is likely to be significant and is driving the need to implement water management options, a company should explain this in its plan.

Companies might consider critical period scenarios where a resource zone is supplied only by 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 company should identify the critical period for each of its resource zones. The company should explore and define the period appropriate to its resource zones in its plan, explaining the fundamental reasons for it being a critical period.

If a company presents a critical period forecast, it should explain the assumptions behind the demand forecast, deployable output, outage and headroom. Companies will need to consider the relationship between different factors (for example peak outage and demand are unlikely to happen at the same time) and should compare these relationships with the equivalent relationships for the dry year forecast. Companies should use their seasonal demand pattern to support this discussion.

If a company submits a critical period forecast within its plan, it should explain how the preferred options or final planning solution will manage under both dry year and critical period supply-demand conditions. Therefore critical period driven companies should submit data for the dry year and for the critical period.

A company's plan should:

- plan for the dry year annual average scenario;
- contain information on the normal year scenario;
- consider a critical period scenario where applicable;
- explain how each scenario has been derived for the base year from the actual 2006/2007 data.

5.7 Reconciling data

Companies should use the maximum likelihood estimation (MLE) method to reconcile the water balance at resource zone level in order to minimise the uncertainty in their base year estimates. MLE provides a good framework to reconcile the water balance to ensure the sum of the estimated components equates to distribution input. The standard method for MLE is provided in the UKWIR/NRA *Demand Forecasting Methodology Main Report* (NRA and UKWIR, 1995). Companies should refer to this report for guidance.

Companies should demonstrate a clear and transparent audit trail. The plan should show how a company moves from the initial estimate of the water balance for each resource zone to the MLE estimate.

5.8 Sensitivity analysis

In developing their water resources plans, water companies have to make many assumptions, affecting almost every part of the plan. Companies should include a description of the sensitivity of the plan to these assumptions. This will help readers to understand the plan and the reasons for the choices made by the company. The sensitivity analysis should help to provide reassurance that the plan is robust and flexible.

Water companies can choose the level of detail for the sensitivity analysis. As a minimum, the analysis should consider two areas:

- The sensitivity of the supply-demand balance to data uncertainty;
- The sensitivity of the proposed actions in the plan to assumptions or changes in the supply-demand balance.

We expect much of the sensitivity analysis to be applied at the resource zone level.

5.8.1 Sensitivity of the supply-demand balance to data uncertainty

Data uncertainty is considered in detail in the calculation of target headroom (section 9.2). The 2003 methodology includes detailed assessment of the sources of uncertainty in the supply demand balance. This would make a good base for a description of the uncertainty around the calculated supply-demand balance. The description should also distinguish between sources of uncertainty that are within the control of the water company and uncertainties over which the company has little or no influence. The company should also explain how it intends to reduce uncertainty in the forecast supply-demand balance.

5.8.2 Sensitivity of the proposed actions in the plan to assumptions or changes in the supply-demand balance

A robust plan will not need to be changed if there is a small change in the timing or magnitude of any deficit in the supply-demand balance. If a small change in one of the components would lead to a completely different set of actions, the plan may need to be changed to be more flexible.

There are many different ways to address this question, ranging from simple qualitative analysis to complex modelling of options to deal with different future deficits. The company should choose an approach to reflect the complexity of the resource zone and the scale of the uncertainty. If the proposed course of action has clear benefits over alternatives, a simple analysis may be appropriate. If there are many different sets of options with varying characteristics and different costs and benefits, a more detailed assessment may be more suitable. The plan should show clearly why the company chose its approach to sensitivity analysis.

5.8.3 Presentation of the sensitivity analysis

Presentation of the results of sensitivity analysis can be difficult. Companies should make sure that the analysis is presented clearly so that readers can understand the robustness of the proposed plan. One way of doing this is to present the results as answers to a series of questions. For example, the sensitivity analysis could deal with questions like:

- Which components of the supply-demand balance are most uncertain?
- What are the biggest sources of change in the supply-demand balance?
- What is the possible range of the future supply-demand deficit?
- How would the plan change if the deficit were 5% higher or lower?
- How would the plan change if the deficit were 10% higher or lower?
- How would the plan change if the timing of the deficit changed?

This is not an exhaustive list and companies should make sure that the sensitivity analysis is suited to their resource zones.

5.9 Company policies

Decisions companies make about the content of their plans are based both on company policy and on an assessment of customers' expectations. The plans should clearly set out the basis for these decisions.

Plans should be based on a sound business planning approach aimed at delivering good value solutions. Water resources plans should be consistent with other strategic and operational plans that the company currently has in place, for example, drought plans and water efficiency plans. They will also need to take

account of agreed changes to licensed abstractions and other changes to the supply-demand balance.

In particular, companies should set out their current policies in relation to leakage, metering and water efficiency and any circumstances likely to change these.

A company's plan should:

- make assumptions that are consistent with the company's current policies;
- detail the policies that are relevant to the water resources plan.

5.9.1 Level of service

Levels of service are a contract between companies and their customers. They set out the standard of service that customers can expect to receive from water companies. It is for each water company to decide on a level of service and explain this to customers.

We will comment on levels of service when consulted by companies before they prepare their draft plan and when we make representations on plans. We will express concern where we believe that companies are not planning for an appropriate balance between the needs of customers and the needs of the environment.

Each water company should propose the levels of service it believes are appropriate for its customers, whilst also considering 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 the environmental and cost implications.

When we make a representation on a company's plan, we will consider the proposed level of service alongside the preferred options for managing the supply-demand balance given in the plan. Companies should specifically identify any proposed changes in their planned levels of service.

The level of service proposed should be consistent with the content of the company's drought plan. The water resources plan should explain and justify any decision to change the level of service. The company should make sure that the new level of service is taken into account throughout the water resources plan and the drought plan.

A company's plan should:

- set out its level of service;
- justify this if it has changed from the previous stated level of service.

5.10 Competition in the water industry

The Water Act 2003 amended the Water Industry Act 1991 to extend the opportunities for competition within England and Wales. Companies that are

interested in supplying customers with water can now apply to Ofwat for a water supply licence. This will allow them to supply water to eligible premises anywhere within England and Wales.

Two categories of water supply licence are available.

A **retail licence** authorises the licensee to supply water to its customers by using a water undertaker's supply system. The licensee buys water wholesale from the undertaker (known as the primary water undertaker) and sells it retail to the licensee's customer.

A **combined licence** gives the licensee a supplementary authorisation in addition to the retail authorisation. The licensee can buy water wholesale from the primary water undertaker and sell it retail to its customer, as described above but may also introduce water into the water undertaker's supply system in order to sell to its customers. Combined licensees must abide by the water quality controls set by the primary water undertaker and the Drinking Water Inspectorate.

There are two ways that a combined licensee can obtain water:

- i) Once it has an abstraction licence, it can introduce water from its own water source, for example a borehole.
- ii) Alternatively, if a neighbouring water undertaker (known as the secondary undertaker) has spare water, the licensee can buy water wholesale from it. The licensee can then introduce that water into the primary water undertaker's supply system and supply water retail to the combined licensee's customers residing within the primary water undertaker's area.

5.10.1 Allowing for competition in water resources plans

Water supply licensees do not produce water resources plans but they have a duty to contribute to the water undertakers' statutory water resource plans. When developing their water resources plans, water undertakers need to know how to represent the effects on supply and demand of the activities of competitors.

One specific area for consideration is the extent to which any one or more introductions of water by a licensee are designated as a *strategic supply* or *collective strategic supply* under the water supply licensing regime. An introduction of water is a strategic supply if, without the introduction being made, there is a substantial risk that the water undertaker would be unable to maintain supplies to its own customers as well as supplying the licensee's customers with water for domestic purposes.

If an introduction is designated as strategic and the licensee fails either procedurally or financially, the licensee will be subject to special administration procedures. This means that the introduction that had been deemed strategic would continue to be introduced into the water undertaker's public supply system. The process is designed to avoid the need for duplication of assets by the water undertaker.

Given that the impact of competition is likely to be low during this round of water resources plans, water undertakers should provide a written commentary on the impact of competition on their supply-demand balance as identified below.

For each resource zone, identify:

- whether there are any licensees operating there and, if so, how many;
- whether the licensed suppliers are retail or combined licensees;
- the volume of water bought wholesale and/or introduced by each licensee;
- the number of customers and volume of water being supplied by each licensee;
- if they are combined licensees, where the water enters the company's supply system (and if it is a raw or potable import);
- whether secondary supplies are involved;
- whether any licensee's supplies are designated as strategic supplies; and
- any other material factors that may affect the company's ability to meet current and future demands.

A company's plan should:

- provide details of the number and type of licensees operating in each resource zone and, the volume of water and numbers of customers involved;
- state whether any secondary supplies are involved;
- whether any supplies are designated as strategic.

5.11 Strategic Environmental Assessment

The Strategic Environmental Assessment (SEA) Directive¹⁴ came into force in July 2004. The directive requires a formal environmental assessment of certain plans and programmes which are likely to have significant effects on the environment. Authorities that prepare and/or adopt a plan or programme that is subject to the Directive will have to prepare a report on the likely significant environmental effects of it and reasonable alternatives. They will also have to consult environmental authorities and the public, and take the results into account.

Environmental assessment will be mandatory for plans and programmes¹⁵:

- which are prepared for, amongst other things, water management and which set the framework for future development consent for projects listed in the Directive on Environmental Impact Assessment¹⁶; or
- which have been determined to require assessment under the Habitats Directive¹⁷.

Assessment is also required for any plans and programmes which set the framework for development consent of projects and which are determined by screening¹⁸ to be likely to have significant environmental effects.

¹⁴ The Environmental Assessment of Plans and Programmes Regulations, 2004 (2001/42/EC)

¹⁵ as defined by Article 2 (a) of the Strategic Environmental Assessment Directive.

¹⁶ 85/337/EEC amended by 97/11/EC

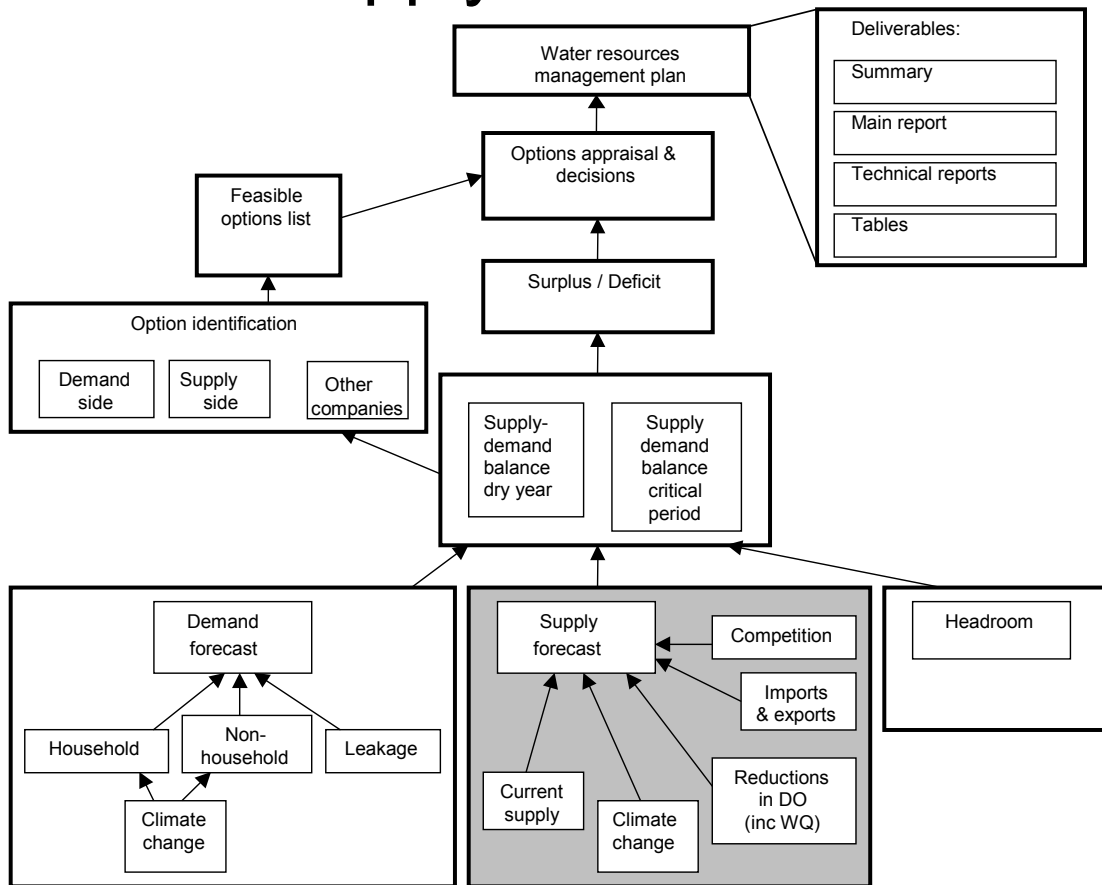
¹⁷ 92/43/EEC

¹⁸ Article 3 (3 – 6) of the Strategic Environmental Assessment Directive

Each water company is responsible for determining whether its water resources plan falls within the scope of the SEA Directive. The plan should state whether the company believes SEA should be undertaken or not. Companies should confirm this when consulting the Environment Agency prior to preparing the draft plan. Where a company believes that SEA is required, SEA should be undertaken following the SEA Directive requirements. The statutory process for the development of water resources plans helps to meet the requirements of the directive.

For further guidance water companies should refer to *A Practical Guide to the Strategic Environmental Assessment Directive* (Communities and Local Government, 2005).

6 Water supply



Water companies supply water from a variety of sources ranging from stand-alone boreholes to interconnected impounding reservoirs.

This chapter looks at assessments of water sources. It gives guidance about the methods we want water companies to follow and the level of detail required in a company's plan. It points out where companies should discuss assumptions and data with the Environment Agency.

6.1 Deployable output

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

- *Reassessment of water company yields* (Environment Agency, 1997);
- *A methodology for the determination of outputs of groundwater sources* (UKWIR, 1995b);
- *Surface water yield assessment* (NRA, 1995);
- *A unified methodology for the determination of deployable output from water sources* (UKWIR and Environment Agency, 2000);
- *Critical period groundwater yield* (UKWIR and Environment Agency, 2001). (A company using this approach to assess deployable output should ensure that

its assessment does not conflict with the principles set out in the unified methodology report.)

Companies do not need to undertake a detailed review of source deployable outputs for their water resources plans.

New assessments are required if:

- a) a company has developed new sources and has not previously reported the deployable output.
- b) a company has undertaken new work on existing source deployable outputs.

This should include: calculations of conjunctive-use output; enhancements to groundwater assessments; revisions to output in connection with environmental or other obligations; or where the company is proposing changes to its planned levels of service. Companies should analyse and report any revisions at least as thoroughly as the yield assessment work undertaken in 1997. Companies should discuss any revised estimates with the Environment Agency before starting to prepare the water resources plan.

Companies where groundwater sources provide most of the water in a zone should show how they have incorporated the improved methodology set out in the unified methodology or include details of how they intend to apply it.

Companies may want to reassess the yield of specific sources following the recent drought. Companies should not just reassess the yield of a single source but look at all the yields in the resource zone to see whether the resource zone has performed better or worse than expected as a whole, as other sources in the resource zone may also have performed differently.

Methodologies allow some flexibility around what is included within deployable output. Companies should state what they have and haven't included in their calculation of it. For example, deployable output may already have taken into account treatment works operational use, treatment works losses, raw water operational use and raw water losses.

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 Environment Agency at an early stage.

Water companies will need to revise their deployable output assessments if they have changed their levels of service.

A company's plan should:

- report deployable output for each of the company's sources or conjunctive use schemes;
- include supporting material to justify deployable output figures for new sources or where the information has changed.

6.2 Reductions in deployable output

Temporary short-term losses in deployable output that a company plans to deal with should be included in outage. Medium-term and longer-term loss of deployable output from sources should be considered as reductions in deployable output.

6.2.1 Sustainability reductions

Some current abstractions, including Habitats Directive sites, are thought to have a detrimental effect on the environment. Where the effect of these abstractions has been investigated and identified, the Environment Agency requires water companies to implement solutions that mitigate this effect. These are known as sustainability reductions. With many of these abstractions the water companies are closely involved in, or leading site investigations and, where appropriate, developing a solution to resolve an identified issue.

Water companies should allow for sustainability reductions in their water resources plans. This will ensure that the impact of those reductions on the supply-demand balance is allowed for in the options appraisal. Hence water companies will be able to demonstrate the actions they need to take to maintain their supply-demand balance.

The Environment Agency will provide numbers to water companies for the reductions they need to allow for. In March 2007, we provided companies with a list of the sites for and we will provide the actual numbers in two stages, in May 2007 and in December 2008. We will provide actual numbers at those sites where options appraisal has taken place and indicative numbers where option investigations have been undertaken but an appraisal has not yet been completed. Companies should use both actual and indicative numbers in the same way. They should enter these as sustainability reductions in the appropriate resource zones in the baseline supply-demand balance; this will result in a reduction in the water available for use (WAFU) in those zones. Companies should then use the usual supply-demand balance approach to assess whether this causes or increases a deficit during the planning period. If it does, they should follow the usual options appraisal process to determine the preferred options set.

Companies should not make any allowance for sustainability reductions in headroom. Although the headroom methodologies make allowances for uncertainty due to these, we do not expect companies to include these. We will provide the best information available at the time. If the actual reductions required differ from this information, or if additional reductions are required, companies will be given enough time to adequately plan and implement solutions to deal with these. We will not make changes to licences that undermine the security of public water supply.

6.2.2 Other reductions in deployable output

A water resources plan may also need to consider reductions in deployable output as a result of operational decline or loss of source due to nitrate or other water

quality issues. The company should explore the need for any reductions in detail, and provide supporting information in its plan. It should describe the reason and appropriate driver, for example Drinking Water Standards, for any reduction.

A company's plan should:

- include sustainability reductions as provided by the Environment Agency;
- include any other reductions to deployable output as appropriate. These should be discussed with the Environment Agency in advance.

6.3 Outage

A water resources plan should justify the outage levels provided. Outage should be considered separately from target headroom.

Most companies have followed the principles set out in the operating methodology section of the UKWIR report *Outage allowances for water resources planning* (UKWIR, 1995) when determining their outage allowance. We would encourage those who have not yet done this to adopt this approach. We believe this methodology provides a fuller insight into outage risks and the opportunities to minimise them.

The degree to which a company explores outage will vary according to need and circumstance. As a minimum approach, a company should justify outage allowances in relation to the likelihood of events recurring, given the magnitude, duration and timing of actual outage circumstances. This should be supported by recorded data.

Companies should also include specific remedial solutions to their particular supply-demand balance problem in their assessment of total water management solutions. This should include further treatment options.

A company's plan should:

- include outage figures for each time step within the plan;
- justify those outage figures with information on the likelihood of events recurring given the magnitude, duration and timing of actual outage circumstances. This should be supported by recorded data and justification of the likelihood of the outage events occurring in combination or within the planning scenario. Ideally statistical appraisal of this likelihood should be presented.

6.4 Raw and potable water transfers / bulk supplies

Imports and exports should be shown as planned transfers for each time step across the planning period. For the baseline data, the volume used should be within the existing physical and operational transfer capacities and agreed between donor and recipient companies where it is an inter-company transfer. The existing maximum transfer capacity and its limiting factors should be declared and

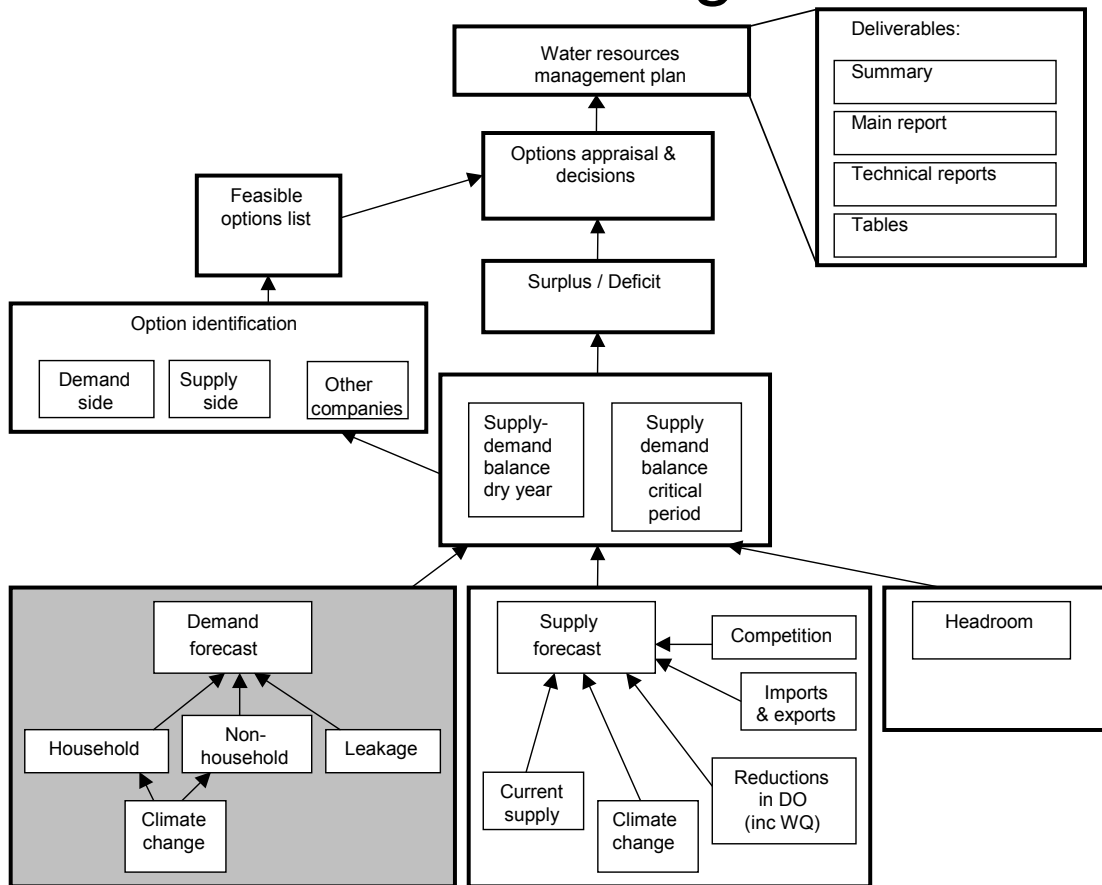
explained in the plan report. Companies should also explain any variation in capacity with the direction of transfer.

Companies should ensure that the values used by a transfer donor match those used by the transfer recipient. Both donor and recipient companies should also explain how such supplies will be managed under a dry year scenario. Where an agreement cannot be reached on the value to be used for an inter-company transfer, both companies concerned should clearly state the assumptions they have used in the plan.

A company's plan should:

- detail existing transfers between its resource zones and between it and neighbouring companies;
- state the maximum capacity of any transfers and explain any limiting factors including any variability according to the direction of the transfer;
- explain the assumptions it has used about the reliability of those transfers and, in the case of inter-company transfers, say whether this is agreed between donor and recipient companies;
- detail any future transfers included in the preferred options set including information about agreements with the relevant donor or recipient company.

7 Demand forecasting



All companies must develop robust demand forecasts based on assumptions about how water demands will change over the next 25 years. The water resources plan should demonstrate a clear understanding of current demands for water and how patterns of water use will change in the future.

This section covers demand forecasting. It concentrates on producing baseline demand forecasts. Companies should produce forecasts for the dry year and for the critical period where appropriate.

Later in the process companies should also produce final planning forecasts which show how the demand savings or resource gains of the preferred options set affect the baseline forecasts.

In section 7.1, the guideline considers the types of demand forecast that should be produced under different scenarios. Sections 7.2 to 7.5 look at household demand forecasting whilst section 7.6 considers non-household demand forecasting. The household sections first look at how companies should assess population and property numbers for the base year (section 7.2) and then considers population and property projections into the future (section 7.3). Sections 7.4 and 7.5 look at base year and forecast consumption including the micro-component approach. Water efficiency and leakage are considered separately in sections 7.7 and 7.8.

7.1 Different types of demand forecasts

A company should submit demand forecasts for each of its resource zones for the range of scenarios set out in section 5.6. Figure 13.2 sets out the different WRP tables that should be submitted for each planning situation. The forecasts should follow good practice methodologies and use the best information available.

The baseline forecast should show how demands are expected to change in a dry year assuming existing management and water efficiency policies continue. The plan should describe the assumptions made about how the drivers of demand will change through the planning period.

A company that predicts a deficit in its supply-demand balance, or whose supply-demand balance is likely to differ from the baseline for any other reason, should also submit a final planning demand forecast. This will show how demand will look in a dry year following implementation of the options identified in the plan.

A company that has deficits in its supply-demand balance driven by a critical period should submit baseline and final planning forecasts of critical period demand.

Each company's plan should also include final planning potable water and leakage information for the normal year scenario to allow Ofwat to assess the forecast revenue. This forecast should assume normal or average weather patterns and should be consistent with data in the company's draft and final business plans.

Companies should clearly describe the assumptions and supporting information they have used to develop their plan. As a minimum, each company's plan should:

- clearly describe the assumptions behind the base year and forecasts;
- explain how the current best estimates of demand have been reconciled;
- describe the method used to develop the demand forecasts.

Companies should also provide a graph of a planning dry year demand pattern for each resource zone, and provide details of how it has been derived including examples of typical historical dry demands.

The demand forecasts are a critical step in developing a water resources plan. We recommend companies discuss these with the Environment Agency at an early stage in the process.

A company's plan should:

- contain a dry year baseline demand forecast at the resource zone level;
- contain a dry year final planning demand forecast at the resource zone level where a company has a supply-demand balance deficit;
- contain a baseline and final planning critical period demand forecast where there is a supply-demand deficit that is driven by critical period;
- contain a forecast for the final planning potable water components for normal year.

7.1.1 Normal year and dry year forecasting

The base year should be as specified in section 5.4 of this guideline. Companies should identify if the base year is a typical or non-typical year in terms of climate and water supply. A non-typical year may be characterised by particularly wet weather or there may have been supply restrictions in place such as in 2006/2007. In these circumstances, companies should adjust (normalise) the water balance estimates to provide a separate average weather baseline set of data. The plans should explain the process companies have followed to normalise their base year data.

Companies should derive a set of normal year demand estimates based on their characterisation of the normal year. Using adjustment factors from their analysis, companies should adjust the observed data from their consumption monitor (or survey) to represent a normal year.

Once the normalised baseline is established, companies should define dry year conditions through analysis of historical trends of climatic and supply data. Companies should include an annotated graph to illustrate historical trends in distribution input and associated potential drivers such as rainfall and temperature.

When developing baseline dry year demand, companies should adopt a similar approach to that used to derive the normal year demand. Using adjustment factors derived from their characterisation of the dry year, companies should adjust the normal year demand to provide a dry weather set of baseline estimates.

The water resources plan should describe the methods used to create the normal year and dry year demand estimates. Companies should describe the assumptions and adjustment factors they have used. This should be supported by appropriate historical data.

The plan should focus on the supply-demand requirements for the dry year. However, it should also include certain components of the normal year final planning demand forecast to allow Ofwat to assess revenue forecasts (see table WRP9).

A company's plan should:

- describe the process followed to define the normal and dry year demand and include an annotated graph to illustrate historical trends;
- describe and justify how the company has created its normal year and dry year.

7.1.2 Peak forecasting

A company that has deficits in its supply-demand balance driven by a critical period should submit baseline and final planning forecasts of critical period demand.

We expect companies that submit a critical period scenario to:

- describe the type and duration of the critical period demand including when this demand typically occurs;

- describe the operational constraints that occur in the resource zone and how they affect management of the critical period demand;
- detail the assumptions made in developing the critical period scenario.

The newly published Peak Water Demand Forecasting Methodology UKWIR 06/WR/01/7 provides a framework for companies to use. The main recommendations are:

- the need to link peak forecasts to the levels of service, incorporating a return period analysis;
- normalisation - the need to assess peak demand in relation to a representative average demand, rather than average of each particular year;
- understanding and forecasting of peak demand and its constituents should be based on what is known about the combination of components at the time of peak total demand, rather than adding together peak values for each of the components;
- rebasing is a key element allowing companies to estimate how the historic peaks would have looked if applied to the current customer base (ie, metering levels, new properties etc);
- validation is needed at each stage to make the forecasts robust;
- the methodology identifies main uncertainties and suggests methods to take them into account and incorporate into headroom.

7.2 Base year population and properties

Companies should present population and property numbers for each resource zone. This section gives guidance on assessing population and property numbers for the base year and population and property projections of the future. We have used the forthcoming report *Methods of Estimating Population and Household Projections* (Environment Agency, 2007) along with the 1995 reports *Demand Forecasting Methodology* and *Forecasting Water Demand Components* (NRA and UKWIR, 1995) to inform this guidance.

7.2.1 Base year population

Companies are likely to estimate household population from company property billing data and customer survey occupancy information. They should explain how this information is derived in the plan. The estimates should account for the different occupancy rates of sub-categories of customers (unmeasured, new build, optant etc.). Companies can assume that void, zero consumption or holiday home properties have no allocated resident population.

Companies should reconcile their resource zone population estimates with the latest published population data from the Office for National Statistics (ONS). Companies will be able to use the report *Methods of Estimating Population and Household Projections* (Environment Agency, 2007) as a guide to reconciling the data. ONS publish two sets of population data:

- **Mid-year population estimates** are published annually for local authorities in England and Wales. There is an approximate publishing delay of one year; for

example, June 2005 data was published in 2006. Companies can assume that mid-year estimates are representative of the annual populations required for the relevant year. If companies amend the data due to the time of the year, they should explain how they have done this.

- Population estimates for the smaller **Super Output Areas (SOAs)** are currently experimental but are consistent with the local authority mid-year estimates. They are published with an approximate two-year delay; for example June 2004 data is published in 2006. The data are available on two levels. The lower layer SOAs have a mean population of 1,500 and their boundaries are constrained by the wards used for the 2001 Census. The middle layer SOAs have a mean population of 7,200. Their boundaries are built from groups of lower layer SOAs and are constrained by the 2003 local authority boundaries.

Allocation to resource zones

Some local authority boundaries span more than one zone, so companies should describe how they have allocated the ONS local authority populations to their resource zones. One way to do this would be to include a table such as the one below, showing the proportion of each local authority population in each zone:

	Resource zone 1	Resource zone 2	Resource zone 3	Total
Local authority 1	20%	70%	10%	100%
Local authority 2	5%	95%	0%	100%
Local authority 3	10%	65%	5%	80%
Local authority 4	2%	0%	5%	7%

Companies could use the SOA data to distribute the local authority populations to the appropriate zone. They could assign the SOA estimates to resource zones using published information and total them to calculate resource zone populations. The SOA populations are associated with local authority areas so companies would then be able to calculate the proportions of each local authority population in a zone. The same proportions could then be used with more recent mid-year local authority area data to estimate the most recent resource zone populations.

For the draft plan, companies may need to then project the population data by one year to obtain the base year population. Companies can assume current growth trends continue for one year or may use any available applicable local data.

The plans should explain any additional adjustments, such as deductions for population associated with properties that are not connected to the public water supply network.

Population breakdown

Companies' plans should present a resource zone breakdown of the measured and unmeasured household population, properties, assumed occupancy rate and pcc (table WRP1). The resource zone total connected population data should agree with the sum of the household and non-household population estimates. Companies should provide information from occupancy rate surveys to explain the breakdown, including size of sample, response rate and breakdown by customer groups.

Base year non-household population

Non-household population is made up of people living in farms and communal establishments (hospitals, prisons, educational establishments etc.). Companies should allocate a proportion of the total resource zone population to the non-household category to allow for this population.

The 2001 Census information contains data on the numbers of communal establishments and their residents by local authority¹⁹. Using local knowledge, companies should show the distribution of non-household population within water resource zones. The communal population should be kept fixed at the 2001 level, unless additional information is available (for example, a hospital closing) as recommended in *Methods of Estimating Population and Household Projections* (Environment Agency, 2007). Companies' plans should justify and describe any adjustments made to the base year communal population.

The plan should describe the method used to estimate the remaining non-household population, such as those living on farms. This can be derived from company billing information and estimated occupancy rates.

Companies' plans should justify and describe any population allocated to the unmeasured non-household category.

A company's plan should:

- describe how it has reconciled resource zone population estimates with the most recent ONS population data, showing adjustments for population in properties that are not connected to the mains;
- present the proportional allocation of local authority data to resource zones;
- include household population and divide it into customer categories;
- include non-household communal population and identify the resource zone distribution of the 2001 census data on communal establishments;
- describe the method used to estimate remaining non-household population and justify any population allocated to the unmeasured non-household category.

7.2.2 Base year properties

The total number of billed properties, household and non-household, can be obtained from billing records. It should be possible to allocate the properties to resource zones using company billing system information (for example, post-codes).

Companies should compare and reconcile the total number of properties with the latest CLG department and WAG household data, taking account of properties that are not connected to the public water supply. Both CLG and WAG latest household projections are based on 2003-population data, but are available for 2006, the base year for the planning period.

¹⁹ http://www.statistics.gov.uk/census2001/table_list_ks.asp (Table KS23)

- The CLG department publishes household projections for local authority areas in England. The latest released data, *ODPM statistical release 2006/0042*²⁰ was published in March 2006.
- WAG publishes household data for local authority areas in Wales. Mid-year household estimates for 2004 were published in October 2006 in *statistical release 139/2006*²¹.

Companies could assume that the local authority household data are allocated to resource zones in the same proportions as the local authority population data (see section 7.2.1) or, if available, use more appropriate local knowledge.

As the household projections for 2006 are based on 2003 population estimates, they may have significantly changed. Companies should compare and reconcile the total number of properties with those derived from the resource zone base-year population estimates, assuming the average CLG department and WAG household sizes for 2006. Companies should explain any differences in the data sets and justify the adjustments they have made to reconcile them.

Property breakdown

Companies should divide the total number of properties into categories: measured households, unmeasured households and void households, and measured non-households, unmeasured non-households and void non-households.

To develop forecasts, companies should understand base year demand so should know how the customer base is composed. **Companies should split the measured household properties into categories**, each with its own pcc rate. These categories include new properties, change in occupancy, optants, compulsory metered and selectively metered. Each category should have a population derived using occupancy estimates from occupancy rate surveys (or other identified sources). Companies should use these categories. If alternative categories are used to those above companies must fully explain and justify these choices.

Water companies may estimate the number of measured non-households from billing records but also should include estimates of those properties sharing a meter. The number of billed unmeasured and void properties, both household and non-household, may also be taken from the company's billing data. If the company does not hold such detailed billing records we expect the company to justify how the numbers have been derived.

A company's plan should:

- allocate household data to resource zones using information from its billing system;

²⁰ Found at www.communities.gov.uk/index.asp?id=1156093 (Table F contains household projections for local authority areas and Table E contains household projections for the government regions and regional average household sizes).

²¹ www.new.wales.gov.uk/topics/statistics/headlines/housing-2006/hdw20061030/?lang=en

- explain how it has reconciled the resource zone property data with CLG department and/or WAG property data and household size and the ONS population data;
- determine the numbers of measured, unmeasured and void households and non-households from billing records;
- include a breakdown of measured households into more detailed categories (in table WRP6);
- justify any adjustments made for non-connected properties.

7.3 Forecasting the potable water customer base

Population and property numbers can be projected forward into the future using either assumptions about trends or on the strength of current policy. Trend-based projections assume recent trends will continue and do not take into account any future policy changes whilst policy-based projections consider planned development initiatives.

Companies should produce and present both trend and policy-based resource zone population and household projections. This will allow the differences due to the planned growth to be identified and will help assess the uncertainty associated with the forecasts. A company's plan should include any uncertainty associated with the forecasts in the target headroom assessment, and should include a detailed explanation of this allowance.

A company's final property and population projections should be policy-based. The policy based approach will enable the water resource plans to be as consistent as possible with the regional spatial strategies.

The water resources plan should describe the basis for projections that reach beyond the dates covered by published projected data. This may be derived either on a growth rate based on the recent projections or on a declining growth rate.

Guidance for England and Wales

Water companies supplying customers in England should follow the guidance set out in section 7.3.1 and 7.3.2 for policy-based and trend-based projections. Water companies supplying customers in Wales should refer to section 7.3.3. Companies with customers in both England and Wales should refer to guidance for both England and Wales.

7.3.1 Policy-based projections (England)

Regional Spatial Strategies (RSSs) set out how many homes are needed to meet the future needs of people in the region together with other planning matters and look at least 15-20 years ahead. The RSSs contain information on household projections by local authority; these are policy driven and should include planned development initiatives.

The regional strategies are in various stages of production. The most recent planned production dates for these strategies are shown in figure 7.1 below. Companies should use the most up-to-date information in either the RSSs, the draft RSSs and, if applicable, the publication by the Government of proposed changes. Most final RSSs or reviews, with the possible exception of West Midlands, should be published in time for their data to be used in preparing the final water resources plans, due to be submitted in April 2009.

Figure 7.1: Planned publication dates for the Regional Spatial Strategies

Planning Group	Previous plan published	Draft Plan/ review submitted	Publication of proposed changes	Final Plan published/ Review end date
East of England Regional Assembly		November 2004	December 2006	Summer 2007
East Midlands Regional Assembly	March 2005	September 2006	Late 2007	Early 2008
North East Regional Assembly		June 2005	August 2006	Spring 2007
North West Regional Assembly		January 2006	Autumn 2007	Late 2007
South East England Regional Assembly		March 2006	September 2007	February 2008
South West Regional Assembly		April 2006	End 2007	Early 2008
West Midlands Regional Assembly	June 2004	December 2007	Late 2008	Early 2009
Yorkshire and Humber Regional Assembly		December 2005	Spring 2007	Autumn 2007
Mayor of London	February 2004	September 2006		Early 2008

Where the current version of the RSS does not include the most recent planned growth, companies should use more recent information from local plans and other strategies.

If the new house completion rates assumed in the policy-based projections have not been realised in the base year then, in the absence of other information, companies should assume that the planned total number of households is still correct. They should increase the future planned growth rate to make sure the planned totals are still achieved. The plan should explain the information sources used and any amendments made to published growth rates to generate policy-based forecasts.

To produce policy-based population projections, household projections may be combined with either projections of average household size or more local information may be available, for example prospective flat developments are likely to have lower occupancy rates than a planned housing estate. The plan should describe the method and assumptions made.

7.3.2 Trend-based projections (England)

ONS sub-national population projections and CLG department projections are derived using assumptions for future levels of births, deaths and migration based

on levels observed over the previous five years. They show what the population and household numbers will be if recent demographic trends continue. They do not take into account any future policy changes. The projected data is available for local authority areas.

In certain areas, the policy-based and trend-based projections may be significantly different. The trend-based projections may either be lower than the policy-based projections, due to significant future planned development, or higher, due to recent high in-migration.

7.3.3 Household policy-based and trend-based projections (Wales)

The [Wales Spatial Plan](#) sets out how many homes are needed to meet the future needs of people in Wales together with other planning matters and look at least 15-20 years ahead. This is policy driven and should include planned development initiatives.

The Welsh Assembly Government has published the latest national and sub-national trend-based household projections for Wales. The data is available in the *statistical release 30/2006*²². The projections use the ONS 2003-based population projections as their base.

As is the case for the 2003-based population projections, household projections for Wales were produced for four regions; North Wales, Mid Wales, South West Wales and South East Wales. As outlined in the Ministerial Interim Planning Policy Statement, it is suggested that local planning authorities work together with appropriate stakeholders to apportion to each authority the Welsh Assembly Government trend-based household projections, or agree their own regional policy-based projections. Water companies supplying water to customers in Wales should use the latest information on trend-based household projections from local authorities. However, where the local authority household projections are policy-based, companies should not use these but instead use the trend-based projections based on the Welsh Assembly Government household projections.

Allocating policy-based population and property projections to resource zones (England and Wales)

Population estimates of larger areas, such as those published for local authority areas, are more accurate than smaller areas. Companies should take account of the SOA population distribution and also of local plans to allocate the projected data to resource zones.

Companies should reconcile resource zone population and household forecasts with the published policy projections and describe and justify any adjustments to the totals in the plan. Below is one suggested method to distribute the projections:

- If the local authority policy-based projections are **lower** than the trend-based projections (perhaps due to high recent in-migration) then companies should distribute the local authority **policy-based** projections to resource zones in the

²² www.new.wales.gov.uk/topics/statistics/wales-figs/population/subnational/?lang=en

same proportions used for the base year data. This assumes that future development will take place in proportion to the existing population locations.

- If the local authority policy-based projections are **higher** than the trend-based projections then companies should distribute the local authority **trend** projections to resource zones in the same proportions used for the baseline estimates. They should then allocate the **additional** local authority policy-based projections to the appropriate resource zones associated with the locations for local developments, as identified from local development plans.

This method reduces the need for companies to examine local development plans in detail for resource zone forecasts unless they are significant and are located in local authority areas that straddle resource zone boundaries.

Companies may need to consider local development information in more detail in resource zones forecast to be in deficit over the planning period. They should consider any available property pipeline information, indicating the location and size of new build activity when a zone is sensitive to short duration (five to ten years) projections. The information may also be useful when companies assess the geographical suitability of proposed new schemes.

Sub-divisions of household projections

Companies should divide the final resource zone projections for household properties into measured and unmeasured categories according to the company's planned metering programme. The number of unmeasured households should decline and the number of metered customers to increase.

Companies should also disaggregate new build housing from existing housing stock and justify the differences in terms of population and occupancy.

A company's plan should:

- present and consider both trend and policy population and household projections; ascertain differences and assess uncertainty in forecasts;
- contain a final household projection that is policy-based using regional spatial strategies where possible;
- adjust the final household projection to reflect recent completion rates;
- justify growth rate used for population and household projections for years beyond the last published data;
- allocate projections to resource zone level – a method is recommended using current SOA proportions for trend development and local development information for increased policy based development;
- sub-divide household projections into measured and unmeasured in accordance with the planned metering programme;
- disaggregate the new build from existing housing stock and justify the differences in terms of population and occupancy.

7.4 Base year household demand

7.4.1 Per capita consumption

Companies should clearly describe the method they have used to derive base year demand and justify their approach.

To reduce the variability of base year per capita consumption (pcc), companies should develop or improve domestic consumption monitors either alone or with other companies that have a similar customer base. Guidance for developing consumption monitors is set out in *Best practice unmeasured per capita consumption* (UKWIR, 1999).

Unmeasured per capita consumption

Companies should derive average unmeasured pcc (and occupancy rates) using observed data from their consumption monitor. Using statistical techniques (for example, regression analysis) companies should extrapolate average pcc across each resource zone and explain how they have done this in the plan. The plan should describe the method used and explain how and why unmeasured pcc varies across the consumption monitor. This should include assessments of how geographical and socio-economic factors influence the range of pcc values.

Companies with consumption monitors that show a considerable range of pcc values should investigate the reasons for high variability in pcc. They should reconcile the difference in pcc against different housing types and socio-economic factors across the consumption monitor and investigate the influence of other factors such as occupancy, mains pressure, monitor type, etc. This is important because companies need to understand the reasons for variation in base year pcc to allow them to forecast pcc properly. Companies should describe their approach in the plan and explain the reasons for the variability in pcc.

Those companies that identify issues with their consumption monitors following investigations should explain in their plan how they will address these.

Measured per capita consumption

Companies should use their billing data for metered households to calculate measured per capita consumption.

If the company does not have sufficient billing data it should follow the approach described above to derive average measured pcc (and occupancy rates) either from observed data or a measured consumption monitor or survey. In the absence of consumption monitor or survey data, companies should apply a metering effect factor to the observed unmeasured consumption data. We expect companies that adopt this approach to describe the method they have used – and justify the factors applied - in their plan. Companies that do not currently have their own measured domestic consumption monitor or survey should explain their plans for developing one or using others' data.

7.4.2 Baseline micro-component per capita consumption

Companies should provide a breakdown of unmeasured and measured household consumption into micro-component categories by resource zone. In each case, the sum of the micro-components should equal the unmeasured or measured pcc value.

We recommend companies break down average consumption into micro-component uses based on a set of detailed assumptions about appliance ownership, frequency of use and volume of water per use for each micro-component category. Companies' plans should show how unmeasured and measured assumptions differ in each resource zone and between zones. Assumptions for measured micro-components should take account of the effect of metering on consumption.

The typical micro-component categories that companies should use are listed below.

- toilet flushing;
- bath;
- shower (standard and power shower);
- hand basin;
- clothes washing (by machine and by hand);
- dish washing (by machine and by hand);
- garden use (sprinkler, held hand hose and watering can);
- car washing (by hose and by bucket);
- miscellaneous use.

It is unlikely that the appliances and activities identified will account for all of the demand for water. Some residual or miscellaneous demand will remain. A company's plan should describe fully the assumptions it has made about the make-up of miscellaneous use. Companies should describe the assumptions that underpin each micro-component category. If companies choose to use alternative categories, they should clearly explain what each category includes.

Different water use characteristics and trends may arise within resource zones due to socio-economic differences. Companies should tailor their assumptions about ownership and frequency of use to the socio-economic characteristics of each resource zone and examine how geographical differences influence water use. Companies should use information from secondary data sources (such as market research, regional trends, and other studies as well as information from consumption monitors (or surveys) to develop their micro-component assumptions. A company's plan should tell us about the information it has used.

A company's plan should:

- contain a breakdown of micro-component pccs for the unmeasured and measured base for each resource zone;
- describe the method used to derive unmeasured and measured pcc including the origin of the observed pcc and any adjustments made to the data;

- state the assumptions that underpin the base year estimates of unmeasured and measured pcc. It should explain how socio-economic and geographical factors influence the pattern of water use in each resource zone;
- describe how metering effects consumption;
- include a summary of the MLE analysis including confidence levels for each component for each resource zone.

7.5 Forecast household demand

There are two UKWIR and NRA R&D reports on demand forecasting: *Demand Forecasting Methodology* and *Forecasting Water Demand Components* (UKWIR and NRA, 1995). The first of these provides an overall framework for forecasting, defines components and recommends data sources that should be used. The second report is a good practice manual that provides specific guidance on the main components. These reports identify numerous methods, which vary in detail and data requirements. A list of reports and publications that provide the most recent information on demand forecasting techniques is included in section 26.

Section 7.4 discusses the different assumptions for baseline unmeasured and measured demand for each resource zone. Companies should use the same approach when they develop the assumptions that underpin their demand forecasts. We recommend companies use secondary data sources such as evidence of changes in customer behaviour or water usage specific to the company, market research, regional trends, and other studies to develop the assumptions.

The new voluntary code for sustainable housing and proposed changes to building regulations will change demand for water in new houses. Companies must estimate the impact of these changes on demand and document their assumptions.

All companies should describe their approach to demand forecasting. A company's plan should clearly describe and justify the approach used to forecast demand. It should describe the assumptions that underpin the demand forecasts including the socio-economic changes, geographical factors, technological advances and changes in regulation that a company has assumed will change patterns of consumption.

7.5.1 Forecast micro-component per capita consumption

We believe that the micro-component approach to demand forecasting is the best way for companies to understand the demand for water of their customers and to identify the scope for changing water use. This approach requires companies to consider how advances in technology, changes in society and the role of regulation will influence growth or decline in water use over the next 25 years. It considers how socio-economic characteristics influence patterns of water use and affect appliance ownership. Detailed examination of the components of demand will also help the industry understand the variability in consumption between

individuals and across different sectors. It also allows companies to test the implications of factors such as climate change.

Section 7.4.2 lists the typical micro-component categories that companies should use. It is unlikely that these categories will account for all of the demand for water. Some residual or miscellaneous demand will remain. A company's plan should briefly describe the assumptions made about the make-up of miscellaneous use. Companies should briefly describe the assumptions that underpin each micro-component category. If companies choose to use alternative categories, they should clearly explain what each category includes.

A company's plan should:

- include a breakdown of forecast micro-component pccs for unmeasured and measured for each resource zone where the micro-component approach has been used;
- describe the method used to forecast consumption;
- describe the assumptions that underpin the demand forecasts with information about the growth factors used;
- for each metering category (optants, new property, change in occupancy, selected and compulsory metering) explain how the pattern of water use changes from baseline to forecast and justify the assumptions that underpin the growth factors.

7.6 Non-household demand

Companies must provide a base year and forecast assessment for non-household demand in each resource zone. Guidance on the standard approach for forecasting non-household demand can be found in the UKWIR/NRA reports on *Demand forecasting methodology* (NRA and UKWIR, 1995) and *Forecasting water demand components* (UKWIR, 1997).

A company's plan should describe the method used to derive the base year estimate of non-household consumption. It should describe the assumptions that underpin the base year including the uptake of water efficiency measures in each SIC category and the assumed savings that are included in the baseline water efficiency policy. Companies should describe any adjustments made to the data.

Companies should develop a detailed set of forecast assumptions that consider how socio-economic growth, emergence of more efficient technology and the impact of regulation will influence non-household demand over the next 25 years. A company's plan should describe the assumptions that underpin its forecast assessments and describe how socio-economic growth, advances in technology and regulatory changes will influence the pattern of water use in each SIC category.

Companies should separate non-household demand into the main Standard Industrial Classification (SIC) categories published by the Office of National

Statistics (ONS) in 2003²³. The list of categories that companies are recommended to use and the corresponding SIC codes are shown in table WRP8. If companies use alternative categories to the SIC codes, they should list the categories and explain which industries and businesses are included in each.

A company's plan should:

- provide base year and forecast assessments for non-household demand by resource zone and clearly set out the methods used to produce these;
- explain the categories of industrial water use used if they differ from the SIC 2003 categories.

7.7 Water efficiency and metering

Water efficiency and metering are covered in this section as ways of reducing demand that need to be considered in developing demand forecasts. They are also referred to in the option section 11.2.

All water companies have a **statutory duty** to promote the efficient use of water. A company's water efficiency policy should provide a framework to achieve this statutory duty. This will include delivery of the company's current metering programme and implementation of current or planned demand management initiatives. Companies' baseline forecasts should include savings that arise from a company continuing existing water efficiency policies unless these are known to change during the planning period.

The plan should clearly describe the water efficiency policies that a company has included in baseline household and non-household demand forecasts. It should detail the water savings that have been assumed for each aspect of the policy. Companies should comment on the confidence they have assigned to the predicted water savings from undertaking water efficiency policies. Companies should comment on whether the predicted water savings will be sustained over time or whether they gradually change (for example savings from cistern displacement devices may decrease as households replace toilets).

Companies should take account of the impact of the Code for Sustainable Homes and regulatory changes expected in 2008 when creating their demand forecasts.

A plan should clearly describe the current metering policies that a company has included in the household demand forecast. The plan should provide a breakdown of metering by category – optants, new build, compulsory, change of occupancy – and detail the assumed take up and savings for each category (see section 19).

Companies should develop a set of forecast assumptions that show how forecast meter penetration rates will change the pattern of water use in each resource zone. Companies should quantify the water savings they expect to achieve over the next 25 years and build them into the measured pcc forecast.

²³ The SIC 03 codes can be downloaded from [www.statistics.gov.uk/methods_quality/sic/downloads/UK_SIC_Vol1\(2003\)](http://www.statistics.gov.uk/methods_quality/sic/downloads/UK_SIC_Vol1(2003)).

Companies should also consider further metering beyond the baseline as a supply-demand option. This could also include different tariffs as a demand management tool.

The company must explain and highlight where supply-side resource options have been offset or obviated as a result of water efficiency measures.

A company's plan should:

- describe the current water efficiency policies included in the demand forecasts;
- include a numerical representation of the water savings it has assumed from its demand management initiatives and metering programme by initiative;
- include an assessment on whether the predicted water savings will be sustained over time or whether they gradually increase or decrease;
- describe the current metering policies included in the demand forecast;
- provide a breakdown of metering by category (in WRP6) and detail the assumed take up and savings for each category;

7.8 Leakage control

Leakage is covered in this section as a way of reducing demand that needs to be considered in developing demand forecasts. Leakage is also referred to in the option section 11.2.

Companies should explicitly detail their current leakage policies to show what is included within the baseline demand forecast. The plan should explain how the minimal operational leakage based on a company's policies and technical assessment is calculated and proved for each water resource zone.

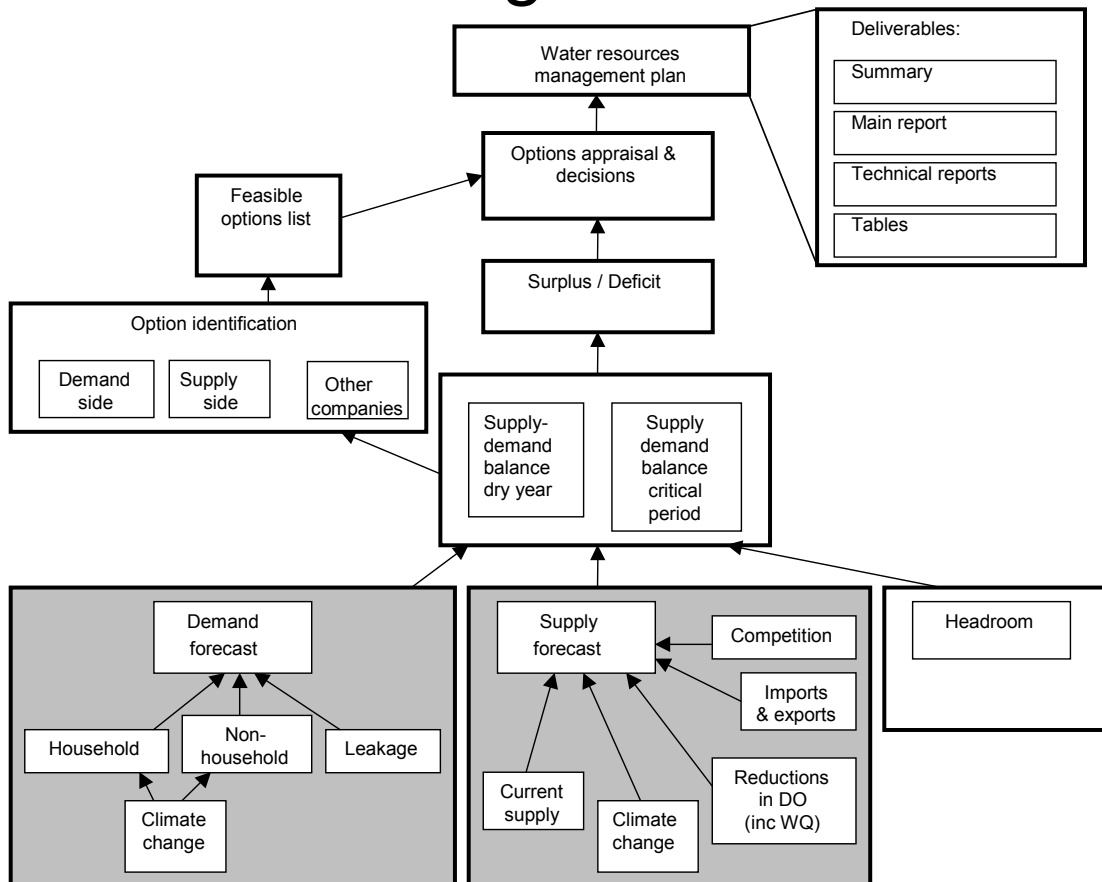
Companies should clearly demonstrate the linkages between district metered areas (DMA) source data, resource zone assessments of economic level of leakage (ELL), and the company level leakage strategy. Companies should recalculate the economic level of leakage assessment throughout the plan period as part of optimising timings for new schemes.

Companies should also consider further leakage control beyond the baseline as a supply-demand option.

A company's plan should:

- demonstrate how the company's leakage appraisal builds from district metered areas source data, to resource zone assessments of economic level of leakage, and to the company-level leakage strategy;
- detail the company's current leakage policies included within the baseline demand forecast;
- not rely on a single assessment of ELL projected across the planning period.

8 Climate change



8.1 Introduction

It is important that the effects of climate change are considered in the water resources plans.

In April 2002, the UK Climate Impacts Programme (UKCIP) released new scenarios of the effects of climate change on the UK (Hulme et al., 2002). Generally, the UK will become warmer and drier. UKWIR commissioned *The effect of Climate Change on River Flows and Groundwater Recharge: UKCIP02 Scenarios in 2002* (Arnell, 2002). This is a detailed methodology for undertaking a simple assessment of the impact of the UKCIP 2002 scenarios on river flows and groundwater recharge for the 2010s, 2020s and 2030s. This work was verified by *Effect of climate change on river flows and groundwater recharge: a review* (Reynard and Young, 2002) and we recommended that the companies follow this approach for the 2004 water resources plans.

Since this work, UKWIR and the Environment Agency have funded several research projects to inform new guidance to the water companies for the 2009 water resources plans. These include:

- a project developing a tiered approach to planning water resources under climate change, including uncertainty;

Environment Agency Water resources planning guideline

- a project that developed a method of incorporating (climate change and hydrological) uncertainty within water resources plans.

Projects have also recently been completed that investigate the climate change impacts on surface and groundwater resources.

We have commissioned work to collate the latest scientific evidence of projected climate change impacts on surface and groundwater resources and appraise the methodologies for incorporating climate change within water resources planning being developed by the various national projects.

The work will summarise the outcomes and methodologies, and produce guidance on how to factor climate change into water company plans. It is scheduled to complete in late Spring 2007 and we will revise this area of the water resources planning guideline shortly after this to ensure water resources plans account for the latest research on the impacts of climate change.

The following section details the approach that we expected companies to take in assessing the impact of climate change on their 2004 water resources plans. Companies should update any work they undertake following this guidance when the planning guideline is revised.

8.2 Scope of guidance

For water resources planning purposes it is possible only to estimate the effect of climate change on average supply rather than on the volume available in peak periods.

Reynard and Young (2002) verified the work carried out by Arnell (2002) to be an appropriate approach for the initial assessment of the impact of climate change. However, it does not provide sufficient certainty for a major investment. Therefore the procedure described here should be used to screen resources zones to identify those where the impact of climate change should be investigated in more detail.

This guidance note should be read in conjunction with the technical guidance provided by Arnell, which includes detailed instructions on how to use his results.

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.

8.3 Supply

The impact of climate change on baseline supply should be considered at a resource zone level. Arnell's report indicates the amount of change that should be

applied for different decades between the 2000s and the 2020s (section 6 table 12), together with guidance for using these factors.

Ideally, a resource zone simulation model should be used to look at impacts:

- river flow – either use Arnell’s scaling factors or a simulation model using rainfall and evaporation scaling.
- reservoir yield – use river flows as above;
- groundwater sources – use aquifer models where possible. Where this is not possible, examine the existing vulnerability of yield to drought. This should help to identify those groundwater sources that are vulnerable to climate change. For these sources, estimate the effect of reduced recharge in line with Arnell’s estimates. Where sources without good models appear to be sensitive to climate change, in the long term it may be appropriate to carry out further modelling work.

Where no resource zone model exists, estimates of the impact on individual sources should be made. An estimate of the cumulative impact for the resource zone should be made, but care should be taken to ensure that this does not lead to the inappropriate accumulation of impacts.

In most cases the four core UKCIP scenarios will give very similar results to the 2030s. Therefore for the purpose of establishing the consequences of climate change, results need only be presented for Arnell’s medium scenario, which reflects both the medium-high and medium-low UKCIP scenarios. This does not preclude the use of other UKCIP scenarios for sensitivity purposes.

Arnell’s approach is suitable only for flow and rainfall records before 1990. If the deployable output of sources is dependent on droughts that occurred in the 1990s, it is possible that these climatic events already include some impact of climate change. An allowance for this should be made and justified.

A company’s plan should:

- consider impact of climate change on baseline supply at resource zone level;
- ideally, show that it has used a resource zone simulation model to look at impacts
- where no resource zone model exists, a company should estimate the impact on individual sources.

8.4 Demand

The impact of climate change on baseline demand should be considered at a resource zone level. Household demand per cent factors from *Climate Change and the Demand for Water* (DoE, 1996; Downing et al., 2003) should be used for average demand. These refer to 2030 and should be scaled linearly between the base year and 2030.

It is not anticipated that companies will factor in peak demands but where peak demands are significant to the supply demand balance and investment then a well argued case would be considered. This should consider the link between current peak demand and weather conditions and show that it is reasonable to assume that peak demand would change with a different climate.

Climate Change and the Demand for Water provides some guidance for demand in different industrial sectors. Companies can use this but should describe their assumptions clearly. Alternatively, they may assume that there will be no impact on industrial demand.

Agricultural demand for most water companies is small. *Climate Change and the Demand for Water* provides estimates of unconstrained future irrigation demand. The benefits of meeting such demand should be considered carefully to produce an estimate of the total agricultural demand for which the company should plan. Only if water companies can demonstrate the proportion of their non-household water use that is used within agriculture for irrigation purposes should an estimate of the impact of climate change on agriculture be considered. Assumptions should be stated clearly.

A company's plan should:

- consider the impact of climate change on baseline demand at the resource zone level;
- use household demand per cent factors from *Climate Change and the Demand for Water* (DoE, 1996; Downing et al., 2003);
- describe the assumptions it has made regarding industrial demand and agricultural demand.

8.5 Impact on supply-demand balance

The effect of climate change on the supply-demand balance should be assessed for each resource zone.

- If it is clear that the impact of climate change makes little or no difference to activities before 2035, the company may state this and does not need to change its water resources plan.
- If the impact of climate change makes little difference before 2025 but could to 2035, companies should consider the timing of the necessary investigations.
- If the impact of climate change is great enough to require changes to the water resources plan before 2025, the company should consider the further investigations and analysis that will be needed.

An allowance for climate change may be made explicitly and/ or in headroom. Where included in headroom, this should reflect only the uncertainty associated with climate change. Where climate change is incorporated explicitly in forecast supply or demand, only the uncertainty associated with this should be included in headroom. Where no explicit allowance for climate change is incorporated in supply or demand, a greater allowance may be incorporated in headroom. In all cases assumptions should be stated clearly.

For each resource zone a statement of the impact of climate change should be included in the plan.

The analysis described here will not be sufficient to justify significant expenditure. However, for zones where it is identified that the impact of climate change may be a significant driver for investment in the next 10 years, companies should provide sufficient information to allow the scoping of such action to begin. Options in these zones are:

- to decide to carry out further investigations between 2010 and 2015;
- to decide to carry out further investigations after 2015.

If this climate change analysis indicates that companies should start work on implementing new options before 2015, they will be expected to finish investigations as early as possible. The nature of such investigations will depend on the scale and type of problem but they could include:

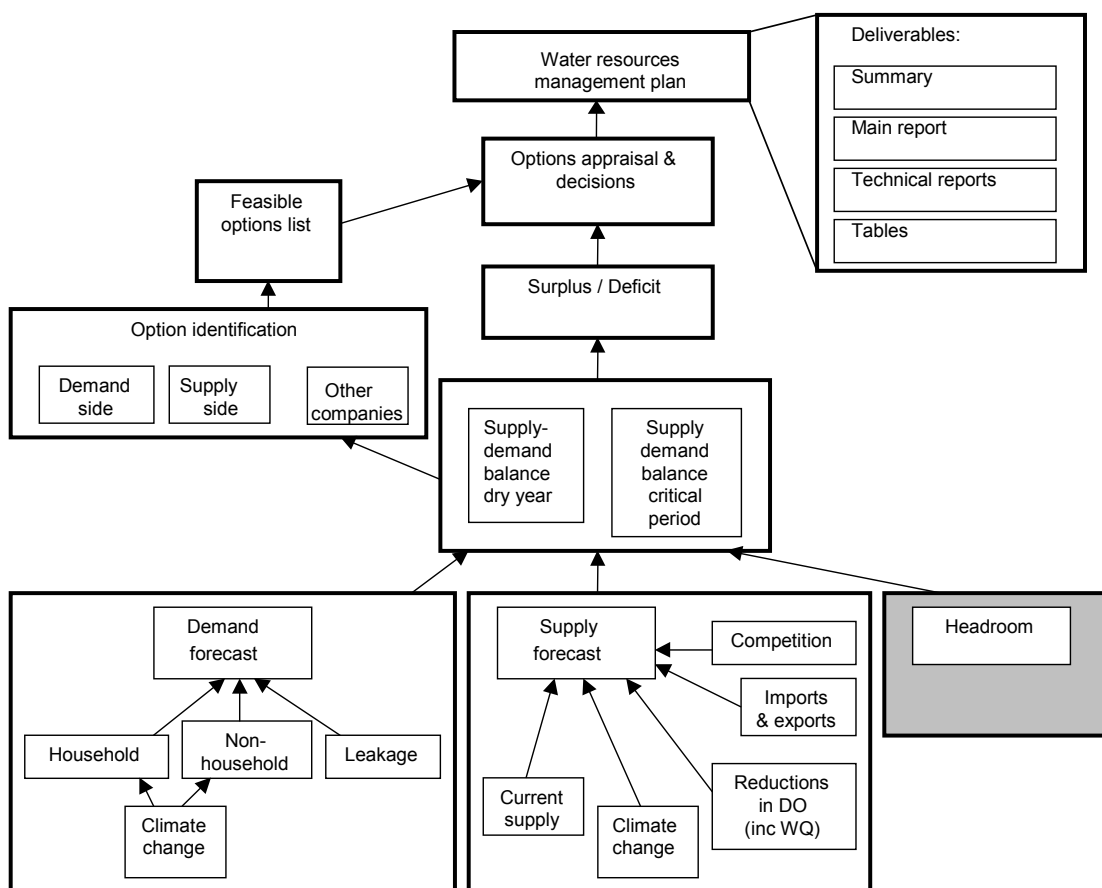
- developing resource zone models where existing models are weak;
- carrying out further work to understand source outputs and the risks associated with climate change;
- more detailed hydrological modelling using the UKCIP work;
- further modelling using results from other global circulation models (GCMs).

The effort and cost involved in using other GCMs could be significant, and it will be necessary to consider this when scoping further work.

A company's plan should:

- assess the effect of climate change on the supply-demand balance for each resource zone;
- state if the impact of climate change makes little or no difference to activities before 2035;
- consider timing of investigations if the impact of climate change makes little difference before 2025 but could to 2035;
- consider further investigations and analysis needed if the impact of climate change is great enough to require changes to the plan before 2025;
- where the company includes an allowance for climate change in headroom, this should reflect only the uncertainty associated with climate change and should be detailed in the plan.

9 Calculating target headroom for water resources plans



This section will help companies present their calculation of target headroom in a consistent and transparent way in their water resources plans. It covers both the 1998 and 2003 headroom methodologies (UKWIR, 1998; UKWIR, 2002) and all companies should refer to this guidance in preparing their water resources plans.

9.1 Defining target headroom

Target headroom is a buffer between supply and demand designed to cater for specified uncertainties. Water companies should adopt a well-informed approach to determining target headroom (the allowance made by a company for forecast uncertainties). This should balance the costs and risks to customers and the environment of a low headroom allowance against those of a high headroom allowance.

Uncertainties are inevitable in planning but it is important to reduce them as far as possible. The headroom assessment in a company's plan should identify the greatest sources of uncertainty and consider options for reducing this uncertainty. For example, it may be possible to collect additional data to reduce questions of data accuracy. Over time we would expect data uncertainty to reduce and

companies should plan to improve this component of headroom over the 2009 – 2014 period.

9.2 Choice of method

Two methods for the calculation of target headroom are available. The 1998 methodology, *A Practical Method for Converting Uncertainty into Headroom* (UKWIR, 1998), is a pragmatic approach that attempts to quantify the uncertainty in the supply-demand balance. It produces an estimate of target headroom that is useful for planning purposes but does not provide sufficient evidence to justify the development of new resources to meet the calculated target headroom. Therefore this approach is most suitable for resource zones where there is a healthy supply-demand balance that persists for at least 10 years.

The 1998 methodology may be appropriate in resource zones where there is no immediate supply-demand balance issue, or in small resource zones where the collation and analysis of the data would be unduly onerous. However, it is important to note that the 1998 methodology remains unsuitable for justifying significant expenditure to meet target headroom. If such expenditure appears necessary it should be supported by further analysis.

The 2003 methodology, *An Improved Methodology for Assessing Headroom – Final Report* (UKWIR, 2002), addresses the shortcomings in the 1998 methodology by taking a more rigorous approach to determining headroom uncertainty through probabilistic simulation. The uncertainties of each headroom component are defined as probability distributions and combined using probabilistic simulation techniques (sometimes called Monte Carlo simulation). Much more work is required to apply this approach but it is sufficiently rigorous to support the justification for developing new resources.

The 2003 methodology report identifies two different approaches to using headroom uncertainty to define target headroom. The simpler approach compares available headroom with headroom uncertainty to provide a rough guide to whether there is sufficient headroom available. The more complex approach combines probability distributions of deployable output, demand, outage and headroom uncertainty to provide a probability distribution of the balance of supply. This is a more sophisticated approach and allows a good assessment of the probability of supply failure at any time, as well as an evaluation of the success of any planned changes to the supply-demand balance.

Either version of the 2003 methodology may be used in zones where there is a supply-demand balance deficit. The more complex approach will result in a clearer justification and will be particularly valuable where significant investment is necessary.

Companies should not use a combination of methods in a single resource zone but it may be appropriate for a company to use different methods in different zones. Companies should take care if individual options affect more than one zone and different headroom methods have been used.

The target headroom methodology is applicable to the dry year scenario but should be used sensibly in relation to critical period 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) should, therefore, be low for the early years of the plan but rise over the planning period.

A company's plan should:

- describe the method it has used and the assumptions it has made.
- clearly justify the assumptions it has made in assessing any critical period target headroom requirement.

9.3 Risk and uncertainty in supply and demand

Water companies should document and justify their assumptions of risk. In most cases a comparison with the previous level of target headroom will be appropriate, explaining what elements of risk remain the same, and what elements have changed and why.

It is neither practical nor affordable to plan for 100 per cent certainty and we will not expect to see companies producing headroom calculations that allow such a level of certainty. However, water companies should not take unnecessary risks by applying too low a target headroom.

In general, we expect water companies to accept a higher level of risk in future years than at present. This is because, over time, the uncertainties for which headroom allows will become smaller.

Time limited licences

Companies should not make allowances for the risk of non-renewal of time-limited licences in headroom. Although the headroom methodologies make allowances for uncertainty due to this risk and also sustainability reductions, we do not expect companies to include these. Ministers have instructed the Environment Agency to ensure that time-limited licences do not present a risk to security of supply. This means that any notice given will provide sufficient time to restore the supply-demand balance based on the accepted level of service. Therefore, any actions can be part of a planned process and there is no need for a headroom allowance for this eventuality.

Where time-limited licences have been identified as having a definite or probable environmental impact the planned reduction should be entered into table WRP1a as a sustainability reduction.

Headroom uncertainty should not be significantly influenced by the headroom components “accuracy of supply-side data” and “accuracy of sub-component data”. We acknowledge that for some sources quality of data may be an issue, but would not expect to see a general adjustment for data quality driving investment to correct a supply-demand imbalance.

Uncertainty and Risk in Supply/Demand Forecasting (UKWIR, 2003) contains a review of risks and uncertainties associated with water resources planning, and their implications in terms of resource management and the associated costs to society. It explores techniques for evaluating these risks and uncertainties, their influence on the supply-demand balance, and proposes a framework for their systematic evaluation.

The methodology is not intended to replace existing methods but to provide additional information about the risks and uncertainties associated with different elements of the supply-demand balance. It is not necessary for water companies to follow this methodology for their water resources plans.

A company may wish to provide additional information on uncertainty and risk and their management, using approaches set out in *Uncertainty and Risk in Supply/Demand Forecasting* (UKWIR, 2003). If a company has used any information based on these methods in a EBSD framework (*The economics of balancing supply and demand* (Environment Agency and UKWIR, 2002)) framework or in the headroom methodology, it should explain how it is derived and indicate the effect of using this approach.

As in the case of assessing headroom, companies that use the methods set out in *Uncertainty and Risk in Supply/Demand Forecasting* (UKWIR, 2003) should provide clear justification of their treatment of inter-dependencies, correlation, and mutual exclusion, between the different sources of uncertainty that feed into their assessment. Water companies should also describe the reasons and the empirical basis for their choice of probability distribution attached to each source of uncertainty. These assumptions should be consistent with those used in the headroom assessment.

In interpreting the results of any methods set out in *Uncertainty and Risk in Supply/Demand Forecasting* (UKWIR, 2003), water companies should also indicate how the level of risk that they are prepared to accept reflects their target level of service.

A company’s plan should:

- document and justify the assumptions it has made around risk.

9.4 Presenting the results of headroom assessment

Target headroom is an important part of the supply-demand balance. It is important that a company’s plan presents sufficient information to allow an understanding of the approach used. The plan should provide a clear justification and an audit trail of the assumptions used in determining the target headroom. It should also set out

the allowance made for each component of headroom so consultees can clearly see what is driving headroom in a zone.

Companies should state clearly which headroom assessment methodology they have used for each resource zone.

Companies that use the 2003 methodology

The 2003 methodology produces an assessment of headroom uncertainty. Companies have to interpret this to produce an estimate of target headroom. The approach taken should be identified clearly in the plan.

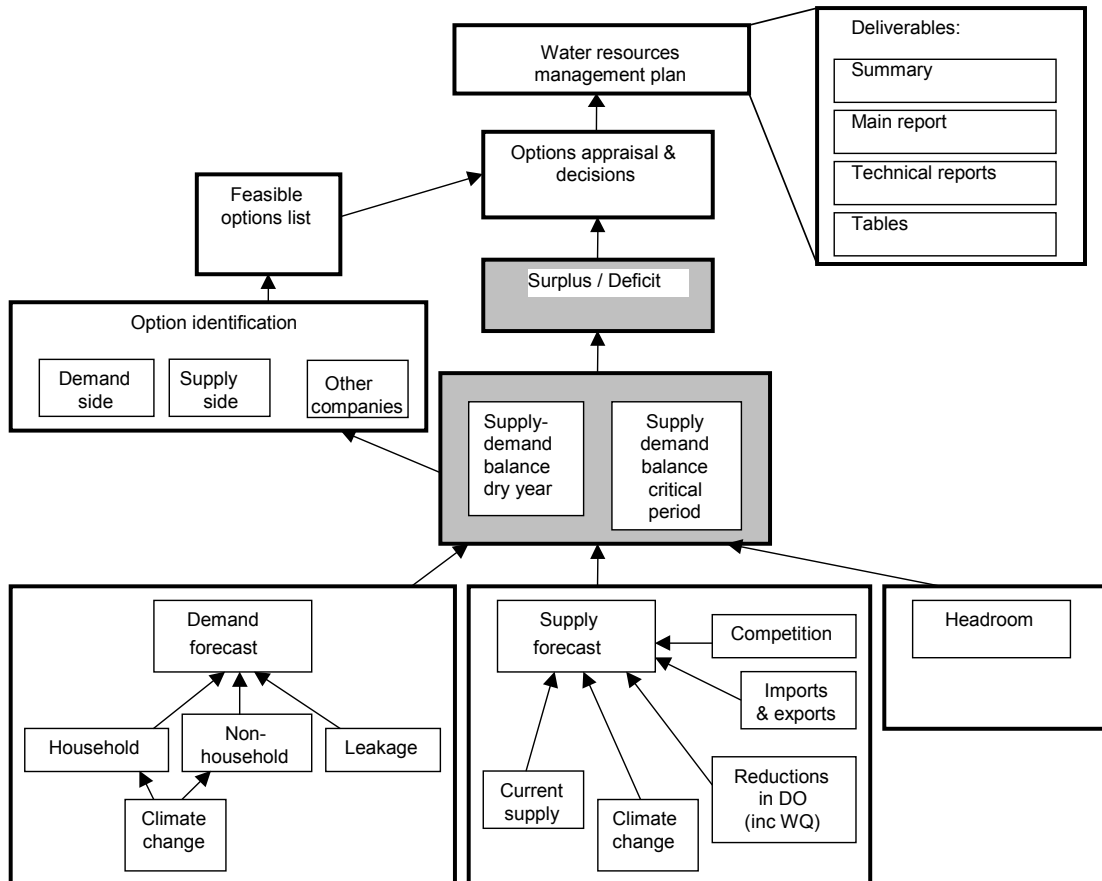
Using this methodology allows companies to consider the probability that they are planning for sufficient headroom. Companies' plans should present a clear discussion of the way that they have used the probability distribution of headroom uncertainty to develop target headroom. This should include a discussion of how exceedence percentiles have been used. The plan should also review the impact on security of supply of the target headroom, showing how the proposed target headroom meets customers' needs. This should include an assessment of the levels of service that this target headroom allows the company to achieve and whether this represents a change to planned levels of service.

Water companies that apply the new approach should justify their treatment of inter-dependencies, correlation, and mutual exclusion, between the different sources of uncertainty that feed into their headroom assessment. They should also describe the reasons and the empirical basis for their choice of probability distribution and level of variance attached to each of the *headroom* sources. These issues are crucial to the effective application of the new headroom methodology.

A company's plan should:

- provide a clear statement of the headroom assessment methodology that it has used for each resource zone;
- provide an assessment of the different sources of uncertainty in the headroom calculation for each resource zone;
- for zones where the 2003 methodology has been used, discuss clearly the way that it has used the probability distribution of headroom uncertainty to develop target headroom and a clear description of how it has used exceedence percentiles to derive target headroom;
- for zones where the 2003 methodology has been used, give an assessment of security of supply with the calculated target headroom and the levels of service that this target headroom allows the company to achieve and whether this is different to planned levels of service.

10 Baseline supply-demand balance



Companies should present a baseline scenario for the supply-demand balance. This should include known changes to water available for use (planned and approved changes to abstraction licences) and the continuation of current demand management policies (including the swiftest possible achievement of the current target for leakage and implementation of companies' water efficiency plans).

Companies should present the nature of the supply-demand problem in the plan so that the actual situation can be understood. They should explain:

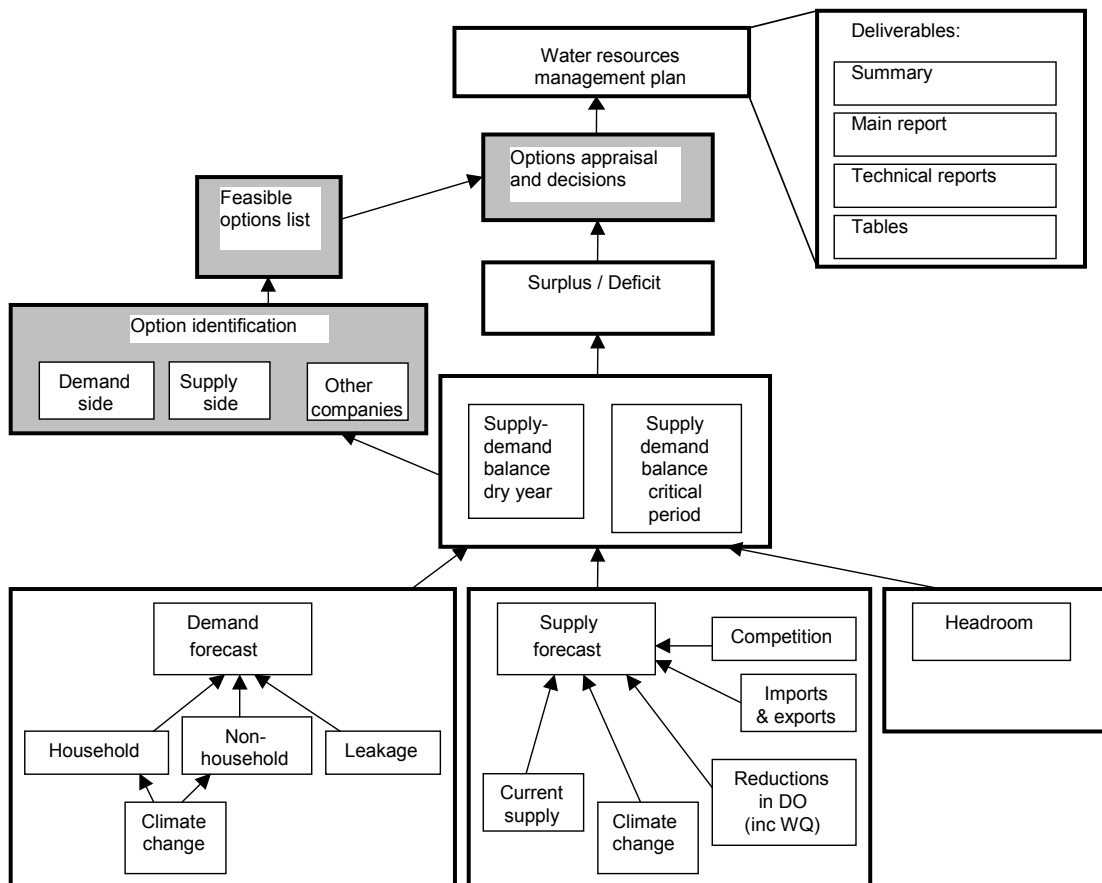
- whether the problem exists in the dry year scenario or in the critical period or whether there is a problem in both;
- the size of the problem (i.e. volume of a deficit);
- the reasons and drivers for the problem;
- the timing of the problem; is it a problem now or does it come into place some time in the future?;
- the impact of the problem should no action be taken.

A company's plan should:

- describe the baseline planning problem.

11 Option appraisal

This section of the document provides guidance on the general approach to options appraisal (section 11.1), developing the unconstrained and feasible options sets (section 11.2), and describing and assessing options (sections 11.3 and 11.4). More detail on the economic appraisal of options is given in section 11.4. Throughout the section we set out the information companies should include in their plans to justify their decisions.



11.1 Approach to option appraisal

A company that forecasts a deficit between supply and demand at any point in the planning period should plan the actions it will take to resolve that deficit. In planning these actions, companies should appraise a range of options, select the preferred options set and justify their choice.

The options appraisal included in the plans is an initial assessment to provide a preferred options set. It does not preclude the need for further and more detailed investigations as companies implement their plans. Companies should however adopt a consistent approach to the appraisal and cost estimates for all of the options in the plan so that the results are comparable.

Options terms

Throughout this chapter we will use standard terms to describe different parts of the

options process. The definitions for these are set out below:

Supply-demand deficit: an identified deficit between water available for use and demand (including headroom).

Unconstrained options: the complete and exhaustive list of all technically feasible options that could be used to address the planning problem.

Feasible options: options that satisfy the screening criteria and are further analysed for capability to address the planning problem.

Preferred options: an option or combination of options that have been selected as the option(s) best able to address the planning problem. Also known as;

Final planning solution: the optimum solution to a company's identified planning problem. This can consist of one option or a combination of several options.

When selecting a preferred options set, companies should demonstrate that they have considered the full range of factors relating to the feasible options. They should consider the financial, environmental and social costs as well as issues such as climate change, energy needs and wider environmental concerns. Companies should also consider the risk and uncertainty associated with an option and its overall flexibility.

Companies' plans should follow the principles set out in *The economics of balancing supply and demand* (Environment Agency and UKWIR, 2002). This provides a more detailed guide to assessing options and choosing a preferred options set. It focuses particularly on the economic assessment of individual options and combinations of options.

11.1.1 Overview of process

The list below summarises the steps a company should take to identify a preferred options set. Subsequent sections provide more guidance on the actual appraisal and costing of options.

To develop a preferred options set, each company should:

- quantify the deficit it is trying to address;
- establish a list of all possible options - this is the unconstrained list;
- review the feasibility of these options and reject those that are not considered realistic. The company should explain in the plan why it has rejected any options. This will leave the feasible list (which should still include more options than the final number of preferred options required to achieve or maintain the supply-demand balance);
- consider the lead-in time needed to promote and implement the options;
- apply economic appraisal;
- consider the equity of different combinations of options;
- identify an initial preferred economic solution;
- consider the links and dependencies between options;
- consider the wider issues of risk, uncertainty, sustainability and climate change etc;
- identify alternative combinations of options in respect to wider issues;
- compare and contrast the relative merits of alternative solutions;
- choose and justify the preferred options set.

The overall process should allow iteration across its steps and revision of assumptions where appropriate. For example, at the end of the process, the preferred options set will need to be revisited in the light of sensitivity tests on the plan (section 5.8).

11.2 Developing unconstrained and feasible options lists

11.2.1 Unconstrained options list

When developing the unconstrained options list, companies should consider a wide range of water management options. These options should be technically feasible but they should not take account of the factors influencing them. Table 3.1 of *The economics of balancing supply and demand* (Environment Agency and UKWIR, 2002) contains a comprehensive list of water management options to consider.

Companies should consider options from each of the following four categories:

- 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 deployable output, such as new reservoirs or resource transfers).

Some options will be the result of a single action but others will have a number of different components. For example, any savings due to metering are likely to be the sum of the individual savings from meter optants, sprinkler owners, new properties etc. As the demand suppression factors will be different for each type of customer, each component should be considered separately when developing the option. Similarly, in leakage control, the predicted overall saving is likely to consist of individual contributions from pressure reduction, enhanced active leakage control, free or subsidised supply pipe repairs and mains replacement. In these cases, a company's plan should clearly state the assumptions made about the components of the options.

Leakage

Any leakage options considered in the unconstrained or feasible options set should be in addition to those already included in the baseline.

Companies that predict leakage will rise in their baseline forecast will be expected to include options to turn the trend around.

Companies may also wish to explore the value of alternative strategies such as concentrating on a mix of actions including reduction in supply pipe leakage, pressure reduction and improved find and fix policies.

Each company should consider a number of different leakage options in choosing its preferred water management options. We expect companies to detail their preferred leakage strategy and to justify why this is the preferred option. They should also explain how this varies from their current approach to leakage management. Companies should recalculate the economic level of leakage assessment throughout the plan period as part of optimising timings for new schemes.

Water efficiency and metering

Any water efficiency or metering options considered in the unconstrained or feasible options set should be in addition to those already included in the baseline. The plan should make it clear how these options differ from the activities already underway or planned.

Water efficiency initiatives - good practice register (Ofwat, 2006) provides a basis for water companies to use in their water efficiency strategy. Another source of information on costs and savings is a database developed for UKWIR project WR 25B – cost effectiveness of demand management. Companies should not be constrained by these sources of information and should consider a wide range of options.

Companies should also look for benefits from combining difference options. For example, increasing metering increases the interest in water efficiency.

Non-household customers' demand for water are sometimes over-looked. Companies should outline how the water efficiency options for this sector are being included in the plan. These options should be explicitly considered as part of the options appraisal process.

11.2.2 Feasible options list

A company should undertake an assessment of the options in the unconstrained list (as described in stage 4 of *The economics of balancing supply and demand* (Environment Agency and UKWIR, 2002)) to identify the feasible options it will consider in more detail. The companies' plans should set out the screening criteria they have used to select the feasible options list. They should justify why they have rejected any options. The same level of information should be presented for all types of options. We are happy to advise companies on the selection and assessment of options.

The feasible options list should include sufficient options to allow real choices when moving to the preferred options set and to make sure alternative solutions can be formed.

A company's plan should:

- set out a full list of unconstrained options and show that it has considered customer-side, production-side, distribution-side and resource-management measures;
- include a range of leakage, water efficiency and metering options that are beyond those included in its baseline scenario;

- explain how its water efficiency strategy has taken account of the *Water efficiency initiatives - good practice register* (Ofwat, 2006);
- include a numerical representation of the water savings it has assumed from its demand management initiatives and metering programme along with an assessment of whether the predicted water savings will be sustained over time;
- explain the criteria it has used to move from the unconstrained to the feasible options list and justify any options that have been rejected.

11.3 Describing feasible options

Companies should provide a description of each option with supporting information including:

- the main features of the option, including how it will work;
- a schematic map illustrating the scale, source of supply and areas over which the option is to be implemented (please refer to section 3.1);
- a conceptual diagram showing the main operational features;
- a schematic showing any links or dependencies to other options;
- for leakage reduction or water efficiency options: a description of the baseline demand savings or leakage management savings and how the option being described differs from this.

A company's plan should:

- include a description for each option in the feasible options set.

11.4 Assessing feasible options

This section provides an outline of the information companies should include in their plans on the assessment of each option on the feasible options list. It is neither an exhaustive list nor a detailed framework for environmental assessment. Companies should refer to *The economics of balancing supply and demand* (Environment Agency and UKWIR, 2002) for more detailed information. If a company wishes, it may submit more detailed scheme assessments as supporting documents to the plan.

Any aspects of describing and assessing an option that may be commercially confidential such as detailed cost information should be summarised within the main water resources plan and detailed fully in an appendix to the plan which can be removed if agreed by the Secretary of State.

There are several parts to the options assessment, each is considered in turn here and companies should refer to *The economics of balancing supply and demand* (Environment Agency and UKWIR, 2002) for more detailed information.

11.4.1 Feasibility

For each option companies should provide information on:

- the volume of water associated with the option (yield or savings as appropriate) and the uncertainty associated with this. If the volume varies across the year companies should include a profile;
- the flexibility of the option;
- an estimate of the time needed to investigate and implement the option;
- any factors or constraints specific to the option.

11.4.2 Environmental and social impacts

Environmental and social impacts can sometimes be regarded as a constraint. For example, if a proposed scheme would cause more than a specified (critical) amount of environmental damage, it would be considered inappropriate. If enough information is available, companies can exclude these options when moving from the unconstrained to the feasible options set. If this is not possible, companies should undertake further appraisal to assess whether the environmental and social impacts mean the option should be excluded from the feasible options set at a later stage. *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 and focus on those options that should be taken forward for more detailed assessment.

Companies should cross-reference this part of the assessment to stages five and eight of *The economics of balancing supply and demand* (Environment Agency and UKWIR, 2002). The assessment could take the form of matrices to score the degree of impact, for instance high/low, positive/negative, short/long term impact or reversible/irreversible damage.

The plan should set out:

- the impacts of the construction, operation and decommissioning of the option;
- any opportunities for environmental enhancement and meeting the needs of other interested groups or water users;
- wider environmental issues such as biodiversity, cultural heritage, soil and geology, air quality, landscape, recreation, and human health and well-being;
- opportunities for addressing environmental inequalities;
- mitigation measures, where appropriate;
- the operational energy needs of options.

11.4.3 Water Framework Directive

When promoting an option companies should consider the potential impact of each option against meeting the environmental objectives of the Water Framework Directive (Article 4). However the environmental objectives will not be established for either surface and groundwater bodies until the draft river basin management plans are published during 2008.

This could represent a risk to options that are to be implemented within the period 2010 to 2015. As a result we want companies to include an indicative assessment in the plans which considers the likelihood of an option affecting Water Framework Directive ecological status. To do this, companies should use information from the first round of the Environment Agency's Catchment Abstraction Management Strategies (CAMS). The environmental flow requirements within CAMS provide a

good approximation of the standards for meeting the Water Framework Directive flow and groundwater objectives.

Where an option involves taking more water from a water resource management unit currently defined as over-abstracted or over-licensed it should be considered likely to have an impact on Water Framework Directive ecological status. Companies should make a judgement on the level of risk this poses to the implementation of that option and how acceptable they find this risk. We will be happy to provide advice to companies on interpreting CAMS information for their plans.

11.4.4 Costs

Stage 8 of *The economics of supply and demand* (Environment Agency and UKWIR, 2002) provides more detail on the assessment of costs.

The economics of supply and demand (Environment Agency and UKWIR, 2002) allows companies to use either the capacity or the expected output of a scheme to calculate costs. Whichever companies choose, they should use a consistent approach throughout the options appraisal.

For each option, companies should include a profile showing the estimated total capital and operating costs over time. Costs should be split into:

- option investigation and feasibility studies;
- design, planning and promotion;
- capital resource costs including breakdown into source works, treatment, pumping stations and service reservoirs;
- capital distribution costs and improvements;
- environmental and social mitigation;
- ongoing operational costs (including labour) and periodic replacements.

Companies should present both the average incremental social cost (AISC) and average incremental cost (AIC) values for each scheme. They should explain how they have calculated their AISC and AIC values including whether these are based on the capacity or the output of the scheme.

Some options might have the potential to supply more than one resource zone. Where this is the case, companies should allocate the cost and yields of the option proportionally between those resource zones. The basis of the allocation of costs is for a company to determine, but it should be clearly explained in their plan. Companies should use the total cost of an option where it is not possible to split the cost; for example a large resource development may cost the same no matter how many resource zones benefit.

When calculating critical period AISC and AICs, companies should present the output costs. For example, a one MI/d scheme required for one month of the year should be approximately 30 MI/year as opposed to 365 MI/year. Companies should also take into account any other factors that affect the use of critical period schemes. For example, if the critical period only impacts on average one year in three, the average usage of the scheme would fall from 30 MI/year to 10 MI/year. Where a company is using capacity costs throughout the remainder of its options

appraisal, it should present the capacity costs for these critical period schemes in the plan. This is particularly important where the same scheme can be used for both the dry year scenario and the critical period scenario.

Companies should explain how they have calculated the NPV of water available for use (WAFU). This is equivalent to a usage-based calculation for AICs as set out in *The economics of balancing supply and demand* (Environment Agency and UKWIR, 2002). Companies should also include the AISC rank of the option in this section; for instance, is it the first / second / third option if the options are sorted by ascending AISC?

11.4.5 Opportunity, risk and uncertainty

Companies should describe the sources of risks and uncertainty associated with the option. For longer-term options this should include the risk or uncertainty presented by climate change. Companies should also identify any opportunities or constraints related to the option.

The Environment Agency's water resources strategies, *Water resources for the future* (Environment Agency, 2001), provide an example of how these factors can be taken into account. However companies choose to account for opportunities, risks and uncertainties they should present their assessment in the plan and justify the assumptions they have made.

11.4.6 Links and inter-dependencies

Companies should explain if an option is, or may be, dependent on the implementation, timing or yield of other existing or proposed schemes. Where this is the case, companies should explain any differences to the information in the previous sections of the options assessment that result from combining the options. This might include efficiencies, a change in energy demands or the cost of the option. Companies should also describe and explain any links between their resource zones or to neighbouring companies.

If a company submits a critical period scenario in its plan, it should explain how its preferred options (and final planning solution) will manage under both dry year and critical period supply-demand conditions.

11.4.7 Economic appraisal of options

An important aspect of a company's plan is the economic analysis of the options. Economic analysis should be carried out for all options on the feasible options list. Approaches to the economic assessment are summarised in *The economics of balancing supply and demand* (Environment Agency and UKWIR, 2002). This builds on the AISC approach used by water companies in developing the water resources plans in 1999 and 2004. *The economics of balancing supply and demand* proposes intermediate and advanced approaches that companies can use to assess the optimum solution when planning the options needed to meet headroom. We expect all companies that need to take action to balance supply and demand to follow the intermediate methods beyond simple AISC's as a minimum. Companies can of course apply the advanced method if they wish.

Companies should express the economics of options as AISC and AIC. 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);
- the net present environmental and social costs and benefits.

Companies should use a discount rate of 4.5 percent when calculating the AISC of their water resource plan options. This assumption is without prejudice to Ofwat's decision on the cost of capital for PR09. The discounted total volume of water which contributes to the reduction in the deficit (additional water delivered or reduced demand) should then be used in the calculation of AISC and AIC for table WRP2. Further guidance is available in *The economics of demand management* (Environment Agency and UKWIR, 1996).

Companies should use *The economics of balancing supply and demand* (Environment Agency and UKWIR, 2002) definitions for AISC, AIC and other costs. The plan should confirm whether this is the approach adopted or explain the approach taken if an alternative has been used.

Companies should present a summary of their economic analysis. This should include a figure similar to figure B4.2 on page 95 of *The economics of demand management* (Environment Agency and UKWIR, 2002) to summarise the solution. This is a bar graph showing AISC in pence/m³ against yield in Ml/year.

Environmental and social costs

The economics of balancing supply and demand (Environment Agency and UKWIR, 2002) recognises the need to take environmental and social impacts into account when evaluating costs of different options.

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* (Environment Agency and UKWIR, 2002), which also recognises that not all factors can be given a monetary value.

We believe that having sound assessments of environmental and social costs and benefits plays an important part in supporting the selection of schemes. In 2002, we commissioned the development of a revised methodology and associated guidance for assessing water resource and water quality management schemes. This is reported in *Benefits Assessment Guidance* (Environment Agency, 2002). This guidance:

- has been developed for use by both Environment Agency and water company planners to help ensure consistency across the different areas in which we make decisions;
- 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 environmental and social costs and benefits of schemes proposed 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;
- also requires the non-monetary assessment of benefits and disadvantages of using qualitative and quantitative descriptions.

The *Benefits assessment guidance* (Environment Agency, 2002) sets out standardised approaches to assessment and uses data that are readily available. It was subject to a peer review and testing process by relevant policy stakeholders (the Environment Agency, Defra, WAG, Ofwat, Natural England), academics and water company economists.

Cost of carbon

Update – September 2007

The following replaces the guidance issued earlier in 2007 about how to incorporate the cost of carbon into the appraisal of options. This is due to the release of new Defra guidance.

Emissions of all greenhouse gases measured in carbon dioxide equivalent (CO₂e) are adopted as the indicator of global warming potential because this is the gas that is most influenced by human activities.

At the end of August 2007 Defra announced that from now on the shadow price of carbon* (SPC) should be used to value the increase or decrease in emissions of greenhouse gas emissions resulting from a proposed policy. For water companies this would be the selection of an option to resolve a deficit in the supply demand balance.

The SPC captures the damage costs of climate change caused by each additional tonne of greenhouse gas emitted, expressed as carbon dioxide equivalent (CO₂e) for ease of comparison. All greenhouse gases that are emitted must be converted into carbon dioxide equivalent. The new guidance brings the value of carbon included in appraisals into line with the Stern Review's assessment of the social cost of carbon. This puts a price of £25 per tonne of carbon dioxide equivalent (CO₂e) in 2007 prices. This will rise over time due to inflation and rising damage costs from higher greenhouse gases. Companies should not use the same value for each year. Future values have been outlined in tables along with the exact methodology of SPC at:

<http://www.defra.gov.uk/environment/climatechange/research/carboncost/index.htm>

The SPC should be included in capital and operating costs so should be used in the calculation of AISCs. It is very important to start carbon dioxide equivalent accounting at the same point in the option evaluation.

Companies should estimate the total carbon dioxide equivalent of their water supply activities in tonnes of carbon dioxide equivalent and present this for each year, ideally broken down further by activity. For more details water companies should refer to the above website.

The adoption of SPC should not cause a large change in final costs when compared to the previous method of social cost of carbon. The Environment Agency had advised companies to use a rate of £87 per tonne of carbon at 2007 prices. The new Defra guidance recommends a rate of £25 per tonne of CO₂e. To convert the rate of carbon into a rate of CO₂e, multiply by 12/44 (atomic mass of carbon divided by carbon dioxide) = .273, so that £87 tonne of carbon is equal to a rate of about £24 per tonne of CO₂e.

* Please note that references to carbon are shorthand for carbon dioxide equivalent (CO₂e).

A company's plan should:

- present the results of the options appraisal including information on feasibility; environmental and social impacts; potential impact on water framework directive ecological status, costs; the opportunities, risks and uncertainties related to the option; and the links and inter-dependencies between the options;
- set out the approach taken to economic appraisal of options;
- explain the derivation of the environmental and social costs calculated for each option.

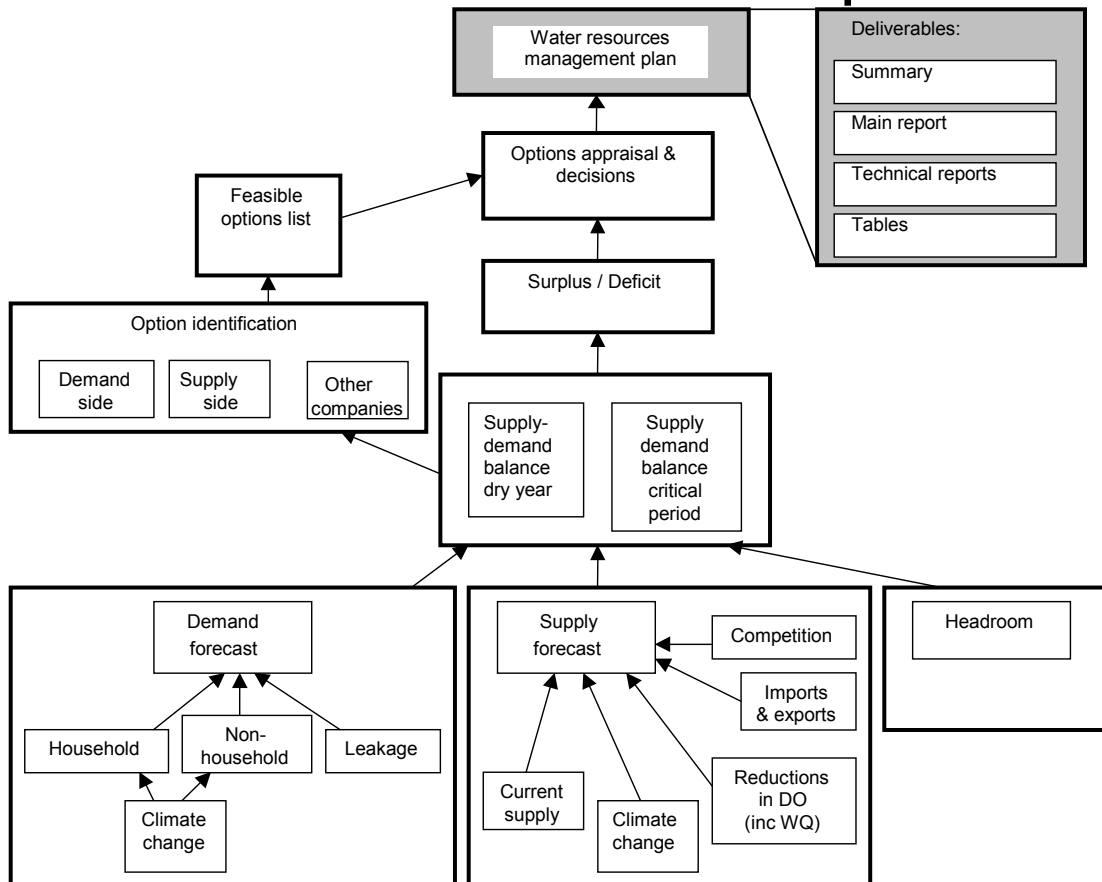
11.5 Using the options assessment to develop the preferred options list

Ranking the individual options in ascending AISC order will provide an initial indication of the least-cost solution to the identified planning problem. This can then be considered alongside other factors such as flexibility, risks and uncertainties and resilience to climate change. Companies should consider the overall AISC and other relevant factors for the various options sets or combined options. It will most likely be necessary to carry out further economic analysis on a variety of different combinations of options. This is because alternative combinations may offer different linkages between options, provide greater resilience to risk, or provide other benefits through their contribution to social progress and sustainable development.

Companies that have based their AISC and AIC calculations on the capacity of their schemes will also need to consider the effect of schemes that produce a large volume of headroom immediately following implementation. For example, a large new reservoir may appear relatively cheap when its capacity costs are compared against other smaller options. **Further advice on how to consider this is given in stage 11 of the EBSD.**

Section 12 gives more guidance on justifying the final planning solution.

12 Final water resources plan



12.1 Justifying the final planning solution

The most important part of a water resources plan is the final planning solution; what companies propose to do to manage the resources in their water resource zones. Water companies should first set out the strategic aims of the water resources plan.

Water companies should set out the water resources planning problems clearly, for example, whether there is a deficit or surplus and whether this is seen in the dry year scenario, the critical period scenario or both. They will need to do this for resource zones and possibly for the company level too.

Companies should then set out the solution. This is likely to be made up of a series of water management options for the resource zone and possibly company level too.

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 good practice;
- robust and flexible to the range of risks and uncertainties identified;
- selected to make a positive contribution to sustainable development.

In considering the final planning solution, a company should consider the risks and costs that it is prepared to accept and present this in its water resources plan. The final decision is a business decision that rests with the company's board.

The final options set should be justified economically, socially, and environmentally. Companies should provide a clearly reasoned justification for how the decision on a preferred solutions set has been reached. This should take account of all the factors detailed in the option description and assessment. It should explain how the options selected performed against the various aspects of the appraisal and why this options set has been chosen over the alternatives. Companies include a summary comparison of net present cost, combined yield, main risks and opportunities for the various options sets they consider. In particular, companies should explain why an option has been selected if it does not appear to be the optimum solution for any element of the assessment.

The justification should include:

- whether the preferred options set will resolve the forecast deficit;
- how much headroom the preferred options set provides;
- the reasons why the preferred options set has been chosen over the alternatives;
- a summary of the likely social and environmental impact of the options including the potential effect on water framework directive ecological status;
- the confidence that the company has in its ability to deliver the preferred options set;
- whether the preferred option(s) will work in combination with existing or proposed schemes;
- the timing of scheme implementation;
- the risks and uncertainties associated with the preferred option(s) and overall programme;
- the alternatives (plan B) that the company plans should the preferred option set fail to deliver the expected yield on time. More than one alternative solution can be included.

Water companies should make the case for further investigations of supply-demand options where appropriate, within their water resources plan.

A company's plan should:

- explain the preferred options set that the company has considered;
- detail the final preferred options set including explanation of how it will resolve the deficit and why it was chosen over the alternatives;
- outline an alternative solution or solutions (plan B) and explain how they will be kept live in case the preferred solution falters;
- Give details of any further option investigations proposed.

12.2 Publishing water resources management plans

The new water resources management plans have introduced an important stage: public consultation. We expect water companies to make their plans as accessible as possible to the general public.

It is up to the company to decide how it will publish its water resources plan. The minimum we would expect is for the summary and main report to be published on company web site. The technical reports and tables should be available on request. The company must follow the [Regulations](http://www.opsi.gov.uk/si/si2007/20070727.htm) ((<http://www.opsi.gov.uk/si/si2007/20070727.htm>) that came into force on 1 April 2007.

12.3 Final planning supply-demand balance

The final planning scenario should reflect the change to supply and demand of implementing the company's preferred options set. Target headroom for the final scenario should also reflect the implementation of the company's preferred options set.

Companies should present the solution to the supply-demand problem that they have identified. A company's plan should contain a final planning demand forecast at the resource zone level that shows the implications of the preferred options set on forecast demand. Where the problem was found within the critical period scenario, companies should explain how the solution affects both the dry year scenario and the critical period. Does a solution to a critical period scenario lead to spare water for the rest of the year? Solutions for critical period driven resource zones should be worked back through the dry year scenario to show whether they provide a surplus of water. Therefore companies that have resource zones with critical period problems need to submit data for both dry year and critical period in their plans.

A company's plan should:

- include a final supply-demand balance that shows the effect of the preferred options set;
- detail where it has a critical period deficit and indicate how the preferred options set affects both the dry year and the critical period situation.

D. TABLE INSTRUCTIONS

This part of the guideline sets out how to use the supply-demand balance tables (WRP tables). These are an essential part of the water resources plan. Electronic copies of the tables can be downloaded from the Water Resources section of the [Environment Agency's](http://www.environment-agency.gov.uk/subjects/waterres/981441/408371/) internet site:
<http://www.environment-agency.gov.uk/subjects/waterres/981441/408371/>

13 General

A company's water resources plan will centre on a series of data tables at resource zone level.

The supply-demand balance tables (WRP tables) represent the supply-demand balance of the plan and provide some of the key supporting information necessary to help people and organisations understand and appraise the plan. Figure 13.1 gives an overview of the content of all the WRP tables. Please note that the numbering of the supply-demand balance tables bears no relation to the numbering system used in the 2004 water resources plan tables.

The necessary WRP tables will vary from company to company according to supply-demand circumstances and the planning scenarios required. The WRP tables needed for each situation is mapped out in figure 13.2. All the tables specified by this for a certain situation should be completed; there are no optional tables. Each WRP table provides a unique row reference for the input data required. This referencing system is intended to assist both companies and us in quality assuring the data.

Figure 13.1: Overview of WRP table content

WRP Table	Content
Summary	Requires no input but shows graphical information taken from the rest of the tables. Contains three graphs: baseline components of demand, final planning components of demand and headroom.
WRP1 – BL	Baseline supply-demand components
WRP1a – BL	Baseline supporting transfer and deployable output reductions data
WRP2	Feasible list of water management options
WRP3	Preferred list of water management options
WRP4 – FP	Final planning supply demand components
WRP4a – FP	Final planning supporting transfer and deployable output reduction data
WRP5	Resource zone deployable output reconciliation
WRP6	Breakdown of measured households (dry year baseline)
WRP7	Household micro-component consumption (dry year baseline)
WRP8	Non-household sector consumption (dry year baseline)
WRP9	Normal year final planning supply demand components

13.1 Overview of changes in supply-demand balance tables (WRP tables)

We have worked to simplify the WRP tables to make them easier to use and to reduce the quantity of data that we request the water companies to submit as part of their plans. The most significant changes are listed below but there have also been many smaller changes throughout the tables.

- We have re-organised the structure of the tables:
 - there is now one set of tables that contains baseline and final planning information for each scenario, either dry year or critical period;

- the old tables WRP1, 2, 3, 4, 5 and 9 have been amalgamated into one table, WRP1;
 - table WRP1 allows companies to input data correctly regardless of how they have calculated deployable output through use of a new row, Process Losses. This row allows companies to include treatment and raw water losses and operational use in WAFU if they are excluded from calculation of deployable output;
 - details of transfers etc. are provided in a supporting table, WRP1a;
 - table WRP9 collects all necessary normal year data.
- We have reduced the normal year information we request. Companies should provide the final planning information for the normal year in order for Ofwat to understand companies' revenue forecast in the business plan, with which this should be consistent. We will use the data to see how they have reached the dry year scenario.
 - Dry year and critical period scenarios are to be reported in separate sets of tables. We have clarified which tables should be completed for each scenario depending on the planning situation of the company.
 - We have clarified what information we require in each of the options tables and tried to make these more workable for companies and to meet the needs of both the statutory water resources plans process and the periodic review.
 - We have reduced the quantity of information we request throughout the tables, several rows from the old tables have been removed and others have been combined.
 - Ofwat has decided not to include the old table WRP8 and will collect the reduced quantity of information they need to see through the options table WRP2 and through the normal year table WRP9.
 - There are no longer any supplementary tables – they have been incorporated within the main set of tables. We have tried to simplify these where possible: we have combined categories of use in old table WRPSup2, allowing companies to add additional lines to include alternative categories where necessary and updated the categories used in the old table WRPSup4 to relate to 2003 SIC codes and to be more usable.
 - We have changed the formatting of the tables, so that in all worksheets all cells can be selected to allow companies to copy and paste easily. However not all cells can be written in, only those that require input or calculation. In tables, WRP1a-BL, WRP2, WRP3, WRP4a-FP, WRP5, WRP7 and WRP8 additional rows can be inserted but not deleted.
 - Companies can overwrite the calculation cells in the tables but should explain any alternative figures within their water resources plans. The calculations that we use are based on established good practice and companies that use

different calculations should explain the calculation they have used and the assumptions that underpin them.

- We have included a summary worksheet that shows graphs of baseline components of demand, final-planning components of demand and headroom.

13.2 Tables to be completed for different scenarios

Section 5.6 of this planning guideline sets out which scenarios water companies should address in their water resources plan. The number of WRP tables that should be submitted as part of the water resources plan will vary from company to company, depending on the company's planning situation.

Normal year annual average

We do not expect companies to complete full normal year forecasts. We request that they complete table WRP9 only. This table is where all normal year information should be recorded. We request only base year normal year information except for the potable water delivered components for which Ofwat needs normal year final planning forecast data to understand a company's revenue forecast in the business plan, with which this should be consistent.

Dry year annual average

Given that the dry year should be the fundamental basis of water demand planned for the water resources plan, all companies should submit one set of tables for the dry year scenario. The baseline and final planning data for each scenario is presented within one set of tables.

Critical period

In addition to the dry year scenario, other planning scenarios may be explored to test the sensitivity of a water company's supply-demand balance. A company whose plan is influenced by a critical period should submit a second set of WRP tables to illustrate any dry year critical period scenario. Again this one set contains tables that will illustrate both the baseline scenario and the final planning scenario. If critical period WRP tables are required, these should be submitted in addition to the dry year WRP tables as described in figure 13.2.

Companies should complete all the tables within the workbooks as set out in figure 13.2 and the following text.

Figure 13.2: Supply-demand balance tables companies should complete for different planning circumstances

Scenario	Data	Table	No deficit identified for dry year scenario	Deficit identified for dry year scenario	Deficit identified for critical period scenario	Deficit identified for dry year AND critical period scenario	
Workbook completed for dry year scenario	Baseline	WRP1	✓	✓	✓	✓	
		WRP1a	✓	✓	✓	✓	
	Options	WRP2	✗	✓	✓If options impact on dry year scenario. ✗Otherwise	✓	
		WRP3	✗	✓	✓If options impact on dry year scenario. ✗Otherwise	✓	
	Final planning	WRP4	Copy and paste WRP1 – will be the same.	✓	✓If options impact on dry year scenario. Otherwise copy from WRP1.	✓	
		WRP4a	Copy and paste WRP1a – will be the same.	✓	✓If options impact on dry year scenario. Otherwise copy from WRP1a.	✓	
	DO	WRP5	✓	✓	✓	✓	
	Baseline	WRP6	✓	✓	✓	✓	
		WRP7	✓	✓	✓	✓	
		WRP8	✓	✓	✓	✓	
	Normal	WRP9	✓	✓	✓	✓	
	Workbook completed for critical period scenario	Baseline	WRP1	✗	✗	✓	✓
			WRP1a	✗	✗	✓	✓
Options		WRP2	✗	✗	✓	✓	
		WRP3	✗	✗	✓	✓	
Final planning		WRP4	✗	✗	✓	✓	
		WRP4a	✗	✗	✓	✓	
DO		WRP5	✗	✗	✓*	✓*	
Baseline		WRP6	✗	✗	✗	✗	
		WRP7	✗	✗	✗	✗	
		WRP8	✗	✗	✗	✗	
Normal		WRP9	✗	✗	✗	✗	

*Table WRP5 can be completed either in one of the workbooks for both scenarios or in both workbooks for each scenario.

Tables WRP6, WRP7 and WRP8 only need to be completed for the dry year baseline scenario. However, the plan should explain if there are any significant changes to the data in the final planning scenario. If the changes are significant then it may be easier to explain, and for others to understand, if a company does complete the tables.

13.2.1 No deficit identified in supply-demand balance for resource zone

Number of workbooks to complete: one
Total number of tables to complete: nine

If a company has no deficit in its supply demand balance, it only need complete one workbook of tables. This will be for the dry year scenario. As a company in this situation does not need to investigate water management options it does not need to complete the options tables WRP2 and WRP3.

As the baseline situation will be the same as the final planning situation, tables WRP1 and WRP1a will in effect also show the final planning situation so companies can copy and paste these into tables WRP4 and WRP4a. Companies should do this so that the final plan data is unmistakable.

Companies should complete all the other tables in the workbook.

13.2.2 Deficit identified for dry year scenario only for resource zone

Number of workbooks to complete: one
Total number of tables to complete: 11

If a company has a deficit in its supply demand balance for the dry year scenario only, it only needs to complete one workbook of tables. This will be for the dry year scenario. It will need to complete all the tables in the workbook.

13.2.3 Deficit identified for critical period scenario only for resource zone

Number of workbooks to complete: two
Total number of tables to complete: 15-17

If a company has a deficit in its supply demand balance for the critical period scenario only, it will need to complete two workbooks of tables: one for the dry year scenario and one for the critical period scenario.

For the first workbook (dry year scenario):

If a company's critical period preferred options set does not affect the final plan under the dry year scenario it does not need to complete the options tables WRP2 and WRP3. However if the critical period preferred options set does include options that will have an effect on the dry year average situation, then the company should complete both options tables.

If the preferred options do not affect the final plan under the dry year scenario then a company will be able to copy and paste tables WRP1 and WRP1a into tables WRP4 and WRP4a as the final planning situation under this scenario will not have changed. Companies should do this so that their final plan is unmistakable.

Companies should complete all the other tables in this workbook.

For the second workbook (critical period scenario):

Table WRP5 can be completed either in one of the workbooks for both scenarios or in both workbooks for each scenario. There are columns for dry year and critical period within table WRP5 so this can be completed either within one table in the first workbook or the relevant column can be completed in the relevant workbook.

Companies do not need to submit tables WRP6, WRP7, WRP8 and WRP9 for the critical period scenario. However, if completing the tables will help people understand the situation more clearly, the company should consider doing so. Companies should complete all the other tables in this workbook.

Companies that have identified more than one critical period scenario should complete a workbook for each critical period identified.

13.2.4 Deficit identified for dry year and critical period scenario

Number of workbooks to complete: two

Total number of tables to complete: 17-18

If a company has a deficit in its supply demand balance for the dry year scenario and the critical period scenario, it should complete two workbooks of tables: one for the dry year scenario and one for the critical period scenario.

For the first workbook:

Companies should complete all the tables in this workbook.

For the second workbook:

Table WRP5 can be completed either in one of the workbooks for both scenarios or in both workbooks for each scenario. There are columns for dry year and critical period within table WRP5 so this can be completed either within one table in the first workbook or the relevant column can be completed in the relevant workbook.

Companies do not need to submit tables WRP6, WRP7, WRP8 and WRP9 for the critical period scenario but should complete all other tables in the workbook.

13.2.5 Climate change

Companies should not submit tables to cover with and without climate change scenarios. Where companies account for the effects of climate change within their forecasts, this should be incorporated in the WRP tables for both the baseline and final planning scenarios. In all cases, a statement of the impact of climate change and associated assumptions should be included in the plan; see section 8.

13.3 Submission of the supply-demand balance workbook (WRP tables)

Companies should submit electronic copies of the WRP tables to the Secretary of State/ Welsh Assembly Government as part of their draft and final water resources plans. These should be provided on the number of CDs required along with the electronic files for the rest of the water resources plan (see section 5.3). The CD

should be labelled clearly with the company name. Companies should also submit paper copies of the WRP tables as detailed in section 5.3.

Companies should submit unprotected WRP tables for each resource zone. The tables for each resource zone should be provided in separate workbooks but on the same CD if possible.

Final tables for the draft plans should be labelled “draft plan final”. Final tables for the final plans should be marked “final plan final”. The workbook title page should also be dated and given a version number. Workbook naming is shown below:

Scenario Name	Workbook Label
Dry Year (includes normal year)	DryYr_ResourceZoneName_DraftPlanFinal_VersionNo_Date.xls
Critical Period	CP_ResourceZoneName_DraftPlanFinal_VersionNo_Date.xls

Companies should input the following information on the title page of each workbook; this data will then auto-complete on each WRP table:

- company name;
- resource zone name to which it relates;
- numbering of the resource zone as representing resource zone x of n;
- planning scenario name;
- chosen level of service.

Each set of tables presented as part of the plan should be signed off and dated by an appropriate responsible officer within the company.

In each workbook, the WRP tables should be presented on sequential worksheets (table WRP1, WRP2, WRP3, etc.), with each worksheet clearly labelled as the relevant table.

13.4 Working with the supply-demand balance tables

Grey shaded parts of the tables indicate that no data entry is required.

The template workbook contains calculated fields that can be over-written. The calculations used in the tables are given in this document, as well as under the Derivation column in the tables. In the tables the calculation uses the row number. In this document both the row number and the input description are given.

Companies should use the calculations provided if values are input. The plan should explain where values are overwritten and provide justification if they do not agree with our calculations. We will ask companies to justify any numbers that do not match our calculations.

The workbook formatting allows companies to copy and paste between and into tables. Rows can also be inserted into some tables and the instructions for each workbook specify whether this is possible. Rows should be inserted in the middle of a range of cells so that any calculations on the range are still correct. No other

structural changes should be made to the tables; if changes are made, a company may need to resubmit the tables.

14 Tables WRP1 and WRP1a - baseline supply-demand components and supporting data

Table WRP1 provides a summary of the baseline supply-demand balance in the resource zone, and combines tables WRP1, 2, 3, 4, 5 and 9 as used in 2004 water resources plans.

Table WRP1a contains supporting information to table WRP1, providing details behind reductions in deployable output and imports and exports.

Tables WRP1 and WRP1a are structurally identical to tables WRP4 and WRP4a. Tables WRP1 and WRP1a are for reporting baseline data and all numbers are suffixed BL. Tables WRP4 and WRP4a present data for the final planning scenario and all numbers are suffixed FP.

Companies should not add to, or delete, any of the reporting lines in table WRP1. Extra rows can be inserted into table WRP1a.

The sections 14.1 to 14.7 below refer to table WRP1 and where appropriate to WRP1a. Each section refers to a different segment of table WRP1.

14.1 Basic resources

This section of table WRP1 contains the data from the old table WRP1 used in the previous water resources plans and concerns deployable output information. The deployable output (DO) figure presented should relate to the company's proposed level of service.

In order to reconcile individual source DO with the overall DO figure for a resource zone, companies should identify the DO figure for each source in a resource zone in table WRP5. The DO reported in row 1 of table WRP1 should be equal to the total of those sources listed in table WRP5 for the reporting zone. It should allow for conjunctive use benefits rather than summing individual source DO for appropriate groupings of sources.

The DO entered in row 1 may differ from the baseline tables to the final planning tables. The baseline table (table WRP1) should show the current DO for the given period.

Companies have different approaches to what is included within DO. DO may already have considered treatment works operational use, treatment works losses, raw water operational use and raw water losses or it may not. Row 4 contains process losses which is equivalent to the sum of row 9 raw water losses and operational use and row 11 treatment works losses and operational use. If a

company has already included the above losses within deployable output then it should overwrite the calculation in Row 4 with zeros. It should still input operational use and losses in rows 9 and 11 as they are reporting lines.

In table WRP1a, the total value for all raw water exports (row 7a) or imports (row 8a) within the resource zone should be given in the first line of the relevant row. Subsequent lines should be used to identify individual transfers. Where a company has included transfers within the calculation of its DO these transfers should not be included in the total line. The individual transfers should then be listed below as usual. This will ensure that the information can be presented without double counting the transfers.

Companies should specify and identify any reductions in DO required to meet statutory and/or environmental obligations in the rows provided. Companies should provide the total of all sustainability reductions for the resource zone in row 2 of table WRP1 and detail the breakdown of this in Row 2a of table WRP1a. The sum of the breakdown in row 2a should equal the reductions in Row 2 of table WRP1. Reductions in table WRP1a should be grouped into different categories, for example, sustainability reductions, other operational decline etc. Companies should use references for the sustainability reductions that we have provided to them.

Where companies have considered the effect of climate change on supply, the figures included within the tables should include any climate change adjustments. The plan should explain how the effect of climate change on supply has been assessed (section 8).

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 (own sources) results from deducting any deployable output reductions, outage, and, where appropriate, process losses from deployable output. Where the DO for the final planning scenario varies from that of the baseline scenario, companies should consider the impact of outage in the final planning scenario. However, if a company chooses to do this then the plan should explain the assumptions used.

Line definitions

Table WRP1

1	Deployable output	MI/d
Definition Processing rules: Methods:	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 Input Deployable output – see section 6.1.	
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:	Calculation: WRP1a-BL 2aBL Reductions in baseline deployable output from table WRP1a.

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 three months, analysis of the cause of the problem would be required in order to satisfy the legitimacy of the outage).	
Processing rules:	Input	
Methods:	Outage allowance – see section 6.3.	

4	Process losses	MI/d
Definition	Where a company has not included raw and treatment works operational use in its calculation of deployable output, this is the sum of raw water operational use and losses and treatment works operational use and losses. Where a company has already included raw and treatment works operational use in its calculation of deployable output, this is zero.	
Processing rules:	Calculation: Row9 + Row 11 where appropriate. Raw water losses and operational use + treatment works losses and operational use	

5	Water available for use (own sources)	MI/d
Definition	The value calculated by deducting allowable outages and sustainability reductions from deployable output in a resource zone.	
Processing rules:	Calculation: Row1 – (Row2+Row3+Row4) Deployable output – (reductions in deployable output + outage allowance + process losses)	

Table WRP1a

2a	Reductions in baseline 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 Input total value for all sustainability reductions in the first line. Subsequent lines should be used to identify individual values.	
Methods:	Sustainability reductions – see 6.2.	

14.2 Raw water

This section is the old table WRP2 from the previous water resources plans. It concerns raw water use from the point of abstraction to the point of production.

We have combined raw water losses and raw water operational use into the same row. However, if we feel that the values for this component look unfeasible we will request that a company provides a further breakdown.

Companies should include raw water losses and raw water operational use even if they have been used to derive the estimates of DO, as they are reporting lines. If they are included they will not be counted twice within the supply-demand balance providing companies overwrite row 4 with a zero.

Existing raw water exports and imports will include both inter and intra-company transfers. Details of all significant transfers should be included in WRP1a, with totals feeding through into WRP1. Rows in WRP1a that are not numbered can be inserted as required.

For all transfers, companies should indicate the donor and recipient company or resource zone in the rows provided. Companies should ensure that the values used by a transfer donor match those used by the transfer recipient and vice versa. Where an agreement cannot be reached on the value to be used for an inter-company transfer both companies should clearly state their assumptions in their plans.

Companies should show imports and exports as planned transfers per time step across the planning period. For the baseline scenario the volume used should be within the existing physical and operational transfer capacities (and agreed in the case of inter-company transfers). Companies should declare and explain the existing maximum transfer capacity and its limiting factors in their plans.

In WRP1a, companies should give the total value for all raw water exports (row 7a) or imports (row 8a) within the resource zone in the first line of the relevant row. Subsequent lines should be used to identify individual transfers. Where a company has included transfers within the calculation of its DO these transfers should not be included in the total line. The individual transfers should then be listed in the rows below as usual. This will ensure that the transfers are not double counted.

Line definitions

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, <i>Demand Forecasting Methodology - Main Report</i> (NRA/UKWIR, 1995a).	
Processing rules:	Input	
7	Raw water exported (existing)	MI/d
Definition	Raw water exported from the forecast geographical area to outside the forecast geographical area (NRA/UKWIR, 1995a).	
Processing rules:	Calculation: WRP1a-BL 7aBL Baseline raw water exported (existing) from table WRP1a.	
8	Raw water imported (existing)	MI/d
Definition	Raw water imported from outside the forecast geographical area to the forecast geographical area (NRA/UKWIR, 1995a).	
Processing rules:	Calculation: WRP1a-BL 8aBL Baseline raw water imported (existing) from table WRP1a.	
9	Raw water losses and operational use	MI/d

Definition	Combined value for raw water losses and raw water operational use. Raw water losses: Net loss to the resource system, comprised of mains/aqueduct (pressure system) losses, open channel/low pressure system losses, and losses from break-pressure tanks and small reservoirs (NRA/UKWIR, 1995a). Raw water operational use: Regular washing-out of mains due to sediment build up and poor quality of source water (NRA/UKWIR, 1995a).
Processing rules:	Input

10	Non potable supplies (existing)	MI/d
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Definition All non-potable water supplied to supply area.
Processing rules: Calculation: WRP1a-BL 10aBL
Baseline non-potable supplies (existing) from table WRP1a.

WRP1a

7a	Baseline raw water exported (existing).	MI/d
-----------	--	-------------

Definition Raw water exported from the forecast geographical area to outside the forecast geographical area (NRA/UKWIR, 1995a).
Processing rules: Input. Input total value for all baseline raw water exports in the first line. Subsequent lines should be used to identify individual transfers.

8a	Baseline raw water imported (existing).	MI/d
-----------	--	-------------

Definition Raw water imported from outside the forecast geographical area to the forecast geographical area (NRA/UKWIR, 1995a).
Processing rules: Input. Input total value for all baseline raw water imports in the first line. Subsequent lines should be used to identify individual transfers.

10a	Baseline non-potable supplies (existing).	MI/d
------------	--	-------------

Definition All non-potable water supplied to supply area.
Processing rules: Input. Input total value for all baseline non-potable supplies in the first line. Subsequent lines should be used to identify individual values.

14.3 Potable water to point of delivery

This is the section from the old table WRP3 and concerns information on potable water use from the point of production to the point of delivery.

We have combined treatment works losses and treatment works operational use into the same row. However, if we feel that the values for this component look unfeasible we will request that companies provide a further breakdown.

Companies should input treatment works losses and treatment works water operational use even if they have been used to derive estimates of DO. They are reporting lines so will not be counted twice within the supply-demand balance.

Existing potable water imports and exports can be both inter and intra company transfers. All significant imports and exports should be detailed in WRP1a, with the totals included in WRP1. Rows in WRP1a that are not numbered can be inserted or deleted as required.

For all transfers, companies should indicate the donor and recipient company or resource zone in the rows provided. They should ensure that the values used by a

transfer donor match those used by the transfer recipient and vice versa. Where an agreement can not be reached on the value to be used for an inter-company transfer both of the companies should state their assumptions in the plan.

Imports and exports should be shown as planned transfers per time step across the planning period. For the baseline scenario the volume used should be within the existing physical and operational transfer capacities (and agreed in the case of inter-company transfers). The existing maximum transfer capacity and its limiting factors should be declared and explained in the plan report.

For the final planning forecast, planned new potable water transfers or increases in existing potable transfers should be shown in tables WRP4 and WRP4a. They should also be specified in tables WRP2 and WRP3 as part of the water management options.

In WRP1a, companies should input the total value for all potable water imports (row 14) or exports (row 15) within the resource zone in the first line of the relevant row. Subsequent lines should be used for individual transfers. Where a company has included transfers in calculating its DO these transfers should not be included in the total line. The individual transfers should then be listed below as usual. This ensures that the information is presented without double counting the transfers.

Line definitions

11	Treatment works losses and operational use	MI/d
Definition	Combined value for treatment works losses and treatment works operational use. Treatment works losses: Made up of structural water loss and both continuous and intermittent over-flows (NRA/UKWIR, 1995a). Treatment works operational use: Treatment process water, i.e., net loss that excludes water returned to source water (NRA/UKWIR, 1995a).	
Processing rules:	Input	
12	Potable water imported	MI/d
Definition	Potable water imports from outside the forecast geographical area to the forecast geographical area (NRA/UKWIR, 1995a).	
Processing rules:	Calculation: WRP1a-BL 12a _{BL} Baseline potable water imported from table WRP1a.	
13	Potable water exported	MI/d
Definition	Potable water from within the forecast geographical area to an area outside the forecast geographical area (NRA/UKWIR, 1995a).	
Processing rules:	Baseline potable water exported from table WRP1a.	
14	Distribution Input	MI/d
Definition	The amount of water entering the distribution system at the point of production (NRA/UKWIR, 1995a).	
Processing rules:	Input	
15	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 (NRA/UKWIR, 1995a).
Processing rules:	Input

16	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 (NRA/UKWIR, 1995a).

Processing rules: Input

17	Water delivered	MI/d
-----------	------------------------	-------------

Definition Volume of water to the point of delivery

Processing rules: Calculation: Row14 – Row 15 – Row 16
Distribution input – distribution losses – distribution system operational use

WRP1a

12a	Baseline potable water imported	MI/d
------------	--	-------------

Definition Potable water imports from outside the forecast geographical area to the forecast geographical area (NRA/UKWIR, 1995a).

Processing rules: Input as appropriate. Input total value for all baseline potable water imports in the first line. Subsequent lines should be used to identify individual transfers.

13a	Baseline potable water exported	MI/d
------------	--	-------------

Definition Potable water from within the forecast geographical area to an area outside the forecast geographical area (NRA/UKWIR, 1995a).

Processing rules: Input as appropriate. Input total value for all baseline potable water exports in the first line. Subsequent lines should be used to identify individual transfers.

14.4 Potable water customer base

This section is the old table WRP4. It concerns information on the customer base for potable water demand. We require the information in order to be able to assess the demand forecasts contained in subsequent tables. Companies should include a breakdown of population, properties and occupancy rates for the measured and unmeasured customer base. This information is required for domestic and industrial / commercial customers.

Line definitions

WRP1

18	Unmeasured household – population	000's
-----------	--	--------------

Definition Resident population in billed households whose water supply is not measured.

Processing rules: Input

19	Unmeasured household – properties	000's
-----------	--	--------------

Definition Number of households billed for a water supply that is not measured.

Processing rules: Input

20	Unmeasured household – occupancy rate	h/pr
-----------	--	-------------

Definition Population per household property whose water supply is not measured.

Processing rules: Calculation: Row 17 / Row 18
 Unmeasured household population / unmeasured household properties

21	Measured household – population	000's
-----------	--	--------------

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

22	Measured household – properties	000's
-----------	--	--------------

Definition Number of households billed for measured water within the supply area.
Processing rules: Input

23	Measured household – occupancy rate	h/pr
-----------	--	-------------

Definition Population per household property supplied with measured water.
Processing rules: Calculation: Row 20 / Row 21
 Measured household population / measured household properties

24	Unmeasured non-household – population	000's
-----------	--	--------------

Definition Resident population in non-households whose water supply is not measured.
Processing rules: Input

25	Unmeasured non-household – properties	000's
-----------	--	--------------

Definition Number of non-households whose water supply is not measured.
Processing rules: Input

26	Measured non-household – population	000's
-----------	--	--------------

Definition Resident population in non-households supplied with measured water.
Processing rules: Input

27	Measured non-household – properties	000's
-----------	--	--------------

Definition Number of non-households billed for measured water within the supply area.
Processing rules: Input

28	Total population	000's
-----------	-------------------------	--------------

Definition The sum of total household and non-household population.
Processing rules: Calculation: Row 18 + Row 21 + Row 24 + Row 26
 Unmeasured household population + measured household population +
 unmeasured non-household population + measured non-household population

29	Void households	000's
-----------	------------------------	--------------

Definition Number of household properties within the supply area, connected to the distribution system but do not receive a charge as there are no occupants.
Processing rules: Input

30	Void non-households	000's
-----------	----------------------------	--------------

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

31	Total properties	000's
-----------	-------------------------	--------------

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

Processing rules: Calculation: Row 19 + Row 22 + Row 25 + Row 27 + Row 29 + Row 30
 Unmeasured household properties + measured household properties +
 unmeasured non-household properties + measured non-household properties
 + void households + void non-households

14.5 Potable water delivered

This section is the old table WRP5 used for the previous water resources plans. It contains information on the main components of water delivered for unmeasured and measured household and non-household properties, including reporting of underground supply pipe losses and consumption.

Where water companies submit a base year demand broken down into micro-components, this data should be reported in table WRP7. All estimates of per capita consumption (pcc) should be expressed in units of litres/head/day and exclude underground pipe losses.

Companies should provide a breakdown of total non-household consumption by sector in support of their base year and forecast assessments in table WRP8.

Where companies have considered the effect of climate change on demand, the figures included within the tables should include any climate change adjustments. The plan should explain how the effect of climate change on the demand forecast has been assessed (section 8).

Line definitions

32	Water taken unbilled	MI/d
Definition	Water taken legally unbilled plus water taken illegally unbilled (NRA/UKWIR, 1995a).	
Processing rules:	Input	
33	Water delivered 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	
34	Unmeasured household – USPL	MI/d
Definition	Estimated underground supply pipe leakage (USPL) 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	
35	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:	Calculation: Row33 – Row34 Water delivered unmeasured household – unmeasured household USPL	
36	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:	Calculation: $(\text{Row35} \times 1,000,000) / (\text{Row18} \times 1,000)$ (Unmeasured household consumption x 1,000,000) / (unmeasured household population x 1,000)

37	Water delivered measured household	MI/d
-----------	---	-------------

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

Processing rules: Input

38	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

39	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: Calculation: Row37 – Row38
Water delivered measured household – measured household USPL

40	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: Calculation: $(\text{Row39} \times 1,000,000) / (\text{Row21} \times 1,000)$
(Measured household consumption x 1,000,000) / (Measured household population x 1,000)

41	Water delivered 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

42	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

43	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: Calculation: Row41 – Row42
Water delivered unmeasured non-household - unmeasured non-household – USPL

44	Water delivered 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

45	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

46	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: Calculation: Row44 – Row45
Water delivered measured non-household - measured non-household – USPL

47	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

14.6 Leakage

Companies should show total leakage and underground supply pipe leakage in this section of WRP1. Leakage for the base year should be the actual leakage reported to Ofwat for the same year.

In the baseline data set, the supply-demand balance should include an estimate of leakage that assumes a company will follow its current leakage policies and, where appropriate, meet any leakage targets set by Ofwat.

In the final planning scenario, the supply-demand balance should reflect the impact of the chosen options for reducing leakage.

Line definitions

48	Total leakage	MI/d
-----------	----------------------	-------------

Definition The sum of distribution losses underground and supply pipe losses (NRA/UKWIR, 1995a).

Processing rules: Calculation: Row15 + Row34 + Row38 + Row42 + Row45 + Row47
Distribution losses + unmeasured household USPL + measured household USPL + unmeasured non-household USPL + measured non-household USPL + void properties USPL

49	Total leakage	l/prop/d
-----------	----------------------	-----------------

Definition The sum of distribution losses underground and supply pipe losses (NRA/UKWIR, 1995a).

Processing rules: Calculation: (Row48 x 1,000,000)/(Row31 x 1,000)
(Total leakage x 1,000,000) / (total properties x 1,000)

14.7 Supply-demand balance

This section summarises the supply-demand balance. The total available headroom will be the difference between the distribution input (row 14) and WAFU (row 50) for the relevant scenario. Supply-deficits should be shown as a negative.

The baseline scenario (WRP1) 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).

Where companies have included the uncertainty associated with climate change within headroom, the figures included within the tables should include any climate change adjustment. The plan should explain in detail how climate change uncertainties have been assessed (section 8).

Line definitions

50	Total water available for use	MI/d
-----------	--------------------------------------	-------------

Definition The value calculated by the deduction from deployable output of sustainability reductions and outages. To this imports are added and exports deducted.

Processing rules: Calculation: Row5+(Row8+Row12)-(Row7+Row13)
WAFU (own sources) + raw and potable water imports – raw and potable water exports

51	Available headroom	MI/d
-----------	---------------------------	-------------

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

Processing rules: Input

52	Target headroom	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: See section 9.

53	Supply Demand Balance	MI/d
-----------	------------------------------	-------------

Definition The difference between available headroom and target headroom

Processing rules: Calculation : Row 51 – Row 52
Available Headroom – target headroom

15 Table WRP2 – feasible list of water management options

Table WRP2 should consider the **feasible list** of water management options. The table should be completed at resource zone level. Where an option is listed in WRP2 it should be cross-referenced to a more detailed explanation and option appraisal in the plan. Companies should give each option a unique reference number that matches between the tables and the plan.

Some options might supply more than one resource zone. Where this is the case, in table WRP2 companies should allocate the cost and yields of the option proportionally between those resource zones. The basis of the allocation of costs is for a company to determine, as unit costs might be higher in one zone than another. Companies should explain this allocation in the option description and assessment section of the plan. Companies should use the total cost of an option where it is not possible to split the cost; for example a large resource development may cost the same no matter how many resource zones will benefit from it.

Unnumbered rows can be inserted as required in this table.

Line definitions

54	Customer-side management	
-----------	---------------------------------	--

Definition A list of options that affect customer use and supply pipe losses
Processing rules: Input as appropriate

55	Distribution-side management	
-----------	-------------------------------------	--

Definition A list of options targeted at activities between distribution and the point of consumption
Processing rules: Input as appropriate

56	Production-side management	
-----------	-----------------------------------	--

Definition A list of options targeted at activities between abstraction and distribution input.
Processing rules: Input as appropriate

57	Resource Management	
-----------	----------------------------	--

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

Column notes

Companies should use the definitions from *The economics of balancing supply and demand* (UKWIR and Environment Agency, 2002) in completing these columns and explain where they have not.

WRP2_E	Option reference number	
---------------	--------------------------------	--

Notes Each option should be given a unique reference number. The reference is up to the company but should be consistent throughout the plan and tables.

WRP2_F	WAFU ON FULL IMPLEMENTATION	MI/d
Notes	Water available for use on full implementation of the option described. This should be the maximum possible WAFU for the option. Where companies do not include maximum WAFU (for example, metering could have a range of possible WAFU), they should state what is included in the option description section of the plan.	
WRP2_G	EARLIEST POTENTIAL OPTION START DATE	YEAR
Notes	The earliest year that the option can be fully implemented.	
WRP2_H	NPV of WAFU	MI
Notes	Net present value of water available for use of the option described. As defined in <i>The economics of balancing supply and demand</i> (UKWIR/Environment Agency, 2002).	
WRP2_I	CAPEX NPV	£000
Notes	Net present value of capex of the option described. As defined in <i>The economics of balancing supply and demand</i> (UKWIR/Environment Agency, 2002).	
WRP2_J	OPEX NPV	£000
Notes	Net present value of opex of the option described. As defined in <i>The economics of balancing supply and demand</i> (UKWIR/Environment Agency, 2002).	
WRP2_K	NPV of OPEX SAVINGS	£000
Notes	Net present value of opex savings for the option described. As defined in <i>The economics of balancing supply and demand</i> (UKWIR/Environment Agency, 2002).	
WRP2_L	SOCIAL & ENV. NPV	£000
Notes	Social and environmental net present value of the option described. As defined in <i>The economics of balancing supply and demand</i> (UKWIR/Environment Agency, 2002).	
WRP2_M	TOTAL NPV	£000
Notes	Total net present value of the option described. As defined in <i>The economics of balancing supply and demand</i> (UKWIR/Environment Agency, 2002).	
WRP2_N	AIC	p/M3
Notes	Average incremental cost of the option described. As defined in <i>The economics of balancing supply and demand</i> (UKWIR/Environment Agency, 2002).	
WRP2_O	AISC	p/M3
Notes	Average incremental social cost of the option described. As defined in <i>The economics of balancing supply and demand</i> (UKWIR/Environment Agency, 2002).	

16 Table WRP3 – preferred list of water management options

Table WRP3 details the **preferred list** of water management options, the options that make up the final planning solution.

The options tables should be completed at resource zone level. The plan should make it clear what solution is proposed at company level.

Economic analysis should be carried out for all options and presented for the preferred list in table WRP3. Unlike previous reporting requirements, we no longer request that options be ranked by AISC value.

We expect that the planned gains in WAFU or the savings in demand should be taken through into the final planning table WRP4.

Unnumbered rows can be inserted as required in this table.

Line definitions

58	Customer-side management	
-----------	---------------------------------	--

Definition Preferred list of customer-side management options.
Processing rules: Input as appropriate

59	Distribution-side management	
-----------	-------------------------------------	--

Definition Preferred list of distribution-side management options.
Processing rules: Input as appropriate

60	Production-side management	
-----------	-----------------------------------	--

Definition Preferred list of production-side management options.
Processing rules: Input as appropriate

61	Resource management	
-----------	----------------------------	--

Definition Preferred list of Resource management options.
Processing rules: Input as appropriate

62	Total customer and distribution management savings / gains	
-----------	---	--

Definition Total savings / gains arising from preferred list of customer and distribution management options.
Processing rules: Calculation: Rows58 + Rows59
 Customer-side management + Distribution-side management

63	Total production and resource management savings / gains	
-----------	---	--

Definition Total savings / gains arising from preferred list of production and resource management options.
Processing rules: Calculation: Rows60 + Rows61
 Production-side management + resource management

Column notes

WRP3_E	Option Reference Number	
---------------	--------------------------------	--

Notes Each option should be given a reference number within the plan so that it is clear which option is being referred to. The reference itself can be whatever the company decides but should be consistent with table WRP3. .

WRP3_F: AH	PLANNED GAINS IN WAFU OR SAVINGS IN DEMAND	MI/d
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Notes Companies should complete the relevant columns for all preferred options to show when an option will deliver gains or savings and the volume. Years when an option will not be active should be left blank.
WAFU gains or savings in demand for each year are individual year gains and not cumulative gains.
Baseline demand savings should not be included within this table but included in the option description section of the plan

17 Tables WRP4 and WRP4a – final planning supply-demand components and supporting data

Tables WRP4 and WRP4a are structurally identical to WRP1 and WRP1a. WRP1 and WRP1a tables are for reporting baseline data and all numbers are suffixed BL. WRP4 and WRP4a tables present data for the final planning scenario, and all numbers are suffixed FP.

Companies should refer to section 14, table WRP1 and WRP1a for general instructions and line definitions for completing WRP4 and 4a. Specific information relating to table WRP4 and WRP4a (and not WRP1 and WRP1a is included below).

Companies should not add to, or delete, any of the reporting lines in table WRP4. Extra rows can be inserted into table WRP4a.

17.1 Basic resources

The DO entered in row 1 may differ from the baseline tables to the final planning tables. The baseline table (WRP1) should show the current DO for the given period. For the final planning table (WRP4) the DO figure should include an estimate of the DO including any new resource developments. Where a development is phased this should be reflected in the profile of the DO. The change in DO should be equivalent to the sum of the relevant option in table WRP3.

For the final planning table (table WRP4) the DO figure should include an estimate of the DO including any new resource developments. Where a development is phased this should be reflected in the profile of the DO.

17.2 Raw water

For the final planning scenario, planned new raw water transfers or increases in existing raw water transfers should be shown on WRP4a. They should also be specified in tables WRP2 and WRP3 as part of the total water management options.

17.3 Potable water customer base

For the final planning scenario, WRP4 should show any adjustments to the breakdown of the customer base into measured and unmeasured as a result of implementing any metering options.

17.4 Potable water delivered

Changes to the potable water delivered components from the baseline need to be shown in table WRP4.

17.5 Leakage

In the final planning scenario, the supply demand balance should reflect the impact of the chosen options for reducing leakage.

17.6 Supply-demand balance

The final planning forecast (WRP4) 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.

18 Table WRP5 – deployable output reconciliation

All licences and sources should be reported in WRP5. Companies should only complete this table for the baseline. Deployable output changes for the final planning solution will be included within tables WRP2 and WRP3.

If a company needs to consider both dry year and critical period scenarios:

- it can either input the sources of deployable output for both scenarios in WRP5 within the dry year workbook; or
- it can input the sources for the dry year scenario within WRP5 of the dry year workbook and the sources for the critical period scenario within WRP5 of the critical period workbook.

Extra rows can be inserted into table WRP5.

19 Table WRP6 – breakdown of measured households (dry year baseline)

Table WRP6 shows the breakdown of consumption from measured households according to their water using characteristics (for example, new property, optant, etc. It provides a summary and companies should provide a full explanation in their plan. They should set out clearly the assumptions, method and information used to make this assessment.

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 WRP6 should be completed for the dry year baseline scenario. Companies should explain in their plan if there are any significant changes to this data in the final planning scenario. If the changes are significant then the company should complete a set of tables for the final planning scenario.

The table is divided into two. The first section rows 6.1 – 6.3 cover cumulative increases and should match WRP 1 rows 21, 22 and 23. The Scenario year will need figures that have been input from WRP 1. The following years will then be calculated using annual increases and previous year figures.

Rows 6.5 onwards represent **annual increases** to the metered property categories, not cumulative totals.

Water companies should explain any other assumptions they have made relating to categorisation of metered users.

Extra rows can be inserted into table WRP6.

Line definitions

6.5 – 6.8	Optant annual increases	
------------------	--------------------------------	--

Definition Annual new meters as a result of customers choosing to have them installed.

Processing rules: Input properties, occupancy and pcc as appropriate
 Population is calculated: 6.6×6.7
 = Optant properties * optant occupancy

6.9 – 6.12	New property annual increases	
-------------------	--------------------------------------	--

Definition Annual new meters installed into new build properties.

Processing rules: Input properties, occupancy and pcc as appropriate
 Population is calculated: 6.10×6.11
 = New property properties * new property occupancy

6.13 – 6.16	Change in OCC annual increases	
--------------------	---------------------------------------	--

Definition Annual new meters installed as a result of change in occupancy
Processing rules: Input properties, occupancy and pcc as appropriate
Population is calculated: $6.14 \div 6.15$
= Change in occupancy properties * change in occupancy occupancy

6.17 – 6.20	Selected uses annual increases	
--------------------	---------------------------------------	--

Definition Annual new compulsory meters installed as a result of company policy on selected uses that have to be metered, for example swimming pool or sprinkler owners.
Processing rules: Input properties, occupancy and pcc as appropriate
Population is calculated: 6.18×6.19
= Selected properties * selected property occupancy

6.21 – 6.24	Compulsory metered annual increases	
--------------------	--	--

Definition Category to be used by companies who have applied for water scarcity status and are able to compulsorily meter customers on this basis.
Processing rules: Input properties, occupancy and pcc as appropriate
Population is calculated: 6.22×6.23
= Compulsory metered properties * compulsory metered occupancy rate

20 Table WRP7 – household micro-component consumption (dry year baseline)

Companies should submit demand broken down into micro-components in support of their base year and forecast assessments. This data should be reported in table WRP7. Additional lines are included at the bottom to accommodate water companies using alternative components. Companies can also insert additional rows into the table if necessary but should explain in the water resources plan what is included in each new micro-component.

Table WRP7 should be completed for the dry year baseline scenario. Companies should explain in their plan if there are any significant changes to this data in the final planning scenario. If the changes are significant then it may be easier to explain and for others to understand if a company completes a second set of tables for the final planning scenario.

The relevant components should be totalled to derive a measured and unmeasured pcc component which should be reported in (and match with) table WRP1.

All estimates of pcc should be expressed in units of litres/head/day and exclude underground supply pipe losses.

21 Table WRP8 – non-household sector consumption (dry year baseline)

Companies should demonstrate how they derived non-household consumption. The components of non-household consumption should be detailed in table WRP8.

Table WRP8 should be completed for the dry year baseline scenario. Companies should explain in their plan if there are any significant changes to these data in the final planning scenario. Where the changes are significant then it would assist justification of the plan if the tables were also completed for the final planning scenario.

Companies should provide a breakdown of total non-household consumption in support of their base year and forecast assessments in table WRP8. This should follow the two-letter Standard Industrial Classification (SIC) categories published by ONS in 2003 (SIC, 2003). Table WRP8 is based on the SIC 03 categories and we have specified the relevant SIC codes for each category in the table WRP8.²⁴ Companies should explain any alternative categorisations in the water resources plan. They should state which industries and businesses are included in different categories and how they relate to the SIC (03) categories.

We have changed the categories in table WRP8 from the categories used in table WRPSup4 for the 2004 water resources plans to make the uses easier to categorise. These changes are shown in figure 21.1.

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).

Blank rows have been included within table WRP8 for alternative classifications but water companies using these should explain what is covered by each category. Water companies can also insert additional rows into the table if necessary.

Water companies may feel hesitant about reporting on industrial water use in categories where the identity of an industrial user may become obvious and where they are concerned about commercial confidentiality. Companies should report all water use in table WRP8 and in the water resources plan and where they believe this might put commercial confidentiality at risk, they should specifically flag this to the Secretary of State or the Welsh Assembly Government when they submit the plan. See section 4 on the statutory process.

²⁴ The SIC 03 categories can be downloaded from [http://www.statistics.gov.uk/methods_quality/sic/downloads/UK_SIC_Vol1\(2003\).pdf](http://www.statistics.gov.uk/methods_quality/sic/downloads/UK_SIC_Vol1(2003).pdf)

Figure 21.1: Categories of non-household consumption

2003 SIC Code	Categories used in table WRP8 for the 2009 water resources plans	Categories used in table WRPSup4 for the 2004 water resources plans
A,B	Agriculture, horticulture, forestry and fishing	Agriculture Horticulture
C	Extraction of metals, minerals and energy producing materials	Extraction
DA	Food and drink (manufacture)	Food and drink
DB, DC	Textile, fur and leather (manufacture)	Textiles
DD, DL, DN	Other manufacturing	Electrical equipment Wood (Other)
DE	Paper (manufacture)	Paper
DF	Fuel refining	Fuel refining
DG, DH,	Chemicals, rubbers, plastics and man-made materials (manufacture)	Chemicals Rubber
DI	Manufacture of non-metallic minerals	Minerals
DJ, DK	Manufacture of basic metals, fabricated metal products and machinery	Metals Machinery
DM,I	Transportation and manufacture of transport equipment	Transport
E	Electricity, gas and water supplies	Utilities
F	Construction	Construction
G	Wholesale and retail	Retail
H	Hotels, bars and restaurants	Hotels
J,K,L,O, P,Q	Other services	Other
M,N	Education and health	Education and health

22 Table WRP9 – normal year final planning supply-demand components

Companies should complete table WRP9 for the normal year scenario – that is assuming normal or average weather patterns. Companies should record the baseline normal year information requested and forecast data for the potable water delivered components.

Table WRP9 will be used to assess a company's forecast revenue and should therefore be consistent with the data that it provides in its draft and final business plans.

Companies should explain how each data item in table WRP9 reconciles with the same data reported for the dry year data in table WRP4-FP with reference to dry year adjustment factors and other relevant factors. The basis of these adjustment factors should be fully explained.

Companies should not add to, or delete, any of the reporting lines in table WRP9.

23 Blank tables

Following are standard blank WRP tables for reference. Electronic versions of all the tables, in Microsoft Excel 2003, are available from our internet site²⁵.

Table WRP1-BL: Baseline Supply Demand Components

Row Ref.	DERIVATION	DESCRIPTION	UNITS	Scenario	Year	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	2030-31	2031-32	2032-33	2033-34	2034-35	
				Year	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	2030-31	2031-32	2032-33	2033-34	2034-35		
BASIC RESOURCES BASELINE																																			
1 _{BL}	Input	Deployable Output (Specify individual Source Yields on Table WRP5)	MI/d																																
2 _{BL}	WRP1a-BL 2a _{BL}	Reductions in Deployable Output	MI/d																																
3 _{BL}	Input	Outage Allowance	MI/d																																
4 _{BL}	9 _{BL} +11 _{BL}	Process Losses	MI/d																																
5 _{BL}	1 _{BL} - (2 _{BL} +3 _{BL} +4 _{BL})	Water Available For Use (own sources)	MI/d																																
RAW WATER BASELINE																																			
6 _{BL}	Input	Raw Water Abstracted	MI/d																																
7 _{BL}	WRP1a-BL 7a _{BL}	Raw Water Exported (existing)	MI/d																																
8 _{BL}	WRP1a-BL 8a _{BL}	Raw Water Imported (existing)	MI/d																																
9 _{BL}	Input	Raw Water Losses and Operational Use	MI/d																																
10 _{BL}	WRP1a-BL 10a _{BL}	Non Potable Supplies (existing)	MI/d																																
POTABLE WATER TO POINT OF DELIVERY BASELINE																																			

²⁵ www.environment-agency.gov.uk

Table WRP1a-BL: Baseline WRP1 Supporting transfer and DO reductions data

Row Ref.	DERIVATION	DESCRIPTION <i>[Insert /delete non-numbered lines to suit]</i>	UNITS	Scenario	Year	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	2030-31	2031-32	2032-33	2033-34	2034-35			
				Year	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	2030-31	2031-32	2032-33	2033-34	2034-35				
2a _{BL}	Input as appropriate	Reductions in Baseline Deployable Output: Total here and specify below	MI/d																																		
			MI/d																																		
			MI/d																																		
			MI/d																																		
			MI/d																																		
7a _{BL}	Input as appropriate	Baseline Raw Water Exported (existing). Total here and specify below	MI/d																																		
		<i>to</i>	MI/d																																		
		<i>to</i>	MI/d																																		
		<i>to</i>	MI/d																																		
8a _{BL}	Input as appropriate	Baseline Raw Water Imported (existing). Total here and specify below	MI/d																																		
		<i>from</i>	MI/d																																		
		<i>from</i>	MI/d																																		
		<i>from</i>	MI/d																																		
10a _{BL}	Input as appropriate	Baseline Non Potable Supplies (existing). Total here and specify below	MI/d																																		
		<i>to</i>	MI/d																																		
		<i>to</i>	MI/d																																		
		<i>to</i>	MI/d																																		
12a _{BL}	Input as appropriate	Baseline Potable Water Imported. Total here and specify below	MI/d																																		
		<i>from</i>	MI/d																																		
		<i>from</i>	MI/d																																		
		<i>from</i>	MI/d																																		
13a _{BL}	Input as appropriate	Baseline Potable Water Exported. Total	MI/d																																		

Table WRP2: Feasible list of water management options

Row Ref.	DERIVATION	OPTION DESCRIPTION <i>[Insert / delete non-numbered lines to suit]</i>	WATER MANAGEMENT OPTION COST AND SOLUTION - TO BE COMPLETED FOR ALL FEASIBLE OPTIONS						
			OPTION REFERENCE No.	WAFU ON FULL IMPLEMENTATION (MI/d)	EARLIEST POTENTIAL OPTION START DATE (YEAR)	NPV of WAFU (MI)	CAPEX NPV (£000)	OPEX NPV (£000)	NPV of OPEX SAVINGS (£000)
54	Input as appropriate	Customer Side Management, Specify Below....							
55	Input as appropriate	Distribution Side Management, Specify Below....							
56	Input as appropriate	Production Side Management, Specify Below....							
57	Input as appropriate	Resource Management, Specify Below....							

Company:	_____
Resource Zone Name	_____
Resource Zone Number:	_____ of _____
Planning Scenario Name:	_____
Chosen Level of Service:	_____

Table WRP3: Preferred list of water management options

Row Ref.	DERIVATION	OPTION DESCRIPTION <i>[Insert / delete non-numbered lines to suit]</i>	OPTION REFERENCE No.	PLANNED GAINS IN WAFU OR SAVINGS IN DEMAND (M/d) - TO BE COMPLETED FOR ALL PREFERRED OPTIONS (WAFU gains for each year are individual year gains and not cumulative gains)																																		
				Scenario Year 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	2030-31	2031-32	2032-33	2033-34	2034-35						
58	Input as appropriate	Customer Side Management, Specify Below....																																				
59	Input as appropriate	Distribution Side Management, Specify Below....																																				
60	Input as appropriate	Production Side Management, Specify Below....																																				
61	Input as appropriate	Resource Management, Specify Below....																																				
SUMMARY of WAFU GAINS																																						
62	sum of 58 + sum of 59	Total Customer and Distribution Management Gains																																				
63	sum of 60 +	Total Production and																																				

Table WRP4-FP: Final Planning Supply Demand Components

Row Ref.	DERIVATION	DESCRIPTION	UNITS	Scenario	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	2030-31	2031-32	2032-33	2033-34	2034-35	
				Year																														
BASIC RESOURCES FINAL PLANNING																																		
1 _{FP}	Input	Deployable Output (Specify individual Source Yields on Table WRP5)	MI/d																															
2 _{FP}	WRP4a-FP 2a _{FP}	Reductions in Deployable Output	MI/d																															
3 _{FP}	Input	Outage Allowance	MI/d																															
4 _{FP}	9 _{FP} +11 _{FP}	Process Losses	MI/d																															
5 _{FP}	1 _{FP} -(2 _{FP} +3 _{FP} +4 _{FP})	Water Available For Use (own sources)	MI/d																															
RAW WATER FINAL PLANNING																																		
6 _{FP}	Input	Raw Water Abstracted	MI/d																															
7 _{FP}	WRP4a-FP 7a _{FP}	Raw Water Exported	MI/d																															
8 _{FP}	WRP4a-FP 8a _{FP}	Raw Water Imported	MI/d																															
9 _{FP}	Input	Raw Water Losses and Operational Use	MI/d																															
10 _{FP}	WRP4a- FP 10a _{FP}	Non Potable Supplies	MI/d																															
POTABLE WATER TO POINT OF DELIVERY FINAL PLANNING																																		
11 _{FP}	Input	Treatment Works Losses and Operational Use	MI/d																															
12 _{FP}	WRP4a-FP 12a _{FP}	Potable Water Imported	MI/d																															
13 _{FP}	WRP4a-FP 13a _{FP}	Potable Water Exported	MI/d																															
14 _{FP}	Input	Distribution Input	MI/d																															
15 _{FP}	Input	Distribution Losses	MI/d																															
16 _{FP}	Input	Distribution System Operational Use	MI/d																															
17 _{FP}	14 _{FP} -15 _{FP} -16 _{FP}	Water Delivered	MI/d																															
POTABLE WATER CUSTOMER USE FINAL PLANNING																																		
18 _{FP}	Input	Unmeasured Household - Population	000's																															
19 _{FP}	Input	Unmeasured Household - Properties	000's																															
20 _{FP}	18 _{FP} /19 _{FP}	Unmeasured Household - Occupancy Rate	h/pr																															

Table WRP4a-FP: Final Planning WRP3 Supporting transfer and DO reduction data

Row Ref.	DERIVATION	DESCRIPTION <i>[Insert / delete non-numbered lines to suit]</i>	UNITS	Scenario	Year	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	2030-31	2031-32	2032-33	2033-34	2034-35		
2a _{FP}	Input as appropriate	Reductions in Final Planning Deployable Output. Total here and specify below	MI/d																																	
			MI/d																																	
			MI/d																																	
			MI/d																																	
7a _{FP}	Input as appropriate	Final Planning Raw Water Exported. Total here and specify below	MI/d																																	
		<i>to</i>	MI/d																																	
		<i>to</i>	MI/d																																	
		<i>to</i>	MI/d																																	
8a _{FP}	Input as appropriate	Final Planning Raw Water Imported. Total here and specify below	MI/d																																	
		<i>from</i>	MI/d																																	
		<i>from</i>	MI/d																																	
		<i>from</i>	MI/d																																	
10a _{FP}	Input as appropriate	Final Planning Non Potable Supplies. Total here and specify below	MI/d																																	
		<i>to</i>	MI/d																																	
		<i>to</i>	MI/d																																	
		<i>to</i>	MI/d																																	
12a _{FP}	Input as appropriate	Final Planning Potable Water Imported. Total here and specify below	MI/d																																	
		<i>from</i>	MI/d																																	

WRP5: Resource Zone Deployable Output Reconciliation

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

*Can be used as it is not a security issue

Company:	_____
Resource Zone Name	_____
Resource Zone Number:	_____ of _____
Planning Scenario Name:	_____
Chosen Level of Service:	_____

WRP6: Breakdown of Measured Households (Dry Year Baseline)

Row Ref	Derivation	Description	Units	Scenario Year	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	2030-31	2031-32	2032-33	2033-34	2034-35				
6.1	6.2*6.3	Total	Population	000's																																	
6.2	6.6+6.10+6.14+6.18+6.22	Total	Properties	000's																																	
6.3	6.1/6.1	Total	Occupancy	h/prop																																	
6.4	(Left blank)																																				
6.5	6.6*6.7	Optant	Population	000's																																	
6.6	Input	Optant	Properties	000's																																	
6.7	Input	Optant	Occupancy	h/prop																																	
6.8	Input	Optant	pcc	l/h/d																																	
6.9	6.10*6.11	New Property	Population	000's																																	
6.10	Input	New Property	Properties	000's																																	
6.11	Input	New Property	Occupancy	h/prop																																	
6.12	Input	New Property	pcc	l/h/d																																	
6.13	6.14*6.15	Change in OCC	Population	000's																																	
6.14	Input	Change in OCC	Properties	000's																																	
6.15	Input	Change in OCC	Occupancy	h/prop																																	
6.16	Input	Change in OCC	pcc	l/h/d																																	
6.17	6.18*6.19	Selected	Population	000's																																	
6.18	Input	Selected	Properties	000's																																	
6.19	Input	Selected	Occupancy	h/prop																																	
6.20	Input	Selected	pcc	l/h/d																																	

WRP7: Household Micro-Component Consumption (Dry Year Baseline)

Row Ref	Derivation	Description <i>Insert additional components as required</i>	Units	Scenario Year	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	2030-31	2031-32	2032-33	2033-34	2034-35			
7.1	Input	Unmeasured toilet flushing	l/h/d																																	
7.2	Input	Unmeasured bath use	l/h/d																																	
7.3	Input	Unmeasured shower use	l/h/d																																	
7.4	Input	Unmeasured hand basin	l/h/d																																	
7.5	Input	Unmeasured clothes washing	l/h/d																																	
7.6	Input	Unmeasured dish washing	l/h/d																																	
7.7	Input	Unmeasured garden use	l/h/d																																	
7.8	Input	Unmeasured car washing	l/h/d																																	
7.9	Input	Unmeasured miscellaneous use	l/h/d																																	
7.10	Input		l/h/d																																	
7.11	Input		l/h/d																																	
7.12	Input		l/h/d																																	
7.13	Input		l/h/d																																	
7.14	Input		l/h/d																																	
7.15	Input		l/h/d																																	
7.16	Input		l/h/d																																	
7.17	Input		l/h/d																																	
7.18	Input		l/h/d																																	
7.19	Sum(7.1:7.18)	Unmeasured pcc	l/h/d																																	
7.20	Input	Measured toilet flushing	l/h/d																																	
7.21	Input	Measured bath use	l/h/d																																	
7.22	Input	Measured shower use	l/h/d																																	
7.23	Input	Measured hand basin	l/h/d																																	
7.24	Input	Measured clothes washing	l/h/d																																	

WRP8:Non-Household Sector Consumption (Dry Year Baseline)

Row Ref	Derivation	Description	2003 SIC code s	Units	Scenario Year	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	2030-31	2031-32	2032-33	2033-34	2034-35	
8.1	Input	Agriculture, horticulture, forestry and fishing	A, B	MI/d																															
8.2	Input	Extraction of metals, minerals and energy producing materials	C	MI/d																															
8.3	Input	Food and drink (manufacture)	DA	MI/d																															
8.4	Input	Textile, fur and leather (manufacture)	DB, DC	MI/d																															
8.5	Input	Other manufacturing	DD, DL, DN	MI/d																															
8.6	Input	Paper (manufacture)	DE	MI/d																															
8.7	Input	Fuel refining	DF	MI/d																															
8.8	Input	Chemicals, rubbers, plastics and man-made material (manufacture)	DG, DH	MI/d																															
8.9	Input	Manufacture of non-metallic minerals	DI	MI/d																															
8.10	Input	Manufacture of basic metals, fabricated metal products and machinery	DJ, DK	MI/d																															
8.11	Input	Transportation and manufacture of transport equipment	DM, I	MI/d																															
8.12	Input	Electricity, gas and water supplies	E	MI/d																															
8.13	Input	Construction	F	MI/d																															

Table WRP9: Normal Year Final Planning Supply Demand Components

Row Ref.	DERIVATION	DESCRIPTION	UNITS	Scenario Year 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	2030-31	2031-32	2032-33	2033-34	2034-35			
BASIC RESOURCES NORMAL YEAR																																			
3 _N	Input	Outage Allowance	MI/d																																
5 _N	Input	Water Available For Use (own sources)	MI/d																																
RAW WATER NORMAL YEAR																																			
6 _N	Input	Raw Water Abstracted	MI/d																																
7 _N	Input	Raw Water Exported (existing)	MI/d																																
8 _N	Input	Raw Water Imported (existing)	MI/d																																
9 _N	Input	Raw Water Losses and Operational Use	MI/d																																
10 _N	Input	Non Potable Supplies (existing)	MI/d																																
POTABLE WATER TO POINT OF DELIVERY NORMAL YEAR																																			
11 _N	Input	Treatment Works Losses and Operational Use	MI/d																																
12 _N	Input	Potable Water Imported	MI/d																																
13 _N	Input	Potable Water Exported	MI/d																																
14 _N	Input	Distribution Input	MI/d																																
15 _N	Input	Distribution Losses	MI/d																																
16 _N	Input	Distribution System Operational Use	MI/d																																
17 _N	14 _N -15 _N -16 _N	Water Delivered	MI/d	0.00																															
POTABLE WATER DELIVERED NORMAL YEAR																																			
32 _N	Input	Water Taken Unbilled	MI/d																																
33 _N	Input	Water Delivered Unmeasured Household	MI/d																																
34 _N	Input	Unmeasured Household - USPL	MI/d																																
35 _N	33 _N -34 _N	Unmeasured Household - Consumption	MI/d																																
36 _N	Input	Unmeasured Household - PCC	l/h/d																																
37 _N	Input	Water Delivered Measured Household	MI/d																																
38 _N	Input	Measured Household - USPL	MI/d																																

24 Glossary of terms

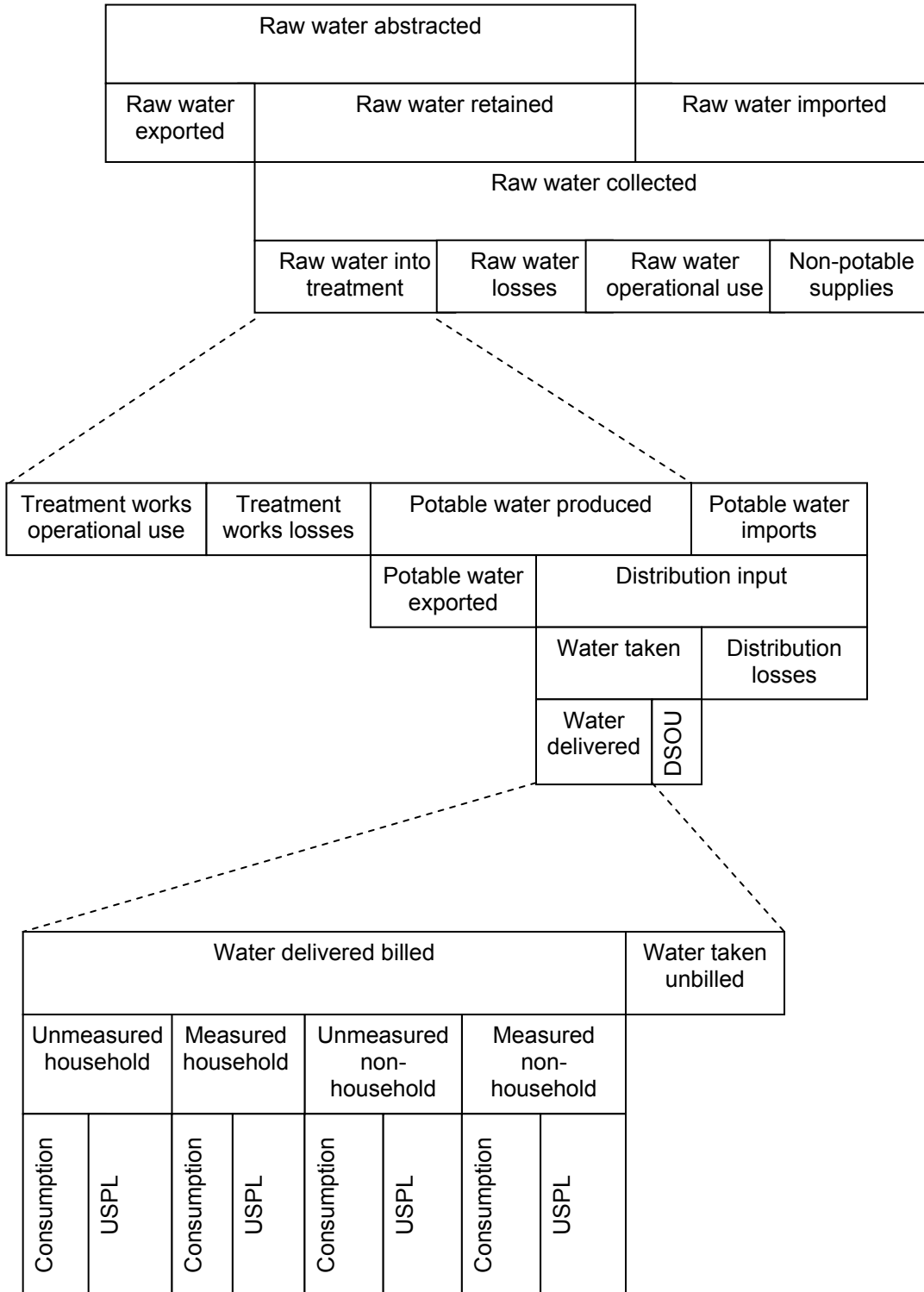
Abstraction	The removal of water from any source, either permanently or temporarily.
Abstraction licence	The authorisation granted by the Environment Agency to allow the removal of water from a source.
ACORN	A Classification Of Residential Neighbourhoods (ACORN) is a socio-demographic classification 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. An outage allowance may be made for such outages.
Annual average	The total demand in a year, divided by the number of days in the year.
Available headroom	The difference (in MI/d or percent) 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
Baseline forecast	A demand forecast which reflects a company's current demand management policy but which should assume the swiftest possible achievement of the current agreed target for leakage during the forecast duration, as well as implementation of the company water efficiency plan, irrespective of any supply surplus.
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.
Demand management	The implementation of policies or measures which serve to control or influence the consumption or waste of water (this definition can be applied at any point along the chain of supply).
Deployable output	The output of a commissioned source or group of <i>sources</i> or of bulk supply as constrained by: <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 figure 24.1).

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 figure 24.1).
Distribution system operation use (DSOU)	Water knowingly used by a company to meet its statutory obligations particularly those relating to water quality. Examples include mains flushing and air scouring (see figure 24.1).
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 at any time during the year without the introduction of demand restrictions. This should be based on a continuation of current demand management policies. 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 demand forecast	A demand forecast, which 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 water available for use 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 (for example, 2035).
Maximum Likelihood Estimation (MLE)	A statistical technique where a reconciliation item 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.
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 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 costs arising from the project.
Non-households	Properties receiving potable supplies that are not occupied as domestic premises, for example, factories, offices and commercial premises.

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 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 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 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	The point where treated water enters the distribution system.
Potable water produced	Raw water treatment less treatment works operational use and treatment work losses (see figure 24.1).
Potable water exported	Potable water exports from within a defined geographical area to an area outside the defined geographical area (see figure 24.1).
Potable water imported	Potable water imports from outside a defined geographical area to the defined geographical area (see figure 24.1).
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 figure 24.1).
Raw water collected	Raw water retained plus raw water imported (see figure 24.1).
Raw water exported	Raw water exported from a specific geographical area (see figure 24.1).
Raw water imported	Raw water imported from outside of a specified Imported geographical area (see figure 24.1).
Raw water losses	The net loss of water to the resource system, comprised of mains/aqueduct (pressure system) losses, open channel/very low pressure system losses, and losses from break-pressure tanks and small reservoirs (see figure 24.1).
Raw water operational use	Regular washing-out of mains due to sediment build-up and poor quality of source water (see figure 24.1).
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 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 pipe losses	The sum of underground supply pipe losses and above ground supply pipe losses (see figure 24.1).
Sustainability reduction	Reductions in deployable 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 water management options to increase water available for use or decrease demand.
Total leakage	The sum of distribution losses and underground supply pipe losses (see figure 24.1).
Total water management	All water management activities from source to end use (i.e. 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 figure 24.1).
Treatment work operational use	Treatment process water i.e. net loss, which excludes water returned to source water (see figure 24.1).
Underground supply pipe losses	Losses between the point of delivery and the point of consumption (see figure 24.1).
Unrestricted demand	The demand for water when there are no restrictions in place (this definition can be applied at any point along the chain of supply).
Void property	A property connected to the distribution network but not charged because it has no occupants.
WRP tables	Water resources plan tables used for presenting key quantitative data associated with a water resources plan.
Water available for use	The value calculated by deducting allowable outages and planning allowances from deployable output in a resource zone.
Water delivered	Water delivered to the point of delivery (see figure 24.1).
Water delivered billed	Water delivered less water taken unbilled. It can be split into unmeasured household, measured household, unmeasured non-household and measured non-households water delivered (see figure 24.1).
Water taken	Distribution input minus distribution losses (see figure 24.1).

Figure 24.1: Diagram illustrating components of supply and demand



DSOU – distribution system operational use
 USPL – underground supply pipe losses

25 List of abbreviations

ADPW	Average day demand peak week
AISC	Average incremental social cost
CAMS	Catchment abstraction management strategies
CAPEX	Capital expenditure
CLG	Communities and Local Government department
Defra	Department for Environment, Food and Rural Affairs
DETR	Department of Environment, Transport and the Regions; (now Defra)
DoE	Department of the Environment; (now Defra)
DO	Deployable output
GCM	Global circulation models
MI/d	Megalitres per day Megalitres = one million litres (1000 cubic metres)
MLE	Maximum Likelihood Estimation
ODPM	Office of the Deputy Prime Minister (now replaced by CLG department).
Ofwat	The Water Services Regulation Authority
ONS	Office for National Statistics
OPEX	Operating expenditure
PCC	Per capita consumption - consumption per head of population
SOA	Super Output Areas
UKCIP	UK Climate Impacts Programme
UKWIR	United Kingdom Water Industry Research Limited
WAFU	Water available for use
WAG	Welsh Assembly Government
WCA	Water Companies Association
WRP	Water resources plan
WSA	Water Services Association
Water UK	Water UK (formerly known as the Water Services Association)

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www.environment-agency.gov.uk**

**incident hotline 0800 80 70 60 (24hrs)
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Appendix 7 – Abstracting water a guide to getting your abstraction licence.

Preliminary Report Draft

Abstracting water

A guide to getting your licence



managing all
our water needs

We are the Environment Agency. It's our job to look after your environment and make it a better place – for you, and for future generations.

Your environment is the air you breathe, the water you drink and the ground you walk on. Working with business, Government and society as a whole, we are making your environment cleaner and healthier.

The Environment Agency. Out there, making your environment a better place.

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The Environment Agency's responsibilities

We are responsible for managing water resources in England and Wales. As part of our role, we:

- Investigate all new proposals to abstract or impound water before deciding whether to grant a licence, and
- In some cases require prior testing to be carried out to assess any effects of your abstraction on other sources.

We strongly encourage applicants to discuss their outline proposals with us before submitting a formal application.

A guide to getting your licence

If you want to remove or abstract water from a surface source (e.g. river, stream or canal) or from an underground source and take more than 20 cubic metres (approximately 4,400 gallons) a day, you will almost certainly need an abstraction licence. The following information gives a brief outline of why abstraction licences are necessary, and how you can apply for one. If you are proposing to abstract water, please contact us as early as possible so that we can discuss the details with you. Contact details can be found on the reverse of this leaflet.

Why are abstraction licences necessary?

We need to ensure that water resources are safeguarded and that abstractions do not damage the environment. Unregulated abstraction could lead to water supply shortages, increased river pollution by reducing dilution, damage to wildlife habitats and ultimately to the loss of rivers for all of us to use and enjoy.

By licensing, we can control the level of abstraction to protect both water supplies and the environment. We screen and appraise all licence applications for potential impact. In doing so we must have regard to certain statutory duties or obligations, for instance, the Conservation (Natural Habitats) Regulations 1994.

Do all abstractions require an abstraction licence?

If you want to take water from a surface or groundwater source, you will normally need to hold an abstraction licence. In some cases you do not need a licence, such as:

- abstraction for any purpose of less than 20 cubic metres a day;
- some land drainage operations;
- the filling of vessels (ships or boats) e.g. with drinking or ballast water;
- with our consent, abstraction exceeding 20 cubic metres a day to test for the presence, quantity or quality of water, in underground strata;
- water used for fire fighting;
- certain emergency abstractions;
- those abstractions operating under an exemption order or some other statutory exemption.

If you are in any doubt about the need for a licence, please contact your local Environment Agency office for further advice.

We need to ensure that water resources are safeguarded and that abstractions do not damage the environment



How does the abstraction licensing system work?

An abstraction licence gives you a right to take a certain quantity of water from a source of supply (inland water such as rivers or streams or an underground source). It also guarantees that no one else who applies for an abstraction licence can take the share of water that is already allocated to you. An abstraction licence does not guarantee the quality of the water or that the amount authorised for abstraction will always be available. The quality and quantity will often depend on the weather, climate and other factors outside our control.

An abstraction licence will specify where you can take the water from (the source), the quantities that you can take, and what you can use the water for. It will also have conditions to protect other water users and the water environment.

Abstraction licences are issued for a time-limited period, normally 12 years. These licences carry a presumption of renewal; however, you will need to re-apply for your licence and satisfy us that you still need the water and that you have been using it efficiently. In addition, we will consider what impact the abstraction has on the environment.

Licence application process

Initially you should contact us to discuss your proposal. We will be able to advise you on relevant local issues and provide guidance on matters specific to your proposal. There may be a Catchment Abstraction Management Strategy for your area that will provide information on our approach to abstraction licensing in the catchment. See our website www.environment-agency.gov.uk

You must use our application form to apply for a licence. You may also need to provide us with supporting information. This can be substantial, depending on what your proposal is and the potential impact it could have on the water environment. Contact us to find out what you need to do as soon as possible.

If you wish to abstract water from an underground source, such as a well or borehole, you will usually require a groundwater investigation consent to construct and then carry out a pumping test before you can apply for an abstraction licence. This will help us to tell whether the water you want is available and, by monitoring the surrounding sources and groundwater dependent features, it will help us to assess the impact on other water users and the environment. You will need to provide an analysis of the pumping test results with your application. The groundwater investigation process alone may take several months.

To ensure the best possible opportunity for eventual success, it is essential that you contact us as early as possible



We may need to advertise your application. If so, we will do this by publishing a press notice in a local newspaper and on our web-site. You will need to pay the costs for advertising in local newspapers.

To ensure the best possible opportunity for eventual success, **it is essential that you contact us as early as possible** to discuss your proposals, and certainly before you make a formal application. We will be able to advise you on relevant local issues and provide guidance on specific matters related to your proposals. If you require the services of a consultant or a technical advisor, you will need to arrange this independently; we cannot provide this service for you.

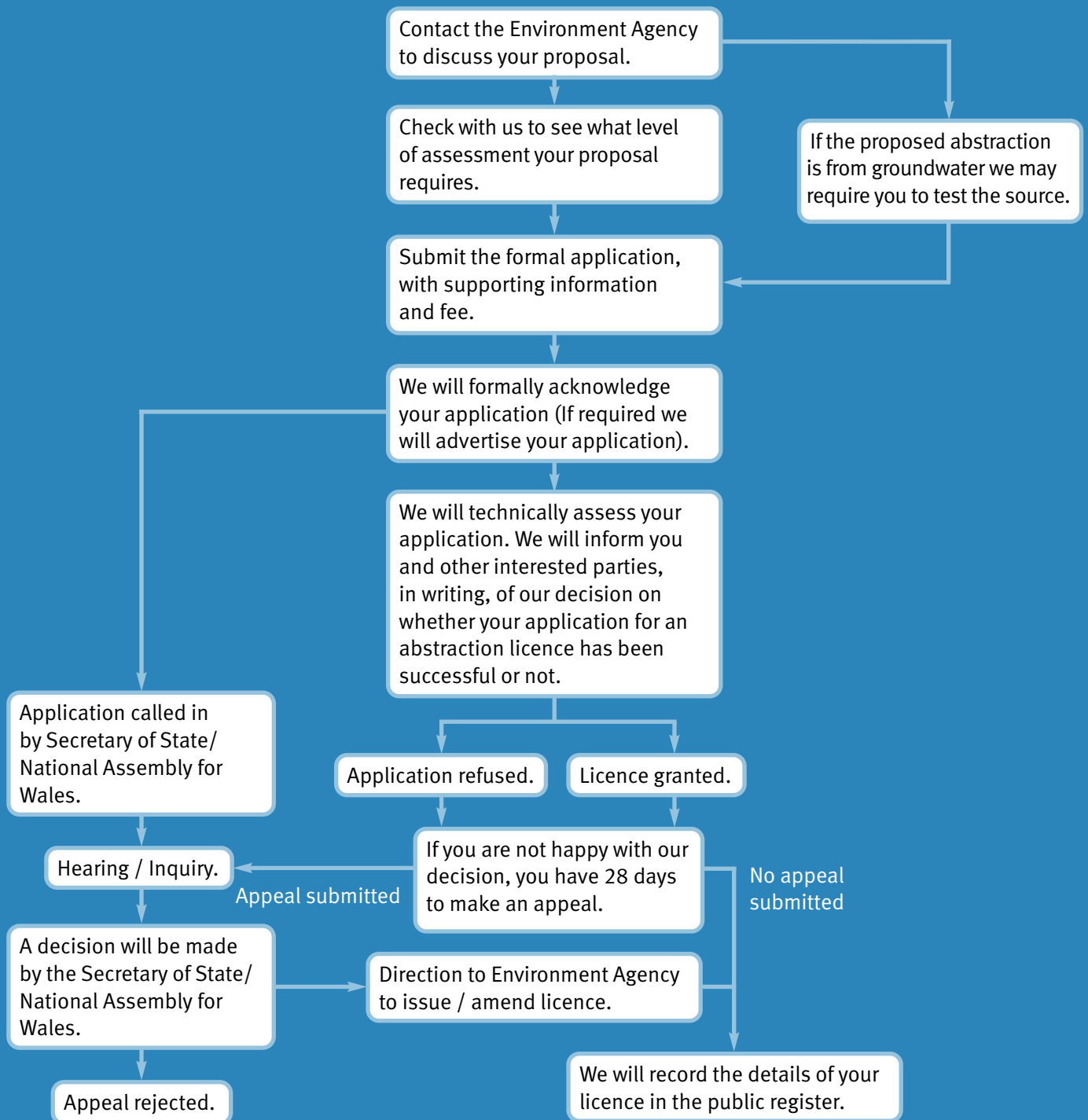
You can apply for three types of licence. The type of licence you need depends on what you want to use the water for, and how long for. As a guide, the types of licence are:

- Full abstraction licence – for most types of abstraction over 20 cubic metres a day;
- Transfer licence – for moving water from one location to another with no intervening use;
- Temporary licence – for abstractions over 20 cubic metres a day over a period of less than 28 consecutive days.

If you only need a temporary licence, the application procedure is simpler. Please contact us for further advice about how you do this.

The flow chart *'Applying for an abstraction or impoundment licence'* outlines the procedure in more detail.

Applying for an abstraction or impoundment licence



In some cases there are exceptions to this procedure. It is important that you contact us for advice before contemplating any form of abstraction, reservoir construction or sinking a borehole.

You must allow sufficient time for the licence application process before you plan to start abstracting water



How long will it take?

Provided that you supply us with all the required information, we aim to make a decision within 3 months of accepting your application, or 4 months if your application needs to be advertised. For temporary licences, we aim to make a decision within 28 days of receiving your completed application. You must allow sufficient time for the licence application process before you plan to start abstracting water. If your application is complex, it may take longer. We will advise you if this is the case and ask you to agree an extension of time for our decision. If you are not happy with our decision you have the right to appeal to the Secretary of State for the Environment, Food and Rural Affairs in England, or in Wales, to the National Assembly for Wales.

How much will it cost?

You will normally pay an application charge for the work we do in processing and registering your application. You must include this fee with your completed form. You will need to pay additional charges and costs if we have to advertise your application; we can provide details on request.

If we grant you a full abstraction licence, you will usually have to pay an annual charge for the amount of water you are authorised to abstract, calculated in accordance with our Abstraction Charges Scheme. The amount you pay will depend on what you use the water for, the source from which it is abstracted and the season in which you take it. We can supply a copy of our Abstraction Charges Scheme on request. There is no annual charge for transfer or temporary licences.

You will also be responsible for any private consultancy fees.



What if my needs change or I sell my land?

If your need for water changes you can apply to vary your abstraction licence or have it revoked if you no longer need it. Please contact us as soon as possible to discuss your changes. Abstraction licences (other than temporary licences) can also be transferred or apportioned (split between two or more parties) if you sell or lease the land. We will supply more details on request. In some cases, abstraction licences can be traded; for further details, ask for our flyer called *'Water Rights Trading'*.

Data Protection Act, Public Registers and Environmental Information Regulations

We will comply with the provisions of the Data Protection Act in handling any personal information you give us in respect of your application. By law we have to keep a register of applications for abstraction licences, our decisions on those applications and any subsequent changes made to abstraction licences. We will register details of your formal application and our decision and make these available for public inspection at our offices. We must also release any environmental information we may collect during the course of your application. This may include environmental reports, pumping test information and, after you obtain your licence, details of how much water you have actually abstracted and reported to us.

We will not make public details of any pre-application discussions you have with us.



Related publications

Making Your Views Count:

A Guide to Making a Representation about Applications for Licences to Abstract or Impound Water

The Environment Agency has the power to decide whether or not to grant licences to abstract or impound water in England and Wales. Anyone concerned about a proposal for a licence can make representations to us about it. This leaflet explains how you do this.

Abstraction Charges Scheme

Applicants for and holders of water abstraction licences are required to pay charges to cover the costs the Environment Agency incurs in managing water resources in line with the Water Resources Act 1991

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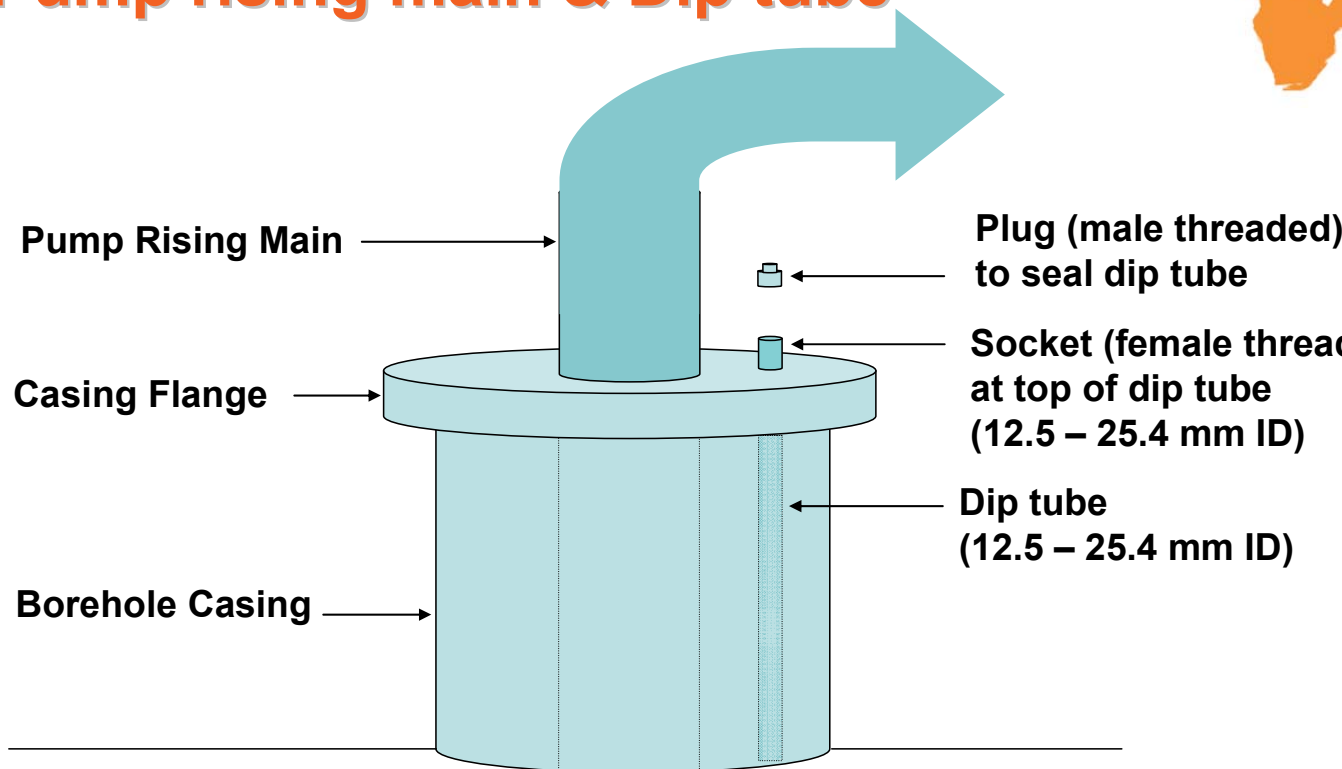


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Borehole head-works

Pump rising main & Dip tube



A retro fit of the dip tube is possible

Prelim