



South Staffs Water

**DROUGHT PLAN**

**SEPTEMBER 2007**

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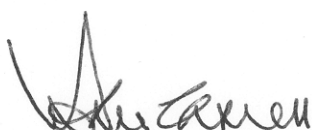
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## Foreword from the Managing Director

The past few years have seen a series of very dry summers and winters across England and Wales, and the 2005/6 drought affected much of the south of England, resulting in several Water Companies imposing restrictions on their customers. At South Staffordshire Water we are proud of our record of not having a hosepipe ban since the drought of 1976. However, we recognise the importance of managing these extreme events and minimising the impact of water abstraction on the environment.

The publication of the Draft Drought Plan in March 2006 was the first time that our Drought Plan has been made public and I am pleased to be able to show that we have incorporated comments from all of our stakeholders in this Final Drought Plan.

It gives me great pleasure therefore, to present to you our Drought Plan for 2007.

A handwritten signature in black ink, appearing to read 'Dr Jack Carnell', with a stylized, cursive script.

Dr Jack Carnell  
Managing Director

# 1 Introduction

## 1.1 Overview

This Drought Plan has been prepared in line with the Environment Agency's Planning Guideline issued in October 2005 and is an update of the Company's second Drought Contingency Plan, submitted to the Environment Agency in March 2003.

A draft of this plan was published on the Company's website in March 2006 and the plan was sent to a wide range of stakeholders. The representations received on the Draft Drought Plan have been considered and the plan has been amended where necessary.

Following the Water Act of 2003 drought plans are now statutory documents, which are submitted to the Secretary of State (DEFRA). The Secretary of State has considered the Company's response to the representations received on the Draft Drought Plan and has issued Directions to the Company (instructions on how the plan should be updated). These Directions have been incorporated into this plan.

The plan will continue to be reviewed annually and a revised plan will be submitted to the Secretary of State every three years or more frequently where there are material changes.

This Drought Plan is consistent with the 2004 Water Resources Plan, however where new work has been undertaken as part of the development of the AMP5 Draft Water Resources Plan this has been incorporated. In particular where additional water resources model developments or other improvements have been made these are identified and described in detail.

The plan will form the basis of internal procedures should a drought appear a realistic possibility in any one year, however it is not intended that the plan provides prescriptive rules to be followed in the event of a drought. The plan details the framework within which the Company will operate in such circumstances, and every effort has been made to ensure that this framework reflects the practical operational issues that may arise. All droughts will be unique in terms of the exact impact on the Company and therefore decisions regarding appropriate actions to be taken will be made on a case by case basis.

The plan is intended to be sufficiently flexible so that we are able to respond to a range of drought scenarios, as described in section 4.

This Drought Plan includes:

- A summary of the Company's Supply / Demand position, and an indication of the drought conditions that could threaten the Company's ability to provide reliable water supplies to its customers.



- A detailed drought planning framework with triggers for operational changes that would be implemented as a drought develops.
- The Company's preferred sequence of demand and supply measures and their likely timing / impact, so as to ensure that any drought is managed effectively.
- The environmental monitoring and assessment that will accompany the drought actions.
- The internal and external drought management and reporting structure and the content and timing of communications messages to customers in the event of a drought.

The Company does not consider that there are any parts of this plan that are commercially confidential, for the Company or for any third party, and the entire plan is presented in this document. There are no licensed water undertakers who supply water via our supply system.

## **1.2 Consultation on this Drought Plan**

South Staffordshire Water has been committed to engaging with all of the stakeholders who have an interest in this plan, and we have consulted with a range of stakeholders and the general public.

The Company consulted the Environment Agency, Ofwat, and the Secretary of State prior to the preparation of the Draft Drought Plan, and we have taken into account any comments or suggestions made. A summary of this consultation is included as Appendix A.

The draft plan was published on the Company website in April 2006, and was accompanied by a wide ranging consultation exercise.

The Company made all of its customers aware of the preparation of the Draft Drought Plan and the consultation period via Waterline, the information leaflet sent to all customers with annual bills. The Company also presented the Draft Drought Plan to its Customer Consultative Committee (CCC) and to the Consumer Council for Water (CCWater) as these are the main bodies representing customer interests. In addition, copies of the draft plan were sent to all the statutory consultees, as specified in the government's guidelines. These were:-

- The Secretary of State
- The Environment Agency
- OFWAT
- Local Authorities

- The Countryside Commission
- English Nature (Natural England)
- The Historic Buildings and Monuments Commission
- The Relevant Regional Development Agencies
- British Waterways
- The Consumer Council for Water

A total of 12 representations were received following the consultation period. The Company published a statement of response to these representations on our website in August 2006, this is attached as Appendix B, and a detailed breakdown of these is provided in Appendix C.

The Company has taken on board the stakeholder comments on the Draft Drought Plan and amended this final plan accordingly. Throughout this process we have been in regular consultation with the Environment Agency. The detailed responses to each representation have been updated and are also shown in Appendix C.

### **1.3 Directions from the Secretary of State**

Following the Water Act of 2003, the Secretary of State for Environment, Food and Rural Affairs has the power to make Directions to water companies, which specify how their drought plans should be amended. The Secretary of State issued Directions to all companies, including South Staffs Water (on 27<sup>th</sup> July 2007).

The specific Directions identified for South Staffs are summarised in the table below, along with our response.

Direction	SSW Response
<p><b>Clarification of Bulk Supply Agreements</b> Details should be provided of how adjacent companies share water resources (where there are bulk supply agreements between companies)</p>	<p>Bulk supply agreements are discussed in section 6.3.4 of the plan. The availability of the emergency bulk supply from Severn Trent Water is dependant on spare resources being available. This is unlikely as a drought would almost certainly affect both companies</p>
<p><b>Implementation Times for Drought Measures</b> Estimates of the length of time to implement drought measures should be provided</p>	<p>Estimates of the timescales for the implementation of drought options have been included within the comments column of table 1 and table 2 (section 6)</p>
<p><b>Methods for Forecasting the Impact of Droughts</b> Details of the methods used to forecast the impact of droughts should be provided</p>	<p>A new sub section (5.7) has been added to provide further details on forecasting methods.</p>
<p><b>Avoiding Emergency Drought Orders</b> Drought plans should identify the full range of options which would minimise the need for emergency drought orders (which allow restrictions via rota cuts and standpipes).</p>	<p>The Company has considered the full range of drought options in the final plan. We do not believe there are any further actions such as restrictions on other water users abstractions, emergency engineering work, further leakage (over and above the additional leakage already identified), or agreements with industrial users to restrict supply, that can be identified. The option to consider potentially damaging (groundwater) drought permits has already been included (section 6.5).</p>

## **2 Work Undertaken Since The 2003 Plan**

### **2.1 Summary of Key Changes Presented in the Draft Plan (March 2006)**

A summary of the changes made to the 2003 Drought Plan was presented in the draft plan in March 2006, and is provided below. More detail is contained within the relevant sections of this document.

- The Company stated a Level of Service for hosepipe bans and drought permits of once every 40 years. This is consistent with the Company not having a hosepipe ban since 1976.
- The draft plan takes into consideration the content of the Environment Agency's updated River Severn Drought Order Process (attached as Appendix D), which is part of the Environment Agency's Drought Plan. The link to the Environment Agency's Drought Plan is described in section 5.2.
- The Blithfield Reservoir control curves were revised following improvements to the Company's WRAPSIM model (see section 5.6). A single set of control curves for Blithfield have replaced the two sets previously reported.
- The previous plan was based predominantly on trigger levels at Blithfield Reservoir, with reference to the Environment Agency's drought triggers at Clywedog. The draft plan gives the Blithfield and Clywedog triggers equal status.
- The colour coded indicator for increasing drought severity has been simplified from 5 colours down to 4 in line with the revised control rules at Blithfield, and the Environment Agency's revised Clywedog triggers.
- The potential savings in water consumption which might accrue as a result of demand side actions more accurately reflect the true scope for savings (section 6.2).
- A more comprehensive list of water resources options has been included in this plan (see section 6.3), this includes new and more detailed proposals for drought permits.

### **2.2 Summary of Changes Between the Draft and Final Plan**

The Company has made a number of improvements to this final plan since the publication of the draft plan in March 2006. These changes include additional work that was identified in the draft plan, and improvements to the plan that have been made in response to the representations received from the public consultation on the draft plan in the spring of 2006. The key changes are summarised below:

- A revised communications plan has been included which provides more detail on Company roles and responsibilities, and a more

comprehensive framework for communication with our stakeholders.

- The section of the plan dealing with drought options has been expanded and more detail has been provided on implementation timescales, permissions and risks associated with each option.
- Clarification has been provided on the level of demand management activity undertaken during a drought. In particular that further leakage management will be considered at an early stage.
- More detail has been provided on the three drought permits that the Company has included in the plan. This includes a detailed environmental assessment for the Hanch Tunnel, River Severn, and Blithe/Trent permits.
- More detailed drought scenarios have been included, for specific drought years, in order to demonstrate that drought options are realistic and timely.
- A revised and improved drought monitoring plan has been added. This includes the existing baseline monitoring that is currently being undertaken at drought permit sites, any additional baseline monitoring that is required, and any specific drought monitoring requirements.
- An update on the ongoing investigations into specific groundwater source options has been added.
- Further clarification of the link between this drought plan and the Company's emergency planning procedures has been provided.

### **2.3 Ongoing Work**

The Company is pleased with the response that it has had from our stakeholders during the ongoing consultations on the plan, and it has made changes to the plan to reflect our stakeholders views. We have already identified some further work (in particular on the specifics of drought monitoring and mitigation), and we will continue to work with stakeholders to ensure that the plan remains current

### **3 Supply Demand Position and Levels of Service**

#### **3.1 Supply Demand Balance Position**

The Company's 2004 Water Resource Plan includes details of our current and projected resource position. The Resources Plan focuses on the Company's ability to meet both annual average and peak week demand scenarios, in dry years. The calculation of resources available to the Company is based on the available climate data that covers the driest periods in the last 85 years, including the major droughts of 1976 and 1995/6. The demand scenarios are derived using the current annual average demand, with a dry year factor and a peak week factor based on data from the 1995/6 drought.

This Drought Plan is designed to provide more detail on the triggers and actions that will be necessary given a recurrence of the historic droughts over the last 85 years, but also to manage as efficiently as possible, a drought event which is more severe than this.

The Company currently has sufficient resources to meet dry year demand on an annual average, and a peak week basis. In the 2004 Water Resources Plan we projected a dry year annual average surplus of resources of 24 MI/d for 2006/7, with a surplus of 8 MI/d in 2006/7 for dry year peak week conditions.

In the 2004 Water Resources Plan the Company has planned that sufficient resources will be available to meet future dry year annual average and peak week demands, beyond the year 2030. This will be achieved by reducing levels of leakage and by developing more resource capacity.

The Company has included a margin of safety to account for the uncertainties involved with supply demand balance forecasts. This headroom allowance (supply security) accounts for, amongst other things, uncertainties in demand forecasts, the impact of climate change, uncertainties in supply forecasts and the risk of losing a source due to pollution. In the 2004 Water Resources Plan this margin of safety or 'Headroom' was equivalent to 8% of peak week demand (for the year 2006/7).

The Company's 25 year supply/demand forecast will be updated, and published (as a draft) as part of the next round of business planning by April 1<sup>st</sup> 2008.

#### **3.2 Levels of Service (Frequency of Hosepipe Bans)**

Despite the drought conditions experienced in 1995, the Company has not imposed a hosepipe ban since the record drought on the River Severn in 1976. This level of service was confirmed in the 2004 Water Resources Plan.

The Company uses a water resources model called WRAPSIM to examine resource availability by simulated drought years. The model uses an extended 84 year inflow sequence for Blithfield Reservoir, and for the River Severn.

The latest model simulations suggest that a hosepipe ban could be required twice if this period of climate was repeated. A hosepipe ban frequency equivalent to once in every 40 years has therefore been used in this plan. The 84 year record includes the most severe drought on record (1976) and the more recent severe drought in 1995/6.

This level of service is consistent with the 2004 Water Resources Plan and the Draft Drought Plan.

The key modelling improvements which have enabled this level of service position to be defined are summarised below.

- Modelling of the River Severn system by the Environment Agency using Severn Trent Water's Ressim model has confirmed that a drought order will still be required in one year of the 80 year simulated record (1976), if the same climatic conditions were encountered. The Environment Agency are responsible for applying for a drought order on the River Severn, however it is expected that DEFRA will require water companies to impose a hosepipe ban at the same time (see section 5.2).
- The control rules for Blithfield Reservoir have been revised and improved. The 'implement hosepipe ban' curve is now higher than the previous curve. The previous trigger was too low (set at the Emergency/Critical Storage curve of 30% storage), and only provided 2-3 weeks of benefit before the reservoir reached dead storage. Environment Agency policy is that implementation of drought permit must be preceded by a hosepipe ban. Raising the hosepipe ban curve at Blithfield also allows more time for the benefit of the Company's drought permit options to be delivered.
- Simulation using the Company's WRAPSIM model shows that the revised 'implement hosepipe ban' trigger for Blithfield Reservoir is crossed twice in the 84 year WRAPSIM model simulation, during 1976 and 1993/4.

Since the publication of the Draft Drought Plan in 2006 the Company has continued to update and improve our water resources model (WRAPSIM). Key improvements since the Draft Drought Plan include:

- An updated model structure
- An updated and improved inflow sequence
- A more representative simulation of the Nethertown and the Trent abstractions

- A refinement of the control rules for Blithfield
- Updated groundwater deployable output figures

This updated modelling has resulted in a small change to the Company's reported dry year average deployable output (up 2%), with a revised peak week deployable output (down 1%).

The model will continue to be updated during 2007 as part of the preparations for the next Business Plan submission to OFWAT.

The Company will not consider planning for a hosepipe ban as a means of ensuring that water for essential purposes remains available, except in exceptional circumstances. We believe that this level of service is consistent with customer expectations. Customer research, undertaken by the Company in 1999 indicated that 70 per cent of domestic customers preferred to pay an additional amount on their water bill, rather than be faced with planned hosepipe restrictions.

The Company has made a commitment to customers to pay compensation to them if they suffer a loss of supply as a result of our mismanagement during a drought situation. Each domestic customer will receive a £10 payment for each day that their home is without water, subject to a maximum of the average annual bill. There is no entitlement to compensation if the circumstances are so exceptional that it would have been unreasonable for us to have avoided the interruption or cut-off.

Compensation is only an entitlement where circumstances are such that the interruption or cut off could have been reasonably avoided. In normal circumstances emergency restrictions will be made under a drought order. A drought order would only be applied as a result of exceptional weather and in accordance with procedures set out in this Plan. If this has been the sequence of events then it would be deemed that the Company could not reasonably have avoided the restriction and compensation would not be payable. In the event that the Company had not sufficiently adhered to its drought plan and had mismanaged its resources as a result then the restriction could reasonably have been avoided and compensation would be paid to the customer.

### **3.3 Summary of Recent Investment**

Investment in the Company's treatment works and distribution network since 1995 has improved the Company's ability to manage a future drought. This work has included:

- Enhanced security of Hayley Green supply area by laying a 500mm main from Shavers End to Hayley Green.



- Construction of a Cryptosporidium plant at Crumpwood, the Company's most northern source. This development, combined with an existing trunk main now provides a more robust resource around Uttoxeter and the northern extremities of the Company's supply area.
- Improved water treatment process at our Fradley Source
- Duplication of the 400 mm main from Hinksford to Hagley
- Blending mains schemes for Seedy Mill with Pipe Hill, and Hinksford with Hagley
- The Company's investment plans for the first five years of the 21st Century have also included provisions to improve the availability and reliability of resources and supply capacity, and also to manage demand. The Company's recent initiatives have included:
  - Completion of the expansion of the peak yield at Seedy Mill. This will enable an extra 40 million litres of water a day to be treated from this site.
  - Remediation works to boreholes at its Slitting Mill source.
  - At its Churchill source the renewal of pumping plant with capacities more closely aligned with the peak licence value has been completed.
  - Implementation of a policy to compulsorily meter users of unattended garden watering devices, such as lawn sprinklers.
  - Implementation of a policy to offer free meters to domestic customers, and recently a proposed trial of metering on change of occupier, with a view to adopting this as a Company policy.
  - Pursuing additional metering policies, including the continuation of the policy to meter all new connections and a new policy to meter those commercial properties that are currently unmeasured. Wherever it is physically possible, meters will have been fitted to the majority of commercial properties by the end of 2007.
  - Investing in infrastructure which, along with associated operating policies and pressure management schemes, will ensure achievement of the Company's economic level of leakage.

### **3.4 Development of Water Resources Modelling Software**

The continued refinement of the Company's water resources modelling software has been ongoing since the first submission of the Drought Plan. The Company has commissioned consultants Entec to assist in this development of the model and they have worked closely with both the Company and representatives from the Environment Agency to conclude key

development milestones prior to the submission of the Strategic Business Plan in 2004. The development of the Water Resources Model (WRAPSIM) has continued for this Final Drought Plan submission, this has included a number of additional improvements, including the refinement of the control rules for Blithfield Reservoir. The latest model developments will be incorporated into the Company's next Water Resources Plan, (the draft of which is due for publication on 1<sup>st</sup> April 2008).

## **4 Drought Scenarios**

### **4.1 Drought Scenarios Covered by this Plan**

In order to demonstrate how the Company's proposed drought actions would be implemented and to test the associated triggers, different scenarios have been examined to show how a range of historic droughts would be managed, given current water demands.

The Company operates a single integrated resource zone, supplied by the River Severn, by Blithfield Reservoir, and by 26 groundwater sources.

In general the Company's groundwater sources are not significantly affected by droughts. This is because all of our groundwater sources abstract from the Sherwood Sandstone aquifer. During drought periods, regional groundwater levels in this aquifer typically only fall by 1-3 metres. For the majority of our sources this does not affect our ability to supply. As a result we do not consider it necessary to examine specific groundwater drought scenarios.

The River Severn is susceptible to a single season drought, as evidenced by the 1976 drought. This is because river flows can reduce fairly quickly, especially following a period of low rainfall and low groundwater levels. Low groundwater levels can result in a reduction in groundwater baseflow from the Triassic Sandstone aquifer in Shropshire, which is an important component of river flow on the Severn, especially during low river flows.

The River Severn is regulated (supported) by releases from Clywedog Reservoir, from the Shropshire Groundwater Scheme, and to a lesser extent by releases from Lake Vyrnwy. Releases are made in order to maintain a minimum flow on the river. River regulation is managed by the Environment Agency. Storage levels at Clywedog are the key measure for the Environment Agency for drought severity and for triggering actions (see section 5.2).

Blithfield Reservoir is considered to be two season critical, as it's lowest storage levels occur in the second year of a drought, if the reservoir has failed to refill over the winter. The critical period on record is 1975/76, although other significant droughts on the record occurred in 1933/34 and 1995/96.

The Company has not identified a separate summer and winter drought scenario as the control curves cover the entire year. It is possible that where a hosepipe ban may be indicated by the trigger curves, that this may not be appropriate during winter months. The Company will consider the implementation of such options in the context of the time of year when the trigger curve is crossed.

The response of our water resources system to a range of historic droughts has been examined using WRAPSIM, our water resources model. The model

simulates the previous 84 years of climate data and examines how the Company would meet current demands for water. This modelling has confirmed that the most severe droughts from the historic record, that would affect the Company, are 1933/34, 1975/76 and 1995/96. These drought periods also include the most severe single season droughts on record (e.g. 1976) and are therefore considered the most appropriate scenarios to test this drought plan. Each of these scenarios is considered in more detail below.

Modelled storage at Clywedog has been provided by Severn Trent Water/Environment Agency, and is derived from Severn Trent Water's RESSIM model.

The triggers curves and actions associated with each reservoir are detailed in sections 5 and 6.

#### **4.2 Scenario 1: A Repeat of the 1933/34 Drought**

The 1933/34 drought was a two season drought which was characterised by an exceptionally dry winter. The modelled storage at Clywedog (River Severn) and at Blithfield is illustrated below. The trigger curves at Clywedog have been developed by the Environment Agency, as the organisation responsible for managing the river, and they are used by the Agency to manage the river during droughts, and ultimately to trigger a drought order on the River Severn to maintain river flows.

The Company has included the Environment Agency's triggers at Clywedog within this Plan as they are an important indicator of drought severity. However the crossing of a trigger curve at Clywedog does not necessarily determine action for the Company. This will depend on a range of factors, in particular storage at Blithfield.

## 4.2.1 River Severn (Clywedog Reservoir)

Figure 1 Modelled Storage at Clywedog 1933/34

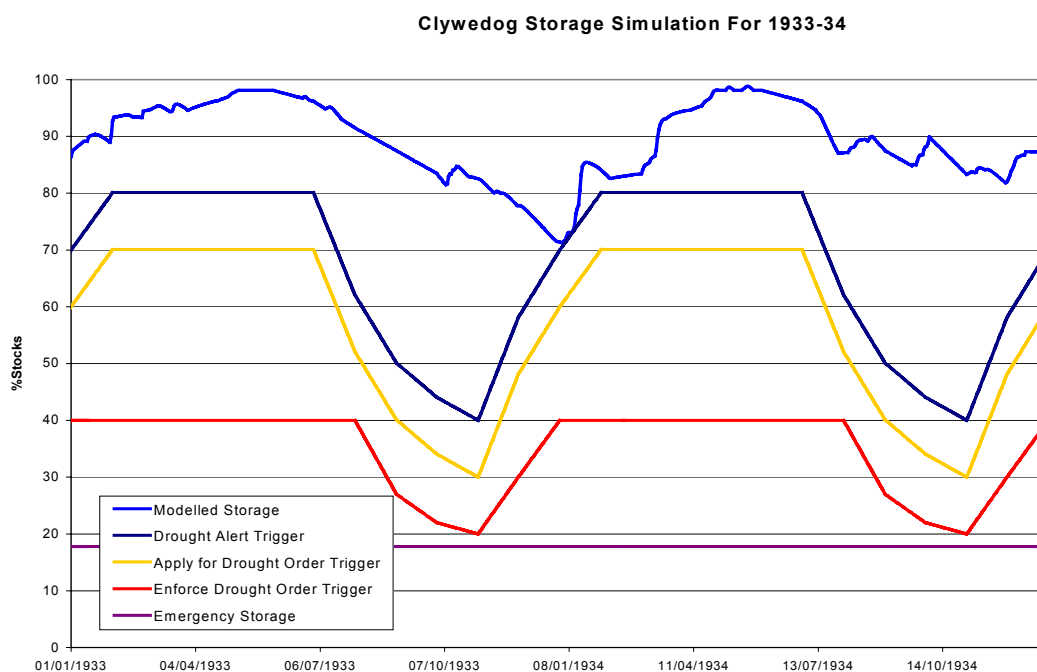


Figure 1 indicates that Clywedog storage would not cross the Environment Agency's Drought Alert curve at Clywedog, given a repeat of the 1933/34 drought. As a result no South Staffordshire Water drought triggers would be crossed, and no drought actions would be taken as a result of storage levels at Clywedog.

## 4.2.2 Blithfield Reservoir

Figure 2 Modelled Storage at Blithfield 1933/34

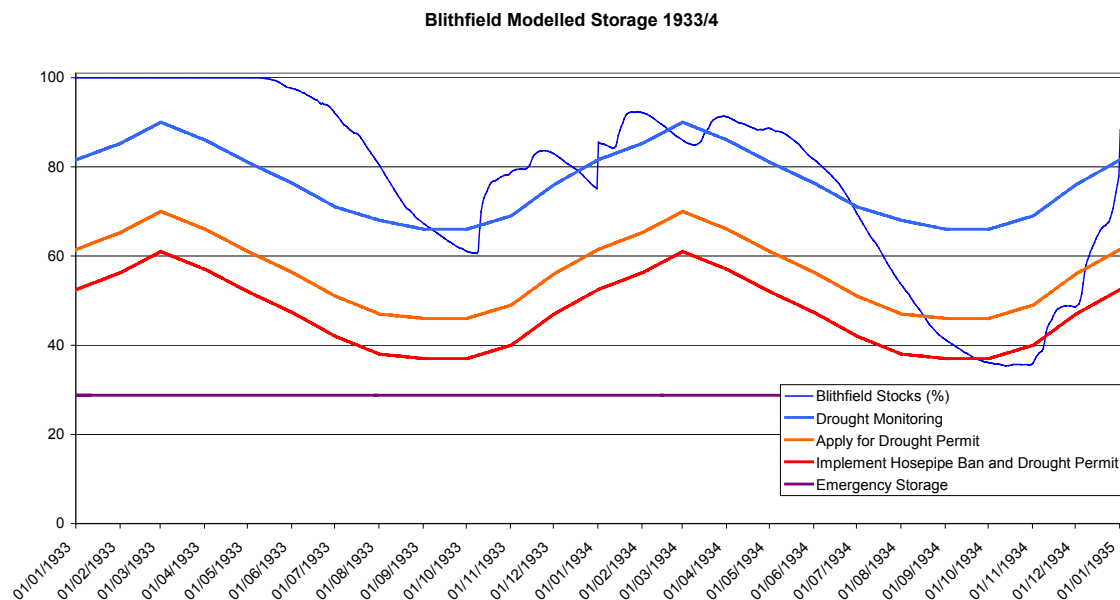


Figure 2 indicates that given a repeat of the 1933/34 drought, Blithfield storage crosses the Drought Monitoring trigger at the end of June 1934, it falls below the Apply for Drought Permit trigger in mid August, and the Enforce Hosepipe Ban and Drought Permit trigger in the last week of September. These timescales are considered to be sufficient in order to implement any necessary drought actions, and to apply for and implement a drought permit if required.

As each drought trigger is crossed the Company would initiate drought management actions as described in section 6 of this plan.

## 4.3 Scenario 2: A Repeat of the 1975/76 Drought

The 1975/76 drought was a two season drought which was characterised by a very dry winter. In addition, 1976 was one of the driest single years on record, and it represents the critical single year for the River Severn. The modelled storage at Clywedog (River Severn) and at Blithfield is illustrated below.

### 4.3.1 River Severn (Clywedog Reservoir)

Figure 3 Modelled Storage at Clywedog 1975/76

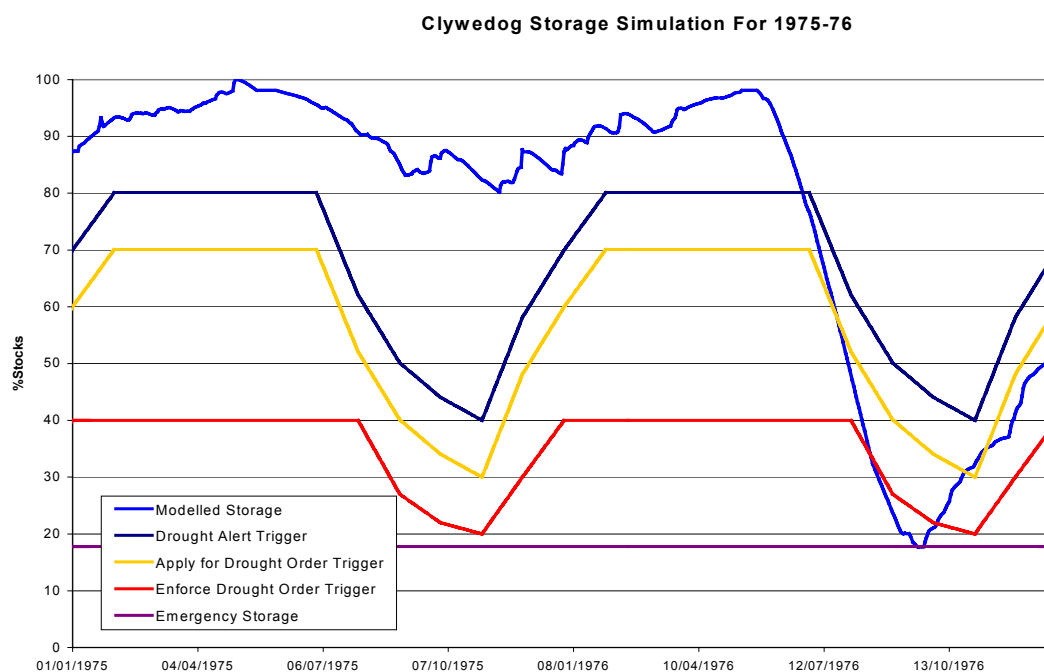


Figure 3 indicates that given a repeat of the 1975/76 drought, Clywedog reservoir would not refill in the winter of 1975. During the following summer the reservoir is used to regulate the Severn and storage falls rapidly between June and August.

The plot suggests that the Environment Agency's Drought Alert curve would be crossed at the end of June. This could trigger the Company to consider initiation of drought management actions as identified in section 6, dependant on the storage situation at Blithfield. For example if Blithfield is in a healthy position then drought management actions may be delayed. If Blithfield storage is approaching the Drought Monitoring trigger (2-3 weeks away) then actions will be initiated immediately.

The model simulation suggests that Clywedog storage falls below the Environment Agency's Apply for Drought Order trigger in the third week in July. Again, this would only trigger action if storage at Blithfield was within 2-3 weeks of the Apply for Drought Permit trigger. If this were the case then the Company would initiate further drought management actions as identified in section 6, including the potential application for a drought permit at Hanch Tunnel and on the Blithe/Trent.

Crossing of the Environment Agency's Apply for Drought Order trigger at Clywedog will not result in an application by South Staffs for a drought permit at Hampton Loade, this would only take place once all other options had

been exhausted (see below).

The modelling suggests that the Environment Agency's Enforce Drought Order trigger would be crossed in mid August. At this time the Company will be expected to reduce abstraction at Hampton Loade by 5%.

The Company has included two separate drought permit options for Hampton Loade in this plan (see section 7.4). Any application for a drought permit at Hampton Loade would be an option of last resort and would require Clywedog storage to be below the Environment Agency's Enforce Drought Order trigger, it would require storage at Blithfield Reservoir to be below the Enforce Hosepipe Ban and Drought Permit trigger curve, and all other drought permits to already be in operation.

Under these circumstances a drought permit application for Hampton Loade could be made at the end of August, 2-3 weeks before the Enforce Drought Order/Implement Drought Permit trigger was crossed at Blithfield (see below).

A comparison of the storage at Clywedog and at Blithfield for the simulated period 1975/76 suggests that the Clywedog Drought Alert trigger and the Blithfield Drought Monitoring trigger would be crossed at about the same time (at the end of June 1976). However, the rapid drawdown of Clywedog means that the Agency's Apply for Drought Order trigger would be crossed approximately one month (3<sup>rd</sup> week in July) earlier than the corresponding Blithfield trigger (3<sup>rd</sup> week in August). The same is true of the Enforce Drought Order/Implement Drought Permit triggers (mid August and mid September respectively). As discussed, under these circumstances the Company would defer any drought permit application until Blithfield storage was closer to the corresponding Blithfield trigger.

The effect of low storage levels at Clywedog is therefore to accelerate drought management actions linked to Blithfield by 2-3 weeks, and ultimately to trigger a drought permit application for Hampton Loade.



### 4.3.2 Blithfield Reservoir

Figure 4 Modelled Storage at Blithfield 1975/76

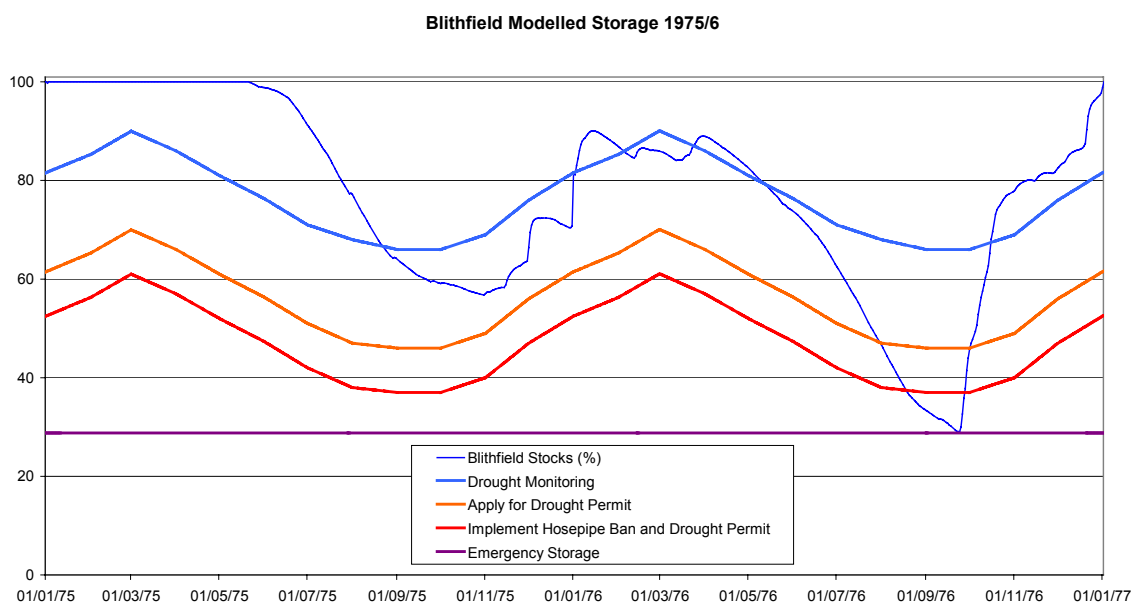


Figure 4 indicates that given a repeat of the 1975/76 drought, Blithfield reservoir would not refill completely in the winter of 1975. As a result, in the following year storage crosses the Drought Monitoring trigger in May, it falls below the Apply for Drought Permit trigger at the end of July, and the Enforce Drought Permit trigger towards the end of August. This is considered to be sufficient time to apply for and implement any necessary drought permit. The implementation of any drought permit would need to be preceded by a hosepipe ban.

As each drought trigger is crossed the Company would initiate drought management actions as described in section 6 of this plan.

#### 4.4 Scenario 3: A Repeat of the 1995/96 Drought

The 1995/6 drought was a severe two season drought, consisting of two dry summers and an intervening dry winter.

##### 4.4.1 Clywedog Reservoir

Figure 5 Modelled Storage at Clywedog 1995/96

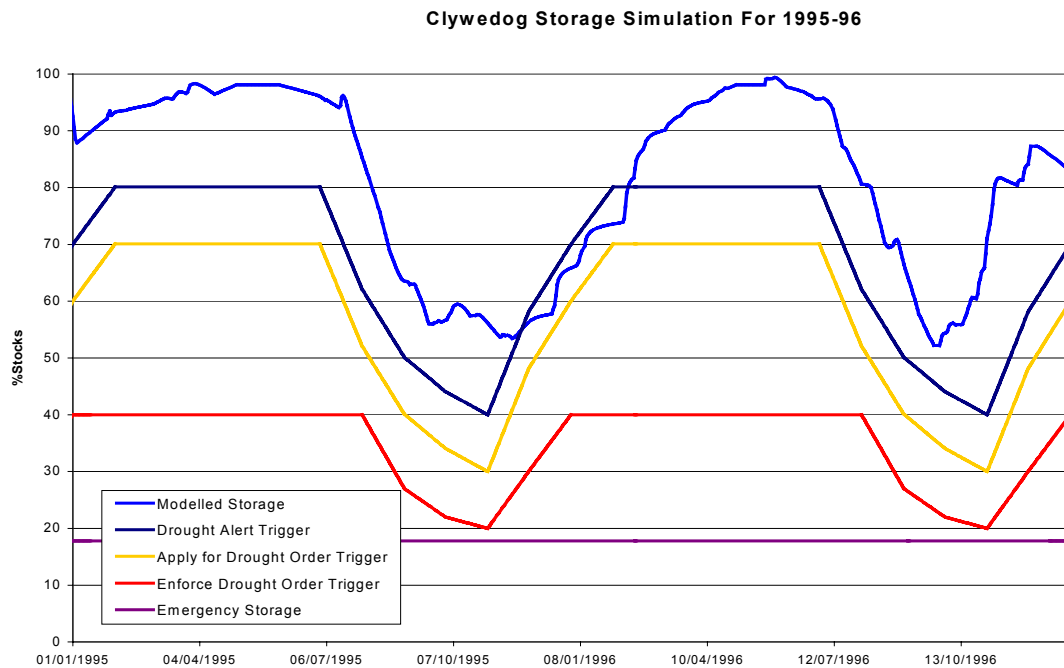


Figure 5 indicates that Clywedog storage would only just cross the Environment Agency's Drought Alert curve at Clywedog at the end of 1995, given a repeat of the 1995/96 drought. Given the time of the year, and the rising storage trend in 1995, it is considered unlikely that any significant drought management actions would be undertaken by the Company as a result of storage levels at Clywedog. Under these circumstances the storage at Blithfield would be the driving indicator.

## 4.4.2 Blithfield Reservoir

Figure 6 Modelled Storage at Blithfield 1995/96

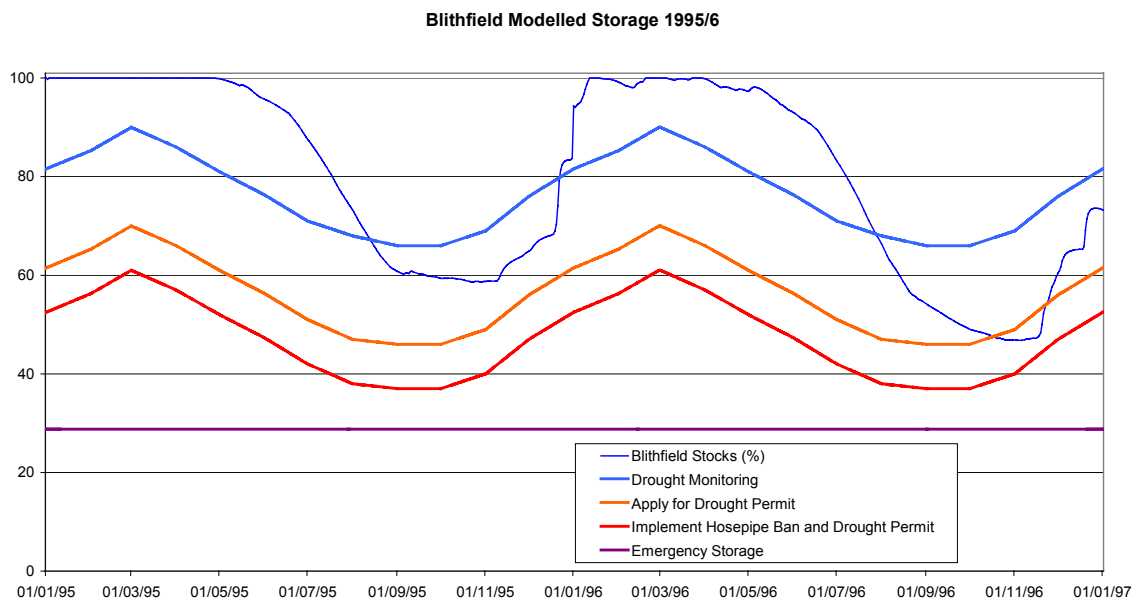


Figure 6 indicates that given a repeat of the 1995/96 drought, Blithfield reservoir would be drawn down in the first year of the drought, cutting the Drought Monitoring Curve at the end of July, and the Apply for Drought Permit trigger in mid October. Drought management actions would be implemented as described in section 6 of this plan. Storage does not cross the Implement Hosepipe Ban and Drought Permit trigger.

The sequence of actions is linked to the crossing of drought triggers, as described in section 6 of this plan.

## 4.4.3 Conclusions

The detailed drought storage simulations presented for Clywedog and Blithfield reservoirs demonstrate that the Company can manage a range of droughts, and that the drought plan allows sufficient lead times to implement the range of management options.

## 5 Drought Control Rules (Trigger Curves and Actions)

### 5.1 Drought Severity and Drought Triggers

The Company has adopted a colour coded system which identifies the severity of a drought. This colour coding is aligned with the two control rules used by the Company to manage a drought situation, at Blithfield Reservoir, and the River Severn (Clywedog). These control rules define the drought trigger curves and actions which can be taken as the severity of the drought increases. The colour coding is also aligned with the Drought Management and Communication Plan (section 9). The alignment of the colour coding system and the drought triggers is shown below, the triggers are described in more detail in section 5.

Colour	Description	Blithfield Trigger	River Severn Trigger
Blue	Normal Operation	above 1	above 1
Yellow	Drought Monitoring	1	1
Orange	Drought	2	2
Red	Severe Drought	3	3

As noted in section 4 the two critical resources within the Company are the River Severn and Blithfield Reservoir, as our groundwater sources are largely unaffected by drought.

The Environment Agency is responsible for managing the River Severn, and it has developed a set of trigger curves at Clywedog Reservoir in order to manage the river during a drought. These trigger curves have been included in this Drought Plan (section 5.2).

Drought trigger curves have also been developed by the Company for Blithfield Reservoir (5.6).

In addition to these control rules the Company will give due regard to a number of other factors when considering whether to implement its drought management actions. These factors include, the demand for water, sources which may be out of supply, the medium term weather forecast, the soil moisture deficit, the time of year, and whether the level in Blithfield Reservoir is rising or falling. The Company reserves the right to use its discretion in the interpretation of the control rules and the implementation of the available actions.

### 5.2 River Severn Triggers and Actions

The River Severn is a Regulated river that is managed by the Environment Agency. Releases from Lake Vyrnwy and Clywedog Reservoir, and

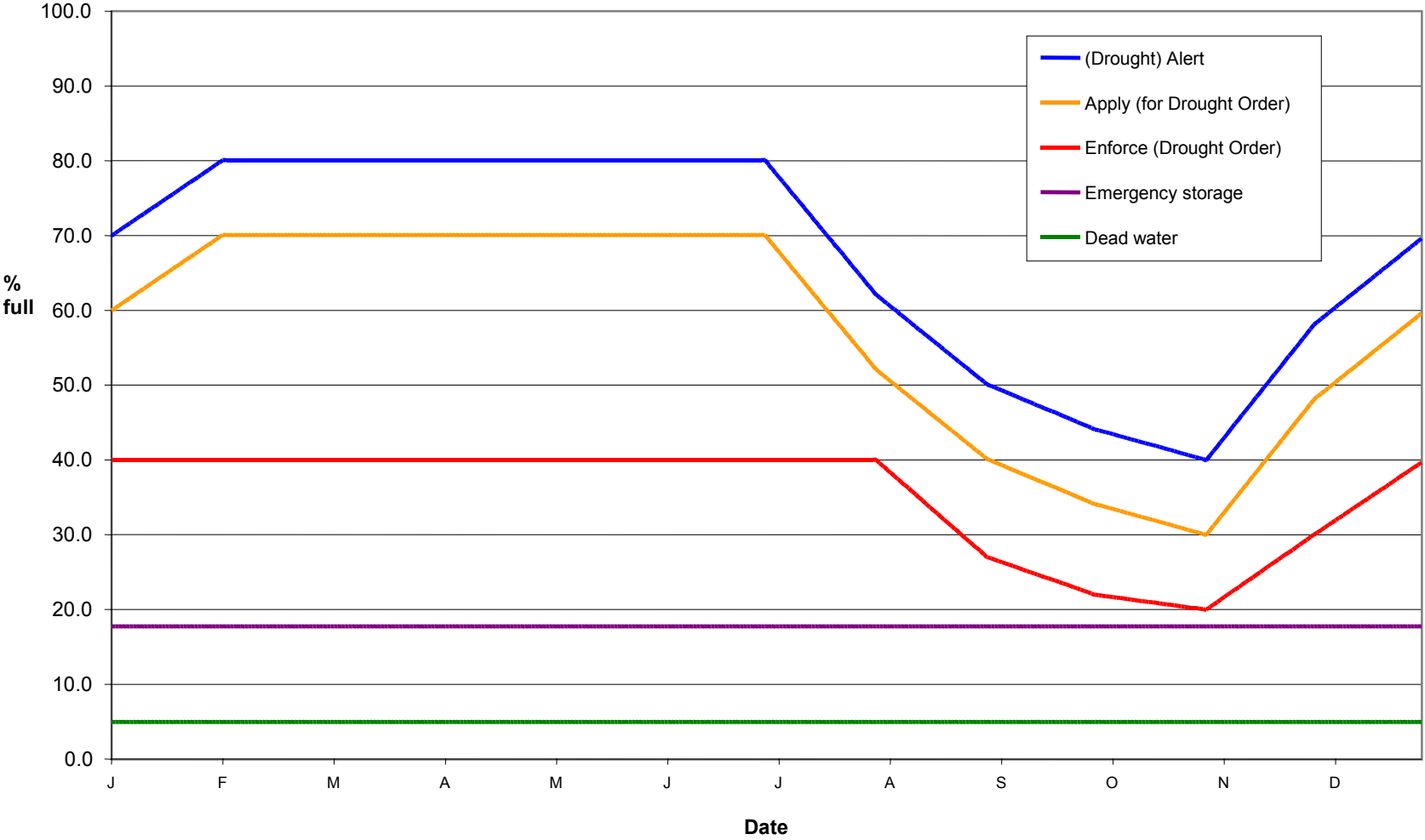
abstraction from the Shropshire Groundwater Scheme are used to maintain the flows in the river. Under the current control rules the Environment Agency is required to maintain a flow at Bewdley of at least 850 MI/d (as a 5 day average), with a minimum daily flow of 650 MI/d.

The river is managed by the Environment Agency in order to protect public water supplies and other abstraction rights, to maintain the environmental habitat of the river, to maintain freshwater flows into the Severn Estuary, and to protect navigation rights and the other amenity uses. The Company has no control on the use of the river regulation sources.

The Midland Region of the Environment Agency has previously prepared a drought contingency plan for the River Severn in 2000 and 2003 (as part of their Regional Plan). This plan has recently been updated by the Environment Agency and the draft is available on their website.

The control rules for the River Severn are based on storage levels at Clywedog Reservoir (the main source of river regulation). These rules have been reviewed by the Environment Agency during the preparation of their new Drought Plan. South Staffordshire Water, and the other major public water supply stakeholders on the river (Severn Trent Water, United Utilities and Bristol Water) were consulted by the Environment Agency as part of this process. United Utilities were consulted because the reservoir at Vyrnwy can be used to regulate the River Severn. The revised control rules produced by the Environment Agency are attached as Appendix D. The Environment Agency's drought triggers are shown on figure 7.

Figure 1 River Severn Drought Trigger Curves at Clywedog Reservoir



The main elements of the Environment Agency's River Severn control rules are summarised below:-

Crossing the drought alert trigger initiates a meeting of the Environment Agency and the water companies to discuss the potential drought order. Preparations are made for the potential drought order application and the Environment Agency issues appeals for the public to reduce demand.

When the apply for drought order trigger is crossed the Environment Agency applies for a drought order to the Secretary of State.

When the drought order in force trigger is crossed the drought order conditions become live (see Appendix D). The main conditions affecting the Company are a 5% reduction in abstraction licence at Hampton Loade.

If the emergency storage trigger is crossed the minimum flow at Bewdley is further reduced and the releases from Clywedog are constrained even further.

The Company has aligned this Drought Plan with the River Severn triggers in the Environment Agency's Plan, however there are still some areas of uncertainty over the management of the River Severn in a severe drought. These uncertainties are discussed in section 10.2.

The Company's triggers and main actions for managing a drought affecting the River Severn are shown on figure 8. These control rules are colour coded to identify the increasing severity of a drought, as described in section 5.2. The supply and demand management options that may be implemented at each trigger are described in more detail in section 6.

The Environment Agency's River Severn drought triggers have been incorporated into this plan and this reflects the importance of the Hampton Loade supply to the Company. However, low storage levels at Clywedog alone will not necessarily trigger action by the Company and this will also be dependant on the storage situation at Blithfield. For example if Blithfield is in a healthy position then drought management actions are likely to be delayed. If Blithfield storage is approaching a trigger (2-3 weeks away) then actions will be initiated immediately.

The effect of low storage levels at Clywedog is therefore to accelerate drought management actions linked to Blithfield by 2-3 weeks, and ultimately to trigger a drought permit application for Hampton Loade.

The use of the Clywedog trigger curves and the timing of actions is further discussed in section 4 with reference to specific droughts.

### **5.3 The River Severn Modelling Group**

Severn Trent Water has developed a water resources simulation model for the River Severn (& River Wye) using a modelling package called Ressim (and now an updated model in AQUATOR). This is currently the most

advanced model available for examining different water resource scenarios on the river, and the model is used by the Environment Agency (by agreement with Severn Trent Water). The model simulates river flows, reservoir storage, and the amount of water available to meet different demand scenarios.

Discussions have continued between the Environment Agency and the main public water supply abstractors on the river (Severn Trent Water, South Staffordshire Water, and Bristol Water) to discuss how the model could be used by all parties. This group has been named the River Severn Modelling Group. As a result of the ongoing discussions, Severn Trent Water have recently confirmed that South Staffordshire Water can make use of the model for drought management and water resources planning purposes. Use of a single model by all the major abstractors will enable a consistent approach to decision making and drought management. We have included a meeting of the River Severn Modelling Group once the Environment Agency's drought alert curve has been crossed at Clywedog, in the communication plan.

The River Severn Modelling Group is separate to the River Severn Drought Management Group which will be convened by the Environment Agency once the alert trigger curve is crossed at Clywedog. The modelling group will concentrate on technical aspects such as the specification and delivery of modelling runs which each Company may require. The purpose of the River Severn Drought Management Group is to manage a drought on the River Severn.

#### **5.4 Use of Chelmarsh Reservoir to Assist River Regulation**

The Company has bankside storage at Hampton Loade on the River Severn in the form of Chelmarsh Reservoir. This provides the facility to assist the Environment Agency with the regulation of the river. Since the previous plan further development has taken place, which under drought conditions may increase the potential for using Chelmarsh for drought management.

The abstraction licence at Hampton Loade has been changed to allow a more rapid filling of Chelmarsh after periods of non-abstraction from the River Severn. Non-abstraction could result from river water quality problems or indeed a request from the Environment Agency to cease abstraction to assist with River Regulation. The current licence has significantly reduced the time taken to refill Chelmarsh. This change in the abstraction licence offers the Company considerable additional comfort that the recovery of levels in Chelmarsh can be achieved without significant risk to public water supply. It will be essential that there is co-ordination between the operations of South Staffordshire Water and the Environment Agency during a drought period.

#### **5.5 Co-ordination of Drought Management on the River Severn with Severn Trent Water**

South Staffordshire Water's abstraction licence at Hampton Loade is a joint



licence with Severn Trent Water, and up to 1/3 of the licence can be used to supply Wolverhampton (Severn Trent supply area). In addition, the licence at Hampton Loade is linked to Severn Trent Water's abstraction licence at Trimpley, further downstream on the River Severn. The total abstraction from Hampton Loade and Trimpley cannot exceed 400 Ml/d during periods of Maximum River Regulation.

These complex joint licences mean that it is essential for close co-operation between the two companies during a drought to ensure that licence conditions are not breached. The two companies have met to discuss alignment of their respective Drought Plans and this is reflected in the communication strategy in this plan.

## **5.6 Blithfield Reservoir Triggers and Actions**

The drought trigger curves for Blithfield Reservoir are shown in figure 9. These curves have been derived using operational experience, and by modelling the inflows into the reservoir and the demand on Seedy Mill. The trigger curves are summarised below.

- Normal operation takes place above the drought monitoring curve. The output from Seedy Mill is only restricted by the capacity of the works or by the abstraction licence.
- When the drought monitoring trigger curve is crossed the Company moves from the normal cost minimisation mode to a resource conservation mode of operation. The range of potential actions that may be implemented at this stage are described in section 6. These include a range of demand management options, minimising abstraction from Seedy Mill (helping to conserve storage at Blithfield), and using the Nethertown pumpback, including the Trent recirculation if residual flows are insufficient on the River Blithe.
- When the apply for drought permit curve is crossed the Company will apply for a drought permit to maintain the Trent recirculation if required. Other groundwater drought permits (Hanch Tunnel) may also be applied for at this stage. (Note: the proposed drought permit at Hampton Loade is linked to storage at Clywedog).
- The implement drought permit curve is used to illustrate when the drought permits would be operational.
- The Emergency Storage Curve is 4% above the dead storage curve. This water will only to be used as a last resort and is a buffer before dead storage is reached. Dead storage (25%) represents the level of storage below which it is extremely difficult to abstract water because of the hydraulics of the system and the quality of the water would be so poor that it will probably be unacceptable to utilise it.

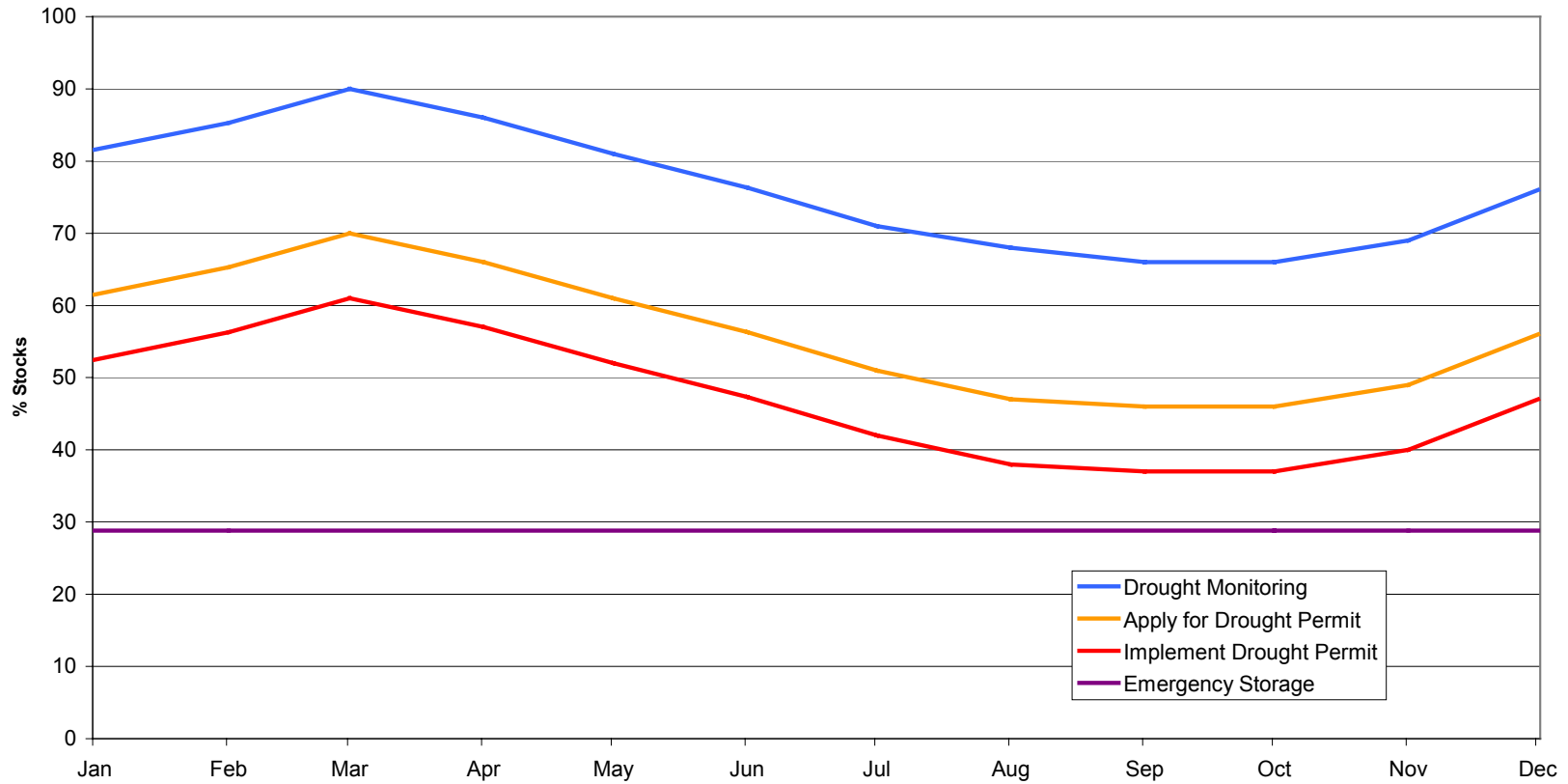
A detailed description of the full list of supply and demand actions that may take place as each trigger curve is crossed is included in section 6.

The Company's WRAPSIM model has been improved and the trigger curves at Blithfield have been revised and improved since the last plan was submitted to the Environment Agency in 2003. This work was undertaken by consultants (Entec).

The improvements to the model and to the control curves include:

- The inflow sequence for Blithfield has been extended from the previous range of 1970-1997 up to 1920-2004.
- The representation of Nethertown and the Trent recirculation has been improved in the model.
- There is now a single set of curves for Blithfield, whereas previously there was a set of curves for a Blithfield only drought, and a set of curves for a drought affecting both Blithfield and the River Severn. In the event that a future drought affected both resources at the same time then all that will happen will be that the trigger curves at Blithfield will be reached earlier, and appropriate action taken. As a result it is now considered unnecessarily complicated to have two sets of Blithfield curves.
- The number of curves has been reduced from 7 to 5 to make for less complicated drought management and more flexibility.
- The shape of the curves has been modified to match the modelled refill profiles more accurately.
- The drought monitoring curve (previously called the normal operation curve) has been set so that it is only crossed on average once every 5 years. Based on the extended inflow sequence this is considered to be the appropriate frequency for drought warning, i.e. not too often, but with sufficient frequency to give enough warning in the event of a potential drought.
- The apply for drought permit curve and the implement drought permit curve have been added in place of a single hosepipe ban curve. These curves have been raised as the previous curve was too close to the dead storage in the reservoir, and only allowed a few weeks for the permit and associated hosepipe ban to take effect.

Figure 9 Blithfield reservoir - Drought Trigger Curves



The control rules have been set to align with the Company's stated level of service of only having hosepipe bans in genuinely exceptional circumstances (once every 40 years on average).

The Company will implement a hosepipe ban immediately prior to any drought permit conditions becoming active. To implement a hosepipe ban earlier would result in an unacceptable level of service to our customers, as hosepipe bans would be in place more frequently, and in some years would not coincide with the benefit of drought permits.

In response to the Environment Agency's representation on this issue (Appendix C) the Company has undertaken sensitivity analysis using the WRAPSIM model to examine the potential change in level of service with an earlier hosepipe ban trigger. The analysis showed that raising the hosepipe ban trigger to the Apply for Drought Permit trigger would result in a change in level of service for hosepipe bans from 1 in 40 to c. 1 in 15. Given the Company's history of managing droughts this decrease in level of service is considered unacceptable.

Further discussion on the timing of a hosepipe ban and of the link to specific drought permits is provided in section 4.

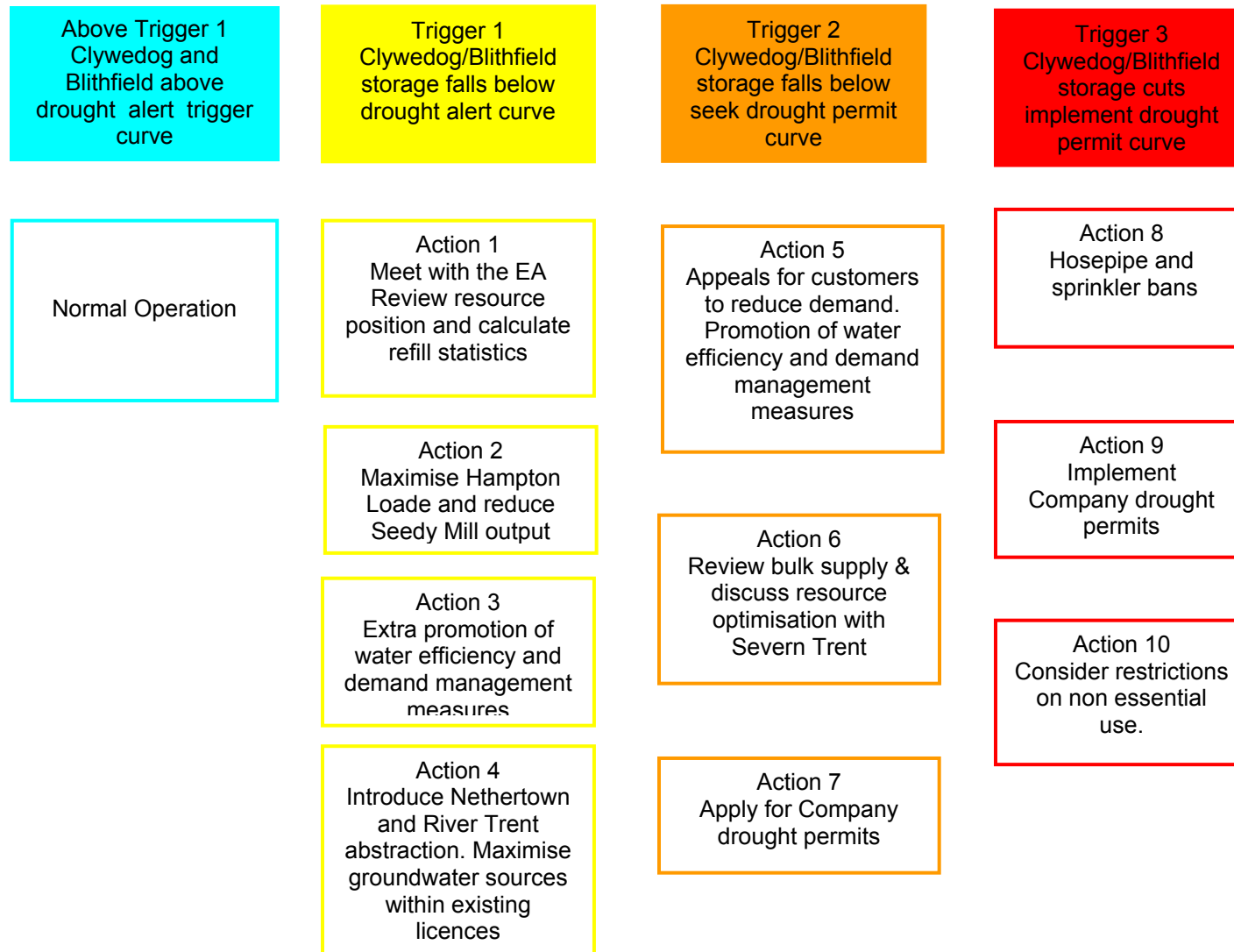
The decision to begin the preparation of any drought permit applications will be made by the Company's Drought Management Team several weeks before the apply for drought permit line is crossed, and this will depend on the particular drought permit and the specific conditions that are in existence at the time. Section 7 describes the programme of environmental impact assessment that the Company has undertaken to support a range of potential drought permits.

The Company's deployable output figure has been reassessed following the recent changes to the WRAPSIM model. The change in deployable output is + 2% compared to the previous reported dry year annual average and -1% for the peak week deployable output, however the level of service remains the same. Further work to improve the new Water Resources Plan. The Company's Water Resources Plan is currently being updated as part of the preparations for the submission of the next 5 yearly Business Plan to OFWAT. The Draft Water Resources Plan is scheduled for completion in March 2008.

The Company's triggers and main actions for managing a drought affecting Blithfield are shown on Figure 8. These control rules are colour coded to identify the increasing severity of a drought, as described in section 5. The supply and demand management options that may be implemented at each trigger are described in more detail in section 6.

The timing of actions and the illustration of how the Company would manage historic droughts is shown in section 4.

**Figure 8 DROUGHT CONTROL RULES: TRIGGERS & MAIN ACTIONS**



Note: The order of actions is an indication of priority, however the Company reserves the right to change the order as circumstances dictate. 37

## **5.7 Triggers Marking the Cessation of Drought Conditions**

The Environment Agency has defined the conditions which will mark the cessation of drought conditions associated with a River Severn drought, and these are detailed in Appendix D. The Company will follow these triggers for the cessation of drought management actions associated with a River Severn drought, and we will also consider the status of the other resources in the Company.

At Blithfield, the Company will consider relaxing drought management actions once levels of storage are 5% above the drought monitoring trigger curve.

If the Company has applied for a drought permit, and storage levels at Blithfield and Clywedog subsequently rise to 5% above the Apply for Drought Order/Permit trigger curve, we will consider withdrawing the application.

The exact timing of these stepping down procedures will depend on several factors, including the rate of refill of Blithfield and Clywedog, the weather forecast, and the other drought specific conditions listed in section 5.

These actions and subsequent effects on resource position will be recorded using the Drought Management Schedule in Appendix E.

All changes to outputs from stations and other associated stepping down procedures will be sanctioned by the Supply and Resources Director.

Following a return to a normal resource position a de-brief session will be held after not more than 8 weeks. This session will reflect on actions taken, any positive or negative outcomes and any lessons learnt from the period. These will be formally recorded using the Drought Management Schedule. This information will then be used to further develop the next Drought Plan.

The Company will also record any environmental data collected during the drought and any mitigation measures adopted.

## **5.8 Forecasting the Impact of Drought**

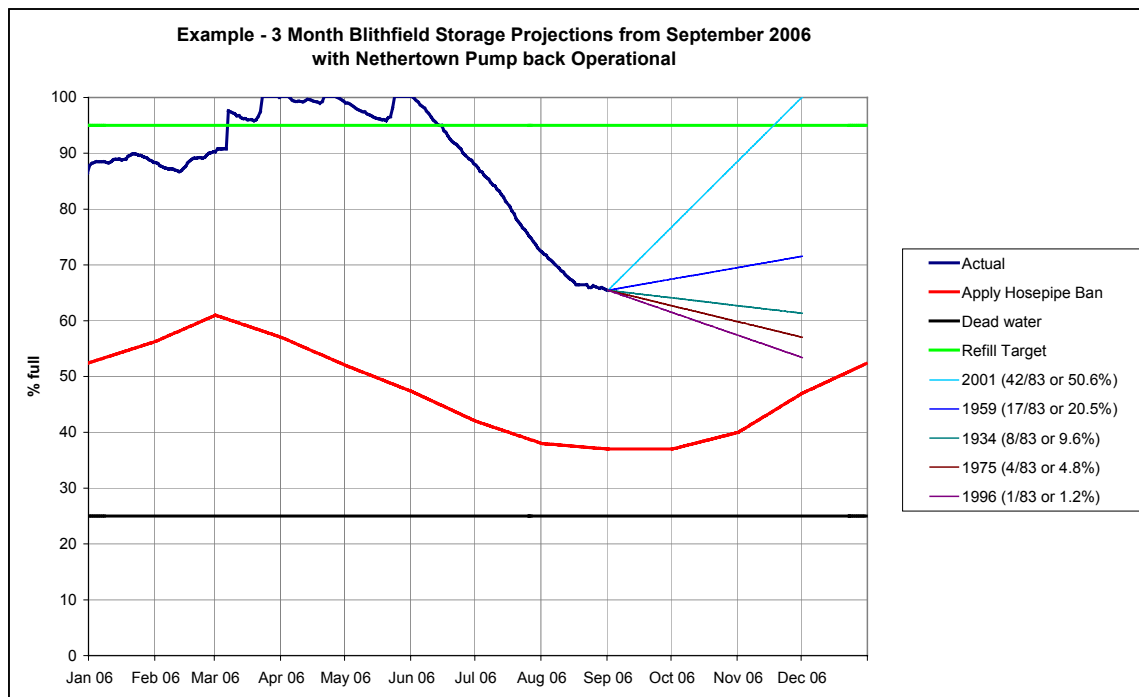
In the absence of accurate long range weather forecasts, the Company needs to understand the potential impact of a range of drought scenarios, at different stages in a drought. The Company will do this by considering each of the 3 main water resources in the following way:

The Company's groundwater sources are largely unaffected by drought, due to the nature of the Sherwood Sandstone aquifer (groundwater levels only fluctuate by a few meters), and therefore no specific scenario analysis is required.

The availability of water from the River Severn at Hampton Loade is

determined by flows at Bewdley, by Storage at Clywedog and by the level of River Regulation. The River Severn Drought Management Group which will be convened by the Environment Agency once the alert trigger curve is crossed at Clywedog, will enable scenario analysis to be undertaken by the Environment Agency and Severn Trent Water, using the RESSIM/AQUATOR model. This will include different scenarios for abstraction, and other river demands, as well as different rainfall runoff (inflow) sequences. The results will be made available as part of the Severn Drought Management Group.

Storage level scenarios at Blithfield reservoir will be examined using the company's spreadsheet 'model'. This is a spreadsheet which contains 80 years of simulated inflows to the reservoir, and allows different abstraction, compensation release, and quantities of water pumped back from Nethertown to be specified. By varying the inflow to the reservoir in the spreadsheet we can simulate reservoir storage levels based on a range of different droughts, and allocate a return period (probability) to the event. An example of the output of the spreadsheet model is shown below.



By considering the modelling outputs from the River Severn Drought Management Group, and the Blithfield reservoir storage scenarios, along with a range of additional information, including the short-medium term weather forecast, the soil moisture deficit, the demand profile and forecast, and the available supplies, decisions can be made on the best way to manage the drought in question, using the triggers and options within the plan.

## **6 Drought Options**

### **6.1 Overview**

A carefully managed strategy, in partnership with customers, will reduce the impact of drought conditions. A partnership approach with customers is consistent with the Environment Act (1995), which places responsibilities upon companies to be prudent in the use of water resources. Section 93 of the Act states that: "...it shall be the duty of every water undertaker to promote the efficient use of water by its customers".

The control rules discussed in section 5 will be used to trigger the commencement of drought management actions, and to identify the need for more intense drought management action as a drought becomes more severe. The drought rules also provide guidance for when restrictions can be relaxed. This section considers the sequence of remedial actions that the Company will consider implementing, together with an indication of the predicted impact of each action.

A key element of the Company's strategy will be the communications it sends to customers and the degree of partnership and co-operation that develops between customers, the Environment Agency, and the Company. The Communication Strategy is covered in detail in section 9.

The Company has a number of demand and supply options that could be implemented during a drought. These represent measures that could be implemented in addition to those which already form part of the Company's Strategic Business Plan and Water Resources Plan. The Company recognises that some of these measures will call for close liaison with Severn Trent and the Environment Agency.

The Company's supply area is limited to one resource zone and hence all information relates to a single supply area.

### **6.2 Emergency Planning and Business Continuity Planning**

Section 3.2 of the Environment Agency's Water Company Drought Plan Guideline 2005 (Version 2.0) states that 'plans are not however expected to include details of arrangements for providing water supplies to cope with situations when there is a civil emergency as a result of a water shortage'.

These conditions would apply in the event of catastrophic drought, which was more severe than that on record, and where the shortage of water resources could not be dealt with by the actions in this plan. Therefore the options within this plan do not include those which would be required to deal with a civil emergency.

However, several of the representations received on the draft plan (March



2006) from local authorities questioned how the plan links with the existing company Emergency Plans. As a result, this final plan includes additional information on the links between this plan and the Company's Emergency Plan and Business Continuity Plan.

The Company's Emergency Plan contains well established emergency planning procedures to deal with various eventualities that could impact on the continuity of customer's water supply. Amongst other issues, these emergency plans address the company's statutory duties under the Security and Emergency Measures Directive (SEMD 1998).

The Emergency Plan is focussed on short term failures of specific assets, such as treatment works and elements of the distribution network and as such does not specifically identify a catastrophic drought scenario. However the procedures, communication strategy and options available in the emergency plan, could be called upon in the event of a catastrophic drought

Incorporated in the Emergency Plan is the strategic use of road tankers, bowsers and bottled water. These actions will be authorized and managed by the Company's Incident Management Team.

In the event of service reservoir levels falling in hot spot areas of high demand then the Company may consider tankering extra water to the reservoir in question to support the levels and maintain supplies. This will of course be subject to there being available resources elsewhere. The Company has direct access to a fleet of tankers, which may be prioritised for this purpose in the event of a severe drought. However tankering is not intended to deliver a Company wide increase in resources. It is an emergency planning option to deal with local distribution problems. As a result the Company has not linked tankering to any specific trigger curve.

The Company framework for dealing with an extended severe drought, worse than that on record, and which resulted in a shortage of water resources beyond the scope of this Drought plan, is the Business Continuity Plan.

Business Continuity Management is a process that helps manage the risks to the business, to ensure that it can continue to operate and provide critical functions and services, in the event of serious disruption.

### **6.3 Demand Side Options**

Table 1 summarises the demand side options that the Company will consider during a drought. The ranking of actions relates both to Blithfield Reservoir and the River Severn trigger curves. Further detailed information on triggers, demand savings, implementation timescales, permissions required, environmental risks, and potential impact on other stakeholders is provided in Appendix F.

Table 1 Summary of Drought Management Options – Demand Side

BLITHFIELD TRIGGER	RIVER SEVERN TRIGGER	OPTION	ESTIMATED DEMAND SAVING (MI/d)	DESCRIPTION/COMMENTS
1	1	Extra promotion of water efficiency and increased publicity campaign	c. 3 MI/d	Communication via the Company website on the current resource position, with appeals for water conservation via press releases. Communications messages will escalate, and could include newspaper and radio messages. Industrial customers may be targeted for water audits and domestic customers may be offered / sent cistern devices.
1	1	Increased leakage detection and repair	c. 1.5 MI/d	Additional finding and fixing of leaks. This action could be initiated within 2-4 weeks, following a review of available leakage management resources. However the logistics of procuring staff and delivering further leakage reductions means that it is likely to take at least 5 months to deliver this additional benefit, and there is some considerable uncertainty over the estimated savings.
3	3	Hosepipe and sprinkler bans	c. 10-20MI/d	Assuming a Company wide ban. We have no recent data to determine what saving might be achieved.
3	3	Enhanced pressure management	c. 1.5 MI/d	Reducing mains pressure to reduce leakage. Regulatory Level of Service (DG2) pressure standards are likely to be breached. There is an estimated 2 months to deliver any additional benefit.
3	3	Consider bans on non-essential use	unknown	This will require a drought order application and a minimum lead time after application of 4 weeks

Further details are provided in Appendix F.

### **6.3.1 Extra Promotion of Water Efficiency and Drought Awareness Messages**

The Company already promotes the efficient use of water in several ways. Water saving messages are included on the Company website and in the annual information pack (Water Line) sent to customers annually with their water bill. In addition the Company is engaged in a number of water efficiency initiatives, such as the free issue of toilet cistern water saving devices, subsidised water butts, and the provision of a suite of water efficiency literature.

During a drought period more sustained water efficiency campaigns will be established. Additional communications are likely to take place in two stages once the drought monitoring/drought alert curve have been crossed:

(i) The Company will issue general water saving messages to the public on the website and in the local press. Other external stakeholders will be updated by email or letter as required (see Appendix G). The Company will also take every opportunity to reinforce water efficiency messages when responding to media contacts.

(ii) As reservoir storage continues to fall towards the apply for drought permit trigger curve, the Company will intensify messages to customers, appealing for water saving. This will include press releases to raise customer awareness of the drought situation. In addition we will seek to encourage industrial customers to receive water audits. The Company will also consider sending out hippo bags to domestic customers. A recent customer survey highlighted that the positive promotion of the device could result in potential savings of up to 1 Ml/d across the Company. However the rate of uptake of the hippo bags and problems of double flushing may reduce this saving significantly

Other external stakeholders will be updated by email or letter (see Appendix G). This may include reference to potential drought permit applications.

The demand savings generated by calls for restraint are likely to be small and they are difficult to quantify.

### **6.3.2 Increase Leakage Detection and Repair**

In the event of a drought, the Company will actively consider whether additional leakage detection and repair activity could be introduced to assist with demand reduction. However, the logistics of procuring appropriately skilled additional staff in the required numbers, as well as the lead time for delivery of potential savings means that a minimum of 5 months will be required to achieve a maximum saving of 1.5 Ml/d.

As a result of the extended lead times required to achieve a reduction in demand it is the Company's view that additional leakage control will not

deliver additional benefit within the timescale of a single season drought. However, if a drought were to extend beyond the end of the season so that Blithfield Reservoir were not refilled for the start of the following season then the Company will be more likely to achieve some limited benefits by implementing additional leakage management activities.

Notwithstanding the above, the Company will review the current leakage position and circumstances at the time to give full consideration to implementation of additional leakage detection and repair activities in a single drought season.

The benefits of demonstrating to customers the Company's commitment to making the best use of resources, especially in times of drought, will form part of the process of consideration. The Company recognises that in order to encourage positive action from customers in response to awareness campaigns and calls for restraint it will need to demonstrate that it is doing all it can to manage demand.

### **6.3.3 Hosepipe and Sprinkler Bans**

The Company's stated level of service is that a hosepipe ban may be required on average once every 40 years. The Company will expect both unmeasured and measured customers to implement the ban, however the benefit that will be achieved by the implementation of a hosepipe ban is difficult to quantify. The last hosepipe ban that was implemented by the Company was in 1976, and data is not available on the impact on demand. A nominal figure of between 2.5 - 5% of demand is included as the estimated range of the benefit that may result. This figure is not based on any specific data although it is within the range used in the industry by other companies.

A hosepipe ban would be triggered by reservoir storage levels falling below the Implement Hosepipe Ban trigger curve at Blithfield and/or Clywedog. The Company's stated position is that it will implement a hosepipe ban immediately prior to the implementation of any drought permit. Preparations for the hosepipe ban will begin as soon as a drought permit application has been submitted.

The Company has not discounted the use of hosepipe bans in winter, and will consider their use if necessary. In particular, where there is a two year drought there may be benefits to maintaining a hosepipe ban that has already been implemented, to help to maintain the water saving message with customers through the winter and into the following spring.

### **6.3.4 Enhanced Pressure Management**

The Company is already increasing coverage of new pressure reducing valves (PRV's) to maximize leakage reduction benefits, while maintaining the required level of customer service for mains pressure (DG2). This is part of

the leakage management strategy submitted to OFWAT and the Environment Agency as part of the AMP4 Business Plan. Very little opportunity exists for any further improvements, without affecting DG2 levels of service.

The OFWAT DG2 reference standard of service requires a minimum pressure of 10m at the stop tap with a flow of 9 l/min, although a surrogate standard of 15m static pressure may be used in its place. However to cover operational constraints or fluctuations in demand the Company's minimum design standard when constructing pressure management areas is to maintain a minimum pressure of 20m in the mains network.

The extent of available pressure reduction is also significantly influenced by the number of shared customer connections within the area, as these need higher network pressures compared to single connection properties. Due to historic practices the Company has a significant number of shared connections, with 40% of properties supplied in this way. As a result, current pressure management schemes usually need to allow more than the Company standard of 20m pressure to maintain supplies, minimise customer service problems and achieve the DG2 standard.

Further savings could be achieved, however these will be at the expense of increased supply interruptions, customer contact and DG2 failures and will have considerably longer lead times.

The likelihood of DG2 levels of service failures with further pressure reduction mean that this option has been included as an option only after all other reasonable demand management measures have been exhausted, including hosepipe bans (which have a level of service of once every 40 years on average). The Company believes that a hosepipe ban will be more acceptable to customers than widespread low pressure and supply interruptions. The Company has calculated that in order to save an additional 1.5 Ml/d of water will require at least 2 months to deliver.

### **6.3.5 Bans on Non Essential Use**

The Company would consider implementing a ban on non essential use if reservoir storage levels fell below the Implement Drought Permit/Hosepipe Ban line at Blithfield or Clywedog. Under these circumstances a hosepipe ban is already likely to be in place. A non essential use ban will require an application for a Drought Order to the Secretary of State. The ban can be used to restrict a wide range of water uses such as, watering parks and gardens, use of ornamental ponds, vehicle washing, and commercial cleaning activities.

The Company would consider the implementation of a non essential use ban after the implementation of a hosepipe ban, and at least 4 weeks before the emergency storage line was crossed at Blithfield.

It is anticipated that it would take 2 weeks to prepare the application to

DEFRA and up to 4 weeks for the order to be determined. Therefore for the order to come in force would require the preparation of the application to begin at the time the Apply for Drought Permit trigger line is crossed at Blithfield. The application for a drought order would be made approximately 1-2 weeks before a hosepipe ban was implemented, so that it could come into force at least one month prior to the Emergency Storage trigger being crossed.

The demand savings from a ban of non essential use for South Staffs Water customers are unknown.

#### **6.4 Supply Side Options**

The Company has reassessed the supply options available to manage a drought since the last drought plan (2003). A brainstorming meeting was held between the Environment Agency water resources planning team, and representatives from the supply, distribution, water quality and water resources planning departments in the Company and a list of potential options was identified. Each option was then scored against a range of criteria, including potential environmental impact, engineering feasibility, and likely deployable output gain. Options above a threshold score of 10 were considered to be unsuitable as they will be too difficult to deliver, carried too much risk, or will be unlikely to get the required consents. The options with a total score of 10 or less are included in this plan. Table 2 summarises the supply side options that the Company will consider implementing as a drought progresses, and each option is described in more detail below.

The potential supply options described in this section generally follow the order in which they are likely to be implemented, however the Company reserves the right to retain flexibility in the actions taken, including the sequence and number of drought permits that will be used once the apply for drought permit trigger has been crossed. Selection of which option to implement will depend on the exact circumstances at the time.

The potential deployable output that might be gained from each option has been modelled using the Company's water resources model (WRAPSIM).

Table 2 Summary of Drought Management Options – Supply Side

<b>BLITHFIELD TRIGGER</b>	<b>RIVER SEVERN TRIGGER</b>	<b>OPTION</b>	<b>ESTIMATED DEPLOYABLE OUTPUT (MI/d)</b>	<b>DESCRIPTION/COMMENTS</b>
1	1	Ensure existing sources are fully operational	Maximised available Deployable Output	Increase output from available sources. Postpone Planned Outages.
1	1	Increase abstraction from Hampton Loade and reduce abstraction from Seedy Mill	Maximised available Deployable Output	The reservoir control rules will be used as a guide to reducing the output from Seedy Mill, and the substitution of replacement resource (implemented in stages over the period of the drought)
1	1	Introduce Nethertown pump back, supported by the Trent abstraction where required	Maximised available Deployable Output	For the purposes of this plan it has been assumed that the Trent/Nethertown abstractions are only available when flow on the Trent at North Muskham is > 2650 MI/d (however this has yet to be agreed w/EA - see section 7.3)
1	1	Introduce nitrate treatment plants	Maximised available Deployable Output	Little Hay and Shenstone sources have nitrate treatment plants, and Sandhills is blended with Pipe Hill
2	2	Review the potential for bulk supplies between Severn Trent and South Staffs.	Up to 5 MI/d	This option is only viable if there is no River Severn drought and Severn Trent have available water resources. Deployable output gain is a peak week figure
2	2	Apply for drought permits	See below	See below (all permits assumed to take at least 1 month to implement from date of application)
3	3	Implement drought permit on the River Blithe/Trent.	1 - 4 MI/d (annual average)	This will allow abstraction from the River Trent when flows at North Muskham are below 2,650 MI/d.
3	3	Implement drought permit at Hanch Tunnel	3 MI/d (peak week)	Pumping 3 MI/d of groundwater out of the Hanch Tunnel into Seedy Mill treatment works.
3	3	Implement drought permit at Hampton Loade	10-40 MI/d (peak Week)	Depending which drought permit option is used.

Further details are provided in Appendix H.

#### 6.4.1 Ensuring Existing Sources are Fully Operational

The Company will ensure that all available plant is commissioned. No planned maintenance works will commence once the drought trigger curve has been crossed at Clywedog or Blithfield Reservoir.

#### 6.4.2 Reducing Abstraction at Seedy Mill

Once the drought trigger curve has been crossed at either Blithfield or Clywedog Reservoir the Company will reduce the abstraction at Seedy Mill in order to conserve storage at Blithfield. The reduction in abstraction at Seedy Mill will increase in stages as the severity of the drought increases, and storage continues to fall at Blithfield. The reductions in Seedy Mill abstraction will be offset by an increase in abstraction from Hampton Loade, and by the other resource options described below.

The existing trigger curves at Blithfield will be used as a guide to the scale and timing of the reductions in Seedy Mill abstraction as follows:-

Blithfield Trigger Curve	Abstraction at Seedy Mill
Above drought monitoring curve	< 120MI/d
Below drought monitoring trigger curve	<70MI/d
Below apply for drought permit curve	<40MI/d
Below implement drought permit curve	<30MI/d
Below emergency storage curve	23 MI/d

The maximum treatment capacity at Seedy Mill is 120MI/d, and the minimum works output is 23 MI/d. The updated modelling of the Company's deployable output using WRAPSIM has used these abstraction rules for Seedy Mill.

#### 6.4.3 The Nethertown Pumpback Scheme

The abstraction licence at Nethertown allows water to be pumped from the River Blithe downstream of Blithfield Reservoir back to refill the reservoir. The abstraction licence requires that at least 9 MI/d is left in the river at Nethertown (this rises to 17 MI/d during the spawning season in mid February-mid March). A second abstraction licence on the River Trent, just upstream of the confluence with the Blithe, enables up to 17 MI/d to be pumped back to Nethertown. This recirculation allows the entire flow in the Blithe at Nethertown to be pumped back to Blithfield, up to the pumping capacity of 23 MI/d. The option to introduce the Nethertown pump back scheme will be considered once the drought monitoring trigger curve has been crossed at Blithfield, and the Trent recirculation will be used when the residual flow at Nethertown needs topping up. This will require careful monitoring of the residual flows on the Blithe at Nethertown. In addition, consideration will also be taken over the use of Nethertown to top up Blithfield



if reservoir levels are above the drought monitoring trigger, but storage at Clywdog is below the Environment Agency's Drought alert trigger.

A condition in the River Trent licence constrains the use of the Nethertown pump back and Trent recirculation to periods when the flows on the River Trent at North Muskham (near Newark) are greater than 2,650 MI/d. There is some uncertainty over the licence conditions at Nethertown, as there is also an emergency clause which appears to allow abstraction under certain circumstances. The Company and the EA are still trying to resolve this uncertainty. This is discussed in section 10.4. For the purposes of this plan the restriction has been assumed to be in place.

#### **6.4.4 Bulk Supplies**

South Staffordshire Water currently supplies and receives small quantities of water to and from Severn Trent Water at the edges of the Company distribution system. These routine supplies are defined by bulk supply agreements between the two Companies, with South Staffordshire Water importing c. 0.2 MI/d and exporting c. 1.5 MI/d in total. There is little scope for optimising these small quantities in drought conditions.

There is also an emergency bulk supply agreement between the two Companies which allows water to be imported from Severn Trent Water at the southern most tip of the Company's distribution system. This emergency bulk supply has never been used and it is currently unclear whether additional treatment or hydraulic capacity will be required to utilise it. More importantly the bulk supply is only available if Severn Trent Water have sufficient water resources available. As a result it is likely that the bulk supply will not be available if storage at Clywedog or Elan Valley Reservoirs were below their respective drought warning trigger curves. It is very unlikely therefore that the emergency bulk supply will be available to the Company in a drought such as that seen in 1976 or 1995/6. However, for completeness this option has still been included in this Drought Plan.

The largest transfer of water between the two Companies is from Hampton Loade to Wolverhampton (Severn Trent Water's supply area). It has been agreed that close liaison will be undertaken in the event of a drought to ensure licence compliance and to optimise available resources.

#### **6.4.5 River Blithe and River Trent Drought Permit**

The River Blithe and River Trent drought permit is described in detail in section 7.3.

The permit would allow abstraction from the Blithe and Trent, to support reservoir storage at Blithfield, at times when the existing abstraction licences would normally be restricted. The current hands off flow is set at 2,650 MI/d on the River Trent at Muskham (near Newark) and effectively means that

during drought periods the abstractions cannot be used for large parts of the year. For example, during the 1995/6 drought there were over 100 days in each year when the flow at North Muskham was less than 2,650 MI/d.

Once the apply for drought permit trigger curve has been crossed at Blithfield the Company will consider making an application for a drought permit to allow the Blithe and Trent abstractions to continue regardless of the flow at North Muskham. As with all drought permits or drought orders the Company will need to demonstrate that this is required in response to an exceptional period of low rainfall, when compared to the available historic data.

Consideration will also be given to the application for a drought permit on the Blithe and Trent should storage at Clywedog fall below the Environment Agency's Apply for Drought Order trigger. However this assessment will take account of storage at Blithfield and it is unlikely that action would be taken by the Company immediately after the Agency's Apply for Drought Order trigger was crossed. Under these circumstances it is likely that the Company would defer a drought permit application until Blithfield storage was closer to the corresponding Blithfield trigger (see section 4).

Modelling of the Company's water resource system using WRAPSIM for the critical drought period (1975/76) indicates that operation of the Nethertown pump back and the Trent recirculation under a drought permit would provide an increase in annual average deployable output of 1-2 MI/d. This gain is small primarily because in the model the key drought (1976) ends shortly after the permit is activated. This is an effect of the modelling scenario, and in reality the timing of the end of any drought is not known, and the benefit of the permit could be significantly higher.

The Company has undertaken an environmental assessment to support this drought permit. This has been discussed in detail with the Environment Agency, Natural England and British Waterways. This environmental assessment is described in more detail in section 7.3.

#### **6.4.6 Hanch Tunnel Drought Permit**

The Hanch Tunnel drought permit is described in detail in section 7.2.

Hanch tunnel is a man made tunnel which was constructed in the Sherwood Sandstone to the west of Lichfield in the 1850's. The tunnel connects Seedy Mill and Sandfields pumping station, to the south west of Lichfield. Originally, groundwater from the tunnel gravitated southwards to Sandhills where the water was abstracted and treated before being used to supply Lichfield. The Sandfields pumping station and treatment works are now abandoned and the groundwater table has recovered in this area. The flow of water in the tunnel is now reversed, flowing northwards and discharging at Seedy Mill. This has led to the proposal to abstract water from the northern end of the tunnel during drought conditions. This raw water will to be treated by the existing surface water treatment works on the site.

A test pumping programme has been undertaken, to investigate the yield, water quality and environmental impact of an abstraction from the northern end of the tunnel. This is described in more detail in section 7.2.

Modelling of the Company's water resource system using WRAPSIM indicates that implementation of the Hanch Tunnel drought permit would only provide a small increase in annual average deployable output (<1 Ml/d), given a repeat of the critical drought period (1976). However, as with the Blithe/Trent permit, the annual average deployable output of the permit is constrained by the end of the drought occurring shortly after implementation, in the model run. The peak week deployable output benefit is more clearly demonstrated, as a direct increase of 3 Ml/d onto Seedy Mill treatment works.

#### **6.4.7 Hampton Loade Drought Permit**

The Hampton Loade drought permit is described in detail in section 7.4.

The Company's abstraction licence at Hampton Loade is restricted when the River Severn is under River Regulation (when water is being released to support the river), and when the Environment Agency has implemented its own drought order on the River Severn (this requires a 5% reduction in abstraction licences on the river).

The Company has included two options for a drought permit at Hampton Loade in this Drought Plan. An application for a drought permit at Hampton Loade would only be considered as a last resort, once all other drought permits had been implemented, and would be in response to genuinely extreme conditions. The need for a drought permit at Hampton Loade could occur if the storage level at Blithfield Reservoir were below the Implement Drought Permit curve, and:-

The EA have implemented a Drought Order on the River Severn, one of the consequences being a reduction in abstraction of 5% from Hampton Loade.

Or

Maximum river regulation has been in force and the abstraction licence capacity at Hampton Loade is restricted to 192 Ml/d. A period of at least 6 weeks Maximum Regulation has been identified as a trigger criteria.

Under the first scenario the Company would consider applying for a drought permit which would enable a 5% increase in abstraction licence (i.e. back up to the level of abstraction permitted prior to the EA's drought order). This would increase the capacity of Hampton Loade back up to 192 Ml/d.

Under the second scenario the Company would consider applying for a drought permit to increase the level of abstraction up to 245 Ml/d. This would allow the Company to utilise the maximum treatment capacity at Hampton Loade, and to enable more rapid refill of Chelmarsh Reservoir, during the

critical drought period.

A drought order may ultimately be required, rather than a drought permit, due to the environmental sensitivity of the river and because of the large number of stakeholders who could be affected. This will be determined by the Environment Agency.

As with the other drought permits in this plan, the modelled annual average deployable output benefit is small reflecting the fact that the 1976 drought scenario ends shortly after the drought permit is initiated in the model. However in reality the timing of the end of any drought is not known, and the benefit of the permit could be significantly higher. The potential peak week deployable output benefit of both options is easier to calculate, and ranges between 10 MI/d for option 1 (above) and 40 MI/d for option 2 .

The Company has undertaken an environmental assessment to support this drought permit. This has been discussed in detail with the Environment Agency, British Waterways and Natural England. This environmental assessment is described in more detail in section 7.4.

The conflict between a Hampton Loade drought permit and a River Severn drought order imposed by the Environment Agency are discussed in section 10.2.

## **6.5 Utilising Additional Groundwater Peak Licence Capacity**

The Company has undertaken a review of the potential to increase deployable output at its groundwater sources, within existing licence conditions. There is little or no potential to increase dry year annual average deployable output in a drought because the Company's annual groundwater group licences are already fully utilized, or major investment is required. There is some potential however, to increase peak week deployable output.

There are a few sites where there are additional boreholes that it may be possible to re-introduce (subject to any licence conditions). There are also a few sources where boreholes are operated as duty and standby and by changing the way in which the source is normally operated it may be possible to achieve a greater output. There are also some sources where it may be possible to increase pumping capacity by up rating pumps.

The Draft Drought Plan identified a number of sites that were worthy of further investigation. This source investigatory work has been aligned with other business drivers such as asset maintenance and the list of sources has been revised during the last year. Detailed investigatory work has been undertaken on two sources; Chilcote and Slade Heath. The investigatory work is still at an early stage, and no additional peak or drought capacity has been commissioned yet, and so the additional benefit has not been included in the list of options within the plan, however this work may lead to further supply capacity in the future. The work undertaken at each source has been

summarised below.

### **6.5.1 Slade Heath**

Slade Heath is a groundwater source located approximately 5 miles to the north of Wolverhampton, in the Sherwood Sandstone aquifer of the Coven groundwater unit.

The original yield of the source was 8 MI/d with a pumping water level of approximately 60 metres below engine house floor (mbEHF). However, the yield has declined steadily over the last 85 years to the current output of 3.5 MI/d. Pumping water levels have remained relatively steady at around 60 mbEHF, however the yield of the source has had to be repeatedly trimmed back to maintain these pumping water levels and to avoid excessive drawdown.

The reason for the deterioration in the performance of the boreholes is attributed to naturally occurring manganese deposition on the borehole walls. Naturally occurring manganese is in solution within the aquifer, however when it enters the borehole it is oxidised and precipitated onto the borehole walls. This has restricted the flow of water into the boreholes.

Different options for remediation were investigated, and a new borehole was drilled at the site in the winter of 2006/7. Test pumping has shown that the source can now sustain an increase in output of 2 MI/d (up to a total of 5.5 MI/d). In addition, the extra water from Slade Heath will enable another 1 MI/d to be obtained from a nearby source at Somerford. This is because the two sources are blended together to obtain the required water quality. A scheme has been programmed to equip the new borehole at Slade Heath and it is programmed for completion in 2008.

This scheme will deliver additional peaking capacity which can be used in periods of high demand, including drought periods.

### **6.5.2 Chilcote**

The Chilcote source is located about 10 km northeast of Tamworth in Staffordshire. It consists of two production boreholes (Boreholes 1 and 2) which are currently being used and of a third borehole (Borehole 3) which has not yet been put into supply, since its construction in 1992.

In order to determine the future role of borehole number 3 (BH3) and to inform the design of the future capital refurbishment of the site, a pumping test was undertaken on BH3 in order to confirm the yield of the borehole and to obtain representative water quality data.

The test pumping has confirmed that borehole No.3 could have a role to play in the future of the source. The borehole can yield 6 MI/d, with a water quality

very similar to the existing boreholes. Any increase in source output would require an expansion of the existing treatment works capacity (currently limited to 7 MI/d) up to the current peak day licence of 10 MI/d. Further investigations are underway to examine the potential for changes to the treatment works.

## **6.6 Groundwater Drought Permits**

Increasing the Company's groundwater output over the full drought period (peak season) cannot be achieved within existing abstraction licences as these are largely fully utilised. Therefore in the Draft Drought Plan (published in March 2006) the Company identified a proposal to include a limited number of groundwater drought permits in the Final Drought Plan which could temporarily increase annual groundwater abstraction licence quantities. Where 5 year or 10 year groundwater licences are also in place these will remain the same. This would mean that groundwater abstraction will be reduced in subsequent years to 'claw back' the over use of the licence.

It was recognised that temporarily increasing existing annual average groundwater abstraction in areas which are already considered by the Environment Agency to be 'over-licensed' or 'over – abstracted' could require detailed environmental assessment, and rigorous justification. In order to successfully apply for a drought permit the Company would have to show that the impact of a relatively small additional abstraction over a single year would not significantly affect the environment or other water users.

Following the publication of the draft plan it was decided that the most appropriate way to consider the potential for groundwater drought permits was to simulate the potential impact of 3 drought abstraction scenarios using a groundwater model (The West Midlands Groundwater Model). This groundwater model was developed by the Environment Agency and it is the most appropriate tool available for considering abstraction scenarios in the Company area, and specifically in the Stour Valley.

The Company commissioned Entec to examine drought abstraction scenarios at 3 sources using the groundwater model (Hagley, Ashwood, and Cookley). The main aims of the modelling project were:

- To simulate an increase in abstraction from the specified sources for one calendar year, followed by a decrease in abstraction throughout the subsequent calendar year (claw back).
- To illustrate the potential magnitude and distribution of resulting impacts on the hydrological and hydrogeological environment.
- To illustrate the duration of resulting impacts and the efficacy of reduced abstraction rates during the 'claw-back' period.
- To make preliminary recommendations for further consideration of groundwater supply options as a component of drought planning.

The modelling report confirms that there could be some impact on local groundwater levels and stream flows within the drought year, particularly for the Hagley and Ashwood scenarios. These impacts, albeit fairly minor could be significant at key sites like Checkhill Bogs SSSI and the Blakedown Brook (Hurcot and Podmore Pools SSSI). Further detailed assessment would be required to confirm the impact. The scenario at Cookley indicates less impact in the drought year, and therefore offers more scope in future.

Given the results of the modelling, particularly for Hagley and Ashwood, the Company is not minded to undertake further detailed assessment of the drought permit potential at these sites. Further consideration may be given to the potential for a drought permit at Cookley in future, if one or more of the three proposed permits (Hanch Tunnel, Blithe/Trent and River Severn) is deemed unworkable and is removed from the plan in future.

The Company considers that the three proposed permits are sufficient to help manage a severe drought.

This position will be reviewed as part of the ongoing drought plan development, and in the preparation of the next Plan (2010).

The full modelling report has been copied to the Environment Agency and Natural England, and is available on request from the Water Resources Manager at South Staffs Water.

## **6.7 Further Options**

In their Directions, DEFRA have made it clear that rota cuts and standpipes should be avoided at all costs, and that a full range of options should be considered in order to maintain supplies in a drought, without recourse to these measures. The Environment Agency have suggested that these additional measures might include; drought orders to restrict other water users abstractions, emergency engineering works to improve supplies, further leakage control (over and above that already proposed), agreements with industrial water users to reduce their supply, and more extreme drought permits, (which might involve damage to the environment).

The Company has considered the full range of options in the plan, and the reasons why some of these more extreme options have not been included are described below.

### **6.7.1 Drought Orders To Restrict Other Water Users**

We do not believe that restricting other abstractors would provide any water resources benefit to the Company. There are relatively few large scale consumptive abstractions upstream of Bewdley on the River Severn. Restricting these abstractions will not have any material effect on the licence condition at Hampton Loade. Similarly, restricting the abstractions

downstream of Bewdley will not impact on Hampton Loade (given that Bewdley is the licence control point).

There are no other significant direct abstractions associated with the Blithe or Blithfield reservoir, which could be reduced to improve the resource position to the Company.

The majority of the Company's groundwater abstractions are not constrained by pumping water levels, so there is no scope for reductions in third part abstraction to improve groundwater deployable output (even if there were abstractions nearby).

### **6.7.2 Emergency Engineering Works**

The Company has considered whether emergency engineering works could be used to improve water resources availability in a severe drought. The only schemes which could provide some benefit are; the equipping of the new borehole at Slade Heath (this is programmed to take place in 2008/9), the expansion of peaking capacity at Chilcote treatment works (this would require significant investment and time to deliver), and the Hanch Tunnel drought permit (described in detail in section 7).

### **6.7.3 Further Leakage Control**

The Company has committed to a review of the leakage position and circumstances once a drought is developing, and will give full consideration to implementation of additional leakage detection and repair activities, including in a single drought season.

However, as identified in section 6.3, the logistics of procuring appropriately skilled additional staff in the required numbers, as well as the lead time for delivery of potential savings means that a minimum of 5 months will be required to achieve significant savings.

### **6.7.4 Agreements with Industrial Water Users**

The Company has not contacted individual water users to discuss the potential for reductions in the event of a severe drought, however at this stage we do not believe there is significant scope for this to take place, without major impact.

### **6.7.5 Drought Permits (more extreme permits)**

The potential drought permit on the River Severn is viewed by the Company as an option of last resort, and falls into the category of a more extreme permit. The assessment concluded that there could have some impact (albeit



low) on the lower Severn, if applied in conjunction with other permits (e.g. Severn Trent Water's).

The Company has also considered a selected number of ground water drought permits, as described in section 6.6, and we have concluded that one of these in particular (Cookley) may be worthy of further investigation in future.

## **7 Environmental Assessment**

### **7.1 Overview**

Water Companies are required to identify all potential drought permits and drought orders within their drought plans, regardless of how unlikely it is that they may be required. South Staffordshire Water has identified 3 potential drought permits which could, in exceptional circumstances, be required to provide additional water resources. The Company has undertaken an environmental assessment of each of these potential drought permits.

Guidance on the content of a drought permit application is provided by DEFRA (Drought orders and drought permits - Information from the Department for Environment, Food and Rural Affairs, Welsh Assembly Government and the Environment Agency, (July 2005) and full details can be found on the DEFRA website at the following address:

<http://www.defra.gov.uk/environment/water/resources/drought/pdf/info2005.pdf>.

Section 5.3 of this guidance deals with the requirements for preparing environmental assessments in advance of drought permit applications. The Company has followed this guidance in the preparation of its environmental assessments.

The following extract is taken from the Company's Environmental Policy; 'South Staffordshire Water PLC is committed to the protection of the environment and will work with its customers, employees and the regulatory authorities to reduce environmental impacts, adopt sustainable practices and achieve continuous environmental improvement'. This statement and the other elements of the policy are directly relevant to this plan and confirm that the Company is committed to minimising the impact of any drought options on the environment.

It should be pointed out that the other elements of any future drought permit application such as; a statement of need, a discussion of alternative options, a demonstration of exceptional shortage of rain, and demonstration of demand management measures, will be considered in detail at the time of the application. This section of the plan deals solely with the environmental assessments that have been undertaken in advance of any future application.

### **7.2 The Hanch Tunnel Drought Permit**

#### **7.2.1 Background**

The Hanch Tunnel is a man-made tunnel that was constructed in the Triassic sandstone to the north and west of Lichfield in the 1850s. When first constructed, the tunnel was connected to Minster and Stowe Pools in

Lichfield, which served as storage reservoirs for use during times of water shortage. These connections are now blocked and there is believed to be no remaining connection between the tunnel and the pools. The tunnel was also used to transport groundwater from Hanch Reservoir (now abandoned), and then from Seedy Mill boreholes, to Sandfields pumping station, where the water was abstracted and treated before being used to supply Lichfield. The tunnel gained groundwater along its length, and net abstraction was greater than the input from the Seedy Mill boreholes. The tunnel was abandoned and the Sandfields pumping station and treatment works were shut down in 1997 as part of a scheme to raise groundwater levels in the Lichfield area. As a result groundwater levels have risen, and the flow of water in the tunnel has reversed. Water from the tunnel now flows northwards, discharging naturally into the Bourne Brook which is adjacent to the Company's treatment works at Seedy Mill.

The tunnel can be accessed by a number of vertical shafts (21 were constructed in total), however many of these are now sealed.

### **7.2.2 The Drought Permit**

The proposed drought permit is to abstract 3 MI/d from the Hanch Tunnel from the access shaft at the northern end, adjacent to Seedy Mill treatment works and to pump this water into the treatment works for public supply. The Company effectively operates a single water resources zone so this water could directly or indirectly be used to meet demand anywhere in the Company. The triggers for drought permit application and implementation are described in section 5 and section 7.

### **7.2.3 Overview of Assessment Methodology**

In order to evaluate the impact of abstraction from the tunnel a test pumping and monitoring programme has been undertaken. The aim of the programme was to determine the impact on groundwater levels, surface water flows, and surface water levels at key points in the catchment, and with this information assess the potential environmental impact of the proposed permit. In addition, water quality analysis were undertaken throughout the test on the abstracted water in order to evaluate the acceptability of the water for public supply.

The test pumping was consented by the Environment Agency and the monitoring requirements specified in the consent. Natural England were consulted by the Environment Agency as part of the consenting process.

The test was undertaken in two stages, a short two week test pumping at 3 MI/d was completed in May-June 2006, in order to assess the short-term response to abstraction. As no major impacts were seen during the short test a longer 4 month test was consented by the Environment Agency.

Water Management Consultants were appointed by the Company to manage the testing programme, to collect and collate the data from the test, and to

report on the results. The report is summarised in the following sections, and a full copy is available by contacting the Water Resources Manager at South Staffordshire Water.

#### **7.2.4 The Baseline Environment**

The Hanch Tunnel is constructed within the Triassic Sherwood Sandstone to the north and west of Lichfield, within a groundwater catchment called the Lichfield Groundwater Unit. The key surface water environmental features within the catchment are the Leamonsley Brook, to the west of Lichfield, and the Stowe and Minster Pools.

The Leamonsley Brook is a small watercourse that flows through Beacon Park in Lichfield before feeding Minster and Stowe Pools. It is a partially baseflow-fed stream which rises from Triassic sandstone at Maple Hayes, to the west of Lichfield. Historical abstraction from the aquifer surrounding Lichfield has lowered groundwater levels locally and it is believed to have reduced flows in the Leamonsley Brook. As a result National Rivers Authority identified the Leamonsley Brook as one of the top 40 low-flow rivers or streams in England and Wales, in 1991.

During 1992 an augmentation borehole was drilled by the Environment Agency (then NRA) upstream of Beacon Park, and this has been used by the Agency to discharge directly into the brook to supplement the flow. However, this was not deemed to be a practical long-term solution. South Staffordshire Water agreed to cut down on abstraction in the Lichfield area to allow groundwater levels to recover. Sandfields pumping station was shut down in 1997 and there is evidence that groundwater levels have already risen significantly.

In addition to the abstraction borehole, the brook can also be augmented by South Staffordshire Water, from Shaft 20 of the Hanch Tunnel, at the point where the tunnel passes under the brook. There is currently an arrangement in place between the Agency and the Company so that when levels at Stowe Pool fall below 0.2m on the staff gauge, augmentation of the brook from the Hanch Tunnel is undertaken by the Company. This is covered by a test pumping consent.

Stowe Pool was created in its present form during the 1850s when it was converted from a fishing pool to a South Staffordshire Water reservoir. It was returned to Lichfield council in 1969 as an amenity pool and is now a Site of Special Scientific Interest (SSSI), designated for its population of native white-clawed crayfish and marginal vegetation. For the SSSI to be in a favourable condition, water levels should be maintained at a level that is beneficial to these animal and plant species.

A wide range of baseline monitoring is undertaken within the catchment,

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<sup>1</sup> National Rivers Authority (1993). *Low flows and water resources*. NRA

predominantly by the Environment Agency. This monitoring is identified in section 8, and in the environmental assessment report.

### **7.2.5 Summary of Impact Assessment**

The following points summarise the findings of the pumping test:

- An abstraction of about 3 MI/d for 104 days from the Hanch Tunnel created a drawdown of no more than 3 cm along the length of the tunnel. The relatively small drawdown in the tunnel confirms that there is a significant groundwater inflow to the tunnel (probably from diffuse inflow along its length). Monitoring along the length of the tunnel shows that it is acting as a single hydraulic system, and it can be thought of as a 6-km long shallow horizontal borehole.
- The water level in the tunnel increases quickly in response to heavy rainfall and takes several days to return to base levels. The length of time taken to recover depends on the intensity and duration of the rainfall.
- Throughout the test additional water continued to flow naturally from the northern end of the tunnel into the Bourne Brook at Seedy Mill.
- There is no evidence from the test that groundwater or surface water levels outside the tunnel were affected by pumping from the tunnel. This is not surprising, given the very low levels of drawdown in the tunnel.
- There is no obvious evidence from the test that flows in the Leamonsley Brook at the A51 culvert and at the weir were being affected by abstraction from the tunnel. There is some loss of flow in the Leamonsley Brook between the A51 and the weir but this remains constant throughout the test.
- Stowe Pool levels were successfully raised prior to the test as a result of augmentation from Shaft 20 of the Hanch Tunnel. During the pumping test water levels remained high and there is no indication that water levels were being affected by pumping from the tunnel.
- Water quality results show that there was no long-term change in water chemistry. There were small variations in most parameters but this is to be expected from an unconfined system which receives water from near-surface inflow.
- With the exception of nitrate, all other water quality parameters monitored were below the drinking water standard. Bacteria are present in the raw water in small quantities.
- An abstraction of about 3 MI/d from the Hanch Tunnel was found to be sustainable during a four-month pumping test. Given that the test took place at a time of very low regional groundwater levels (the lowest on

record for the Whittington monitoring borehole), the tunnel has been shown to be capable of maintaining this yield under drought conditions.

- There were no detectable impacts on any of the water features being monitored in the surrounding area.
- It is most unlikely that the additional drawdown of 3 cm imposed on the tunnel water level by the abstraction from the northern end would increase any leakage from Leamonsley Brook.
- Following the fairly recent groundwater level rise in the area to the west of Lichfield the Hanch Tunnel is now flowing northwards and discharging groundwater outside of the catchment. Residual overflow from the tunnel continued during the testing programme, confirming that the main impact of the proposed permit is to intercept some of the groundwater which is already overflowing from the tunnel.
- The overall conclusion from the test pumping and monitoring programme is that there would be no impact of the proposal on the groundwater or surface water flows in the Leamonsley Brook or the Stowe or Minster Pools.

The full environmental report is available on request, by contacting the Company's water resources manager at; South Staffs Water, Green Lane, Walsall, WS2 7PD.

### **7.2.6 Monitoring and Mitigation**

The following additional monitoring is recommended by Water Management Consultants; that the outflow from the northern end of the Hanch Tunnel is monitored continuously, and in particular prior to, during and after a drought permit application. This could be done by instrumenting the tunnel mouth, or instrumenting the Bourne Brook upstream and downstream of the tunnel outlet. The Environment Agency have also requested that continuous monitoring of the tunnel overflow is undertaken.

The Company has agreed to undertake continuous monitoring of the tunnel outflow in response to these recommendations.

Natural England have requested that the monitoring undertaken during the test is repeated once the permit is in force. This primarily includes additional flow monitoring on the Leamonsley brook and levels at Stowe Pool. The Company understands that some of this will be undertaken by the Environment Agency in future (Hanch Tunnel and Stowe Pool levels, and flows at the Agency's weir in Beacon Park), and is willing to make up any additional monitoring if required.

As stated in section 7.2 the Leamonsley Brook and Stowe Pool can also be augmented by South Staffordshire Water, from Shaft 20 of the Hanch Tunnel. This augmentation took place in the dry summer of 2006, prior to the test

pumping programme, and successfully maintained levels in the SSSI. This agreement will remain in place to protect levels in Stowe Pool, and will form part of any drought permit application.

### **7.2.7 Consultation with Key Stakeholders**

Both the Environment Agency and English Nature (now Natural England) were consulted at the time of the test pumping programme. In addition, we have discussed our proposals for a potential future drought permit with both the Agency, Natural England, British Waterways, and Lichfield District Council, and these key stakeholders have been given the opportunity to comment on the environmental assessment. Overall there were no major objections to the assessment, however the following issues were raised and will require action by the Company :

- Continuous monitoring of the tunnel outflow is required (as recommended in the environmental report), and the Company has agreed to do this.
- The Environment Agency has requested that the Company examine the potential impact of any flow reduction in the Bourne Brook, specifically with respect to fish migration. As a result the Company has agreed to undertake a walk over survey downstream of the tunnel discharge.
- Future operation of the abstraction should include additional design features, and/or maintenance to ensure that the pump intake does not become blocked with a resulting decrease in abstraction rate. Metered abstraction should be integrated. This will be done.
- Natural England has requested that the monitoring undertaken during the test is repeated once the permit is in force.

## **7.3 The River Blithe and River Trent Drought Permit**

### **7.3.1 Background**

Blithfield Reservoir is situated to the north of Rugeley, on the River Blithe. The reservoir is used as a source of public water supply (PWS) with water being treated at Seedy Mill WTW, to the north west of Lichfield. In addition to the natural inflow from the river upstream, the reservoir can also be augmented by abstraction from the Blithe downstream, at Nethertown, near the confluence of the Blithe and the Trent.

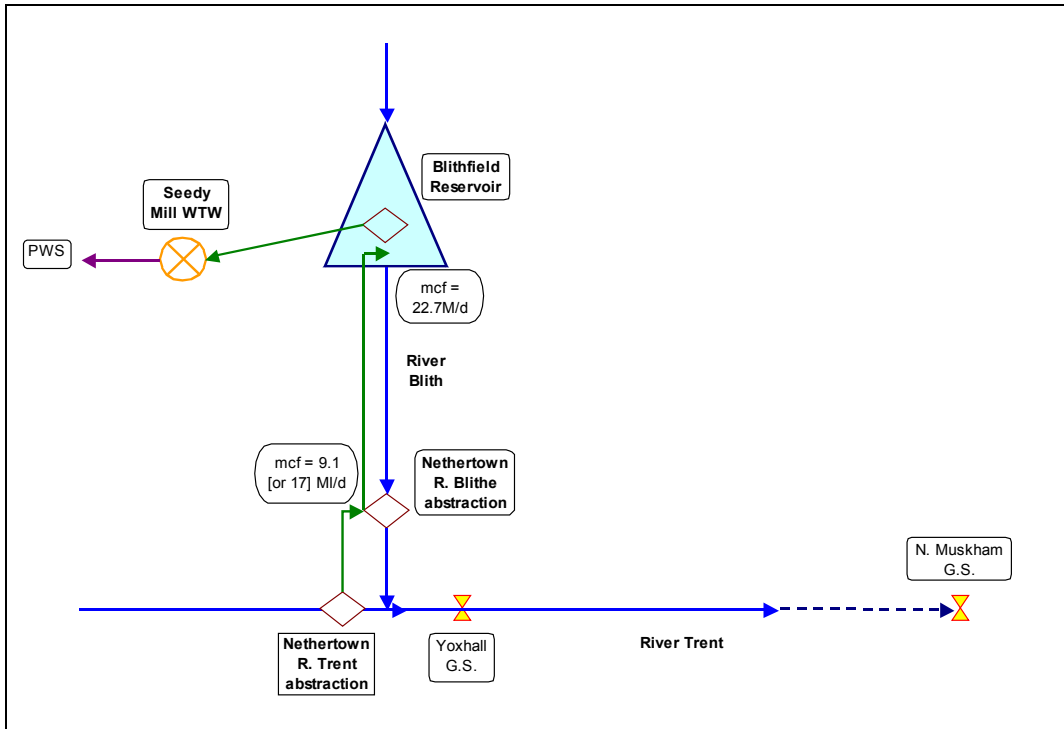
The Nethertown operations include; i) an abstraction from the River Blithe (downstream of Blithfield Reservoir) which is pumping back to the reservoir to supplement stocks; and ii) an abstraction from the Trent for transfer in to the Blithe so as to substitute for the minimum control flow imposed on the

Nethertown abstraction from the Blithe. A condition of the abstraction licence means that the Trent abstraction cannot be used when flows on the Trent downstream at North Muskham (near Newark) are less than 2650 MI/d. For the purposes of this assessment a similar condition is also assumed for the Nethertown abstraction, even though the licence conditions remain somewhat unclear (see section 10.4).

The Blithfield Reservoir and Nethertown operations are shown schematically below



## Blithfield Reservoir and Nethertown Operations



### 7.3.2 The Drought Permit

The Drought Permit would come in to effect when Blithfield Reservoir stocks are below the Implement Drought Permit trigger, and when river flow on the River Trent was below 2,650 Ml/d at North Muskham. The purpose of the permit is to lift cessation restrictions on the Nethertown and Trent abstractions, in order to supplement reservoir stocks enabling a minimum mode of supply operations from Seedy Mill. The permit would allow abstraction at Nethertown and on the River Trent to continue, even when flow at North Muskham was below 2650 Ml/d.

The triggers and timing for drought permit implementation are described in detail in section 5.

It is most likely that a drought permit would be required in late summer/autumn, and that this would continue until reservoir storage rose above the Apply for Drought Permit trigger. It is also possible that the permit would be required over the winter, if Blithfield did not refill, and if winter flow on the Trent was exceptionally low.

### 7.3.3 Overview of Assessment Methodology

In order to examine the potential environmental impact of the proposal, a detailed desk study has been undertaken for South Staffordshire Water by our appointed consultants, ENVIROS. The report is summarised in the following sections, and a full copy of the environmental report is available on request, by contacting the Company's water resources manager at; South Staffs Water, Green Lane, Walsall, WS2 7PD.

The key elements of the environmental assessment are outlined below.

**Project scoping:** following the preparation of a proposal by ENVIROS a meeting was held with the EA where refinements to the initial scope were discussed along with data availability and the timetable for the project.

**Baseline data collection and assimilation:** this included the identification and collation of the key data sets on the project. These are Environment Agency hydrometric data, water resources data, Catchment Abstraction Management (CAMS) data, and water quality, ecological and fisheries data. Also, data held by the Company in the form of previous environmental assessments, and water resources modelling data was identified. Other data was also collected from key stakeholders, such as English Heritage and other water companies. A significant proportion of the data for the assessment was provided by the Environment Agency.

**Conceptualisation and risk assessment:** the available data was used to develop a conceptual model of the Blithe and Trent catchments. This included the identification of the major abstractions and discharges within the catchment, and an understanding of the hydrological regime and the key features within the catchment. The environmental report includes an assessment of potential impact from Blithfield reservoir, all the way down to the Humber Estuary. However, in order to focus the assessment the Blithe and Trent were divided into a series of reaches and an initial conservatively based screening exercise was undertaken considering levels of potential hydrological impact and receptor sensitivity. The risk assessment has enabled the spatial extent and specific issues considered to be at significant risk and which needed to be considered in more detail.

**Detailed Assessment:** having undertaken the initial screening exercise the residual reaches and issues deemed significant were considered and addressed in appropriate detail. Irrespective of the outcome in the initial screening assessment it was considered prudent to conduct more detailed evaluation of certain receptors/issues because they are known to be regarded as highly sensitive and/or emotive issues. These issues include:

- Natura 2000 issues/features associated with the Humber Estuary in so far as they extend in to the lower tidal Trent.
- Dilution of confluent water from the River Tame.
- Possible impacts/effects on Beeston Weir hydropower scheme and Holme Pierrepont canoe slalom course.

- Impacts/effects on Blithfield Reservoir SSSI and the lower Blithe.

The assessment has considered the impact attributable to South Staffordshire Water's proposal as well as the cumulative impact of in combination impacts/effects with other key catchment pressures. In combination considerations include regular large abstractions and discharges, as well as the possibility of other Drought Permits being operated simultaneously or other occasional or seasonal operations coming in to effect such as operation of the Trent Witham Ancholme Scheme.

### **7.3.4 The Baseline Environment**

#### River Blithe

The River Blithe is a tributary of the River Trent rising just to the east of Stoke on Trent and flowing to the Trent at their confluence near Nethertown. The most significant feature along the river is Blithfield Reservoir public supply. The reservoir is also a designated SSSI noted for its wintering wildfowl habitat for waders including both the shallow margins and adjacent transitional zones. The reservoir is also stocked as a trout fishery. In addition, the reservoir provides an important amenity facility for angling, sailing and bird watching. From Leigh (located some 12 km upstream of Blithfield Reservoir) the river (except for the reservoir) is essentially classed as a coarse fishery although there are pockets of brown trout present particularly below the reservoir.

There is little in the way of treated effluent discharge made to the Blithe although downstream of the reservoir there is a discharge from a fish farm. In the Upper Blithe there are significant groundwater abstractions made by Severn Trent Water for public supply. These abstractions are made from the Sherwood Sandstones of the Forsbrook groundwater unit by Severn Trent Water and it is believed there are some localised low flow problems associated with these operations.

#### The River Trent.

The River Trent has a catchment area of 10,500 km<sup>2</sup> and is some 275 km long. The river rises on Biddulph Moor (upstream of Stoke on Trent) and follows a southerly arc from west to east through the Midlands and outfalls into the Humber Estuary at Trent Falls just north-west of Scunthorpe. The river is heavily utilised and managed but, unlike the river Severn, is not significantly regulated.

The river and its tributaries provide a key water resource for public water supply throughout the Midlands and to Sheffield (via the Derwent Valley Reservoirs). In addition, the river provides; significant water supplies to industry, agriculture and navigation; a navigational channel (being a formal navigational waterway over a considerable length); a major receptor of treated effluent from municipal and industrial wastewater treatment works;

and, an amenity for angling, boating and riverside pursuits. The river forms an important fishery designated as a cyprinid fishery under the 'Freshwater Fish Directive' 78/659/EEC) from Willington to Gainsborough.

The Humber Estuary is a designated Natura 2000 and Ramsar site important for; inter-tidal habitats; wildfowl and waders; and, migratory fish. There are a range of environmental issues that require consideration with respect to the Natura 2000 and Ramsar designation for the Humber Estuary, in particular the migration of lamprey. It is also noted that in recent years salmon and trout migration along the Trent has recommenced with particular runs entering the Dove tributary but some also extending along the Trent up to the Penk tributary. Along the course of the river there are many designated nature conservation sites including numerous SSSIs (e.g. Attenborough Nature Reserve near Nottingham) as well as sites with other designations (particularly County Wildlife Sites). As part of the Biodiversity Action Plan (BAP) initiative the EA also plan to restore a large area of wet grazing marsh at Beckingham Marshes near Gainsborough. Additionally, under the Central Rivers Project there are initiatives to restore wetland habitats along the river.

There is a wide range of baseline monitoring undertaken within the Trent catchment, in particular by the Environment Agency. This includes; water quality, ecological, hydrometric, abstraction, discharge, amenity, and navigation data. The environmental report, summarised in Appendix I provides more detail on the baseline environmental features within the Blithe and Trent catchments, and considers the potential for impact on key river reaches.

### **7.3.5 Summary of Impact Assessment**

Following the process of conceptualisation of the River Blithe and Trent catchments and the identification of sources, pathways and receptors, an initial risk assessment was undertaken, in accordance with precautionary principles, to determine the likely significant impacts associated with the operation of a Drought Permit at Nethertown. In order to be precautionary even those risks identified as being low (or greater) were initially deemed to be significant and were subjected to further, more detailed assessments.

Hydrographs and flow duration curves were collated for actual gauged flow conditions occurring over the period January 1971 to December 2006 and this was taken as the baseline situation. The following four scenarios were examined by simulating the actual River Blithe and Trent abstractions over specific periods when very low flows actually occurred:

Scenario 1 When flows at North Muskham fall below 2650 Ml/d and storage in Blithfield Reservoir falls below the 'implement Drought Permit curve', abstraction will continue at a rate of 23Ml/d from the River Blithe intake and 9.1 Ml/d from the River Trent intake, until reservoir storage is at least 5% greater than the 'implement Drought Permit Curve'.

Scenario 2 As Scenario 1, but assuming the Blithe and Trent Drought Permit is operating concurrently with the lower drought related licensed control flow conditions coming in to effect on the River Dove (where Severn Trent Water (STWL) have a large abstraction for public supply) ;

Scenario 3 As Scenario 1, but assuming the Blithe and Trent Drought Permit is operating concurrently with a STWL Drought Permit on the River Derwent;

Scenario 4 As Scenario 1, but assuming the Blithe and Trent Drought Permit is operating concurrently with both the STWL Derwent Drought Permit and the lower drought related licensed control flow conditions coming in to effect on the River Dove.

The outcomes of the initial risk assessment indicated that when the Blithe and Trent Drought Permit operated in isolation, the majority of risks were negligible (or less). However, low levels of risk were identified for a number of receptors, both immediately downstream of the Blithe (Nethertown) abstraction (Reach 1b) and in Reaches 5-7 (from Drakelow PS to the Dover Beck confluence). No significant additional risks were identified when the DP was assessed in combination with additional abstraction on the Dove and/or the Derwent Drought Permit.

The outcomes of the initial risk assessment indicated that when the Blithe and Trent Drought Permit operated in isolation, the majority of risks were negligible (or less). However, low levels of risk were identified for a number of receptors, both immediately downstream of the Blithe (Nethertown) abstraction (Reach 1b) and in Reaches 5-7 (from Drakelow PS to the Dover Beck confluence). No significant additional risks were identified when the DP was assessed in combination with additional abstraction on the Dove and/or the Derwent Drought Permit.

Based on the outcomes of the initial risk assessment, a number of receptors in reaches 5-8 were identified as being at low risk and were subjected to further level and flow related analysis to quantify the likely impacts.

Following the additional assessments it was concluded that none of the receptors are likely to be impacted significantly by the operation of the Blithe and Trent Drought Permit under all scenarios. It was concluded that the proposed Blithe and Trent Drought Permit would enable an overall increase in abstractions for public water supply during severe drought periods, without causing any significant impacts to the environment, either alone or in combination with other key abstractions within the River Trent catchment.

### **7.3.6 Monitoring and Mitigation**

The environmental assessment concluded that due to the low risk of any impact associated with the Blithe and Trent Drought Permit, further mitigation or specific monitoring would not be necessary. However the assessment also

concluded that the Company should keep a watching brief on the baseline data collected in future by the Environment Agency. In particular on water quality and ecology (invertebrates, macrophytes and fisheries) within the Rivers Blithe (reach 1b) and Trent (reaches 6, 7 and 8). The Company will do this in future.

### **7.3.7 Consultation with Key Stakeholders**

The Company has consulted on our proposals for a potential future drought permit in detail with the Environment Agency, Natural England, British Waterways and Severn Trent Water. These key stakeholders have recently been given the opportunity to comment on the environmental assessment. Once their comments have been received we will update the environment assessment if necessary.

## **7.4 The Hampton Loade Drought Permit**

### **7.4.1 Background**

South Staffordshire Water's single most important water resource is the abstraction from the River Severn at Hampton Loade, to the south of Bridgnorth. This abstraction provides over 1/3 of the Company's total available water resource.

A potential drought permit for Hampton Loade has been included in this plan as an option of last resort, and could only be required in a drought which was more severe than the worst drought on record (1976). The Company recognises that there is likely to be conflict with an Environment Agency drought order (see section 10.2) under these conditions.

The abstraction licence for Hampton Loade is complicated, and the amount that can be abstracted is dependant upon the flow on the River Severn at Bewdley, the time of year, the degree of River Regulation, and in extreme droughts, by the implementation of an Environment Agency drought order. In addition, the licence at Hampton Loade is further complicated because Severn Trent Water are entitled to part of the licence, and furthermore the licence has some joint licence conditions with Severn Trent Water's licence downstream on the river at Trimley.

Water abstracted from the river Severn at Hampton Loade is pumped into Chelmarsh bankside storage reservoir, and then onwards to the treatment works across the river.

Severn Trent utilise their share of the Hampton Loade licence by transferring 20 MI/d down to Trimley (by agreement), and by taking a bulk supply of treated water to Wolverhampton (c.40 MI/d).

The River Severn is Regulated by the Environment Agency, who control the release of water from Clywedog Reservoir, the Shropshire Groundwater Scheme, and the Vyrnwy bank. Further details are provided in the environmental report, that is summarised in Appendix J.

The key licence constraint with regard to this potential drought permit is that the abstraction licence at Hampton Loade is effectively restricted to 192 MI/d when the river is being Regulated, and this reduces by a further 5% if the Environment Agency enforce a drought order on the River.

#### **7.4.2 The Drought Permit**

The Company appointed consultants (ENVIROS) to assess the potential environmental impact of a drought permit at Hampton Loade. The report is summarised in the following sections, and a full copy is available by contacting the Water Resources Manager at South Staffordshire Water.

Two separate drought permit options at Hampton Loade are included in this plan, and these have been considered separately within the environmental report. These two options have been investigated in order to give the Company the flexibility to apply the most appropriate drought permit, depending on the particular circumstances of a future drought. Each permit is described below:

(i) The first permit scenario (called Option 1) would be a request to maintain abstraction at Hampton Loade at normal maximum regulation levels during periods when the EA have sought a drought order on the Severn. An Environment Agency drought order would require the Company to reduce abstraction by 5% from 192 MI/d down to 182.4 MI/d. The DP would therefore allow the take from the Severn to be increased from the theoretical maximum of 182.4 MI/d back up to 192MI/d.

The Company would only consider applying for this drought permit if two conditions were met, (a) that an Environment Agency Drought Order was in force, and (b) that Blithfield Reservoir was below the Apply for Drought Permit trigger curve, and the application for all other permits had been made.

Modelling of the River Severn by Severn Trent Water and the Environment Agency using Severn Trent Water's water resources model (RESSIM), and by the Company (using WRAPSIM) suggests that this option would only be required in a drought worse than that seen in the historic 80 year record.

(ii) The second permit scenario (Called Option 2) would be a request to increase abstraction at Hampton Loade during maximum regulated conditions on the Severn from 192MI/d up to 245MI/d. This would allow the maximum operational capacity of the Hampton Loade treatment works to be used if required.

The Company would only consider applying for this drought permit if two conditions were met, (a) that Maximum Regulation was in force (b) that

Blithfield Reservoir was below the Apply for Drought Permit trigger curve, and the application for all other permits had been made.

This option is only likely to be considered if Blithfield storage is below the Emergency Storage trigger, and additional resources are required from Hampton Loade to maintain supply. Modelling of the River Severn by Severn Trent Water and the Environment Agency using Severn Trent Water's water resources model (RESSIM), and by the Company (using WRAPSIM) suggests that this option would only be required in a drought at Blithfield that was worse than that seen in the historic 80 year record.

Having two options in the plan for Hampton Loade provides a measure of flexibility, so that the most appropriate permit can be identified, and the impact on the environment minimised.

### **7.4.3 Overview of Assessment Methodology**

In order to determine the potential environmental impact of the proposed drought permit scenarios consultants (ENVIROS) were commissioned to undertake an environmental report. The objectives of the study were to assess implications of the proposed drought permit application(s) on:

- River water quality and ecology (macroinvertebrates, macrophytes and fisheries);
- The Severn Estuary Special Protection Area (SPA), proposed Special Area of Conservation (pSAC) and Ramsar (protected wetland) features and associated conservation objectives;
- Navigation, particularly the Gloucester-Sharpness canal;
- Recreation and amenity;
- Other abstractions and protected rights;
- Archaeology and heritage;

The study included;

- a review of previous studies and an update of datasets and information;
- an assessment of the requirements of the report in light of regulatory frameworks such as Catchment Management Strategy (CAMS) and Resource Assessment and Management Framework (RAMS) and the latest guidance on the scope of Environmental Reports in support of Drought Permit applications;
- the identification of the historical and ongoing effects of significant abstractions and discharges on low flow conditions within the Severn catchment;



- an analysis of the physico-chemical and ecological data to establish the critical relationships between flow and the ecological condition of the river which may influence the ecological quality (defined by ecological ranking/weighting indices);
- a conceptualisation of the River Severn system
- a preliminary risk assessment
- a further assessment of those issues which scored as a low risk or higher
- a recommendation of appropriate mitigation measures

#### **7.4.4 The Baseline Environment**

The River Severn is a highly utilised and managed/regulated system. The river is a key water resource supplying public water supplies to Merseyside, the West Midlands (stretching from Coventry to Shropshire and including Wolverhampton and parts of Birmingham), Worcestershire, Gloucester and Bristol (via the Gloucester to Sharpness Canal). In addition, the river provides; significant water supplies to industry, agriculture and navigation; navigational channel (being a formal navigational waterway as far upstream as Stourport and used more informally as far upstream as Welshpool); a major receptor of treated effluent from municipal and industrial wastewater treatment works; and, an amenity for angling, boating and riverside pursuits.

The river forms an important fishery designated as a cyprinid fishery under the 'Freshwater Fish Directive' 78/659/EEC) and the Severn Estuary is a designated Natura 2000 and Ramsar site important for; inter-tidal habitats; wildfowl and waders; and, migratory fish (including salmon, sea trout and lamprey). Along the course of the river there are many designated nature conservation sites including numerous SSSIs as well as sites with other designations (particularly County Wildlife Sites).

The baseline physical and environmental status of the river is described in considerable detail in the environmental report.

#### **7.4.5 Summary of Impact Assessment**

Following the process of conceptualisation of the River Severn catchment and identification of sources, pathways and receptors an initial risk assessment was undertaken, in accordance with precautionary principles, to determine the likely significant impacts associated with the operation of a Drought Permit at Hampton Loade. In order to be precautionary even those risks identified as being low (or greater) were initially deemed to be significant and were subjected to further, more detailed assessments.

The risk assessment was undertaken for four scenarios looking at different changes to the current abstraction regime (under maximum regulation conditions) at Hampton Loade and cumulative pressure that may result from a simultaneous drought permit at Trimpey (operated by Severn Trent Water). The most severe scenario tested was Scenario 3 where abstraction at Hampton Loade was maintained at 245MI/d (up from 192MI/d) and an additional 120MI/d was modeled as being abstracted at Trimpey (this is the difference between the normal 60MI/d abstraction and the maximum drought permit abstraction of 180MI/d under consideration).

The outcomes of the initial risk assessment indicated that when the proposed Hampton Loade drought permit was considered in isolation almost all of the risks were negligible or very low. However; when analysing in combination effects the risk levels increased. For scenario 3 risks (from low to medium) were evident for a number of receptors in all reaches of the River downstream of the abstraction.

Based on the outcomes of the initial risk assessment (for Scenario 3), a number of receptors (including riverine and estuarine ecology, protected rights, navigation and amenity, riparian ecology and heritage) were identified as being at low or greater risk and were subjected to additional level and flow related analysis to further quantify the likely impacts. Subsequent to the additional level and flow related assessments it was concluded that most receptors are unlikely to be impacted significantly by the operation of a Drought Permit at Hampton Loade (even when considered in combination with additional abstraction at Trimpey). However, significant impacts are likely in the upper estuary (reaches 7-8) for fish/angling and for the navigation/abstraction issues associated with the Gloucester & Sharpness Canal.

These impacts are a direct result of the water quality problems (saline intrusion, high turbidity and DO sags) associated with the critical combination of very low flow and spring tides in the upper estuary. Whilst it is acknowledged that measures have been put in place to reduce such occurrences, it is felt that such impacts could still potentially occur during extreme periods of low flow in combination with Spring tides.

Although these issues have already been highlighted as a concern to the upper estuary, the proposed additional abstraction during these critical periods is likely to exacerbate existing impacts. While all assessments were undertaken using very precautionary approaches, consideration of the available mitigation measures is necessary to ensure the ecology and protected rights of the upper estuary are protected.

A number of mitigation options have been identified for consideration which could be carried out, either in isolation or through a combination of activities, which would substantially alleviate the water quality and related problems in the upper estuary during these critical flow-tide periods. Finally, it was concluded that the adoption of a more flexible approach to abstraction operations, regulation operations and the terms of associated licences could

enable an overall increase in abstraction, whilst maintaining (or possibly improving) the safeguards to the environment.

Under prevailing low flow conditions it is envisaged that this would involve abstractions on the river that vary according to the tidal situation in the estuary. Under these circumstances higher rates of abstraction could be sustained during neap tide conditions. Part of this additional abstraction would be used to either replenish bankside storage or conserve reservoir stocks. This would allow selected abstractions to be safely limited during Spring tides enabling residual flows to the estuary to be transitorily increased. In conjunction with the above enhanced water quality monitoring in the upper estuary is also recommended and consideration should also be given to enhance monitoring of the associated fishery.

#### **7.4.6 Monitoring and Mitigation**

The environmental report recommended that additional monitoring of dissolved oxygen, conductivity, and suspended sediment should be undertaken on the upper estuary; both upstream and downstream of Gloucester. The report suggested that the use of existing monitoring stations should be explored. In addition the report concluded that installation of continuous monitors may be required, particularly at the intake to Gloucester and Sharpness canal.

The Company has begun to discuss the monitoring requirements with the Environment Agency, and with the other key stakeholders on the river and is committed to undertaking additional monitoring where appropriate. However there are several stakeholders involved, and this is a complex issue, which will also be influenced by ongoing Habitats Directive and Water Framework Directive programmes. The Company believes that a joint approach to any future monitoring and mitigation is essential.

The consultants report also identified a number of mitigation options which could be carried out, either in isolation or through the combined activities of a number of stakeholders. The report suggests that these options could substantially alleviate the water quality and related problems in the upper estuary during critical flow-tide periods. The mitigation options include changes to abstraction operations and river regulation, with the aim of alleviating water quality problems (dissolved oxygen sags, turbidity, and saline intrusion) in the Upper Estuary and associated impacts to fisheries and the abstraction to the Gloucester & Sharpness Canal. The specific options identified are listed below:

- Encourage major abstractors, particularly those who operate sources in tandem with significant bank-side storage facilities, to adopt more flexible modes of operation. Under low flow conditions this will mean varying river abstractions depending upon the state of the tide. In order to help facilitate this, the EA may need to consider more flexible abstraction licences.

- Adopting a secondary flow control on the Severn in addition to Bewdley relevant to the estuarine reach. In this respect moves are already under development by the EA to consider use of the Deerhurst gauge for this purpose.
- Develop flow controls which also consider tidal condition and level of demands by British Waterways at Gloucester.
- Consider refinements to river regulation operations, and associated control rules, at Clywedog and Vyrnwy which also consider the state of flow regime and tide in the Upper Estuary.

The Company is willing to actively consider more flexible modes of abstraction during drought conditions, where these do not adversely impact on supply capability. These issues require further discussion and clarification with the Environment Agency and the other key stakeholders on the river.

The remaining options are largely under the remit of the Environment Agency, who are responsible for river regulation. Potential changes to the way in which the Severn is regulated are already under consideration by the Agency (as identified in the Agency's River Severn Corridor Catchment Abstraction Management Strategy). The Company is keen to be involved in this process and to understand the potential impact of any changes.

The Company believes that the adoption of a more flexible approach to abstraction and regulation operations could enable an overall increase in abstraction, whilst maintaining (or possibly improving) the safeguards to the environment.

#### **7.4.7 Consultation with Key Stakeholders**

The Company has consulted on our proposals for a potential future drought permit in detail with the Environment Agency, Natural England, British Waterways, Severn Trent Water and Bristol Water. These key stakeholders have been given the opportunity to comment on the environmental assessment, and the Environment Agency's detailed feedback has been included in the final report.

Natural England have also commented on the assessment. They are also broadly in support of the report, although they have identified a few specific questions. The Company is currently reviewing these comments and questions and intends to respond to Natural England shortly.

## **8 Drought Monitoring Plan**

### **8.1 Overview**

The amended Water Industry Act (1991) states that water companies shall address in their drought plans how they 'will monitor the effects of the drought and of the measures taken under the drought plan'. In addition, the Environment Agency's Drought Planning Guidelines (2005) require that 'A water company should include details of how the impact of the drought, the impact of the company's drought activities and a given site's recovery will be assessed by its monitoring plan. Monitoring should focus on those features of greatest sensitivity or importance.'

This section of the plan outlines the baseline hydrometric monitoring undertaken by the Company and by the Environment Agency, to monitor the water resources position, and the severity of a drought. In addition, the section provides details of the baseline and drought specific monitoring that the Company will undertake to examine the impact on the environment of sensitive existing abstractions, and potential drought permits.

The extent of the Environment Agency's own monitoring network is summarised below, as the data from this network is used extensively by the Company during normal and drought scenarios.

In addition to the Environment Agency's own monitoring network, the Company also carries out selective baseline monitoring, this is also described below.

Any additional monitoring which may be required to understand the effects on the environment of specific Company drought actions, is the responsibility of South Staffordshire Water. Where additional monitoring is necessary, this is identified in section 8. This is restricted to those options where abstraction outside of current licence conditions is proposed (drought permits).

### **8.2 Baseline Water Resources and Environmental Monitoring**

#### **8.2.1 Baseline Monitoring by the Environment Agency**

The Environment Agency maintain and report on a comprehensive hydrometric and environmental monitoring network, and this information is made available to Water Companies by regular communication with the Agency. This includes hydrometric, water quality and ecological data. This information is essential to South Staffordshire Water in the identification and monitoring of drought conditions, and in the identification of baseline conditions against which any impact assessments are measured. The Company believes that this baseline monitoring should continue to be the responsibility of the Environment Agency.

The Environment Agency have identified a number of specific monitoring sites within the Midland Region, which can be used to track the development of a drought and be used as indicators for determining drought status by the Environment Agency. These sites include river flows, groundwater levels, rainfall and reservoir levels. Details of each site relevant to South Staffordshire Water can be found in the Agency's area drought plans for the Upper Severn, and Upper Trent. The Agency monitor these sites weekly during April to October and fortnightly during November to March, unless required weekly earlier or later in the year due to dry conditions. In addition to these sites, the Agency also monitor soil moisture deficits (a measure of the dryness of the soil).

Baseline data is made available to South Staffordshire Water in the form of monthly water situation reports from the EA, and in response to specific data requests. In addition the Agency sends out notification letters to the Company when abstraction licence conditions may be triggered by low river flows or by other triggers.

The following key datasets are worthy of separate mention;

The key river flow data that controls the Company's surface water abstraction at Hampton Loade is at Bewdley on the River Severn. This information is measured by the Agency and provided by the Agency's existing telemetry system so that it can be interrogated on a real time basis via a telemetry link at Hampton Loade treatment works.

River Trent flow at North Muskham (Newark) is a key control on the Nethertown and River Trent abstractions downstream of Blithfield reservoir. This information is not provided by the Agency on a continuous real time basis, however when the flow is approaching the trigger (when it reaches a nominal threshold of 3180 MI/d) the EA send a letter to the Company identifying that river flows are approaching the 'hands off flow' limit of 2650 MI/d. In order to help the Company manage abstraction at Nethertown the Agency has recently set up an automated flow alarm (sent via email) which informs the Company when flow on the River Trent is below 4,000 MI/d and below 2,800 MI/d.

Reservoir storage at Clywedog is recorded by Severn Trent Water (who maintain the reservoir) for the Environment Agency. This information is provided to the Company by the Agency as part of the regular water situation reports. Storage at Clywedog is the basis for one set of drought triggers in this plan.

### **8.2.2 Baseline Monitoring by South Staffordshire Water**

The Company maintains an automated groundwater level monitoring system at many of its groundwater sources, which is linked to telemetry. This is supported by a comprehensive monthly manual dipping programme.

Information on abstraction rate and pumping water level is recorded, and can be compared to historical records when required.

The Company also maintains a network of 14 rain gauges at selected treatment works, groundwater sources, and service reservoirs. This information is also provided to the Environment Agency. In addition 3 new weather stations have been constructed, at Barr Beacon service reservoir, at Outwoods service reservoir, and at Cookley. These stations measure temperature, sunshine hours, and rainfall, and they are connected to the Company's telemetry system.

River flows are measured by the Company on the Blithe at Nethertown, in order to manage the abstraction at Nethertown, and the supporting River Trent abstraction. This data is recorded by the Company's telemetry system. In addition, compensation flows from Blithfield reservoir are recorded on a daily basis.

Reservoir storage at Blithfield is measured continuously, and is available via telemetry. Blithfield storage is the main drought trigger within this plan.

In addition to the collection of hydrometric data, the Company will also continue to measure abstraction from all of its sources in order to ensure that abstraction licence limits are not exceeded during periods of high drought demand, and that any licence conditions are met. The Company will also continue to measure and report on overall demand as accurately as possible. Accurate measurement of demand is an essential part of drought management, and in the identification of the benefit from any demand saving measures.

The Company does not currently undertake any baseline ecological or water quality monitoring of the environment, with the exception of the raw and treated water analysis from its treatment works.

### **8.3 Monitoring the Environmental Effects of Company Drought Management Options**

#### **8.3.1 Demand Management Options**

The environmental impact of the Company's demand management options is considered to be negligible, therefore no specific environmental monitoring is proposed.

#### **8.3.2 Options Where Abstraction will remain within existing Abstraction Licence Limits**

The Company is legally entitled to abstract water from the River Severn, Blithfield Reservoir and 27 groundwater sources, up to the quantities defined in our abstraction licences. These licences are issued and regulated by the

Environment Agency.

The Company is aware that, during a serious drought, abstraction within abstraction licence limits, combined with severe rainfall shortages, could in some cases contribute to short-term environmental impact. The Company is fully committed to the long-term sustainability of water resources and measures have already been taken by the Company, in collaboration with the Environment Agency, to protect long-term average flows in the Leamonsley Brook near Lichfield, and the Blakedown Brook near Kidderminster, by a reduction in abstraction from sources in their vicinity. The Company is currently investigating another scheme at Checkhill Bogs SSSI in the Stour catchment.

Despite these measures, an extreme drought and the associated likelihood of high customer peak demands, may necessitate abstraction levels with some short-term environmental impact. Below (in table 3) is a list of sites that the Company believes may be at risk under such circumstances, together with an indication of existing monitoring plans. Table 3 identifies the actions that the Company will consider in order to minimise the environmental effect of a drought.

A map of these sites is shown in Appendix K.



**Table 3 Environmental Monitoring Associated with Existing Abstraction Licences**

Site/Location	Monitoring	Potential Impact	Mitigation Action
Chelmarsh Reservoir (near Hampton Loade)	Chelmarsh is a man made bank side storage reservoir. Levels in Chelmarsh will be drawn down as required to meet the demand from Hampton Loade. The Company already monitors levels at Chelmarsh.	Low levels	The Company aims to keep Chelmarsh as full as possible, and will consider modifying abstraction regimes where this will not compromise the operation of Hampton Loade.
Blithfield Reservoir SSSI.	Blithfield is a man made impounding reservoir. The Company undertakes water level and water quality monitoring. The frequency of monitoring may be increased in the event of a drought.	Low levels	Levels in Blithfield Reservoir will be drawn down as required to meet the demand from Seedy Mill. Company policy is to conserve storage in Blithfield as much as possible during a drought.
Hurcott and Podmore Pools SSSI (Blakedown Brook catchment)	The Environment Agency currently undertakes a wide range of surface water and groundwater level monitoring in this catchment.	Low levels	Long-term reductions in average abstraction already implemented. Increase use of compensation borehole in the short term.
Leamonsley Brook, Stowe and Minster Pools SSSI.	The Environment Agency currently undertakes a wide range of surface water and groundwater level monitoring in this catchment.	Low flows,	The Company can pump water out of the Hanch Tunnel into the Leamonsley Brook if the levels in Stowe Pool fall to unacceptable levels.
Rising Brook (Cannock Chase)	The Company is already undertaking routine flow monitoring.	Low flows	Compensation releases currently made to the brook in dry weather, and may be increased in drought.
Sutton Park SSSI.	The Company is undertaking routine groundwater level monitoring at a number of observation boreholes to examine the impact of abstraction from the Wheatmoor Wood groundwater source. The source is currently mothballed and a review of the monitoring requirements is underway.	Low flows in brooks and ponds.	The Company has no plans to use the Wheatmoor Wood groundwater source even in drought. No actions proposed.
Checkhill Bogs	The Environment Agency currently undertakes a range of surface water and ecological monitoring in this catchment.	Low flows	The impact of the Company's abstractions is currently being investigated by the EA and by SSW.

### **8.3.3 The Hanch Tunnel Drought Permit**

The scope of the potential drought permit for the Hanch Tunnel is described in section 7.2, along with a summary of the environmental investigations carried out to date. The historical data and existing baseline monitoring programme is summarised in section 8 and in the environmental assessment report, along with the data collected as part of the recent test pumping programme. The Company has discussed the future baseline, drought, and recovery monitoring requirements with the Environment Agency and Natural England, and these are summarised in table 4 below.

### **8.3.4 The River Blithe and River Trent Drought Permit**

The scope of the potential drought permit for the River Blithe and the River Trent is described in section 7.3, along with a summary of the environmental assessment. The environmental assessment concluded that due to the low risk of any impact associated with the Blithe and Trent Drought Permit, further mitigation or specific monitoring would not be necessary. However the assessment also concluded that the Company should keep a watching brief on the baseline data collected in future by the Environment Agency. In particular on water quality and ecology (invertebrates, macrophytes and fisheries) within the Rivers Blithe (reach 1b) and Trent (reaches 6, 7 and 8). The Company will do this in future.

### **8.3.5 The River Severn Drought Permit at Hampton Loade**

The scope of the potential drought permit for the River Severn at Hampton Loade is described in section 7.4, along with a summary of the environmental investigations carried out to date. The historical data and existing baseline monitoring programme is recorded in detail in the environmental assessment, summarised in Appendix J.

The environmental report (section 7.4.7) recommended that additional monitoring of dissolved oxygen, conductivity, and suspended sediment should be undertaken on the upper estuary; both upstream and downstream of Gloucester. The Company has had initial discussions with the Environment Agency on the future baseline, drought, and recovery monitoring requirements, however there are a number of stakeholders involved and a number of ongoing work programmes which could influence this issue. The Company believes that a joint approach, involving all stakeholders is required to agree the way forward on this issue, and that this should be coordinated by the Environment Agency.

### **8.3.6 Monitoring the Impact of Abstraction on Amenity and Recreation**

No direct monitoring of the impact of licensed or drought permit abstraction

on amenity and recreation value is undertaken, or is proposed. These issues are specifically covered in the drought permit environmental reports for the Blithe/Trent and the River Severn, and where necessary measurement of key parameters like flow, level and water quality can be used to assess impact.

Table 4 South Staffordshire Water - Environmental Drought Monitoring Plan

Drought Measure	Environmental Site/Catchment	Parameters Monitored	Method	Frequency	Trigger	New or Existing?	Owner	Duration
The Hanch Tunnel Drought Permit	Leamonsley Brook catchment, Stowe Pool SSSI	Hanch Tunnel Overflow	Fixed flow measurement device in tunnel.	Daily	N/A	New	SSW	Baseline and Drought
		Stowe Pool Level	Gauge Board	Weekly	N/A	Existing	EA/LDC	Baseline
	(Site 'A' in Environment Report)	Stowe Pool Level	data logger	Continuously	N/A	Existing	EA	Baseline
		Leamonsley Brook	spot gauging/flow sensor	Continuously	Apply for Drought Permit	Existing	EA	Drought
		Darwin and MinsterPool Level	Data logger,	Continuously	N/A	Existing	EA	Baseline
		Beacon Park stream flow	Weir, data logger	Continuously	N/A	Existing	EA	Baseline
		Hanch Tunnel Groundwater Levels	Transducers at shaft 20,25 and 1.	Continuously	N/A	Existing	EA	Baseline
		11 groundwater observation boreholes	Manual dips	Weekly	N/A	Existing	EA	Baseline
		Invertebrates and Crayfish Stowe Pool/Leamonsley	Kick Sampling	Twice Yearly	N/A	Existing	EA	Baseline
(Note: further details of baseline and investigatory monitoring are included in section 8 and the environmental report .	Walkover Surveys	Adhoc	N/A	Existing	EA/NE	Baseline		

<b>Drought Measure</b>	<b>Environmental Site/Catchment</b>	<b>Parameters Monitored</b>	<b>Method</b>	<b>Frequency</b>	<b>Trigger</b>	<b>New or Existing?</b>	<b>Owner</b>	<b>Duration</b>
The River Blithe/River Trent Drought Permit	The River Blithe downstream of Nethertown.	River Flow at Nethertown	Weir, with stage recorded by transducer linked to telemetry	Continuous	N/A	<b>Existing</b>	SSW	Baseline
	(Note: further details of baseline and investigatory monitoring are included in the environment report and in section 8.	Compensation Discharge at Blithfield	Weir, with stage recorded by transducer linked to telemetry	Continuous	N/A	<b>Existing</b>	SSW	Baseline
	The River Blithe and the Trent from the Blithe Confluence to the Humber Estuary (Habitats Directive-SAC)	Flow, level, water quality, ecology and fishery data	See Environment Report	See Environment Report	N/A	<b>Existing</b>	EA	Baseline

<b>Drought Measure</b>	<b>Environmental Site/Catchment</b>	<b>Key Parameters Monitored</b>	<b>Method</b>	<b>Frequency</b>	<b>Trigger</b>	<b>New or Existing?</b>	<b>Owner</b>	<b>Duration</b>
The River Severn Drought Permit at Hampton Loade	The River Severn upstream and downstream of Hampton Loade, to the Severn Estuary	River Flow at Bewdley, and other key locations along the River	Gauge, linked to telemetry	Continuous	N/A	<b>Existing</b>	EA	Baseline
	(Note: further details of baseline and investigatory monitoring are included in the Environmental Assessment report in Appendix J.	Storage at Clywedog and reservoir releases	Level and flow monitoring linked to telemetry	Continuous	N/A	<b>Existing</b>	STW/EA	Baseline
		Shropshire Groundwater Scheme catchment monitoring	Wide ranging hydrometric, ecological and water quality data collection.	Continuous	N/A	<b>Existing</b>	EA	Baseline
		River and Estuary water quality, ecology and fisheries data.	Wide ranging hydrometric, ecological and water quality data collection.	Continuous	N/A	<b>Existing</b>	EA	Baseline
		Upper estuary, upstream and downstream of Gloucester	Dissolved Oxygen, conductivity, suspended sediment	Spot sampling or permanent gauge	This has yet to be confirmed (see s.7.4.6)	This has yet to be confirmed (see s.7.4.6)	<b>New</b>	To be confirm.

Note: there is an extensive baseline hydrometric, water quality and ecological monitoring network managed by the Environment Agency in the Severn and Trent catchments, and it is not practical to list every parameter measured. Key parameters have been included for information, along with any specific additional monitoring required by SSW.

## **9 Drought Management**

### **9.1 Overview**

South Staffordshire Water recognise that communication is an essential part of drought management, both internally within the Company, and externally, with our customers, our other stakeholders, and the media.

The Company drought management structure and the drought communication plan are described below, and detailed in Appendix L and Appendix G. The management structure provides a detailed breakdown of who will be responsible for managing and implementing the Company's actions during a drought, and the communication plan identifies how and when relevant information will be communicated to all of our stakeholders. It should be stressed however, that the circumstances of each drought will be different, and a certain amount of flexibility in the communication plan is required in order to respond to this uncertainty.

It will be very important to ensure that there is good liaison between the Company and the Environment Agency to ensure that a consistent message is sent out to the public.

Liaison with Severn Trent Water and Bristol Water will also take place to ensure where possible that consistent messages are sent out with respect to a River Severn drought. Liaison with other key stakeholders will also be undertaken as the drought develops.

To further ensure delivery of a consistent message, the internal collation and subsequent release of information to external parties shall be the responsibility of the Drought Management Team. Final signing off of any releases of information will be the responsibility of the Company's Senior Management Team following recommendations from the Drought Management Team.

### **9.2 Company Roles and Responsibilities**

Under normal operating conditions (when both Blithfield and Clywedog are above their respective drought warning triggers) the Company Supply Planning Group meets at the beginning of every week to discuss the demand forecast for the week, to review any known operational restrictions on output, and to plan the required output from sources to meet demand.

The Supply Planning Group will identify when either of the drought monitoring trigger curves is likely to be crossed and this will trigger a meeting of the Company Drought Management Team. This team will meet to discuss the longer term water resources position and to review reservoir storage predictions. Actions to mitigate a potential drought will be identified. This group will meet fortnightly and will update the Senior Management Team

(SMT) and the Company Directors with regard to the Company's supply / demand position and actions proposed according to this plan. Key issues will be referred to SMT and the Board for approval. The frequency of the Drought Management Team meetings will be reviewed as the Company moves from a drought monitoring position into a drought.

The Drought Management Team is summarised below and the roles and responsibilities are detailed further in Appendix L.

<b>Job Title</b>	<b>Role</b>
The Supply and Resources Director	Head of the Drought Management Team and liaison with SMT and the board of directors.
The Head of Water Strategy	Lead role on supply and demand management measures and stakeholder management.
The Water Resources Manager	Water resources technical specialist. Blithfield Reservoir storage forecasting. Ensuring consistency with the Drought Plan. Drought permit preparation and application
The Northern Area Production Manager	Management of Seedy Mill and the northern groundwater sources
The Southern Area Production Manager	Management of Hampton Loade and the southern groundwater sources
The Network Controller	Control of the supply network.
The Director of Customer Services	Coordinator for external communication with customers and CCWater.
Media Team	Respond to specific media queries.

A range of other Company roles will be called upon as and when required. These may include representatives from the Water Quality, Distribution, and Customer Services Departments.

All aspects of internal operational management during periods of drought will be the responsibility of the Supply and Resources Director who will report directly to the Company's Senior Management Team and to the Board of Directors.

### **9.3 Administration Procedures**

An accurate and well organised administration procedure is an important element in the management of any future drought. This will enable the key decisions and actions from the drought management team to be recorded,



and it will minimise delays in the implementation of actions. The drought management schedule in Appendix E will be used to record key actions and issues during the drought, and any benefits that result. This will be useful in the internal review at the end of the drought.

The drought management team will appoint an administrator at the first meeting. The administrator will be responsible for recording minutes and actions from the drought management meetings, and for keeping an up to date electronic filing record of all the drought related information.

## **9.4 Communication Plan**

An overview of the key actions and communications that may take place during a drought are described below and summarised in table 5. In addition a detailed Communication Plan which identifies all of our stakeholders is presented in Appendix G.

Customers are advised to visit our website for an update of the current resources position, or to contact us via our supply line no. 0800 3891011.

Communication from the Company to external stakeholders will generally be made by the Head of the Drought Management Team (the Supply and Resources Director) or by the Head of Water Strategy, as detailed in Appendix G.

In the event of any uncertainty, queries and contact from external stakeholders on drought specific issues should be addressed to the Head of the Drought Management Team (The Supply and Resources Director).

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### **9.4.1 The Timing and Nature of Communications**

The Drought Management Team will identify the requirement for external communication based on the triggers identified in this plan. The overall responsibility for this decision will lie with the Company's Senior Management Team (SMT).

Communication with the public and with other stakeholders will escalate as the drought progresses and as each trigger curve is crossed. This is illustrated in the table below.

Table 5 Communication Plan Overview

Reservoir Storage Position	Main Actions and Communications
<p style="text-align: center;"><b>Above Drought Monitoring Trigger Curve at Blithfield (or alert curve at Clywedog)</b></p>	<p><b>Normal Operation</b> The Company aims to minimise costs.</p> <p><b>Communications:</b> Routine liaison with the Environment Agency on reservoir storage levels both at Clywedog and at Blithfield.</p> <p>Routine communication with Severn Trent Water in order to manage the Hampton Loade/Trimpley Licence</p> <p>The Company has a continuous programme to promote water efficiency with customers, including an annual message which is sent out with bills, information on the website and specific water efficiency projects.</p>
<p style="text-align: center;"><b>Drought Monitoring Trigger Curve Crossed (or alert curve at Clywedog)</b></p>	<p><b>Drought Monitoring:</b> The Drought Management Team will meet to review the Company resource position and calculate refill statistics at Blithfield. The EA will be consulted on reservoir storage forecasts for Clywedog and for the River Regulation forecast. There will be a move from cost minimisation to the conservation of reservoir stocks. There are a range of resource and demand management options available to the Company, these are described in Section 6.</p> <p><b>Communications:</b> The Environment Agency will be contacted to discuss the course of action proposed by the Company, and to compare refill predictions. If necessary a meeting will be held. In the event that the Clywedog alert trigger is crossed the Environment Agency will arrange a meeting of the major stakeholders of the River Severn Drought Management Group. This could also include a meeting of the River Severn Modelling Group. As the apply for drought permit trigger lines are approached a further meeting with the EA is likely to take place to confirm actions.</p> <p>Close liaison with Severn Trent Water will take place over the operation of Trimpley and Hampton Loade.</p> <p>The wider external communication messages that the Company will undertake will depend on the particular circumstances of the drought. However, communications are likely to take place in two stages once the drought monitoring/drought alert curve have been crossed:</p> <ul style="list-style-type: none"> <li>(i) The Company will issue general water saving messages to the public on the website and in the local press (see section 6). This type of activity is already undertaken by the Company. Other external stakeholders will be updated by email or letter as required (see Appendix G).</li> <li>(ii) As the apply for drought permit trigger is approached an additional message will be issued with greater emphasis</li> </ul>

	<p>on water savings (see section 6 and Appendix F). Other external stakeholders will be updated by email or letter (see Appendix G). This may include reference to potential drought permit applications.</p> <p>External communication will be coordinated by the Head of Water Strategy (see Appendix L).</p>
<p><b>Apply for Drought Permit Trigger Curve Crossed</b></p>	<p><b>Drought Management</b> This stage is reached when the apply for drought permit trigger curve is crossed at Blithfield or the apply for drought order trigger curve is crossed at Clywedog.</p> <p><b>Communications:</b> When the Blithfield trigger curve is crossed the Company will organise a meeting with the Environment Agency to discuss the drought situation and the proposed drought permit conditions. Further meetings may be required to discuss the detail of the application(s).</p> <p>Drought permits will be advertised and available for public inspection.</p> <p>When the Clywedog apply for drought permit trigger is crossed the Company would seek a meeting with the EA to discuss the future reservoir storage predictions at Clywedog, the likely River Regulation status and the implementation of the 5% reduction in abstraction identified in the EA drought permit/order.</p> <p>Appeals for customers to reduce demand will intensify, and will make reference to any drought permit applications and other demand management proposals. This would include information on the Company website with press releases as required. Other external stakeholders (including Natural England and British Waterways) will be contacted/updated by email or letter on drought specific issues (see Appendix G).</p> <p>A further meeting of the River Severn Modelling Group is likely to be required. The Company will also examine the potential to maximise resources with Severn Trent Water, and to ensure that the Hampton Loade and Trimpey licences are managed efficiently.</p>
<p><b>Enforce Drought Permit Trigger Curve Crossed</b></p>	<p><b>Management of a Severe Drought</b> The drought permits that have been applied for become live. Any drought permits will need to be preceded by a hosepipe ban.</p> <p><b>Communications:</b> The Company will advertise and enforce a hosepipe and sprinkler ban immediately prior to the implementation of a drought permit. Information will be posted on the Company website. This will be accompanied by appropriate media messages and calls for customers to reduce water use.</p> <p>The drought permit conditions will become live.</p> <p>The Company will continue to liaise closely with the Environment</p>

	Agency and all the other stakeholders. If the Emergency Storage trigger curve is approached the Company will contact the Environment Agency to discuss reservoir forecasts and further actions.
<b>Emergency Storage</b>	<p><b>Emergency Storage</b> The Company will consider restrictions on non essential use. This will require a drought order application.</p> <p><b>Communications:</b> A meeting will be arranged with the Environment Agency to discuss the course of action proposed by the Company, and to compare refill predictions.</p> <p>If a drought order to ban non essential use is required it will be advertised and accompanied by the appropriate press releases.</p> <p>Media messages and calls for customers to reduce water use will continue.</p> <p>Extensive consultation and liaison with affected stakeholders will be undertaken in the run up to any such action.</p>
	<p><b>Drought Cessation</b> The Company will consider reducing or ceasing any drought actions if storage at Blithfield rises 5% above the drought monitoring trigger curve and/or storage rises above the drought alert curve.</p> <p>The Company will consider withdrawing drought permit applications if storage rises 5% above the apply for drought permit trigger curve at Blithfield.</p> <p>The Company will consider relaxing drought permits or drought orders once storage rises 5% above the implement drought permit trigger curve at Blithfield.</p> <p><b>Communications:</b> A meeting will be arranged with the Environment Agency if necessary to discuss the course of action proposed by the Company, and to compare refill predictions.</p> <p>Other stakeholders will be kept informed of any change in drought status.</p>

#### 9.4.2 Communication with the Public

The Company already provides information on water efficiency to its domestic customers through a variety of communication channels including its billing envelopes, website, and education programme. It also has a communication strategy in place for advising domestic customers about the high water use and metering requirements associated with unattended hosepipes and sprinklers, and offers advice on how customers might reduce the volume of water consumed when using these devices.

The Company is committed to keeping the public informed about a developing drought and, with the help of our customers, to reducing the demand for water as much as possible. Communication will take place via the Company website and through specific press releases and media campaigns.

Direct communication from our customers is processed by ECHO, South Staffordshire Water's sister company who manage our customer services contacts. Following the crossing of the drought monitoring trigger a briefing of ECHO staff will take place so that the most useful and up to date information on the potential drought can be available directly to our customers. This will include a list of frequently asked questions which will be updated as the drought progresses.

Once the apply for drought permit trigger curve is crossed the Company will intensify messages to customers, appealing for water saving. Media groups to be targeted may include:

Express & Star	Radio WM	Midlands Today	
Evening Mail	BRMB	Central TV	Birmingham Post
Heart FM	Walsall Advertiser	Beacon Radio	
Burton Mail	Sutton Observer	Lichfield Mercury	

An example of the type of message that the Company will deliver is provided in Appendix M. Similar messages will be repeated according to the severity of the drought.

Just before the Implement drought permit / order trigger is crossed at Blithfield or Clywedog the Company will implement a hosepipe and sprinkler ban. Notification of the ban will be targeted at the media groups listed above and on the Company website. An example of the notification for a ban is provided in Appendix N, with a cessation notice in Appendix O.

A similar communication process will take place if a further ban on non essential use is required.

### **9.4.3 Communication with the Environment Agency**

The Environment Agency will be contacted as the drought monitoring trigger curves are crossed, the water resources position will be discussed and regular fortnightly contact will continue if the drought develops. Reservoir refill predictions will be discussed and media messages will be coordinated where appropriate.

If the drought continued and reservoir storage levels were approaching the apply for drought permit curve, the Company will seek a meeting with the Environment Agency to discuss the potential drought permit applications.

All communication with the EA will be through the EA's drought coordinators.

These are:-

Regional Drought Coordinator  
Area Drought Coordinator (Upper Severn)  
Area Drought Coordinator (Upper Trent)

The regional Environment Agency office is at

Sapphire East  
550 Streetsbrook Road  
Solihull  
B91 1QT

The Environment Agency drought coordinators can be contacted during working hours through the general Environment Agency contact number.

Tel: 08708 506 506

#### **9.4.4 Communication with Severn Trent Water**

Communication between the Company and Severn Trent Water is described in section 5.5. Initial contact will be through the following position.

Chairman Drought Action Team

Severn Trent Water Ltd  
Severn Trent Headquarters  
2297 Coventry Road  
Birmingham  
B26 3PU

Tel: 0121 722 4000

#### **9.4.5 Communication with OFWAT**

The Company will inform OFWAT should it appear possible that drought conditions may present supply problems and / or the necessity for the introduction of demand restrictions.

OFWAT require notification to be sent to:

Head of Supply Demand Balance Team  
OFWAT  
Centre City Tower  
7 Hill Street  
Birmingham  
B5 4UA

Tel: 0121 625 1300

#### **9.4.6 Communication with the Drinking Water Inspectorate**

The Company will inform the DWI should it appear possible that drought conditions may present concerns to customers about the water quality of their supplies. The notification will be made by the Director of Water Quality in accordance with the requirements of the Information Direction 1998 (see DWI information letter 13/99). The DWI require notification to be made to the relevant inspector nominated for the specific event. The DWI can be contacted at;

DWI  
Ashdown House  
123 Victoria Street  
London  
SW1E 6DE

Tel: 020 7944 5974

#### **9.4.7 Communication via the Media**

Key external messages, press releases and Company statements will be handled in a consistent manner by the Company Media Team. This team is made up of a small selection of senior managers and directors, some of who will also be part of the Drought Management Team. The Media Team provides a network of communication within the Company that is particularly attuned to any issues that may require customer awareness. This team also acts as a response agent to external enquiries from the media and other interested parties and is available 24hrs a day. Internal procedures allow enquiries of this nature to be transferred directly to a member of the team allowing an efficient and appropriate response. The team has two tiers to allow contentious matters to be escalated to a Water Board Director for action.

##### **◆ First Tier Media Team**

Supply and Resources Director  
Director of Water Quality  
Director of Customer Services  
Support Services Director  
Head of Water Strategy  
Head of Underground Asset Management

##### **◆ Second Tier Media Team**

Managing Director  
Regulation and Asset Planning Director

The media team can be contacted during working hours at:

South Staffordshire Water PLC  
Green Lane  
Walsall  
WS2 7PD

Tel: 01922 638282

#### **9.4.8 The Detailed Communication Plan**

The above list of contacts is not meant to be completely comprehensive, and there will be other important contacts required depending on the specific circumstances of the drought in question. All of these stakeholders and the timing and nature of contacts are detailed in Appendix G.

#### **9.5 Drought Review**

Following a return to a normal resource position a de-brief session will be held after not more than 8 weeks. This session will reflect on actions taken, any positive or negative outcomes and any lessons learnt from the period. These will be formally recorded using the Drought Management Schedule in Appendix E. This information will then be used to further develop the next Drought Plan.

Feedback will be requested from key stakeholders so that any lessons learnt can be incorporated into subsequent plans.

The Company will also record any environmental data collected during the drought and any mitigation measures adopted (see section 7 Environmental Impact).



## **10 Drought Plan Development**

This Drought Plan provides a robust framework for managing droughts in future, however there are a few areas where uncertainties remain. These areas of uncertainty are discussed below.

### **10.1 The Consequences of an Environment Agency River Severn Drought Order**

The Environment Agency control rules for a drought on the River Severn are summarised in section 5.2 and details are included as Appendix D. Crossing of the apply for drought order curve at Clywedog will trigger the Environment Agency to apply for a drought order, which will enforce a 5% reduction in abstraction licences on the River Severn.

The Environment Agency has confirmed that it cannot force companies to implement hosepipe bans, and that it is up to the Companies how they will achieve a 5% reduction in abstraction once the drought order is in force.

During the spring of 2006 the Environment Agency publicly made requests for water companies in the south of England to impose a hosepipe ban. The Company believes that before a drought order is implemented there will be considerable pressure from both the Environment Agency and DEFRA for the implementation by South Staffordshire Water, and the other public water supply companies, of a resource zone or Company wide hosepipe ban to reduce demand and ensure a 5% reduction in abstraction.

Further clarification is required from the Environment Agency and DEFRA on the requirement for a hosepipe ban in such circumstances.

### **10.2 Conflict Between Environment Agency and Company Drought Orders**

One of the drought options that the Company has identified for the River Severn is a drought permit at Hampton Loade (described in section 7.4). This drought permit will allow abstraction over the existing licence constraints at times of river Regulation, and it could be in direct conflict to an Environment Agency drought order on the Severn, which will require a 5% reduction in abstraction.

In undertaking its statutory duties the Environment Agency has to balance the competing interests of the river environment, water companies, navigation interests, industry and agriculture. During severe droughts this balance becomes increasingly more difficult to manage. The Environment Agency recognises that in extreme drought situations they will have to give priority to ensuring that essential public water supplies can be met, whilst working together with water companies to minimise the effects of any resulting

environmental damage.

We have agreed with the Environment Agency that we will meet to discuss the potential conflicting nature of these permissions at an early stage during a drought. This will be important to ensure we manage proper use of water resources on the River Severn during a drought and both parties make appropriate, timely decisions. A meeting will be called when the drought monitoring trigger curve at Blithfield or the Clywedog reservoir alert curve is crossed, whichever the sooner.

### **10.3 The Impact of a Severn Trent Drought Permit at Trimpley**

Severn Trent Water have identified that they intend to include a potential drought permit at Trimpley as an option in their Draft Drought Plan. This option is similar to the potential drought permit at Hampton Loade, as it will allow abstraction over and above the current licence conditions, during river Regulation.

The Hampton Loade and Trimpley abstraction licences are also constrained by joint licence conditions. This means that if one Company applied for a drought permit to increase abstraction and the other Company did not, then it will be unclear what the revised licence limits were. Equally if one Company applied for a drought permit they will be required to implement a hosepipe ban. It is unclear whether a hosepipe ban will be required by both Companies under these circumstances.

### **10.4 Clarity Over Licence Conditions at Nethertown**

A re-examination of the Nethertown licence and the assumptions in the Wrapsim model have identified an issue with the current abstraction licence at Nethertown. Section 10A (7) of the Nethertown abstraction licence contains a clause which allows 90 MI/d of abstraction (up to a total of 9,000 MI/yr) for emergency purposes. One of the emergency conditions is defined as being when reservoir levels fall below 93.4m A.O.D (c.70% full)

A separate condition restricts the Nethertown abstraction to operation only when the flow at North Muskham on the River Trent is below 2650 MI/d.

These two conditions appear to be in conflict. We have sought clarification from the Environment Agency, however there is still a difference of interpretation between the company and the Agency. The Company is awaiting the completion of our WRAPSIM model updates before we can fully assess the impact of any potential changes to the interpretation of the licence, and its impact on deployable output.

The Wrapsim modelling undertaken for the Draft Drought Plan assumed that abstraction can take place when flows are below 2,650 MI/d at North Muskham, if storage at Blithfield is below 70%.

## **10.5 Drought Plan Review and Development**

The Company will review the plan annually and make any necessary amendments. An updated plan will be submitted to the Secretary of State if revisions of materiality are made. Irrespective of any annual amendments a complete review will be undertaken every 3 years.